

# BUDGET ESTIMATES FISCAL YEAR 2011

# FEDERAL AVIATION ADMINISTRATION

SUBMITTED FOR USE OF THE COMMITTEES ON APPROPRIATIONS

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#### **OVERVIEW**

#### Introduction

The FAA's mission is to operate and maintain the safest and most efficient air traffic control system in the world. Since aviation represents more than 5 percent of America's GDP, FAA and its mandate for safety and efficiency contribute to America's economic recovery.

Over the past several years, we have made real advancements in the safety and efficiency of the aviation system. Since 2001, there have been 93 million successful flights on U.S. commercial aircraft, safely carrying more than 6.5 billion passengers. The rate of commercial aviation fatalities and runway incursions continue to decline, with the number of serious runway incursions dropping 50 percent last year. In FY 2009, FAA also achieved all seven of its capacity goals, and the recent deployment of Automatic Dependent Surveillance-Broadcast (ADS-B) in the Gulf of Mexico is making the system even safer and more efficient. Recent aviation accidents, however, show that vigilance must be a watchword. And even with the downturn in aviation activity nationwide, delays can still be a major problem.

The FAA's FY 2011 budget is a fiscally responsible investment that will enable us to maintain our progress. Our budget contains limited discretionary increases and emphasizes cost efficiency in keeping with fiscal restraints outlined by the Administration. The budget will maintain our safety and capacity gains and allows us to execute our plans for controller and safety staffing, research and development, capital investment, and NextGen. Our investments in capital programs and in our highly capable workforce will enable us to be ready for a future marked by returning demand and changes in the industry.

Regardless of the complexity of the issues at hand, this budget recognizes that system safety continues to be our number one priority.

In the past four years, FAA has hired more than 5,500 air traffic controllers, ensuring the flexibility to meet the continuously changing traffic volumes and workload. As we continue to bring these new employees on board, we also continue to manage the process carefully to ensure that our trainees develop the skills they need to succeed and are hired in the places we need them. We are expanding our aviation safety workforce as well. The FY 2011 request maintains our critical Aviation Safety inspector staff increases from FY 2007—2010, while further increasing overall Aviation Safety staffing by 82 positions in FY 2011.

Even with this progress, safety and efficiency still need to advance in tandem. New technology is the answer, and that advance can come through NextGen, our blueprint for modernization. We continue to move forward aggressively with NextGen. Despite recent, temporary drops in air traffic levels, NextGen is needed to improve efficiency, create additional capacity, and provide enhancements to safety and environmental performance. NextGen ushers aviation into the satellite era. NextGen is **not** a single piece of equipment or a program or a system that will instantaneously transform the air transportation system. NextGen is an evolutionary process, and elements of it are already providing improvements for passengers and operators.

Given the scope of this undertaking, substantial investment is required now to achieve near-term and midterm deployment of mature technologies, develop and mature concepts for operational viability, and perform research to better define longer-term capabilities. When fully implemented, NextGen will allow aircraft to safely fly more closely together on more direct routes, reducing delays, and providing benefits for the environment and the economy through reductions in carbon emissions, fuel consumption, and noise. The FY 2011 budget request provides a total of \$1,143 million in support of NextGen, an increase of \$275 million over the amount enacted in FY 2010.

#### **Overview by Appropriation Account**

#### **Operations**

The FY 2011 request of \$9,793 million is an increase of \$443 million (4.7 percent) above the FY 2010 enacted level. This will fund salary increases for FAA employees, annualization of FY 2010 new hires, adjustments for inflation, and maintenance and operating costs of new National Airspace System (NAS) systems and equipment. Other major initiatives funded by the request include the NATCA arbitration settlement with air traffic controllers, required navigation performance routes and procedures to support NextGen, increased safety staffing, service center facility expansion, enhanced Information System Security protection, implementation of environmental and energy technologies, and increased staffing to improve safety and compliance of hazardous materials transportation. The request also incorporates base transfers to better align our resources with organizational functions.

The FAA's ten-year strategy for the air traffic control workforce calls for hiring a sufficient number of controllers to sustain the level of staffing needed to address projected traffic levels. The budget ensures that the right numbers of trained controllers are in the right place at the right time. Our goal is to limit the trainee ratio to no more than 35 percent of the total controller workforce, ensuring there are adequate numbers of fully-trained controllers in all facilities. On a per-operation basis, there are more Certified Professional Controllers (CPCs) on board today than in 2000.

The Aviation Safety organization will maintain a highly trained and proficient workforce as it transitions to a Safety Management System (SMS). The FY 2011 budget provides \$19 million to annualize the cost of new safety staff added in FY 2010 and \$4 million for 42 additional safety staff in FY 2011. The increase enables FAA to review additional applications for aeronautical products and parts and increase drug inspections. In addition, the FY 2011 budget request supports 40 additional positions that will analyze emerging risk, future hazards, and trends within the National Airspace System.

As part of our NextGen efforts, the budget includes a \$25 million increase to support Performance-Based Navigation. Under this initiative, FAA will design and implement new high–altitude, performance-based routes between ten major metropolitan areas. These routes will provide greater en route efficiency and flexibility to aircraft using them, and can now be deployed over the next three to four years rather than the originally planned six-to-eight years. The funding will also be used to develop new Terminal procedures that simplify operations in congested and closely-located airports in major metropolitan areas, including Chicago, Washington, Baltimore, Atlanta, and Denver. These procedures and associated airspace redesigns will lead to greater efficiencies when arriving at or departing from area airports. With this funding, the procedures will be developed in three-to-four years rather than the more typical four-to-six year timeframe.

The NAS continues to grow in size and complexity, with an average of 2,162 new pieces of equipment procured and fielded each year. Operations base funding is increased to include recurring operating costs of systems and equipment that were fielded in previous years. The budget request provides \$28.5 million for newly-commissioned systems that must be maintained in a highly reliable condition to achieve their projected safety and capacity benefits. A major system continuing to transfer to Operations in FY 2011 is the Airport Surface Detection Equipment Model X (ASDE-X), a system that provides seamless multi-sensor airport surveillance with identification and conflict alerting to air traffic controllers.

The FY 2011 Operations request also reflects \$22 million in new cost savings realized by the Air Traffic Organization and an additional \$8 million in administrative efficiencies achieved by the Aviation Safety organization. In addition to these savings, FAA is exploring the feasibility of implementing cost-saving ideas submitted as part of the President's SAVE award program.

#### Facilities & Equipment (F&E)

The FY 2011 budget allows FAA to meet the challenge of both maintaining the capacity and safety of the current NAS while keeping our comprehensive modernization and transformation efforts on track. The request of \$2,970 million is an increase of \$34 million (1.2 percent) above the FY 2010 enacted level. The F&E NextGen portfolio is \$1,023 million in FY 2011, a 30 percent increase above the FY 2010 enacted level.

A more detailed discussion of the NextGen effort is included later in this section. The remainder of our investment – \$1,947 million – will be in legacy areas, including aging infrastructure, power systems, information technology, navigational aids, and weather systems. In FY 2011, FAA plans to award one tower construction contract.

#### Research, Engineering & Development (RE&D)

The FY 2011 request of \$190 million is \$500 thousand below the FY 2010 RE&D enacted level. This funding is sufficient to continue our work in legacy research areas, including fire research and safety, propulsion and fuel systems, advanced materials research, and aging aircraft. In addition, the budget allows for a slight increase to the RE&D NextGen portfolio, which grows to \$77.5 million. This 7.6 percent increase over FY 2010 supports enhanced NextGen research and development efforts in the areas of air ground integration, weather in the cockpit, and environmental research for aircraft technologies, fuels, and metrics. A more detailed discussion of the NextGen effort is included later in this section.

#### **Grants-in-Aid for Airports**

Airports are an essential part of the aviation system infrastructure. Their design, structural integrity, and ongoing maintenance have a direct impact on safety, capacity, and efficiency. The FY 2011 request of \$3,515 million allows us to continue our focus on safety-related development projects, including runway safety area improvements, runway incursion reduction, aviation safety management, and improving infrastructure conditions.

The request provides programmatic increases in Personnel & Related Expenses to fully implement Safety Management Systems (SMS) in the Office of Airports, initiate a program to collect data on over 14,000 private airports, information technology maintenance and upgrades, engineering support, financial management and oversight, and ISO auditing. The budget also provides \$27.2 million for Airport Technology Research – an increase of \$4.7 million over FY 2010 – to support enhanced safety and pavement research efforts, and \$15 million for Airport Cooperative Research.

#### NextGen

The aviation sector will be an important factor in the nation's economic recovery. Building a new air traffic control system will help set the stage for economic growth. NextGen represents a wide-ranging transformation of the entire national air transportation system to meet future demand and support the economic viability of aviation while improving safety and protecting the environment. NextGen will change the way the air transportation system operates – reducing congestion, noise, and emissions, expanding capacity and improving the passenger experience. By increasing FAA's NextGen investments by \$275 million above the FY 2010 enacted level, the FY 2011 budget positions FAA to meet the future demand that will occur as the nation's economy improves.

As FAA lays the groundwork for this dramatic transformation, new technology and procedures are already being implemented to provide immediate benefits to operators. The rollout of Automatic Dependent Surveillance-Broadcast (ADS-B) continues, with controllers at the Houston Air Route Traffic Control Center now managing aircraft flying over the Gulf of Mexico with this safer, more efficient technology. Houston is the latest facility to utilize ADS-B, which gives pilots precise information on location, as well as possible weather problems. Before ADS-B was implemented in the Gulf, controllers were required to maintain a 120-mile separation between aircraft. The new technology shrinks that distance to only five nautical miles. The system also increases safety, as FAA can now precisely monitor thousands of daily helicopter flights that ferry workers to and from nearly 3,700 oil platforms. The Gulf of Mexico is the second major installation of ADS-B equipment in the U.S., following its successful introduction at Louisville International Airport. In 2010, ADS-B is expected to become operational at Philadelphia International Airport and in Juneau, Alaska, with nationwide availability by 2013.

Planned investments are aimed at delivering programs that will truly transform the NAS and deliver the definitive NextGen vision. Although the current system is the safest in the world, NextGen is needed to bring to air transportation the same twenty-first century processes that give operations in other industries

reliability, flexibility, and predictability. Step by step and procedure by procedure, we are increasing the integration between aircraft and ground-based technologies. The satellite era is well underway, and the aviation world is putting itself in position to use these capabilities to greatest benefit. The installation of certified avionics in the cockpit will be essential to realize NextGen capabilities and will require significant investment by aircraft operators.

The entire FY 2011 NextGen portfolio totals \$1,143 million distributed among F&E programs, Research, Engineering & Development, and Operations activities. Line-item details for each account are shown in the table below.

#### NextGen Programs (\$ in Thousands)

	FY 2009	FY 2010	FY 2011
	Actual	Enacted	Request
Facilities and Equipment (F&E)			
NextGen Network Enabled Weather (NNEW)	20,000	20,000	28,250
Data Communications for Trajectory Based Operations	28,800	46,700	153,300
Demonstrations and Infrastructure Development	28,000	34,602	27,000
NextGen – System Development	41,400	66,100	95,000
NextGen – Trajectory Based Operations	39,500	63,500	58,600
NextGen – Reduced Weather Impact	14,400	35,600	43,202
NextGen – High Density Arrivals/Departures	18,200	51,800	<i>57,</i> 000
NextGen – Collaborative ATM	27,700	44,641	<i>75,</i> 500
NextGen – Flexible Terminals and Airports	37,100	64,300	80,700
NextGen - Safety, Security and Environment	8,000	8,200	8,000
NextGen – Networked Facilities	15,000	24,000	35,000
System-Wide Information Management	43,043	56,548	92,000
ADS-B NAS Wide Implementation – Segment 1b	306,765	201,350	176,100
NAS Voice Switch	10,000	26,600	30,200
Collaborative ATM Technologies <sup>1</sup>	-	18,100	35,900
Activity 5 F&E PCBT - NextGen <sup>2</sup>	-	26,250	27,038
SubTotal F&E	637,908	788,290	1,022,790
Research, Engineering and Development (RE&D)			
NextGen – Wake Turbulence	7,370	7,605	10,685
NextGen – Air Ground Integration	2,554	5,688	10,614
NextGen — Self Separation	8,025	8,247	9,971
NextGen – Weather in the Cockpit	8,049	9,570	9,312
NextGen Environmental Research – Aircraft Technologies, Fuels and Metrics	16,050	26,509	20,600
NextGen – JPDO	14,466	14,407	14,292
NextGen Alternative Fuels - General Aviation	-	-	2,000
SubTotal RE&D	56,514	72,026	77,474
Operations			
NextGen Environmental/Noise/Congestion Studies (5 EOY/FTE)	-	1,665	1,681
NextGen Staffing (ATO 75 FTE)	-	5,000	12,083
NextGen - Environmental Performance (5 FTE)	704	725	747
Program, Models & Metrics (3 EOY/2 FTE)	-	-	3,019
Performance Based Navigation (ATO \$15M; AVS \$10M - 40 EOY/20 FTE)	-	-	25,000
SubTotal Operations	704	7,390	42,530
Total NextGen Programs	695,126	867,706	1,142,794

<sup>&</sup>lt;sup>1</sup> Beginning in FY 2010, funding for Collaborative ATM Technologies is included in the NextGen portfolio.

The FAA is moving forward with a dual-pronged approach for implementing NextGen. We are maximizing the use of untapped capabilities in today's aircraft and ground infrastructure, while working aggressively to develop and deploy new systems and procedures that will form a foundation for more transformative capabilities that will be delivered in the mid-term. This approach allows both government and industry to extract the greatest value from existing investments, while positioning the industry to gain exponential benefits in the mid-term and beyond.

 $<sup>^{2}</sup>$  Beginning in FY 2010, Activity 5 funding is included in the NextGen portfolio.

NextGen will provide significant benefits in terms of delay reduction, fuel savings, additional capacity, improved access, enhanced safety, and reduced environmental impact. Modeling just a portion of the NextGen capabilities, the FAA has estimated that NextGen would reduce delay by 35-40 percent by 2018 compared with what the system would experience without NextGen. The FAA is currently developing a detailed breakdown of the near- to mid-term NextGen benefits. This analysis will be completed in the near future, and updated annually.

Last year, FAA asked the RTCA to analyze NextGen mid-term implementation. The RTCA NextGen Mid-Term Implementation Task Force, comprised of 300 members of the aviation community, including representatives from commercial airlines, general aviation, the military, manufacturers, and airports, worked for seven months to produce a slate of recommendations published in a final report issued September 9, 2009. The Task Force achieved an unprecedented consensus among NAS users with regard both to what we should do in the near term to advance NextGen and how we can help establish a business case for users to equip their aircraft. We believe that it is important for us to respond positively to the task force, and to continue the collaboration we have established this year. The FY 2011 budget supports recommendations from the RTCA Task Force in the areas of surface tactical flows, runway access, metroplex, cruise, NAS access, integration ATM, and data communications.

This budget supports the broad initiatives outlined in FAA's upcoming NextGen Implementation Plan and the NAS Enterprise Architecture. These documents will provide a picture of NextGen near-term deliverables (through 2012) as well as targets for the mid-term (2013-2018).

#### Implementing DOT's Strategic Goals

#### Safety

The budget request supports Increased Safety, DOT and FAA's most important strategic objective. The FAA estimates approximately 53 percent of the agency's FY 2011 budget will be required to maintain and improve the agency's safety programs. Our efforts to improve operations have contributed to a safer aviation environment; our goal is to continue to improve safety.

FAA's day-to-day operations, along with four key programs, contribute toward a reduction in air transportation related deaths and injuries. These key programs include:

- Reduce Commercial and General Aviation Fatalities
- Reduce Runway Incursions (High Priority Performance Goal)
- Reduce Operational Errors, and
- Commercial Space Transportation

One major key to FAA's successful safety efforts is its work with stakeholders to engender their cooperation for the open reporting of safety concerns. Voluntary reporting of safety related events is one of the FY 2011 activities in support of *Reduce Commercial and General Aviation Fatalities*. Each group contributes to a safer airspace system through technology, communications, and its own unique expertise. In its safety oversight capacity, FAA works with stakeholders to establish their own safety management systems to identify potential risk areas and then works together to address these risks.

Recently, we hosted a "Call to Action" to identify immediate steps to strengthen and improve pilot hiring, training, and testing practices at airlines that provide regional service, as well as at our major air carriers. Participants agreed on best practices for pilot record checks, development of pilot mentoring programs, and reassessing rules for pilot flight and duty time to incorporate scientific research about fatigue. FAA and industry representatives agreed to hold as many as ten similar meetings throughout the country to ensure that every carrier and pilot union has the opportunity to commit to the actions and to identify additional best practices. FAA inspectors will assist in the implementation of these actions and evaluate their effectiveness.

The FAA places a high priority on initiatives to *Reduce Runway Incursions*, and will continue to implement recommendations that reduce their occurrence. These initiatives include enhanced runway and taxiway markings, improved lighting such as runway status lights, reduction of frangible equipment on the airports

surface, and improved driver training. The Runway Incursion Reduction Program remains a catalyst for acquisition of promising safety technologies that have reached a level of maturity appropriate for transition and implementation in the NAS.

In FY 2011, FAA will continue to evaluate and deploy runway status lights at airports. The deployment of runway status lights (RWSL) provides another layer of safety to help reduce runway incursions and provide a direct warning capability to flight crews and airport vehicle operators. The system software detects the presence and motion of aircraft and surface vehicles on or near the runways, illuminates red runway-entrance lights if the runway is unsafe for entry or crossing, and illuminates red takeoff-hold lights if the runway is unsafe for departure. The FAA expects to complete installation of RWSL at 22 major airports by the end of FY 2012.

The FY 2011 budget request will allow FAA to further promote safety in the rapidly developing *Commercial Space Transportation* industry. With more suborbital space tourism flights expected in 2011, FAA's challenge is to maintain this industry's spotless record. The agency also must ensure the availability of resources to handle the expected increases in licensing and permitting activity and the number of inspections and to ensure that safety oversight keeps pace with changes in the commercial space transportation environment.

To support another rapidly developing area of aviation, FAA will develop policies, procedures, and approval processes to enable operation of unmanned aircraft systems.

#### **Reduced Congestion**

FAA Operations works daily to reduce congestion throughout the National Airspace System. Additionally, three key programs contribute to meet new and growing demands for air transportation services through 2025 and beyond. These include:

- Increase NAS On-Time Arrivals
- Increase Average Daily Airport Capacity
- Sustain Adjusted Operational Availability

American Recovery and Reinvestment Act funding has provided resources used for grants and contracts in support of achieving increased NAS capacity, efficiencies and operational performance. Specific ARRA projects include improved navigation facilities and equipment, upgraded power systems, airport control towers, facility construction, safety enhancements and the rehabilitation of runways, taxiways and other infrastructure.

NextGen will continue to address today's constraints and comprehensively modernize and transform the air transportation system. The NextGen portfolio of investments focuses on the implementation and integration of key NextGen transformational technologies. The capabilities these technologies provide begin a shift of decision-making from the ground to the cockpit. These include: Automatic Dependent Surveillance-Broadcast (ADS-B), System Wide Information Management (SWIM), Data Communications, NextGen Network-Enabled Weather (NNEW), and NAS Voice Switch (NVS).

The FY 2011 budget request supports airspace redesign in key metropolitan areas, including Charlotte, Dallas, Denver, and Southern California. Redesign efforts in southern Nevada will provide short-term operational efficiencies and accommodate a potential future new airport. The request will also redesign airspace serving the Chicago metropolitan area; supporting two key airports and accommodating future airfield changes at O'Hare International Airport.

The FY 2011 budget request also supports terminal airspace redesign efforts which are essential in the delivery of increased capacity associated with the implementation of new runways. Terminal airspace optimization (mid-term) and redesign (long-term) projects are on-going across the United States. These efforts are underway for all major metropolitan areas and congested terminal areas servicing key airports, focusing on the airspace associated with the 35 Operations Evolution Plan (OEP) airports. When completed, these projects will reduce complexity, balance controller workload and reduce en-route flow constraints.

#### **Global Connectivity**

The FY 2011 budget request supports expanded global presence, training, and technical assistance to foreign aviation authorities and maintenance of aircraft certification work. Specifically, FAA's leadership presence will be increased by implementing the action plan developed for an Aviation Cooperation Program in Brazil, using the FAA's successful China and India models.

Through strategic activities in FY 2011, FAA will support safety programs and build mutually beneficial partnerships with civil aviation organizations in the Middle East, China, India and Latin America. The FAA will increase efforts to create and expand government-industry partnerships and strengthen the capabilities of regional aviation authorities and organizations through technical assistance and training. The agency will also continue to build and maintain bilateral and multilateral relationships, support FAA senior leadership in achieving United States objectives, and negotiate agreements that improve safety and efficiency worldwide.

The FAA provides direct or indirect assistance to over 100 countries around the world to help them improve their aviation systems. The United States is the largest contributor of technical and financial support to the International Civil Aviation Organization (ICAO), which represents 189 of the world's civil aviation authorities. While the worldwide air accident rate has improved over the last ten years, the rate is higher in parts of the world where major growth is forecast to occur over the next century. In this environment, FAA will work with our international partners to be able to ensure that the flying public is able to travel as safely and efficiently abroad as at home.

FAA will support safety programs and build mutually beneficial partnerships with civil aviation organizations in the Middle East, China, India and Latin America. The FAA will increase efforts to create and expand government-industry partnerships and use technical assistance and training to strengthen the capabilities of regional aviation authorities and organizations. The agency will also continue to build and maintain bilateral and multilateral relationships, support FAA senior leadership in achieving U.S. objectives, and negotiate agreements that improve safety and efficiency worldwide.

#### **Environmental Stewardship**

Improving environmental protection and addressing the energy challenge are vital elements to ensure continued United States air transportation viability and global leadership. The overarching environmental goal for NextGen is environmental protection that allows sustained aviation growth. Despite the downturn in aviation activity experienced in 2008 – 2009, environmental and energy pressures on the national and international aviation system remain and will continue to increase as growth in aviation activity returns. The primary environmental and energy issues that will significantly influence the future capacity and flexibility of the NAS are aircraft noise, air quality, global climate effects, energy availability, and water quality.

In FY 2011, FAA will initiate transition of maturing NextGen environmental and energy research and development to implementation. The budget request supports the implementation—through adoption into policies, standards, guidance, and operational programs—of environmental and energy research and development results/products in areas of new aircraft technologies and operational procedures, alternative fuels, advanced decision support models, evolving health and welfare targets and metrics.

The FAA is committed to managing aviation's growth while ensuring the health and welfare and climate impacts of aviation noise and air emissions are reduced. Through increased efforts on the Continuous Low Energy, Emissions and Noise (CLEEN) initiative, FAA will develop and mature clean and quiet technologies and advance alternative fuels. In FY 2011, we plan to conduct early demonstrations of two to four promising CLEEN technologies and alternative fuels. The Commercial Aviation Alternative Fuel Initiative (CAAFI) is moving forward to qualify and approve new aviation alternative fuels for operational use. A number of key tests to support approval of these new fuels will occur in 2011. These efforts build on already promising results, and move the agency closer to its goal of environmental protection that allows for sustained aviation growth.

The FY 2011 budget request supports identifying and exploring advances in communication, navigation and surveillance technology to advance aircraft arrival and departure, surface movements, and en route/oceanic procedures for reduced noise, fuel burn, and engine emissions. It also supports updating and enhancing the Voluntary Airport Low Emissions (VALE) Program so that airports located in non-attainment or

maintenance areas for National Ambient Air Quality Standards will have continued opportunities to reduce air emissions.

In addition, FAA is working to remove thousands of people from the 65 DNL (the energy-averaged sound level metric used by the aviation industry to determine the impact of noise) through ongoing noise compatibility efforts, which include the purchase and relocation of residences and businesses, the soundproofing of residences and buildings used for educational or medical purposes, the purchase and installation of noise barriers or monitors, recommended land use planning, and public outreach.

#### Security, Preparedness and Response

The FAA continues to ensure and promote aviation safety in support of national security and the national aerospace system. The FY 2011 budget request provides resources for critical infrastructure protection, emergency operations, contingency planning, and the safe transportation of hazardous materials in air commerce. In addition, FAA ensures FAA's critical information systems, networks, and administrative systems are protected from cyber-terrorism and malicious activities by hackers and other unauthorized personnel.

Aviation operations occur domestically and overseas 24 hours a day, and FAA must be able to respond to events in the air domain around the clock. The Operations budget request includes an increase in the Office of Security and Hazardous Materials for additional staffing that will provide on-site, immediate, decision-quality intelligence information to the FAA Administrator and Lines of Business outside of normal duty hours and, most notably, during a crisis or developing aviation security incident. The increased staffing will also help FAA meet requirements for personnel security investigations and reinvestigations of new hires and existing staff as well as enhance safety and compliance by all parties involved in transporting hazardous materials onboard passenger and cargo aircraft.

This budget serves to increase the reliability, availability, and integrity of the NAS, provide mission support and administrative information, and address other FAA information systems requirements. The budget request supports activities to remediate moderate vulnerabilities identified for FAA information systems that support Human Resources, Finance, Security/Safety, and Air Traffic services. In the last three to five years, FAA has focused on its high risk vulnerabilities. Beginning in 2011 and continuing into 2014, the focus is on remediating the moderate vulnerabilities. The request will cover contracts that will conduct information system assessments, certifications, recertifications, and risk mitigation activities. The funding will allow FAA to handle risks to its information systems sooner, which will save out-year dollars and prevent higher and more costly system vulnerabilities and remediations.

#### **Organizational Excellence**

The FY 2011 budget request ensures the success of FAA's mission through stronger leadership, a better-trained workforce, enhanced cost control measures, and improved decision-making based on reliable data. Key programs targeted to achieve results through successful management of our people and resources include:

- Human Resource Management
- Financial Management
- Information Technology
- Legal Counsel
- Procurement
- Administrative Services

The Aviation Safety organization will maintain a highly trained and proficient workforce as it transitions to a Safety Management System (SMS). Increases in the Aviation Safety workforce will enable FAA to review additional applications for aeronautical products and parts and increase drug inspections. In addition, the FY 2011 budget request supports additional positions that will analyze emerging risk, future hazards, and trends within the National Airspace System.

In additional to increases in the Aviation Safety workforce, FAA is taking steps to place the right number of controllers in the right place at the right time to maximize the safety and efficiency of the NAS. In the next

decade, FAA will continue to hire sufficient numbers to replace retiring controllers, and the FY 2011 budget request supports FAA's hiring and training plans.

The FAA strives to invest in high-performing programs and services that increase efficiencies. The agency is implementing its Real Property Asset Management Plan to ensure timely disposition of assets is measured by the number of days to process inactive assets.

The Organizational Excellence funding directly supports DOT's Major Acquisition measures, as well as DOT's performance measures for Major Federally Funded Infrastructure projects. The Government Accountability Office (GAO) removed FAA's air traffic control modernization program from the High Risk List because of the agency's progress over the last several years in keeping programs within budget, on schedule, and for meeting its performance measures and program commitments. The FY 2011 budget request supports continued efforts to manage our acquisitions responsibly so we deliver programs on time and on budget.

#### Cost Control and the President's SAVE Award

The FAA has operated a cost control and cost reduction program since 2005. Cost efficiencies have resulted from initiatives like strategic sourcing, consolidation of functions, and a reduction of contractor and overhead staff.

- Savings have averaged more than \$89 million per year over the last five years.
- For FY 2010, \$67 million in savings and cost avoidance activities are being implemented.

Many of the innovations proposed by employees through the President's SAVE Initiative mirror those of the cost control program and their feasibility is being explored in three phases.

Phase 1: The three most promising initiatives are proposed for more detailed analysis and possible implementation before the end of fiscal year 2011. See below.

Phase 2: The next most promising submissions (there are 78) will be referred to the appropriate FAA office for assessment of their feasibility and potential savings.

Phase 3: The remaining 70 submissions will be referred to the appropriate FAA office for assessment of their feasibility and potential savings.

#### **Proposed 2011 Cost Control Actions**

Administrative Space Reduction: The FAA has developed a coordinated plan to optimize its administrative space portfolio across its nine regions and Headquarters. The leases for regional service center facilities in Seattle, Fort Worth, and Atlanta expire between FY 2011 and FY 2013 and cannot be renewed. In addition, organizational realignment in the Air Traffic Organization and staffing increases in the Aviation Safety workforce have created a shortage of space in the three service centers mentioned above and underutilized space in the six remaining regional offices. The FAA has identified seven locations for moving staff and consolidating into existing administrative space that is projected to foster a gross savings of \$3 million in agency lease costs across all service centers. We are also consolidating space and terminating leases within our Headquarters portfolio. The cost savings are to be achieved by the close of fiscal year 2011.

**Decommission Unused Instrument Landing System:** For the last three years, the Philipsburg, PA Airport (PSB) has not been used and has had no NAS operations because the runways are identified as out of service. The FAA, however, continues to expend funds to support the Instrument Landing System (ILS) navigation facilities. The FAA will assess the feasibility of decommissioning and removing the ILS in order to avoid the costs of maintaining unused equipment.

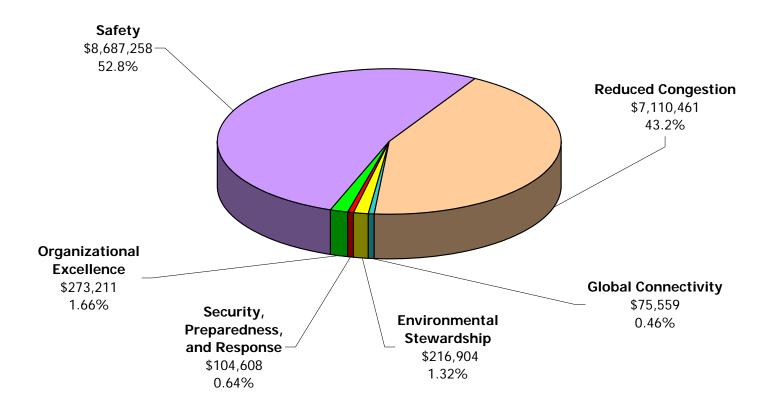
**Reduce Hours of Operation at Willow Run Air Traffic Control Tower:** The FAA will assess whether flight operations (i.e. take-offs and landings) at the airport in Ypsilanti, MI (and other similar facilities) support staffing the Air Traffic Control Tower for 24 hours/day seven days a week. If flight operations are

insufficient to justify this level of staffing, FAA will reduce the hours of operation thereby saving in personnel costs.

#### Conclusion

As the aviation industry and the Nation continue to face economic uncertainty, we must prepare for the future, and the future begins with responsible investments in capital and a highly capable workforce. Given the vital role aviation plays in the economy, our funding request is designed to support the demand for aviation-related services, making our aviation system ever safer, efficient and sustainable and moving us more rapidly toward realizing NextGen benefits.

### FY 2011 FAA Budget Request by Goal (\$000)



Note: The Strategic Goals in this pie chart reflect those identified in DOT's 2006 – 2011 Strategic Plan. DOT's new strategic plan will be released in FY 2010.

The source for the goal allocation in this chart is Exhibit IV-1 in the Performance Budget section. Discrepancies in goal allocation between Exhibit IV-1 and Exhibit II-3 are due primarily to differences in the methodology for aligning the traditional programs for F&E and R,E&D among goals, used for Exhibit II-3, and the new Logic Model approach used for Exhibit IV-3, which is based on redefined programs. The FAA plans to review these methodologies in the near future and will reconcile the differences in these two exhibits.

#### Exhibit I

#### FEDERAL AVIATION ADMINISTRATION

Office of the Administrator and Deputy Administrator

**Corporate Services** 

FY 2010 24 FTE/ 30 FTP FY 2011 24 FTE/ 30 FTP

#### Assistant Administrator for Regions and Center Operations

#### Safety

FY 2010 4 FTE/ 4 FTP FY 2011 0 FTE/ 0 FTP

#### **Reduced Congestion**

FY 2010 9 FTE/ 10 FTP FY 2011 0 FTE/ 0 FTP

#### **Global Connectivity**

FY 2010 4 FTE/ 4 FTP FY 2011 0 FTE/ 0 FTP

#### **Organizational Excellence**

FY 2010 29 FTE/ 32 FTP FY 2011 5 FTE/ 5 FTP

#### Corporate Services

FY 2010 781 FTE/ 883 FTP FY 2011 822 FTE/ 928 FTP

#### Total

FY 2010 827 FTE/ 933 FTP FY 2011 827 FTE/ 933 FTP

### Associate Administrator for Airports

#### Safety

FY 2010 166 FTE/ 173 FTP FY 2011 178 FTE/ 182 FTP

#### **Reduced Congestion**

FY 2010 282 FTE/ 283 FTP FY 2011 283 FTE/ 284 FTP

#### Global Connectivity

FY 2010 4 FTE/ 4 FTP FY 2011 4 FTE/ 4 FTP

#### **Environmental Stewardship**

FY 2010 82 FTE/ 82 FTP FY 2011 82 FTE/ 82 FTP

### Security, Preparedness, and Response

FY 2010 2 FTE/ 2 FTP FY 2011 2 FTE/ 2 FTP

#### Organizational Excellence

FY 2010 30 FTE/ 30 FTP FY 2011 35 FTE/ 40 FTP

#### Total

FY 2010 566 FTE/ 574 FTP FY 2011 584 FTE/ 594 FTP

### Associate Administrator for Aviation Safety

#### Safety

FY 2010 6,609 FTE/ 7,141 FTP FY 2011 7,217 FTE/ 7,562 FTP

#### **Reduced Congestion**

FY 2010 70 FTE/ 76 FTP FY 2011 48 FTE/ 51 FTP

#### **Global Connectivity**

FY 2010 209 FTE/ 226 FTP FY 2011 241 FTE/ 257 FTP

#### **Environmental Stewardship** FY 2010 70 FTE/ 76 FTP

FY 2010 70 FTE/ 76 FTP FY 2011 17 FTE/ 18 FTP

#### **Organizational Excellence**

FY 2010 418 FTE/ 452 FTP FY 2011 0 FTE/ 0 FTP

#### Total

FY 2010 7,376 FTE/ 7,971 FTP FY 2011 7,523 FTE/ 8,054 FTP

#### Air Traffic Organization

#### Safety

FY 2010 16,201 FTE/ 16,466 FTP FY 2011 21,715 FTE/ 21,916 FTP

#### Reduced Congestion

FY 2010 14,488 FTE/ 14,823 FTP FY 2011 12,454 FTE/ 12,687 FTP

#### **Global Connectivity**

FY 2010 42 FTE/ 43 FTP FY 2011 5 FTE/ 5 FTP

#### **Environmental Stewardship**

FY 2010 338 FTE/ 344 FTP FY 2011 40 FTE/ 42 FTP

#### Security, Preparedness, and

#### Response

FY 2010 26 FTE/ 28 FTP FY 2011 26 FTE/ 28 FTP

#### **Organizational Excellence**

FY 2010 4,549 FTE/ 4,631 FTP FY 2011 1,370 FTE/ 1,400 FTP

#### Total

FY 2010 35,644 FTE/ 36,335 FTP FY 2011 35,610 FTE/ 36,078 FTP

#### Total, FAA

FY 2010 46,485 FTE/ 48,026 FTP FY 2011 46,678 FTE/ 48,805 FTP

Note: The Strategic Goals in this organizational chart reflect those identified in DOT's 2006 – 2011 Strategic Plan. DOT's new strategic plan will be released in FY 2010.

Discrepancies in goal allocations between FY 2010 and FY 2011 levels are due to changes in the methodology for identifying, calculating and distributing indirect costs in the new Performance Planning Logic Model.

#### Exhibit I

#### FEDERAL AVIATION ADMINISTRATION

Office of the Administrator and Deputy Administrator

Corporate Services

FY 2010 24 FTE/30 FTP FY 2011 24 FTE/30 FTP

#### Assistant Administrator for Civil Rights

#### Corporate Services

FY 2010 85 FTE/90 FTP FY 2011 84 FTE/89 FTP

#### Assistant Administrator for Aviation Policy, Planning & Environment

#### Global Connectivity

FY 2010 OFTE/OFTP FY 2011 10 FTE/10 FTP

#### Environmental Stewardship

FY 2010 56 FTE/57 FTP FY 2011 55 FTE/59 FTP

#### Corporate Services

FY 2010 SS FTE/ S7 FTP FY 2011 54 FTE/56 FTP

#### Total

FY 2010 111 FTE/114 FTP FY 2011 114 FTE/120 FTP

#### Assistant Administrator for Government & Industry Affairs

#### Corporate Services

FY 2010 12 FTE/15 FTP FY 2011 12 FTE/15 FTP

#### Assistant Administrator for Security & Hazardous Materials

FY 2010 142 FTE/157 FTP FY 2011 355 FTE/432 FTP

#### Global Connectivity

FY 2010 OFTE/ÖFTP FY 2011 1 FTE/1 FTP

#### Security, Preparedness, and Response

FY 2010 342 FTE/377 FTP FY 2011 154 FTE/180 FTP

#### Corporate Services

FY 2010 OFTE/OFTP FY 2011 29 FTE/32 FTP

#### Total

FY 2010 484 FTE/534 FTP FY 2011 539 FTE/645 FTP

#### Office of the Chief Counsel

#### Corporate Services

FY 2010 279 FTE/288 FTP FY 2011 279 FTE/288 FTP

#### Assistant Administrator for Communications

#### Corporate Services

FY 2010 34 FTE/40 FTP FY 2011 34 FTE/40 FTP

#### Assistant Administrator for Human Resource Management

#### Organizational Excellence

FY 2010 114 FTE/113 FTP FY 2011 OFTE/ OFTP

#### Corporate Services

FY 2010 510 FTE/510 FTP FY 2011 628 FTE/628 FTP

#### Total

FY 2010 624 FTE/623 FTP FY 2011 628 FTE/627 FTP

#### Associate Administrator for Commercial Space Transportation

#### Safety

FY 2010 71 FTE/77 FTP FY 2011 45 FTE/52 FTP

#### Reduced Congestion

FY 2010 OFTE/ OFTP FY 2011 14 FTE/16 FTP

#### Global Connectivity FY 2010 OFTE/OFTP

FY 2011 3 FTE/ 3 FTP Environmental Stewardship

FY 2010 OFTE/ OFTP FY 2011 9 FTE/10 FTP

#### Total

FY 2010 71 FTE/ 77 FTP FY 2011 71 FTE/ 81 FTP

#### Assistant Administrator for International Aviation

#### Global Connectivity

FY 2010 65 FTE/69 FTP FY 2011 65 FTE/76 FTP

#### Assistant Administrator for Financial Services

#### Organizational Excellence

FY 2010 41 FTE/ 51 FTP FY 2011 6 FTE/ 6 FTP

#### Corporate Services

FY 2010 127 FTE/164 FTP FY 2011 162 FTE/209 FTP

FY 2010 168 FTE/215 FTP FY 2011 168 FTE/215 FTP

#### Assistant Administrator for Information Services

#### Security, Preparedness, and Response

FY 2010 95 FTE/ 98 FTP FY 2011 60 FTE/ 62 FTP

#### Organizational Excellence

FY 2010 20 FTE/ 21 FTP FY 2011 OFTE/ OFTP

#### Corporate Services

FY 2010 OFTE/ OFTP FY 2011 55 FTE/ 57 FTP

#### Total

FY 2010 115 FTE/119 FTP FY 2011 115 FTE/119 FTP

#### **EXHIBIT II-1**

# COMPARATIVE STATEMENT OF NEW BUDGET AUTHORITY FEDERAL AVIATION ADMINISTRATION (\$000)

	FY 2009 <u>ACTUAL*</u>	FY 2010 <u>ENACTED</u>	FY 2011 REQUEST
<u>ACCOUNTS</u>	ROTORE	<u> </u>	REGOLOT
Operations	\$9,046,167 **	\$9,350,028	\$9,793,000
Facilities and Equipment Recovery Act Supplemental (Non-Add)	\$2,942,095 \$200,000	\$2,936,203	\$2,970,000
Research, Engineering and Development	\$171,000	\$190,500	\$190,000
Grants-in-Aid for Airports			
Recovery Act Supplemental  AATF	\$1,100,000	\$0	\$0
Contract Authority	\$3,900,000	\$4,000,000	\$3,515,000
Rescission of contract authority	(\$93,200)	(\$394,000)	
Subtotal Grants-in Aid	\$4,906,800	\$3,606,000	\$3,515,000
Obligation Limitation	\$3,514,500	\$3,515,000	\$3,515,000
Overflight Fees	\$27,286	\$50,000	\$50,000
Overflight Fees (Transfer to EAS)	(\$27,286)	(\$50,000)	(\$50,000)
TOTAL:	\$17,066,062	\$16,082,731	\$16,468,000

<sup>\*</sup> Includes funding provided by the American Recovery and Reinvestment Act of 2009. This Act provided supplemental funding of \$200 million to Facilities & Equipment and \$1.1 billion to Grants-in-Aid for Airports.

<sup>\*\*</sup> Includes \$3.7 million transfer from the U.S. Department of State.

#### **EXHIBIT II-2**

# FY 2011 TOTAL BUDGETARY RESOURCES BY APPROPRIATION ACCOUNT FEDERAL AVIATION ADMINISTRATION Appropriations, Obligation Limitations, and Exempt Obligations (\$000)

<u>ACCOUNTS</u>	FY 2009 ACTUAL*	FY 2010 ENACTED	FY 2011 REQUEST
Operations	\$9,046,167	\$9,350,028	\$9,793,000
Air Traffic Organization (ATO)	7,098,322	7,299,299	7,630,628
Aviation Safety (AVS)	1,164,597	1,234,065	1,293,986
Commercial Space Transportation (AST)	14,094	15,237	15,747
Staff Offices	769,154 **	801,427	852,639
Facilities & Equipment	\$2,942,095	\$2,936,203	\$2,970,000
Engineering, Development, Test and Evaluation	345,100	520,742	708,552
Air Traffic Control Facilities and Equipment	1,768,290	1,581,244	1,377,892
Non-Air Traffic Control Facilities and Equipment	141,800	131,917	150,456
Facilities and Equipment Mission Support	226,405	232,300	241,100
Personnel and Related Expenses	460,500	470,000	492,000
Research, Engineering & Development	\$171,000	\$190,500	\$190,000
Improve Aviation Safety	90,763	93,572	93,702
Improve Efficiency	43,226	48,543	54,874
Reduce Environmental Impacts	31,658	42,031	35,974
Mission Support	5,353	6,354	5,450
Grants-in-Aid for Airports	\$4,614,500	\$3,515,000	\$3,515,000
Grants-in-Aid for Airports	4,482,498	3,378,106	3,372,575
Personnel & Related Expenses	89,654	93,422	100,208
Airport Technology Research	19,348	22,472	27,217
Small Community Air Service	8,000	6,000	0
Airport Cooperative Research Program (ACRP)	15,000	15,000	15,000
TOTAL:	\$16,773,762	\$15,991,731	\$16,468,000

<sup>\*</sup> Includes funding provided by the American Recovery and Reinvestment Act of 2009. This Act provided supplemental funding of \$200 million to Facilities & Equipment and \$1.1 billion to Grants-in-Aid for Airports.

 $<sup>\</sup>ensuremath{^{\star\,\star}}$  Includes \$3.7 million transfer from the U.S. Department of State.

### EXHIBIT II-3 FY 2011 REQUEST BY APPROPRIATION ACCOUNT AND STRATEGIC GOAL Federal Aviation Administration

Appropriations, Obligation Limitations, and Exempt Obligations (\$000)

PERFORMANCE MEASURES BY PROGRAM ACTIVITIES 1	<u>SAFETY</u>	REDUCED CONGESTION	GLOBAL CONNECTIVITY	ENVIRONMENTAL STEWARDSHIP	SECURITY, PREPAREDNESS & RESPONSE	ORG. EXCELLENCE	<u>TOTAL</u>
FY 2011 REQUEST							
OPERATIONS Air Traffic Organization (ATO)							
A. Reduce the Commercial Air Carrier Fatality Rate     B. Reduce the General Aviation Fatal Accident Rate     C. Increase NAS On-Time Arrival Rate at the 35 OEP	3,413,408 1,532,860						3,413,408 1,532,860
Airports D. Increase Average Daily Airport Capacity for the 35 OEP		1,334,536					1,334,536
Airports E. Expand the Use of NextGen Performance-Based		1,093,675					1,093,675
Systems or Concepts in Priority Countries F. Promote International Aviation Development			375				375
Projects G.FAA Activities Supporting the Achievement of DOT's Organizational Excellence Goals			763			255,010	255,010
Subtotal - ATO Aviation Safety (AVS)	4,946,268	2,428,211	1,138	0	0	255,010	7,630,628
A. Reduce the Commercial Air Carrier Fatality Rate     B. Reduce the General Aviation Fatal Accident Rate     C. Increase NAS On-Time Arrival Rate at the 35 OEP	1,036,897 202,992						1,036,897 202,992
Airports D. Promote International Aviation Development		8,488					
Projects E. Reduce Exposure to Significant Aircraft Noise			42,541	3,068			42,541 3,068
Subtotal - AVS Commercial Space Transportation (AST) A. Maintain Zero Commercial Space Transportation	1,239,889	8,488	42,541	3,068	0	0	1,293,986
Accidents  B. Increase Average Daily Airport Capacity for the 35 OEP	10,098						10,098
Airports C. Promote International Aviation Development		3,076					3,076
Projects D. Streamline the Completion of Environmental Reviews			555				555
for DOT-Funded Infrastructure Subtotal - AST	10,098	3,076	555	2,018 <b>2,018</b>	0	0	2,018 <b>15,747</b>
Information Services (AIO)  A. Security, Preparedness and Response Subtotal - AIO	0	0	0	0	27,636 <b>27,636</b>	0	27,636 <b>27,636</b>
Aviation Policy, Planning & Environment (AEP) A. Promote International Aviation Development			1 100				1 100
Projects B. Reduce Exposure to Significant Aircraft Noise Subtotal - AEP	0	0	1,182 <b>1,182</b>	7,847 <b>7,847</b>	0	0	1,182 7,847 <b>9,029</b>
International Aviation (API) A. Promote International Aviation Development				·			·
Projects Subtotal - API	0	0	18,938 <b>18,938</b>	0	0	0	18,938 <b>18,938</b>
Security and Hazardous Materials (ASH)  A. Reduce Serious Hazardous Material Incidents B. Promote International Aviation Development	62,929						62,929
Projects C. Security, Preparedness and Response			180		28,991		28,991
Subtotal - ASH Corporate Services	62,929	0	180	0	28,991	0	92,100
A. Reduce the Commercial Air Carrier Fatality Rate     B. Reduce the General Aviation Fatal Accident Rate	267,910 93,133						267,910 93,133
C. Reduce Serious Hazardous Material Incidents     D. Maintain Zero Commercial Space Transportation     Accidents	2,861 627						2,861 627
E. Increase NAS On-Time Arrival Rate at the 35 OEP Airports	027	102,097					102,097
F. Increase Average Daily Airport Capacity for the 35 OEP Airports		210,869					210,869
G. Promote International Aviation Development Projects			2,817				2,817
H. Expand the Use of NextGen Performance-Based Systems or Concepts in Priority Countries			392				392
Reduce Exposure to Significant Aircraft Noise     Increase Percentage of DOT Facilities Categorized as     No Further Remedial Action				9,665 35			9,665
K. Streamline the Completion of Environmental Reviews for DOT-Funded Infrastructure				115	4.00		115
L. Security, Preparedness and Response M.FAA Activities Supporting the Achievement of DOT's Organizational Excellence Goals					4,634	9,780	4,634 9,780
Subtotal - Corporate Services Subtotal Operations	364,530 6,623,715	312,966 2,752,741	3,209 67,744	9,815 22,748	4,634 61,262	9,780 264,790	704,935 9,793,000

# EXHIBIT II-3 FY 2011 REQUEST BY APPROPRIATION ACCOUNT AND STRATEGIC GOAL Federal Aviation Administration Appropriations, Obligation Limitations, and Exempt Obligations (\$000)

PERFORMANCE MEASURES BY PROGRAM ACTIVITIES 1	<u>SAFETY</u>	REDUCED CONGESTION	GLOBAL CONNECTIVITY	ENVIRONMENTAL STEWARDSHIP	SECURITY, PREPAREDNESS & RESPONSE	ORG. EXCELLENCE	<u>TOTAL</u>
FACILITIES AND EQUIPMENT							
Engineering, Development, Test and Evaluation  A. Reduce the Commercial Air Carrier Fatality Rate  B. Reduce the General Aviation Fatal Accident Rate	104,000 1,300						104,000 1,300
C. Increase Average Daily Airport Capacity for the 35 OEP Airports		577,252					577,252
D. FAA Activities Supporting the Achievement of DOT's Organizational Excellence Goals Subtotal - Engineering, Development, Test and						26,000	26,000
Evaluation	105,300	577,252	0	0	0	26,000	708,552
Air Traffic Control Facilities and Equipment A. Reduce the Commercial Air Carrier Fatality Rate B. Reduce the General Aviation Fatal Accident Rate	85,600 178,100						85,600 178,100
C. Increase NAS On-Time Arrival Rate at the 35 OEP Airports		56,400					56,400
D. Increase Average Daily Airport Capacity for the 35 OEP Airports		924,992					924,992
E. Increase Percentage of DOT Facilities Categorized as No Further Remedial Action				6,300			6,300
F. FAA Activities Supporting the Achievement of DOT's Organizational Excellence Goals G. Critical Acquisitions on Schedule H. Critical Acquisitions on Budget						94,100 16,200 16,200	94,100 16,200 16,200
Subtotal - Air Traffic Control Facilities and Equipment	263,700	981,392	0	6,300	0	126,500	1,377,892
Non-Air Traffic Control Facilities and Equiptment		,		-,		,	1,211,212
Reduce the Commercial Air Carrier Fatality Rate     Increase Percentage of DOT Facilities Categorized as	52,800						52,800
No Further Remedial Action C. Security, Preparedness and Response D. FAA Activities Supporting the Achievement of DOT's				20,000	49,156		20,000 49,156
Organizational Excellence Goals E. Critical Acquisitions on Schedule F. Critical Acquisitions on Budget Subtotal - Non-Air Traffic Control Facilities and						26,500 1,000 1,000	26,500 1,000 1,000
Equipment	52,800	0	0	20,000	49,156	28,500	150,456
Facilities and Equiptment Mission Support  A. Reduce the General Aviation Fatal Accident Rate  B. Increase NAS On-Time Arrival Rate at the 35 OEP	18,300						18,300
Airports C. Increase Average Daily Airport Capacity for the 35 OEP		119,300					119,300
Airports D. FAA Activities Supporting the Achievement of DOT's		2,600					2,600
Organizational Excellence Goals  Subtotal - Facilities and Equiptment Mission						100,900	100,900
Support	18,300	121,900	0	0	0	100,900	241,100
Personnel and Related Expenses  A. Reduce the Commercial Air Carrier Fatality Rate	48.128						48.128
B. Reduce the General Aviation Fatal Accident Rate C. Increase NAS On-Time Arrival Rate at the 35 OEP	39,253						39,253
Airports D. Increase Average Daily Airport Capacity for the 35 OEP		34,885					34,885
Airports E. Increase Percentage of DOT Facilities Categorized as		298,782					298,782
No Further Remedial Action F. Security, Preparedness and Response G. FAA Activities Supporting the Achievement of DOT's				5,222	9,760		5,222 9,760
Organizational Excellence Goals H. Critical Acquisitions on Schedule I. Critical Acquisitions on Budget						49,140 3,415 3,415	49,140 3,415 3,415
Subtotal - Personnel and Related Expenses Subtotal - Facilities and Equiptment	87,381 527,481		0		9,760 58,916	55,970 337,870	492,000 2,970,000

# EXHIBIT II-3 FY 2011 REQUEST BY APPROPRIATION ACCOUNT AND STRATEGIC GOAL Federal Aviation Administration Appropriations, Obligation Limitations, and Exempt Obligations (\$000)

PERFORMANCE MEASURES BY PROGRAM ACTIVITIES 1	<u>SAFETY</u>	REDUCED CONGESTION	GLOBAL CONNECTIVITY	ENVIRONMENTAL STEWARDSHIP	SECURITY, PREPAREDNESS & RESPONSE	ORG. <u>EXCELLENCE</u>	<u>TOTAL</u>
RESEARCH ENGINEERING AND DEVELOPMENT							
Improve Aviation Safety							
A. Reduce the Commercial Air Carrier Fatality Rate Subtotal - Improve Aviation Safety	93,702 <b>93,702</b>	0	0	0	0	0	93,702 <b>93,702</b>
Improve Efficiency	70,702	Ü	ŭ	· ·	Ü	ŭ	75,702
A. Increase NAS On-Time Arrival Rate at the 35 OEP  Airports		54,874					E4 074
Airports Subtotal - Improve Efficiency	0	54,874 <b>54,874</b>	0	0	0	0	54,874 <b>54,874</b>
Reduce Environmental Impacts							
Reduce Exposure to Significant Aircraft Noise     Subtotal - Reduce Environmental Impacts	0	0	0	35,974 <b>35,974</b>	0	0	35,974 <b>35,974</b>
Mission Support	Ū	Ü	ŭ	33,774	· ·	ŭ	33,774
A. Reduce the Commercial Air Carrier Fatality Rate	2,685						2,685
B. Increase NAS On-Time Arrival Rate at the 35 OEP Airports		1.702					1.702
C. Reduce Exposure to Significant Aircraft Noise		1,702		1,063			1,063
Subtotal - Mission Support	2,685	1,702	0	1,063	0	0	5,450
Development	96,387	56,576	0	37,037	0	0	190,000
GRANTS-IN-AID FOR AIRPORTS Grants-in-Aid for Airports							
A. Reduce the Commercial Air Carrier Fatality Rate	570,210						570,210
B. Reduce the General Aviation Fatal Accident Rate C. Increase Average Daily Airport Capacity for the 35 OEP	808,723						808,723
Airports		1,582,265					1,582,265
D. Reduce Exposure to Significant Aircraft Noise E. Streamline the Completion of Environmental Reviews				277,255			277,255
for DOT-Funded Infrastructure				43,341			43,341
F. Security, Preparedness and Response	4 070 000	4 500 0/5		200 50/	90,781		90,781
Subtotal - Grants-in-Aid for Airports Personnel & Related Expenses	1,378,933	1,582,265	0	320,596	90,781	0	3,372,575
A. Reduce the Commercial Air Carrier Fatality Rate	21,594						21,594
B. Reduce the General Aviation Fatal Accident Rate C. Increase Average Daily Airport Capacity for the 35 OEP	16,163						16,163
Airports D. Promote International Aviation Development		32,800					32,800
Projects			402				402
E. Reduce Exposure to Significant Aircraft Noise F. Streamline the Completion of Environmental Reviews				8,600			8,600
for DOT-Funded Infrastructure G. Security, Preparedness and Response				3,584	1,732		3,584 1,732
H. FAA Activities Supporting the Achievement of DOT's					1,732		1,732
Organizational Excellence Goals						11,016	11,016
Major Infrastructure Projects on Schedule     J. Major Infrastructure Projects on Budget						2,158 2,158	2,158 2,158
Subtotal - Personnel & Related Expenses Airport Technology Research	37,758	32,800	402	12,184	1,732	15,332	100,208
A. Reduce the Commercial Air Carrier Fatality Rate	17,424						17,424
B. Reduce the General Aviation Fatal Accident Rate C. Increase Average Daily Airport Capacity for the 35 OEP	429						429
Airports	47.050	9,364			•		9,364
Subtotal - Airport Technology Research Airport Cooperative Research	17,853	9,364	0	0	0	0	27,217
A. Reduce the Commercial Air Carrier Fatality Rate B. Increase Average Daily Airport Capacity for the 35 OEP	5,000						5,000
Airports		5,000		F 600			5,000
C. Reduce Exposure to Significant Aircraft Noise Subtotal - Airport Cooperative Research	5,000	5,000	0	5,000 <b>5,000</b>	0	0	5,000 <b>15,000</b>
Subtotal - Grants-in-Aid for Airports	1,439,544	1,629,428	402	337,781	92,513	15,332	3,515,000
TOTAL REQUEST	8,687,126	6,452,956	68,145	429,088	212,691	617,993	16,468,000

<sup>&</sup>lt;sup>1</sup> The Strategic Goals in this exhibit reflect those identified in DOT's 2006 – 2011 Strategic Plan. DOT's new strategic plan will be released in FY 2010.

Discrepancies between goal allocation in Exhibit II-3 and Exhibit IV-1 are due primarily to differences in the methodology for aligning the traditional programs for F&E and R,E&D among goals, used for Exhibit II-3, and the new Logic Model approach used for Exhibit IV-3, which is based on redefined programs. The FAA plans to review these methodologies in the near future and will reconcile the differences in these two exhibits.

# EXHIBIT II-4 FY 2011 BUDGET AUTHORITY BY APPROPRIATIONS ACCOUNT FEDERAL AVIATION ADMINISTRATION (\$000)

<u>ACCOUNTS</u>	Mandatory/ <u>Discretionary</u>	FY 2009 <u>ACTUAL*</u>	FY 2010 ENACTED	FY 2011 REQUEST
Operations	D	\$9,046,167	\$9,350,028	\$9,793,000
General		\$3,808,162 **	\$5,350,028	\$3,729,000
AATF		\$5,238,005	\$4,000,000	\$6,064,000
Facilities & Equipment (AATF)	D	\$2,942,095	\$2,936,203	\$2,970,000
General		\$200,000	\$0	\$0
AATF		\$2,742,095	\$2,936,203	\$2,970,000
Research, Engineering &				
Development (AATF)	D	\$171,000	\$190,500	\$190,000
AATF		\$171,000	\$190,500	\$190,000
Grants in Aid for Airports (AATF)		\$4,906,800	\$3,606,000	\$3,515,000
General	D	\$1,100,000	\$0	\$0
AATF				
Contract Authority	М	\$3,900,000	\$4,000,000	\$3,515,000
Rescission	M	(\$93,200)	(\$394,000)	\$0
Overflight Fees	М	\$27,286	\$50,000	\$50,000
Overflight Fees (transfer to EAS)	M	(\$27,286)	(\$50,000)	(\$50,000)
TOTAL:		\$17,066,062	\$16,082,731	\$16,468,000
[Mandatory]		\$3,806,800	\$3,606,000	\$3,515,000
[Discretionary]		\$13,259,262	\$12,476,731	\$12,953,000
[General]		 \$5,108,162	\$5,350,028	\$3,729,000
[AATF]		\$3,108,162 \$11,957,900	\$5,350,026 \$10,732,703	\$12,739,000
[ההו ]		Ψ11,737,700	Ψ10,132,103	Ψ12,137,000

<sup>\*</sup> Includes funding provided by the American Recovery and Reinvestment Act of 2009. This Act provided supplemental funding of \$200 million to Facilities & Equipment and \$1.1 billion to Grants-in-Aid for Airports.

<sup>\*\*</sup> Includes \$3.7 million transfer from the U.S. Department of State.

#### **EXHIBIT II-5**

#### FY 2011 OUTLAYS BY APPROPRIATIONS ACCOUNT FEDERAL AVIATION ADMINISTRATION (\$000)

	FY 2009 <u>ACTUAL*</u>	FY 2010 ENACTED	FY 2011 REQUEST
Operations	\$8,999,723	\$9,720,545	\$9,739,840
General	\$3,761,718	\$5,720,545	\$3,675,840
AATF	\$5,238,005	\$4,000,000	\$6,064,000
Facilities & Equipment General	\$2,462,548	\$2,828,916	\$3,041,178
-Discretionary	\$2,462	\$87,769	\$109,769
AATF	\$2,460,086	\$2,741,147	\$2,931,409
-Discretionary	\$2,447,086	\$2,741,147	\$2,918,409
-Mandatory	\$13,000	\$28,000	\$13,000
Aviation Insurance Revolving Account (M)	(\$175,000)	(\$187,000)	(\$191,000)
Research, Engineering (TF) & Development	\$143,476	\$188,190	\$208,666
Grants-in-Aid for Airports General	\$4,055,479	\$3,978,622	\$3,605,692
-Discretionary	\$179,022	\$590,989	\$219,989
-Discretionary	\$3,876,456	\$3,387,633	\$3,385,703
Franchise Fund	(\$67,000)	\$121,000	\$4,000
TOTAL: [Mandatory]	\$15,419,226 (\$162,000)	<b>\$16,650,274</b> (\$159,000)	\$16,408,376 (\$178,000)
[Discretionary]	\$15,581,226	\$16,809,274	\$16,586,376

<sup>\*</sup> Includes funding provided by the American Recovery and Reinvestment Act of 2009. This Act provided supplemental funding of \$200 million to Facilities & Equipment and \$1.1 billion to Grants-in-Aid for Airports.

#### EXHIBIT II-6

## SUMMARY OF REQUESTED FUNDING CHANGES FROM BASE FEDERAL AVIATION ADMINISTRATION Appropriations, Obligation Limitations, and Exempt Obligations (\$000)

#### **OPERATIONS**

	FY 2010 Enacted	2010 PC&B By Program	2010 # FTE Per Program	2010 Contracts Expenses	Annualization of FY 2010 Hiring	Annualization of 2010 Pay Raises	2011 Pay Raises	WCF Increase/ Decrease	Inflation/ Deflation	FY 2011 Adjusted Base	Program Increases/ Decreases	2011 PC&B Program Increase	2011 # FTE Per Program Increase	2011 Contract Expense Program Increases	FY 2011 Request
DEDCOMMEN DESCRIPCION (FTF.)		N	lote Non-Add										Note Non-Add	l	
PERSONNEL RESOURCES (FTE) Direct FTE	42,643				202					40.047	(04)				40.045
DIFECT FTE	42,643				203					42,846	(31)				42,815
FINANCIAL RESOURCES															
ADMINISTRATIVE EXPENSES															
Salaries and Benefits	\$6,448,521	\$6,448,521			\$28,693	\$59.043	\$146,909			6,683,166	\$128,048	\$0			\$6,811,214
Travel	\$179,008	\$0,440,321			\$20,073	457,043	\$140,707		\$2,449	181,457	\$120,040				\$181,457
Transportation	\$22,503				<del>-</del>				\$113	22,616	\$0				\$22,616
GSA Rent	\$124,654				<del>-</del>				\$1,836	126,490					\$126,490
Rental Payments to Others	\$35,068	<del></del>			<del>-</del>				\$498	35,566					\$35,566
Communications, Rent & Utilities	\$311,338				<del>-</del>				(\$17.876)	293,462	\$20,000				\$313,462
Printing	\$6,244				<del>-</del>				\$165	6,409	\$0				\$6,409
Other Services:	40,2	·· <mark></mark>			<del>-</del>				V.00	0,107					φο, το γ
-WCF	\$30.864			\$30.864	<del>-</del>			\$1.030		31.895					\$31.895
-Advisory and Assistance Services	\$473,541	·· <mark></mark>		\$473,541	<del>-</del>			ψ.,σσσ	\$3,720	477,261					\$477,261
-Other	\$1,445,443			\$1,445,443	<del>-</del>				\$2,286	1,447,729	\$45,771	\$0	\$0	\$0	\$1,493,500
Supplies	\$153,464			<b>4</b> 171107110	<del>-</del>				\$1,159	154,623	\$0				\$154,623
Equipment	\$101,812				<del>-</del>				\$21,103	122,915	\$0				\$122,915
Lands and Structures	\$9,148	·· <mark></mark>			<del>-</del>				\$60	9,208					\$9.208
Grants, Claims and Subsidies	\$5,358	·· <mark></mark>			<del>-</del>				\$0	5,358					\$5,358
Insurance Claims and Indemnities	\$2,105	·· <mark></mark>			<del>-</del>				(\$1,500)	605					\$605
Interest and Dividends	\$957	·· <mark></mark>							(\$535)	422					\$422
Admin Subtotal	\$9,350,028	\$6,448,521	\$0	\$1,949,848	\$28,693	\$59,043	\$146,909	\$1,030	\$13,478	\$9,599,181	\$193,819	\$0	\$0	\$0	\$9,793,000
PROGRAMS															
Air Traffic Organization (ATO)	\$7,299,299	\$5,105,197	\$0	\$1,545,461	\$9,738	\$45,771	\$108,339	(\$915)	\$10,971	\$7,473,204	\$157,424				\$7,630,628
Aviation Safety (AVS)	\$1,234,065	\$972,451	\$0	\$154,926	\$18,955	\$9,803	\$23,855	\$475	\$1,308	\$1,288,461	\$5,525				\$1,293,986
Commercial Space Transportation (AST)	\$15,237	\$10,122	\$0	\$4,104	\$0	\$138	\$346	\$0	\$26	\$15,747	\$0				\$15,747
Staff Offices	\$801,427	\$360,751	\$0	\$245,357	\$0	\$3,331	\$14,369	\$1,470	\$1,173	\$821,770	\$30,870				\$852,639
Programs Subtotal	\$9,350,028	\$6,448,521	\$0	\$1,949,848	\$28,693	\$59,043	\$146,909	\$1,030	\$13,478	\$9,599,180	\$193,819	\$0	\$0	\$0	\$9,793,000
GRAND TOTAL	\$9.350.028	\$6.448.521	90	\$1,949,848	\$28.693	\$59.043	\$146.909	\$1,030	\$13,478	\$9,599,180	\$193.819	\$0	\$0	\$0	\$9,793,000

#### **EXHIBIT II-6**

# SUMMARY OF REQUESTED FUNDING CHANGES FROM BASE FEDERAL AVIATION ADMINISTRATION Appropriations, Obligation Limitations, and Exempt Obligations (\$000)

#### **FACILITIES & EQUIPMENT**

	2010 Enacted	2010 PC&B By Program	2010 # FTE Per Program	2010 Contracts Expenses	Annualization of FY 2010 Hiring	Annualization of 2010 Pay Raises	2011 Pay Raises		WCF Increase/ t Decrease	Inflation/ Deflation	FY 2011 Adjusted Base	Program Increases/ Decreases	2011 PC&B Program Increase	2011 # FTE Per Program Increase	2011 Contract Expense Program Increases	FY 2011 Request
			Note Non-Add											Note Non-Add	i	
PERSONNEL RESOURCES (FTE)	<u>3,023</u>															
Direct FTE	2,968										2,968	0				2,968
Reimbursable FTE	55										55	0				55
FINANCIAL RESOURCES																
ADMINISTRATIVE EXPENSES																
Salaries and Benefits	\$425,013	\$425,013				\$5.068	\$14.663				\$444,744	\$0	\$0			\$444,744
Travel	\$35,126									\$176	\$35,302	\$2,043				\$37,345
Transportation	\$3,073									\$15	\$3,088	\$0				\$3,088
GSA Rent	\$0										\$0					\$0
Rental Payments to Others	\$33,929									\$170	\$34,099					\$34,099
Communications, Rent & Utilities	\$40,576									\$203	\$40,779	\$0				\$40,779
Printing	\$743									\$4	\$747	\$0				\$747
Other Services:	\$1,862,108									\$9,311	\$1,871,419	(\$533)				\$1,870,886
-WCF	\$0									Ψ,,ο	\$0	(\$000)				\$0
-Advisory and Assistance Services	\$0										\$0					\$0
-Other	\$0										\$0	\$0	\$0	\$0	\$0	\$0
Supplies	\$42,660									\$213	\$42,873	\$0				\$42,873
Equipment	\$309,826									\$1,549	\$311,375	\$0				\$311,375
Lands and Structures	\$177,575									\$888	\$178,463					\$178,463
Grants, Claims and Subsidies	\$5.574									\$28	\$5,602					\$5,602
Insurance Claims and Indemnities	\$0,574									Ψ20	\$0					\$0
Interest and Dividends	\$0										\$0					\$0 \$0
Admin Subtotal	\$2,936,203	\$425,013	0	\$0	\$0	\$5,068	\$14,663	\$0	\$0	\$12,556	\$2,968,490	\$1,510	\$0	0	\$0	\$2,970,000
PROGRAMS																
Engineering, Development, Test and																
Evaluation	\$520,742				-					\$3,606	\$524,348	\$184,204				\$708,552
Air Traffic Control Facilities and Equipment	\$1,581,244				-					\$6,892	\$1,588,136	(\$210,244)				\$1,377,892
Non-Air Traffic Control Facilities and																
Equipment	\$131,917				- 					\$707	\$132,624	\$17,832				\$150,456
Facilities and Equipment Mission Support	\$232,300				- 					\$1,125	\$233,425	\$7,675				\$241,100
Personnel & Related Expenses	\$470,000	\$425,013				\$5,068	\$14,663			\$226	\$489,957	\$2,043				\$492,000
Programs Subtotal	\$2,936,203	\$425,013		\$0	\$0	\$5,068	\$14,663	\$0	\$0	\$12,556	\$2,968,490	\$1,510				\$2,970,000
GRAND TOTAL	\$2,936,203	\$425,013	\$0	\$0	\$0	\$5,068	\$14,663	\$0	\$0	\$12,556	\$2,968,490	\$1,510	\$0	\$0	\$0	\$2,970,000

### Federal Aviation Administration FY 2011 OMB Budget Submission

### EXHIBIT II-6 SUMMARY OF REQUESTED FUNDING CHANGES FROM BASE

### FEDERAL AVIATION ADMINISTRATION Appropriations, Obligation Limitations, and Exempt Obligations (\$000) RESEARCH, ENGINEERING, & DEVELOPMENT

	2010 Request		2010 FTE by Program Note Non-Add	2010 Contracts Expenses	Annualization of 2010 Hiring	Annualization of 2010 Pay Raises	2011 Pay Raises	GSA Rent	WCF Increase/ Decrease	Inflation/ Deflation	FY 2010 Adjusted Base	Program Increases/ Decreases	2011 PC&B Program Increase	2011 # FTE Per Program Increase	Expense Program Increase	FY 2011 Request
PERSONNEL RESOURCES (FTE)			Note Non Add											Note Non Add		
Direct FTE	308										308			3		<u>311</u>
FINANCIAL RESOURCES																
Salaries and Benefits	\$42,284	\$42,284	308			\$260	\$1,281				\$43,825	\$65	\$65	3		\$43,890
Benefits for Former Personnel	\$0	ψ 12/20 T			<del>-</del>		V.,20.				\$0			<u>~</u>		\$0
Travel	\$2.564										\$2,564	\$261				\$2,825
Transportation	\$51										\$51	\$15				
GSA Rent	\$0										\$0					\$66 \$0 \$0
Rental Payments to Others	\$0										\$0					\$0
Communications, Rent & Utilities	\$149										\$149	(\$15)				\$134
Printing	\$129										\$129	(\$81)				\$48
Other Services:	\$0										\$0					\$0
-WCF	\$0										\$0					\$0 \$0
-Advisory and Assistance Services	3															
<b>,</b>	\$0										\$0					\$0
-Other	\$117,317			\$117,317						\$212	\$117,529	(\$1,182)			(\$1,182)	\$116,347
Supplies	\$1,560										\$1,560	\$207				\$1,767
Equipment	\$1,618										\$1,618	(\$495)				\$1,123
Lands and Structures	\$0										\$0					\$0 \$23,800
Grants, Claims & Subsidies	\$24,828										\$24,828	(\$1,028)				\$23,800
Insurance Claims and Indemnities	\$0										\$0					\$0
Interest & Dividends	\$0										\$0					\$0
Admin Subtotal	\$190,500	\$42,284	308	\$117,317	\$0	\$260	\$1,281	\$0	\$0	\$212	\$192,253	(\$2,253)	\$65	3	(\$1,182)	\$190,000
PROGRAMS					_											
Improve Aviation Safety	\$93,572	\$31,682	234	\$48,152		\$195	\$958			\$161	\$94,886	(\$1,184)			\$397	\$93,702
Improve Aviation Efficiency	\$48,543	\$4,611	22	\$35,953		\$32	\$160			\$25	\$48,760	\$6,114	\$22	1	\$5,425	\$54,874
Reduce Environmental Impact	\$42,031	\$3,272	32	\$30,015		\$19	\$94			\$15	\$42,159	(\$6,185)	\$43	2	(\$6,100)	\$35,974
Mission Support	\$6,354	\$2,719	20	\$3,197		\$14	\$69			\$11	\$6,448	(\$998)			(\$904)	\$5,450
Programs Subtotal	\$190,500	\$42,284	308	117,317	\$0	\$260	\$1,281	\$0	\$0	\$212	\$192,253	(\$2,253)	\$65	3	(\$1,182)	\$190,000
GRAND TOTAL	\$190,500	\$42,284	308	\$117,317	\$0	\$260	\$1,281	\$0	\$0	\$212	\$192,253	(\$2,253)	\$65	3	(\$1,182)	\$190,000

### ${\bf EXHIBIT~II-6} \\ {\bf SUMMARY~OF~REQUESTED~FUNDING~CHANGES~FROM~BASE} \\$

#### FEDERAL AVIATION ADMINISTRATION Appropriations, Obligation Limitations, and Exempt Obligations (\$000)

#### GRANTS-IN-AID FOR AIRPORTS

		2010 PC&B by	2010 FTE by	2010 G	Annualization of				WCF Increase/	Inflation/	FY 2011	Program Increases/Decrea	2011 PC&B Program		2011 Contract Expense Progra	
	2010 Enacted	Program	Program	Expenses	2010 Hiring	2010 Pay Raises	2011 Pay Raises	GSA Rent	Decrease	Deflation/	Adjusted Base		Increase	Program Increase		FY 2011 Request
	2010 Enacted	Trogram	Note Non-Add	Expenses	2010 III ilig	2010 Lay Kaises	2011 Lay Raises	GDA Rent	Decrease	Denation	Aujusteu Dase	303	Increase	Note Non-Add		TT 2011 Request
PERSONNEL RESOURCES (FTE)																
Direct FTE	566				8						574	. 10				584
FINANCIAL RESOURCES																
Salaries and Benefits	\$78,131	\$78,131	566.0		\$1,229	\$391	\$1,418				\$81,168	\$1,720	\$1,720			\$82,889
Benefits for Former Personnel	\$0										\$0					\$0
Travel	\$4,803									\$24	\$4,827					\$4,827
Transportation	\$121									\$1	\$122					\$122
GSA Rent	\$0									\$0	\$0					\$0
Rental Payments to Others	\$566									\$3	\$568					\$568
Communications, Rent & Utilities	\$137									\$1	\$138					\$138
Printing	\$71									\$0	\$71					\$71
Other Services:	\$0										\$0	1				\$0
-WCF	\$0									\$0	\$0	)				\$0
-Advisory and Assistance Services	\$0									\$0	\$0	1				\$0
-Other	\$42,950			\$42,950						\$49	\$42,999	\$6,675			\$6,67	5 \$49,674
Supplies	\$1,220									\$6	\$1,226					\$1,227
Equipment	\$2,895									\$14	\$2,909					\$2,909
Lands and Structures	\$0										\$0	)				\$0
Grants, Claims and Subsidies	\$3,384,106										\$3,384,106	(\$11,531)				\$3,372,575
Insurance Claims and Indemnities	\$0										\$0	1				\$0
Interest & Dividends	\$0										\$0	)				\$0
Admin Subtotal	\$3,515,000	\$78,131	566.0	\$42,950	\$1,229	\$391	\$1,418	\$0	\$0	\$98	\$3,518,137	(\$3,136)	\$1,720	\$0	\$6,67	5 \$3,515,000
PROGRAMS																
Grants-in-aid for Airports	\$3,378,106	\$0	0.0	\$0							\$3,378,106	(\$5,531)				\$3,372,575
Personnel and Related Expenses	\$93,422	\$74,518	542.5	\$10,525	\$1,152	\$373	\$1,319			\$94	\$96,360	\$3,848				\$100,208
Airport Technology Research	\$22,472	\$3,442	22.5	\$17,646	\$78	\$17	\$94			\$96	\$22,756	\$4,461				\$27,217
Airport Cooperative Research	\$15,000	\$171	1.0	\$14,779		\$1	\$5			(\$92)	\$14,916	\$86				\$15,000
Small Community Airport Service	\$6,000	\$0	0.0	\$0							\$6,000	(\$6,000)				\$0
Programs Subtotal	\$3,515,000	\$78,131	\$566	\$42,950	\$1,229	\$391	\$1,418	\$(	\$0	\$98	\$3,518,137	(\$3,136)				\$3,515,000
-																
GRAND TOTAL	\$3,515,000				\$1,229	\$391	\$1,418	\$0	\$0	\$98		(\$3,136)				\$3,515,000

#### **EXHIBIT II-7**

# WORKING CAPITAL FUND FEDERAL AVIATION ADMINISTRATION Appropriations, Obligation Limitations, Exempt Obligations and Reimbursable Obligations

	FY 2010 ENACTED	FY 2011 REQUEST	CHANGE
DIRECT:			
Operations	30,863,523	31,893,635	31,893,635
Air Traffic Organization (ATO)	9,721,162	8,806,678	8,806,678
Aviation Safety (AVS)	2,089,104	2,563,798	2,563,798
Commercial Space Transportation (AST)	-	-	-
Staff Offices	19,053,257	20,523,159	20,523,159
TOTAL	30,863,523	31,893,635	1,030,112

**EXHIBIT II-8** 

# FEDERAL AVIATION ADMINISTRATION PERSONNEL RESOURCE -- SUMMARY TOTAL FULL-TIME EQUIVALENTS

DIRECT FUNDED BY APPROPRIATION	FY 2009 <u>ACTUAL</u> *	FY 2010 ENACTED	FY 2011 REQUEST
Operations	42,198	42,643	42,815
Facilities & Equipment	2,736	2,968	2,968
Research, Engineering & Development	260	308	311
Grants-in-Aid for Airports	557	566	584
SUBTOTAL, DIRECT FUNDED	45,752	46,485	46,678
REIMBURSEMENTS/ALLOCATIONS			
Operations Aviation Insurance Revolving Fund	228 5	156 5	156 5
Facilities & Equipment	40	55	55
Grants-in-Aid for Airports	1	6	3
Administrative Services Franchise Fund	1,453	1,452	1,467
SUBTOTAL, REIMBURSE./ALLOC.	1,727	1,674	1,686
TOTAL FTEs	47,479	48,159	48,364

<sup>\*</sup> Actuals for each account reflect FAA's allocation of total FTEs as reported on the SF-113G Report.

**EXHIBIT II-9** 

# FEDERAL AVIATION ADMINISTRATION RESOURCE SUMMARY - STAFFING FULL-TIME PERMANENT POSITIONS

DIRECT FUNDED BY APPROPRIATION	FY 2009 <u>ACTUAL</u>	FY 2010 ENACTED	FY 2011 REQUEST
Operations	43,553	43,963	43,916
Facilities & Equipment	3,181	3,181	3,181
Research, Engineering & Development	308	308	314
Grants-in-Aid for Airports	558	574	594
SUBTOTAL, DIRECT FUNDED	47,600	48,026	48,005
REIMBURSEMENTS/ALLOCATIONS			
Operations Aviation Insurance Revolving Fund	300 5	300 5	285 5
Facilities & Equipment	55	55	55
Grants-in-Aid for Airports	4	6	3
Administrative Services Franchise Fund	1,566	1,566	1,566
SUBTOTAL, REIMBURSE./ALLOC.	1,930	1,932	1,914
TOTAL	49,530	49,958	49,919

Note: Figures reflect authorized positions (FTP) approved by Congress. FAA does not intend to staff to these levels in FY 2011.

#### **OPERATIONS**

For necessary expenses of the Federal Aviation Administration, not otherwise provided for, including operations and research activities related to commercial space transportation, administrative expenses for research and development, establishment of air navigation facilities, the operation (including leasing) and maintenance of aircraft, subsidizing the cost of aeronautical charts and maps sold to the public, lease or purchase of passenger motor vehicles for replacement only, in addition to amounts made available by Public Law 108-176, \$9,793,000,000, of which \$6,064,000,000 shall be derived from the Airport and Airway Trust Fund: Provided, That not to exceed 2 percent of any budget activity, except for aviation safety budget activity, may be transferred to any budget activity under this heading: Provided further, That no transfer may increase or decrease any appropriation by more than 2 percent: Provided further, That funds may be used to enter into a grant agreement with a nonprofit standard-setting organization to assist in the development of aviation safety standards: Provided further, That none of the funds in this Act shall be available for new applicants for the second career training program: Provided further, That there may be credited to this appropriation as offsetting collections funds received from States, counties, municipalities, foreign authorities, other public authorities, and private sources, including funds from fees authorized under Chapter 453 of title 49, United States Code, other than those authorized by section 45301(a)(1) of that title, which shall be available for expenses incurred in the provision of agency services, including receipts for the maintenance and operation of air navigation facilities, and for issuance, renewal or modification of certificates, including airman, aircraft, and repair station certificates, or for tests related thereto, or for processing major repair or alteration forms.

#### **Program and Financing** (in millions of dollars)

		FY 2009	FY 2010	FY 2011
Identifica	ation code: 69-1301-0-1-402	Actual	Enacted	Estimate
	Obligations by program activity:			
	Direct program:			
00.01	Air Traffic Organization (ATO)	7,095	7,299	7,631
00.04	Regulation and Certification	1,170	1,234	1,294
00.05	Commercial Space Transportation	14	15	16
00.06	Staff Offices.	764	802	852
01.00	Direct Program Activities Subtotal	9,043	9,350	9,793
09.01	Reimbursable program	156	224	224
10.00	Total new obligations	9,199	9,574	10,017
10.00	Budget resources available for obligation:	7,177	7,071	10,017
21.40	Unobligated balance carried forward, start of year	28	82	
22.00	New budget authority (gross)	9,258	9,492	10,017
22.10	Resources available from recoveries of prior year obligations	4		
22.10		3		
	Expired unobligated balance transfer to unexpired account		0.574	10.017
23.90	Total budgetary resources available for obligation	9,293	9,574	10,017
23.95	Total new obligations	-9,199	-9,574	-10,017
23.98	Unobligated balance expiring or withdrawn	-12		
24.40	Unobligated balance carried forward, end of year	82		
	New budget authority (gross), detail:			
	Discretionary:			
40.00	Appropriation	3,804	5,350	3,729
42.00	Transferred from other accounts (19-0113)	4		
43.00	Appropriation (total discretionary)	3,808	5,350	3,729
	Spending authority from offsetting collections:			
	Discretionary:			
58.00	Offsetting collections (cash)	5,322	4,142	6,288
58.10	Change in uncollected customer payments from Federal	0,022	.,=	0,200
00.10	sources (unexpired)	128		
58.90	Spending authority from offsetting collections (total	120	********	********
30.70	discretionary)	5,450	4,142	6,288
70.00				
70.00	Total new budget authority (gross)	9,258	9,492	10,017
70.40	Change in obligated balances:	4.445	1 100	1 100
72.40	Obligated balance, start of year	1,415	1,409	1,122
73.10	Total new obligations	9,199	9,574	10,017
73.20	Total outlays (gross)	-9,139	-9,861	-9,964
73.40	Adjustments in expired accounts (net)	-2		
73.45	Recoveries of prior year obligations	-4		
74.00	Change in uncollected customer payments from Federal			
	sources (unexpired)	-128		
74.10	Change in uncollected customer payments from Federal			
	sources (expired)	68		
74.40	Obligated balance, end of year	1,409	1,122	1,175
	Outlays (gross), detail:			
86.90	Outlays from new discretionary authority	7,817	8,370	8,842
86.93	Outlays from discretionary balances	1,322	1,491	1,122
87.00	Total outlays (gross)	9,139	9,861	9,964
07.00		7,137	7,001	7,704
	Offsets:			
	Against gross budget authority and outlays:			
00.00	Offsetting collections (cash) from:	F 0F0	4 100	
88.00	Federal sources	5,352	4,122	6,268
88.40	Non-Federal sources	24	20	20
88.90	Total, offsetting collections (cash)	5,377	4,142	6,288

	Against gross budget authority only:			
88.95	Change in uncollected customer payments from Federal			
	sources (unexpired)	128		
88.96	Portion of offsetting collections (cash) credited to expired			
	accounts	-55		
	Net budget authority and outlays:			
89.00	Budget authority	3,808	5,350	3,729

For 2011, the Budget requests \$9,793 million for FAA operations. These funds will be used to continue to promote aviation safety and efficiency. The Budget provides funding for the Air Traffic Organization (ATO) which is responsible for managing the air traffic control system. As a performance-based organization, the ATO is designed to provide cost-effective, efficient, and, above all, safe air traffic services. The Budget also funds the Aviation Safety Organization (AVS) which ensures the safe operation of the airlines and certifies new aviation products. In addition, the request also funds regulation of the commercial space transportation industry, as well as FAA policy oversight and overall management functions.

#### **Object Classification** (in millions of dollars)

		FY 2009	FY 2010	FY 2011
Identific	cation code: 69-1301-0-1-402	Actual	Enacted	Estimate
	Direct obligations:			
	Personnel compensation:			
11.1	Full-time permanent	4,224	4,479	4,755
11.3	Other than full-time permanent	46	48	49
11.5	Other personnel compensation	387	386	387
11.9	Total personnel compensation	4,657	4,913	5,191
12.1	Civilian personnel benefits	1,486	1,535	1,620
13.0	Benefits for former personnel	1	1	1
21.0	Travel and transportation of persons	180	179	181
22.0	Transportation of things	23	23	23
23.1	Rental payments to GSA	121	125	126
23.2	Rental payments to others	42	35	36
23.3	Communications, utilities, and miscellaneous charges	310	311	313
24.0	Printing and reproduction	6	6	6
25.1	Advisory and assistance services	483	474	477
25.2	Other services	1,468	1,478	1,526
26.0	Supplies and materials	153	153	155
31.0	Equipment	101	102	123
32.0	Land and structures	8	9	9
41.0	Grants, subsidies, and contributions	3	5	5
42.0	Insurance claims and indemnities	1	1	1
99.0	Direct obligations	9,043	9,350	9,793
99.0	Reimbursable obligations	156	224	224
99.9	Total new obligations	9,199	9,574	10,017

#### **Employment Summary**

		FY 2009	FY 2010	FY 2011
Identific	ration code: 69-1301-0-1-402	Actual	Enacted	Estimate
	Direct:			
10.01	Total compensable work years: Full-time equivalent employment	42,198	42,643	42,815
20.01	Total compensable work years: Full-time equivalent			
	employment	228	156	156

#### **EXHIBIT III-1**

#### **OPERATIONS**

Summary by Program Activity
Appropriations, Obligation Limitations, and Exempt Obligations
(\$000)

	FY 2009 <u>ACTUAL</u>	FY 2010 ENACTED	FY 2011 REQUEST	CHANGE <u>FY 2010-2011</u>
Air Traffic Organization (ATO)	7,098,322	7,299,299	7,630,628	331,329
Aviation Safety (AVS)	1,164,597	1,234,065	1,293,986	59,921
Commercial Space (AST)	14,094	15,237	15,747	510
Staff Offices	<u>769,154</u>	801,427	852,639	<u>51,212</u>
TOTAL	9,046,167	9,350,028	9,793,000	442,972
FTEs				
Direct Funded	42,198	42,643	42,815	172
Reimbursable, allocated, other	228	156	156	0

#### **Program and Performance Statement**

This account provides funds for the operation, maintenance, communications, and logistical support of the air traffic control and air navigation systems. It also covers administrative and managerial costs for the FAA's regulatory, international, medical, engineering and development programs as well as policy oversight and overall management functions. The operations appropriation includes the following major activities:

- (1) operation on a 24-hour daily basis of a national air traffic system;
- (2) establishment and maintenance of a national system of aids to navigation;
- (3) establishment and survellance of civil air regulations to assure safety in aviation;
- (4) development of standards, rules and regulations governing the physical fitness of airmen as well as the administration of an aviation medical research program;
- (5) regulation of the commercial space transportation industry;
- (6) administration of acquisition programs; and
- (7) headquarters, administration and other staff offices.

#### EXHIBIT III-2

OPERATIONS
SUMMARY ANALYSIS OF CHANGE FROM FY 2010 TO FY 2011 Appropriations, Obligation Limitations, and Exempt Obligations

Item	Change from FY 2010 to FY 2011	FY 2011 PC&B by Program	FY 2011 FTEs by Program	Expenses	Total
	112011	Note Columns are Non-Add			
FY 2010 Enacted					
Operations Appropriations, Obligations, Limitations, and Exempt Obligations		\$6,448,522	42,643	\$1,949,848	\$9,350,028
Address and to Book					
Adjustments to Base	20.400	00.400	000		
Annualized FTEs	28,693	28,693			
Annualized FY 2010 Pay Raise (GS Population)	7,771	7,771			
Annualized FY 2010 Pay Raise (Core Comp Population)	51,272	51,272	1		
FY 2011 Pay Raise (GS Population)	18,491	18,491			
FY 2011 OSI (Core Comp Population)	101,722	101,722			
FY 2011 SCI	26,696	26,696			
Non-pay Inflation	14,508			7,035	
NAS Handoff Requirements	28,541			28,541	
NATCA Arbitration Decision	144,000	130,933		13,067	
Workforce Attrition	-14,363	-14,363	-121		
Flight Services Contract Savings	-22,400			-22,400	
Adminstrative Efficiencies	-8,000			-8,000	
Base Transfers	0	0	0	0	
Subtotal, Adjustments to Base	\$376,931	\$351,215	82	\$18,243	\$376,931
New or Expanded Programs					
NextGen RNAV/RNP	25,000	3,300	20	21,700	
Continued Operational Safety	2,600	1,350	10	1,250	
Production Certification	1,400	540	4	860	
New Service Center Buildings	20,000				
Protect FAA Information Security Infrastructure	6,000			6,000	
Implementation of NextGen Environmental & Energy Technologies, Models & Metrics	3,019	270	2	2,749	
Safety Inspections and Emergency Operations	8,022	6,017	54	2,005	
Subtotal, New or Expanded Programs	\$66,041	\$11,477	90	\$34,564	\$66,041
Total FY 2011 Request	\$442,972	\$6,811,214	42,815	\$2,002,655	\$9,793,000

#### OPERATIONS APPROPRIATION

## Operations Summary (\$ in Thousands)

Item Title	Dollars	FTP	OTFTP	FTE
FY 2010 Enacted	9,350,028	41,397	1,228	42,643
FY 2010 One-Time Items	0	0	0	0
Unavoidable Adjustments				
1. Annualized FTEs (ATO: 91 , AVS: 112)	28,693	0	0	203
2. Annualized FY 2010 Pay Raise (GS Population)	7,771	0	0	0
3. Annualized FY 2010 Pay Raise (Core Comp Population)	51,272	0	0	0
4. January 2011 Pay Raise (GS Population)	18,491	0	0	0
5. January 2011 OSI (Core Comp Population)	101,722	0	0	0
6. January 2011 SCI	26,696	0	0	0
7. Non-pay inflation	14,508	0	0	0
Total Unavoidable Adjustments	249,153	0	0	203
Uncontrollable Adjustments				
1. NAS Handoff Requirements	28,541	0	0	0
2. NATCA Arbitration Decision	144,000	0	0	0
3. Workforce Attrition (-242 EOY/-121 FTE)	-14,363	-242	0	-121
Total Uncontrollable Adjustments	158,178	-242	0	-121
Discretionary Increases				
1. NextGen RNAV/RNP (40 EOY/ 20 FTE)	25,000	40	0	20
2. Continued Operational Safety (26 EOY/ 10 FTE)	2,600	26	0	10
3. Production Certification (16 EOY/ 4 FTE)	1,400	16	0	4
4. New Service Center Buildings	20,000	0	0	0
5. Protect FAA Information Security Infrastructure	6,000	0	0	0
6. Impl. of NextGen Env. & Energy Tech. , Models & Metrics ( 3 EOY/ 2 FTE)	3,019	3	0	2
7. Safety Inspections and Emergency Operations (110 EOY/ 54 FTE)	8,022	110	0	54
Total Discretionary Increases	66,041	195	0	90
Cost Efficiencies				
Flight Services Contract Savings	-22,400	0	0	0
2. Adminstrative Effeciencies	-8,000	0	0	0
Total Cost Efficiencies	-30,400	0	0	0
Base Transfers				
NextGen and Acquisitions Hiring Support (3 EOY/ 3 FTE)	0	0	0	0
Labor Relations/ National Employee Safety (1 EOY/ 1 FTE)	0	0	0	0
3. Safety and Hazardous Materials (1 EOY/ 1 FTE)	0	0	0	0
Total Base Transfers	0	0	0	0
FY 2011 Request	9,793,000	41,350	1,228	42,815

# OPERATIONS APPROPRIATION FY 2011 Base Transfer Summary (Whole dollars)

<u>Title</u>	<u>From</u>	<u>To</u>	PC&B	Other Objects	<u>Total</u>	<u>FTE</u>	<u>EOY</u>
NextGen and Acquisitions Hiring Support	ATO	AHR	251,800	15,000	266,800	3	3
2. Labor Relations/ National Employee Safety	AEP	AHR	168,216	8,784	177,000	1	1
Safety and Hazardous Materials	ACR	ASH	66,057	0	66,057	1	1

#### OPERATIONS APPROPRIATION

### <u>Air Traffic Organization (ATO)</u> (\$ in Thousands)

Item Title	Dollars	FTP	OTFTP	FTE
FY 2010 Enacted	7,299,299	31,194	1,030	32,566
FY 2010 One-Time Items	0	0	0	0
Unavoidable Adjustments				
1. Annualized FTEs (ATO: 91 , AVS: 112)	9,738			91
2. Annualized FY 2010 Pay Raise (GS Population)	2,221			
3. Annualized FY 2010 Pay Raise (Core Comp Population)	43,550			
4. January 2011 Pay Raise (GS Population)	5,284			
5. January 2011 OSI (Core Comp Population)	86,380			
6. January 2011 SCI	22,675			
7. Non-pay inflation	10,971			
Total Unavoidable Adjustments	180,818	0	0	91
Uncontrollable Adjustments				
NAS Handoff Requirements	28,541			
2. NATCA Arbitration Decision	144,000			
3. Workforce Attrition (-242 EOY/-121 FTE)	-14,363	-242		-121
Total Uncontrollable Adjustments	158,178	-242	0	-121
Discretionary Increases				
1. NextGen RNAV/RNP (40 EOY/ 20 FTE)	15,000			
2. Continued Operational Safety (26 EOY/ 10 FTE)	0			
3. Production Certification (16 EOY/ 4 FTE)	0			
4. New Service Center Buildings	0			
5. Protect FAA Information Security Infrastructure	0			
6. Impl. of NextGen Env. & Energy Tech. , Models & Metrics (3 EOY/ 2 FTE)	0			
7. Safety Inspections and Emergency Operations (110 EOY/ 54 FTE)	0 15 000	0	0	0
Total Discretionary Increases	15,000	0	U	U
Cost Efficiencies				
Flight Services Contract Savings	-22,400			
2. Adminstrative Effeciencies	0	0	0	0
Total Cost Efficiencies	-22,400	0	0	0
Base Transfers				
NextGen and Acquisitions Hiring Support (3 EOY/ 3 FTE)	-267	-3	0	-3
Labor Relations/ National Employee Safety (1 EOY/ 1 FTE)	0	3	· ·	J
Safety and Hazardous Materials (1 EOY/ 1 FTE)	0			
Total Base Transfers	-267	-3	0	-3
FY 2011 Request	7,630,628	30,949	1,030	32,533

#### **Detailed Justification for Air Traffic Organization (ATO)**

#### **Air Traffic Organization**

#### Overview:

The Air Traffic Organization (ATO) is the global leader in delivering the world's safest, most secure air traffic services. As a Performance-Based Organization (PBO), ATO measures its success in terms of safety, reliability, and cost effectiveness. ATO:

FY 2011 Request: \$7,630,628

- Provides safe, secure, and cost-effective air traffic services.
- Creates a professional workplace for its employees in which they can excel and innovate in an
  environment where all members of the ATO team embrace the organization's mission and vision
  with enthusiasm and pride.
- Accounts for its performance by measuring achievements against clear, specific goals.
- Effectively aligns its resources with programs that provide value to the flying public.

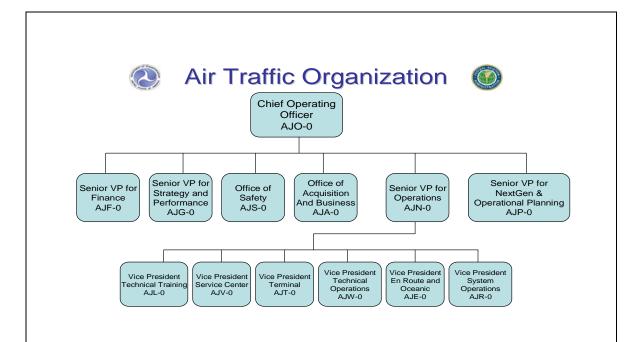
The FY 2011 Operations budget request reflects these values. ATO plans on hiring 915 controllers in 2011. However, due to 2011 attrition projections, ATO does not anticipate increasing end-of-year controller staffing levels in FY 2011. ATO will have a sufficient level of on-board staff needed to meet projected air traffic demand. This budget request supports the deployment of new equipment and programs, and also funds much needed maintenance of existing systems in the National Airspace System (NAS). It covers anticipated increases in pay and inflation, including \$144 million for the National Air Traffic Controllers Association (NATCA) contract settlement costs. Cost savings and avoidances are being sought throughout the system as well, with \$22.4 million in projected cost savings associated with the Automated Flight Service Stations (AFSS) contract and \$14.4 million in workforce attrition savings. In addition, the request reflects a \$0.3 million base transfer to the Human Resources staff office to support NextGen and acquisition support recruitment and hiring.

In order to advance efficiency, safety, security, and customer service, new pieces of equipment are being installed and commissioned. This equipment is designed to improve overall operations, which will continue to streamline airline industry operations that are anticipated to increase—possibly tripling over the next 20-years—and enhance the experience for the air traveling public. Each of these systems will need to transition from the Capital Programs budget to the Operations program. Called NAS Plan Handoff (NPHO), these resources (\$28.5 million in FY 2011) cover the day-to-day cost of operating and maintaining these new systems.

The Congressionally-mandated National Civil Aviation Review Commission, chaired by former Secretary of Transportation Norman Mineta, first articulated the need for ATO in 1997. In 2000, Congress directed FAA to establish a PBO that would maintain the viability of the air traffic control system and control rising operating costs. In 2003, FAA created ATO in direct response to requests from the White House and Congress.

As the ATO evolves, changes in its structure are inevitable. Significant changes were made in FY 2009 in order to take advantage of the operational character of several of the service units. Since tactical decisions were needed by Terminal, Technical Operations, En Route, and System Operations, they were all grouped below a single Senior Vice President of Operations (AJN) to facilitate the day-to-day nature of each organization. Additionally, two new service units were created – Service Centers and Technical Training. These were added to the other four in the tactical unit in order to ensure the air traffic control mission was fully supported.

The leadership of this tactical structure, AJN, along with the service units for Finance, Strategy and Performance, Safety, Acquisition and Business, and NextGen and Operations Planning, make up the strategic leadership cadre for the ATO, with the Chief Operating Officer as the executive officer.



The ATO grouped expertise in a simplified, shared-service structure. All branches of the organization will be able to access the knowledge and skills they need centrally. Shared services will reduce duplication of effort while increasing efficiency, productivity, and consistency in the support provided to field facilities.

In December 2005, after 15 months of study, FAA announced its plans to simplify the ATO service area structure. The ATO consolidated its administrative and support staff functions wherever possible, reducing overhead and increasing productivity. The ATO consolidated administrative functions located in the nine service areas into shared service centers in just three regions. The three Service Centers (listed below) became operational in June 2006 and most of the affected personnel have already been transferred.

- The Eastern Service Area Office and Service Center is located at FAA regional office in Atlanta, Georgia.
- The Central Service Area Office and Service Center is located at FAA regional office in Fort Worth, Texas
- The Western Service Area Office and Service Center is located at FAA regional office in Seattle, Washington.

The final phase of the service center consolidation effort began in FY 2008 with the engineering services merger and it will be completed by 2011. It includes realigning design engineering from the nine regional offices to the three previously-established service area offices. This effort should accomplish the centralization of design processes and staffing synergy, with the goals of achieving cost savings, increasing productivity, and improving customer service without adversely impacting the core engineering service mission.

As a result of this restructuring, FAA will provide higher quality, more consistent service to its customers while avoiding an estimated \$360 to \$460 million in costs over from 2005 to 2014. Most of the savings will result from reductions in staffing requirements under a shared services environment and productivity gains realized by providing specialized skills and knowledge to different parts of the organization.

The FAA continues to reduce costs and improve performance by fundamentally changing the way it does business. The agency has slowed the growth of expenses by implementing several resource management initiatives, including a cost accounting system, and a pay-for-performance compensation structure. In 2005, FAA launched an agency-wide cost control program and ATO remains focused on:

reducing overhead costs;

- investing in projects that will yield long-term savings;
- improving financial and project reporting; and
- holding managers accountable for controlling the cost of their programs.

To become better stewards of taxpayer funds, ATO:

- Trained management in financial management best practices over the past few years. The ATO
  also put standardization information on its web site that outlines the agency's standard financial
  management policies and procedures.
- 2. Continues to thoroughly evaluate the performance of capital programs. Members of ATO Capital Investment Team apply a business case approach to each project as the program is assessed. Since April 2004, more than 213 projects have been reviewed. Of six major projects (totaling approximately \$360 million), three were significantly restructured and segmented. Three projects were terminated. In FY 2009, 31 projects have been reviewed for cost, schedule, performance, and benefits. Of these, three projects were significantly restructured and segmented to ensure delivery of capabilities in the most efficient time period.
- 3. The ATO's, Technical Operations, Aviation System Standards, High Performing Organization (HPO) is an initiative to improve the operational efficiency and increase the quality of products and services in the areas of aeronautical charting and instrument flight procedure development. When fully implemented in FY 2013, projected savings will increase from \$2.8 million today to an annual savings of approximately \$15.2 million. A new pricing structure is expected to increase revenues by approximately \$8.9 million. The total annual financial benefit (cost savings plus increased revenue) from implementing all HPO initiatives is expected to reach approximately \$24 million by FY 2013. The HPO plan includes re-engineering business processes across the aeronautical charting and instrument flight procedures development functions, integrating AVN information technology systems and databases to support improved operational efficiencies, streamlining printing activities to focus on the FAA and AVN core mission, and instituting a new pricing methodology for paper products that links prices to the actual costs to produce them.

One of the biggest success stories in cost management was the contracting out of FAA's flight services function. That action will save the agency an estimated \$2.1 billion in total savings and cost avoidance over a 13-year period.

In March 2010, FAA will distribute an update of the Air Traffic Controller Workforce Plan entitled "A Plan for the Future." The plan will contain detailed estimates of staffing requirements and highlight initiatives to improve controller hiring and training. The following table represents the controller workforce staffing for FYs 2009 – 2011.

	FY 2009 Actual	FY 2010 Projected	FY 2011 Projected
	Controller Workforce	Controller Workforce	Controller Workforce
Air Traffic Controllers (	1) (2)		
Fully-Qualified (3)	11,812	12,084	12,985
En Route	5,145	5,206	5,386
Terminal	6,667	6,878	7,599
Developmental	3,958	3,608	2,465
En Route	1,680	1,491	1,144
Terminal	2,278	2,117	1,321
Total ATCT	15,770	15,692	15,450

- Actual distribution between Terminal and En Route may change based on actual attrition and operational needs.
- (2) Air Traffic Controller numbers include all employees, Full-Time Permanent, Part-Time Permanent, Leave Without Pay, Full-Time Temporary, and Trainees.
- (3) Full-Qualified category includes Certified Professional Controllers-In-Training.

The ATO provides essential services to the nation's aviation industry, which independent studies have estimated accounts for almost 12 million jobs and over \$1.3 trillion in annual economic activity—5.6 percent of the Gross Domestic Product. More than 30,000 ATO employees support the operations that help move about 48,000 aircraft through U.S. airspace each day. Our employees are service professionals, providing the world's safest airspace and handling more than six times the traffic of the next largest air traffic control organization in the world. Air traffic controllers keep planes moving safely and efficiently while technicians, engineers, and support specialists maintain and repair critical equipment and facilities. Leaders at every level work to ensure that these services are provided in a cost-effective manner.

#### Significant accomplishments achieved in FY 2009 include:

#### Operational Improvements:

- Expanded the use of NextGen performance-based systems to five priority countries.
- Ensured harmonization of service improvements through collaboration with international and industry service providers through active participation and leadership in regional International Civil Aviation Organization (ICAO) and inter-organizational workgroups and decision-making processes.
- Promoted strategic U.S. navigation technologies, including the Global Positioning System (GPS), with key civil aviation authorities and the global aviation community. Coordinate GPS and augmentation-related activities with key global partners in North America, the Caribbean Basin, South America, Europe, and Asia Pacific.
- Promoted strategic U.S. surveillance technologies, including Automatic Dependent Surveillance –
  Broadcast (ADS-B), with key civil aviation authorities and the global aviation community.
  Coordinate with the FAA Surveillance and Broadcast Services (SBS) Office to support key international efforts, including Asia Pacific, Caribbean and South American regional ADS-B Task Force meetings, and multilateral ADS-B-provider coordination meetings.
- Supported the commissioning of new runway/taxiway projects, to increase the annual service volume of the 35 Operational Evolution Plan (OEP) airports by at least 1 percent annually, measured as a 5-year moving average, through FY 2013.
- Achieved an average daily airport capacity for the seven major metropolitan areas of 39,484
  arrivals and departures per day by FY 2009 (FY2009 Actual: 42,926) and maintain through
  FY 2013.
- In 2009, the Chicago Airspace Project (CAP) completed airspace design for Stage-3, in anticipation of the O'Hare Modernization Program (OMP) Phase 1C. Stage-3 includes a second High and Wide arrival procedure from the west further increasing arrival capacity, and new west departure fixes and procedures that double the current capacity for Chicago O'Hare and Midway Airports; completed design and modeling of sector realignments in Chicago Center to support the new arrival and departure procedures; completed airspace reassignment design to expand approach control airspace to support new arrival procedures; supported Safety Risk Management (SRM) process for facilities; and supported process to ensure environmental integrity is sustained.
- The implementation of the airspace improvements in the New York, New Jersey, and Philadelphia (NY/NJ/PHL) Metropolitan Areas began. Analysis on the three sector changes for the J80 sectors started. Three Human-In-The-Loop (HITL) simulations were performed as part of the analysis, one for the En Route sector, one for the Terminal Sector, and one combined simulation in May 2009. Meetings were conducted to plan and design the transition of the three sectors from New York Center to West Gates/Liberty Area. The team continued the analysis for and implementation of Area Navigation (RNAV) arrival and departure procedures where possible. Two RNAV arrivals at PHL were published on October 22, 2009, and four RNAV departures at PHL are scheduled for publication on February 11, 2010.
- Completed airspace study for proposed Southern Nevada Supplement Airport including analysis, modeling, and simulation to quantify capacity, throughput, and delay. The final report was completed in the 1<sup>st</sup> quarter of FY 2010. Designed routes and procedures supporting Las Vegas (LAS) near-term enhancements, referred to as LAS Optimization. Evaluated and modified resulting airspace sector modifications. Began Environmental Assessment for LAS Optimization, estimated to

be completed in FY 2011.

- Published 88 Area Navigation (RNAV) routes, 55 RNAV Standard Instrument Departure (SID) and Standard Terminal Arrival (STAR) procedures, and 54 Required Navigation Performance (RNP) Authorization Required approach procedures. As of September 2009, FAA has published more than 700 routes and procedures, including more than 300 RNAV procedures at 117 airports in 30 states.
- Expanded FAA's existing OEP to incorporate critical NextGen operational concepts and changes and detailed milestones of key NAS modernization programs through 2025. Updated Joint Planning and Development Office (JPDO) related avionics and policy decisions into the OEP Solution Set roadmaps.
- Deployed surveillance, air/ground communications and weather in the Gulf of Mexico in support of
  the SBS National Program Office baseline. Completed installation of six air/ground communications
  sites in the Gulf of Mexico. Deployed weather in the Gulf of Mexico in support of the SBS National
  Program Office baseline. Completed an airspace plan for the Houston Center. Achieved Initial
  Operational Capability (IOC) for weather in the Gulf of Mexico in support of the SBS National
  Program Office.
- Continued deployment of SBS at key sites in the Eastern Service Area. Achieved In-Service
  Decision for Service Volume 168 Essential Services. Completed site acceptance testing at Louisville
  and Philadelphia.
- Developed and implemented RNAV standard instrument departures (SIDs) and Standard Terminal Arrival (STARs) procedures. Implemented the performance-based navigation roadmap by continuing development and implementation of RNAV routes, SIDs, and STARs.

#### Safety:

- Provided safe and efficient terminal air traffic control services to meet target levels for Category
  A&B Runway Incursions. Achieved the annual safety performance target for Category A&B Runway
  Incursions of no more than 0.472 incursions per million operations. FY 2009 Category A&B
  Runway Incursions were well below the 0.472 target at a total of 0.228
- As part of the Administrator's Call-to-Action, it was recommended (and accepted by the
  Administrator) that the ATO establish and implement a voluntary safety reporting program for
  credentialed employees and technical employees of the ATO that actively operate, maintain, and
  certify the systems and equipment of the NAS. On September 25, 2009, the Administrator
  approved this program, known as Air Traffic Safety Action Program (ATSAP), as a standing FAA
  program.
- Published minimums to runways in Alaska. Developed 10 RNAV GPS instrument approach
  procedures with lateral precision with vertical guidance/lateral precision/lateral navigation
  (LPV/LP/LNAV) minimums to runways in Alaska. Completion of this activity was contingent upon at
  least 10 qualifying runway/obstacle surveys being approved and delivered to the National Flight
  Procedures Office no later than September 30, 2009. These surveys must be at airports located
  within existing Wide Area Augmentation System (WAAS) coverage. This goal was exceeded.
- Published 54 Required Navigation Performance (RNP) Authorization Required approach procedures.
   As of September 2009, FAA has published more than 190 RNP procedures at 61 airports in 31 states.

#### Capacity:

- Published 88 Area Navigation (RNAV) routes, 55 RNAV Standard Instrument Departure (SID) and Standard Terminal Arrival (STAR) procedures. As of September 2009, FAA has published more RNAV procedures at 117 airports in 30 states.
- Provided power systems engineering, implementation, and operations expertise in support of major systems acquisitions and modifications in the NAS. Sustained operational availability of at least 99.7 percent for reportable power system facilities that support the 35 OEP airports.
- Provided spectrum and engineering services and assign radio frequencies. Processed 90 percent of all frequency requests within 90 calendar days from the original request.

- Analyzed Extended Service Volumes (ESV) requests in support of RNAV/required navigation performance (RNP) requirements. Completed 100 percent of all ESV requests in support of RNAV/RNP requirements.
- Achieved an average daily airport capacity for the seven major metropolitan areas of 39,484
  arrivals and departures per day by FY 2009 (FY 2009 Actual: 42,926), and maintain through
  FY 2013.

#### Organizational Excellence:

- Organizations throughout the agency continued to implement cost efficiency initiatives such as 10-15 percent savings for strategic sourcing for selected products and services.
- By the end of FY 2009, we reduced leased space for automated flight service stations (AFSS) from approximately 510,000 square feet to approximately 150,000 square feet.
- ATO IT reduced the server footprint by 146 servers in 2009. As a result of this reduction, there was a logical consolidation of 61 applications and elimination of 99 obsolete or duplicate web-sites.
- The Traffic Analysis Review Program (TARP) was upgraded to function on an unmonitored, round-the-clock basis, with centralized reporting. These enhanced capabilities moved TARP into the risk management arena.

#### International:

- Completed two Performance-Based Navigation international seminars:
  - A joint seminar with the ICAO and the European Organization for the Safety of Air Navigation (EUROCONTROL) IN Nairobi, Kenya in December 2008 and
  - An ICAO Asia-Pacific Region/Japan Civil Aviation Bureau (JCAB) seminar in Osaka, Japan in March 2009.

#### FY 2010 Program:

In FY 2010, FAA has a controller employment target of 15,692. ATO projected staffing will maintain the controller workforce to a level at which traffic at all facilities will be more than adequately covered.

#### **Anticipated FY 2010 Accomplishments:**

#### Operational Improvements:

- Manage the international strategy in support of the NextGen Global Harmonization Working Group and work with civil aviation and interagency partners to continually assess and implement the strategy.
- Manage the implementation of the NextGen international activity by undertaking international
  collaborative activities with United States Government stakeholders and key countries in
  technologies or procedures of mutual interest. Identify existing mechanisms to expand
  international NextGen cooperation with additional countries and international organizations. With
  support from the JPDO and respective ATO service units, manage the cooperative projects and
  initiatives identified in the established NextGen System Steering Groups with Japan, China, Canada,
  and Mexico.

#### Safety:

 Demonstrate a ground-movement safety infrastructure by 2013 that provides direct warning capability to pilots, drivers, and controllers to reduce the severity of Runway Incursions. For FY 2010, the Runway Safety Office will complete a field evaluation of an initial flight deck warning capability in at least one pilot airport. Continue to conduct an integrated assessment of emergent runway safety technologies and conduct simulation analyses to assess effectiveness, interoperability, and level of readiness for operational transition to a NAS ground movement safety

- infrastructure. Conduct field evaluations of an initial flight deck direct warning capability. Test initial algorithms in test avionics with industry participants.
- Beginning in FY 2010, the ATO will maintain a System Loss Index, the average of Measures of Loss
  for all reported losses of standard radar separation. The ATO will identify causal and coincident
  factors for all events involving less than 66 percent required radar separation and will use a safety
  management system-based risk scheme to focus corrective resources on the most serious trends.
  The ATO will ensure that the System Loss Index improves by at least 0.01 of the FY 2010 baseline
  index through FY 2011.
- Achieve the annual efficiency performance target for NAS On-Time Arrivals of not less than 88 percent.
- Improve flight hours per direct employee from FY 2009 levels. FY 2010 target: 3,696 annualized forecasted flight hours per En Route and Oceanic Service Unit direct employee.
- Maintain service availability to achieve a NAS on-time arrival rate of 88 percent at the 35 OEP airports.
- Identify risk concerns through audits, evaluations, and investigations. Brief and provide recommendations to senior management. Review a minimum of 12 preliminary pilot deviations and other air traffic incident reports each month to validate the accuracy of initial classifications. Conduct on-site investigations of accidents and incidents. Identify good operating practices to avoid recurrences of risks identified through evaluations and investigations processes. Disseminate findings and provide recommendations for corrective actions to appropriate service units.
- Continue TARP. In FY 2010, continue the development and deployment of TARP with a targeted completion of NAS-wide implementation by September 30, 2011. Develop and maintain TARP software and support on-going deployment of NAS Operating Plan capability to the remainder of the NAS. Complete TARP audit tool implementation at 40 percent of all applicable terminal sites.
- By FY 2010, limit Category A and B (most serious) runway incursions to a rate of no more than 0.450 per million operations, and maintain or improve through FY 2013.
- Expansion of voluntary reporting systems via agreement with other unions is on-going with on-going discussions with Professional Airway Systems Specialists (PASS). We anticipate having a draft agreement with PASS by the 3<sup>rd</sup> quarter of FY 2010. Initial training for management and union members is on-going, but cannot be finalized until an Memorandum of Understanding is negotiated and agreed by the parties.

#### Capacity:

- Sustain operational availability at 99.7 percent for reportable power system facilities that support the 35 OEP Airports.
- Increase percentage of oceanic airspace using reduced separation standards from the FY 2004 baseline. Improve global interoperability in the oceanic and off-shore domains via collaboration with strategic partners and support longer-term JPDO/NextGen Air Traffic System initiatives. Develop operational and software requirements for operational prototyping of pre-departure Oceanic Trajectory Management 4D.
- Improve aviation fuel efficiency by another 1 percent over the FY 2008 level (for a total of 7 percent) through FY 2009, and 1 percent each subsequent year through FY 2013 to 11 percent, as measured by a 3-year moving average of the fuel burned per revenue mile flown, from the 3-year average for calendar years 2000-2002.
- Sustain adjusted operational availability of 99.7 percent for the reportable facilities that support the 35 OEP airports through FY 2013.
- Continue phased redesign in major metropolitan areas. Chicago Airspace Project: realign airspace
  and implement new departure routes and procedures to support O'Hare Modernization Project
  runway openings. NY/NJ/PHL Redesign: continue design implementation to support westbound
  departures from metro airports of NY/NJ and PHL.
- Begin development and implementation of an integrated procedures concept for Performance-Based Navigation (PBN) with the goal of moving towards NextGen capabilities. This

effort incorporates Required Navigation Performance (RNP) and Area Navigation (RNAV) route and procedure development in a single initiative with emphasis on maximizing benefits and airspace efficiency. We will continue to develop RNAV arrivals with Optimized Profile Descents (OPDs) where feasible.

#### Organizational Excellence:

- Acquire and develop necessary skills in controller workforce by achieving the target for months-tocertification of developmentals from Stage I to IV (not including the Certified Professional Controllers (CPC) in-training (IT)).
- Reduce on-the-job training for certification of developmentals from Stage I to IV (not including CPCs-IT). Ensure that 90 percent of new controllers meet or come in under their budgeted time for certification.
- Coordinate and report on the initiative efforts to maintain the air traffic control (ATC) Workforce Plan annual hiring within 2 percent of the ATC Workforce Plan hiring targets. Report progress on meeting ATC actual on-board monthly targets as indicated in the Federal Personnel Payroll System.
- Update the Air Traffic Control Workforce Report to Congress.
- Complete Federal Telecommunications Infrastructure deployment of sites and services. Operate and maintain telecommunications for FAA users consistent with expected performance levels.
- Ensure a safe and healthful workplace for all ATO employees. Achieve full compliance with safety
  and environmental compliance requirements based on the Environmental Protection
  Agency/Occupational Safety and Health Administration (OSHA) regulations. Receive zero OSHA
  findings designated as "willful violations."

#### FY 2011 Budget Request:

The Chief Operating Officer for ATO requests \$7,630,628,000 and 32,533 FTEs in Operations to meet its mission in FY 2011. This is an increase of \$331,329,000 (4.5 percent) above the FY 2010 enacted level. The FY 2011 budget requests a funding increase to annualize FY 2010 new hires, adjustments for inflation, maintenance and operating costs of new NAS systems and equipment, \$144 million for the NATCA contract settlement costs, \$15 million for NextGen RNAV/RNP procedures, less \$22 million for FSS savings. FAA plans to hire 915 controllers in FY 2011. Due to attrition, FAA does not anticipate increasing its end-of-year controller workforce staffing level in FY 2011.

#### Specific goals for FY 2011 include:

#### Safety:

- Complete research, initiated in FY 2010, on high energy density lithium batteries in passenger carry-on items, shipped as cargo and in aircraft power systems.
- As part of the Administrator's Call-to-Action on Surface Safety, it was recommended that the ATO implement a voluntary reporting system of safety-related events from controllers and other air traffic services employees. Continue orientation training for all new air traffic control personnel during FY 2011 and offer Air Traffic Safety Action Plan (ATSAP) workshops and Executive Resource Council (ERC) visits to selected members of ATO management and NATCA management personnel.
- Implement a voluntary reporting system for safety-related events for all technical employees of the ATO that actively operate, maintain, and certify the systems and equipment of the NAS. Continue orientation training for all new airway transportation system specialist personnel during FY 2011, and offer voluntary reporting system workshops and ERC visits to selected members of ATO management and PASS management personnel.
- Maintain an effective program to monitor the performance of the contract service provider (Lockheed Martin) for the AFSS contract to determine achievement of acceptable performance level. Evaluate and/or validate AFSS contract performance data and report results guarterly.

- Reduce accidents in Alaska for general aviation and all Part 135 operations. Provide funding to develop, flight inspect, and publish 10 RNAV GPS LPV/LP procedures to runways in Alaska in accordance with Flight Plan Initiative 11S2K, WAAS Approaches.
- Use weather cameras to enhance aviation safety improvements in the Alaska Region. Complete installation and make services available to the public for 24 additional weather camera sites.
- Develop, flight check, and publish up to 12 GPS/RNAV WAAS routes validated by en route with a
  goal to complete implementation by September 2011.
- Apply safety assurance processes to detect hazards, verify safety risk mitigations, and assure SMS is effectively implemented across the ATO. Conduct SMS audits on four service units. Verify mitigation and residual risks associated with high risk hazards. Produce quarterly reports starting in January 2011.
- Communicate and disseminate safety information and manage SMS training to promote SMS across the ATO. Track and report training completions monthly on the Enterprise Learning Management System, with reports due monthly beginning in October 2010. Plan and conduct the annual ATO SMS Summit.
- Update and publish a new version of the National Runway Safety Plan. Continue to monitor progress.
- Promote and develop Airmen's Information Manual standards in order to improve global aviation safety and efficiency. Conduct classes and conferences on Aeronautical Information Exchange Model (AIXM) for at least 100 participants. Ensure that FAA participates in at least 75 percent of the AIXM Configuration Control Board meetings.
- Track and validate conduct of safety risk management on all system operations-initiated changes to the NAS.
- In conjunction with Runway Safety Regional Program Managers, ATO, and Airports, FAA Safety Team and Flight Standards personnel will design, develop, deliver, and update a Runway Safety Training Curriculum. The curriculum addresses optimal runway safety practices and procedures with an emphasis on ways to minimize causal-related factors and maximize safety and awareness during surface operations.
- Continue to develop and publish 500 WAAS LPV/LP approach procedures annually.
- Provide WAAS service at 300 runway ends currently not served by instrument landing systems.
- Support FAA Civil Air Navigation Services Organization activities to refine global safety metrics for runway safety and losses of Instrument Flight Rules.
- Conduct on-site assessments of accidents and high-profile incidents involving ATO operations.
   Identify recurrent risks and causal factors, disseminate findings, and provide recommendations for corrective actions to appropriate service units.
- Conduct analysis of significant safety events to identify risks and causal factor trends in ATO
  operations. Disseminate findings and provide recommendations for corrective actions to
  appropriate service units. A minimum of one significant safety event analysis finding per service
  area per quarter is required.
- Sustain adjusted operational availability of 99.7 percent for the reportable facilities that support the 35 OEP airports through FY 2013.

#### Capacity:

- Redesign airspace in key metropolitan areas, including Charlotte, Dallas, Denver, and Southern California. Complete business cases and determine whether to charter airspace projects for four metropolitan areas.
- Continue to implement RNAV routes (Q-routes, Tango routes, and GPS minimum en route altitude) in support of Airspace Management Program and industry requests. Develop procedures, conduct flight checks, and prepare publications for a minimum of 12 routes and 50 RNAV SIDs/STARS.
- Continue implementation of an integrated procedures concept for Performance-Based Navigation

- (PBN), incorporating airspace redesign, environmental analysis, and RNAV and RNP route and procedure development with the goal of expediting NextGen capabilities.
- Introduce a new, site-adapted Runway Template Action Plan document in support of Ft. Lauderdale new runway initiatives into the NextGen process.
- Develop implementation plan for high-altitude airspace operational improvements, including realignment, re-stratification and/or re-sectorization. Complete implementation plan for high altitude operations for transition to mid-term operational concepts.
- Use the Integrated Collaborative Routing (ICR) process during weather events. Continue to enhance, expand, and train employees on the ICR process for use during the severe weather season.
- Develop a process to share airport surface data with stakeholders. Develop an airport Collaborative Decision-Making process model at a target airport in the NAS.
- Collaborate with security partners to develop security-related Temporary Flight Restrictions (TFRs) and Notices to Airmen (NOTAMs) and to ensure timely distribution of the information to reduce the impact on NAS operations. Complete actions to publish TFR and other security NOTAM information via the Internet within 1 hour of finalizing the details.
- Support and represent DOT/FAA in development of plans that support the National Strategy for Aviation Security meetings.
- Utilize existing Category I-equipped runways in conditions that exceed normal Category I
  minimums through the use of Runway Visual Range (RVR) systems and appropriate equipage and
  training in the cockpit. In coordination with Flight Standards, work toward establishing lower RVR
  minima at one OEP airport.
- Provide RNAV capability in the terminal area to aircraft equipped with distance measuring
  equipment (DME)-DME capability, but without Inertial Reference Unit. In coordination with Flight
  Standards and Spectrum, work to assure that standalone DMEs can be established within the NAS
  and support DME-DME RNAV in the terminal domain.
- Wide Area Augmentation System equipage: Complete three supplemental-type certification approvals for commercial transport aircraft.
- Complete a minimum of 95 percent of all scheduled preventive maintenance on time.
- Update the Spectrum Strategic Plan.
- Address all mold remediation projects identified through the agency identification process in 2011.
- Deconstruct 300 NAS facilities, perform environmental, site restoration, and closeout activities, and release to the Regions and Centers Organization.
- Acquire data communication system: Complete evaluation and selection activities for acquisition of an air-ground network service.
- Design, develop, and test Voice Switching and Control System (VSCS) technical refresh hardware and software. Complete 80 percent of VSCS Console Equipment Program Language for Microcomputers (PLM) to C++ software conversion.
- Alaskan Satellite Telecommunications Infrastructure: Begin upgrade of satellite communications equipment at 64 facilities.
- Complete service certifications on FAA-owned NAS Equipment. Complete a minimum of 98 percent of service certifications within identified schedules.
- Coordinate scheduled maintenance activities to sustain NAS reportable facilities adjusted operational availability. Sustain adjusted operational availability of 99.7 percent at NAS reportable facilities.
- Achieve an average daily airport capacity for the 35 OEP airports of 103,068 arrivals and departures per day by FY 2011 and maintain through FY 2013.

#### Organizational Excellence:

- Each FAA organization will track and report quarterly on their compliance with leadership
  development policies and initiatives in the areas of mandatory probationary manager training,
  probationary manager certification, continuing management education, and steps taken to improve
  compliance rates. Report quarterly the percentage of probationary managers who completed
  mandatory training (FMC-1, FMC-2, and FMC-3) during the previous quarter within prescribed
  timeframes.
- Ensure that capital planning activities are conducted in a sound, efficient manner, and in accordance with cyclical (e.g., budget, strategic, and acquisition) planning requirements. Review annual updates of OMB Exhibit 300 to confirm that business cases are complete and up-to-date.
- Implement an efficient and effective cyber security program in accordance with the Federal Information Security Management Act of 2002. Recertify 15 ATO administrative information systems by each system's anniversary date. Perform annual assessments on 18 ATO administrative information systems.
- Survey ATO customers' opinions of the products and services provided by the ATO and provide final survey results to ATO management.
- Determine the number of cost reimbursable contracts of \$100 million or more in value. Request Defense Contract Audit Agency audits on those contracts. Report on audit status quarterly.
- Coordinate and report on the initiative efforts to maintain the ATC Workforce Plan Annual Hiring
  within 2 percent of the ATC workforce hiring plan targets. Report progress on meeting ATC actual
  on-board (AOB) monthly targets as indicated in the FPPS.
- Conduct an audit of each Alaskan Flight Services facility to identify and prioritize what is required to
  maintain and sustain the facilities. In coordination with Technical Operations and Western Service
  Center, develop a plan to maintain and sustain Alaskan Flight Services facilities. Conduct three
  assessments and produce three reports.
- Complete 95 percent of scheduled 3-year information technology (IT) systems re-certifications by the target system's Certification and Authorization anniversary date.
- Award procurements to small businesses in accordance with the Acquisition Management System Small Business Development Program policies and guidance. Provide outreach and training to small businesses with special emphasis on small, disadvantaged, and women-owned businesses, and service-disabled veteran-owned businesses. Deliver and participate in two outreach events or programs by July 30, 2011, with a total of four by the end of FY 2011.
- Continue standardizing non-NAS IT infrastructure and user support processes to improve responsiveness and quality of service to customers, while reducing costs. Achieve greater than 90 percent satisfaction on customer satisfaction surveys. Replace IT Infrastructure hardware per the approved life cycle management plan 90 percent of the time.

#### International:

- Promote strategic U.S. navigation technologies, including the GPS and its wide and local area augmentations systems, with key civil aviation authorities and global aviation community. Manage bilateral and regional cooperative GPS-based projects to encourage adoption and increased use of GPS and augmentation-related technologies with key global partners.
- Promote strategic U.S. surveillance technologies, including Automatic Dependent Surveillance -Broadcast (ADS-B), with key civil aviation authorities and global aviation community. Manage bilateral and regional cooperative ADS-B projects to encourage adoption and increased use by key global partners.
- Promote global implementation of U.S. RNAV/RNP concepts and applications. Demonstrate RNAV/RNP applications via educational seminars or concept demonstrations in at least two countries
- Support ICAO and the global aviation community with performance-based navigation (PBN) implementation. Support ICAO PBN Study Group meetings, ICAO regional forums, and bilateral forums with position papers and expertise as necessary.

- Plan and execute key NextGen international activities with regional aviation authorities, organizations, United States Government (USG) stakeholders and industry members. Coordinate with the NextGen and Ops Planning Service Unit to support established and maturing cooperative projects and initiatives with the countries of Japan, China, Canada, and Mexico. Manage ATO support for European Commission Industry Consultation Body meetings, EUROCONTROL Coordination Committee and Strategic Executive Meetings, and NextGen and Single European Sky Air Traffic Management Research Joint Undertaking harmonization efforts.
- Implement the NextGen international activities through collaboration with USG stakeholders and key countries on technologies or procedures of mutual interest. Identify existing mechanisms to expand international NextGen cooperation with additional countries and international organizations, as necessary. Update Joint Planning Environment to reflect global harmonization initiatives.
- Coordinate ATO international activities and initiatives that support the continued development of ATO best business practices and processes. Coordinate ATO activities in support of on-going and future employee exchange programs with foreign Air Navigation Service Providers to assist the ATO with its development of best business practices.
- ICAO Headquarters: Coordinate ATO support for ICAO global efforts, including but not limited to
  oversight of Universal Safety Oversight Audit Program action plan commitments, the annual filing
  of differences to ICAO standards in accordance with FAA Order JO7000.6, Identification and
  Notification of Differences Between ATO Products and Services and ICAP Documents, and ATO
  participation in panels and other groups. Lead ATO coordination with the International Policy
  Office.

#### NAS Plan Handoff Requirements

NAS Plan Handoff (NPHO) funding requirements are driven by operations and maintenance (O&M) bills for new acquisition programs being commissioned in FY 2009. While the Facilities & Equipment (F&E) appropriation will be paying these bills through FY 2010, agency policy dictates that they be subsequently transitioned to the Operations appropriation in FY 2011. These costs include recurring telecommunications installations and upgrade expenses, contractor support for preventative maintenance, funding to buy parts and pay for repairs, software maintenance updates and fixes, infrastructure repairs, field maintenance support, and training. The ATO is requesting \$28.5 million for NPHO costs in FY 2011.

The NAS continues to grow in size and complexity as new systems are procured and fielded. In 1998, the NAS had 38,209 operational facilities, and as of October 1, 2008, there were 59,833 facilities, an increase of 21,624 systems in 10 years. The NAS Operational Inventory Report was re-written in October 2007. It now uses WebFSEP as the national source for the report. The new version of the report includes all disciplines, for example, Automation, Communication, Navigation, Surveillance, Weather, Infrastructure, and Mission Support. Previously, the report did not include Infrastructure and Mission Support equipment.

The NPHO request is a direct result of capital acquisition programs fielding systems in the F&E appropriation and varies each year depending on the number of systems being deployed. The Operations appropriation is required to pick up the additional recurring O&M expenses for newly-commissioned NAS systems.

Although most replacement systems are more efficient and reduce O&M costs by replacing older systems, this is not always the case. Some replacement systems are more expensive than the systems being replaced and require additional funding to maintain. For example, when a consolidated TRACON facility is built, the towers co-located with the TRACONs being consolidated do not actually shut down, but stay open and continue to have an operational requirement for utilities, grounds maintenance, custodial, guard services, and general maintenance. Therefore, the Operations funding for these facilities cannot be transferred to the new consolidated TRACON, so additional resources are frequently required to pay the recurring bills to support the new TRACON. In addition, a new or replacement system often has additional features that make the hardware and software more complex, and thus more difficult and expensive to maintain.

An example of this is Airport Surface Detection Equipment, Model X (ASDE-X). The ASDE-X system is a surface surveillance system that provides seamless multi-sensor airport surveillance with identification and conflict alerting to air traffic controllers. The system integrates five technologies: transponder

multilateration, surface movement radar, Automatic Dependent Surveillance – Broadcast (ADS-B) data, multi-sensor data fusion, and control tower display equipment. The integration of these sensors provides data with accuracy, update rate, and reliability suitable for improving airport safety and efficiency in all weather conditions. The ASDE-X is particularly useful as a traffic control aid during hours of darkness and other conditions of poor visibility.

ASDE-X was developed to aid in preventing surface collisions and in reducing critical Category A and B runway incursions by enabling air traffic controllers to track the surface movement of aircraft and vehicles. ASDE-X provides air traffic controllers with a visual representation of the traffic situation on the airport movement area and arrival corridors which improves their ability to maintain awareness of the operational environment and to anticipate contingencies.

The FAA Standard Work Breakdown Structure (WBS) is used to identify O&M costs associated with both new and replacement systems. Below is a brief description of each WBS element:

- Preventive Maintenance/Certification All activities associated with preventive maintenance of hardware and software, including activities specific for certification.
- Corrective Maintenance All activities associated with corrective maintenance of hardware and software. This also includes activities related to packaging and shipping components to depot level repair facilities.
- Modifications All activities associated with implementation of modifications to in-service hardware and software.
- Maintenance Control All activities associated with providing oversight and coordination in operating and maintaining the NAS infrastructure, including NAS Operation Managers.
- Technical Teaming All activities associated with the investigation and resolution of general technical issues relating to system performance.
- Watch Standing Coverage Watch standing coverage beyond stated staffing requirements.
- Program Support All administrative activities associated with planning, organizing, managing, and directing actions required in support of operating and maintaining the solution.
- Logistics All activities associated with depot level support to NAS prime mission equipment and associated support equipment.
- In-Service Training All activities associated with on-the-job training and refresher training of personnel who directly operate, maintain, or provide support functions of the solution. This includes contractor provided costs associated with specific training. Training costs include course conduct (including instructor and facilities costs), travel, and per diem costs for students.
- Second-Level Engineering All engineering activities in support of the delivery of service, to
  include development of modifications, documentation, testing, and configuration management. It
  includes the evaluation, prototype, testing, and implementation of technology refresh initiatives, as
  well as contractor staffing and travel as applicable.
- Infrastructure Support All activities associated with maintenance, operations, and security of leased and owned buildings, structures, grounds, roads, and support vehicles for operational systems or people who support or operate those systems. Also includes physical security personnel.
- Flight Inspections and Standard Instrument Approach Procedures Development All activities associated with the development, NAS integration, and maintenance of standard instrument flight procedures, flight inspection procedures, and the compilation, replication, and dissemination of charts and related paper and digital products.
- System Performance Assessment All activities associated with assessing equipment and system performance and trends, including metrics development, data collection, and trend analysis.
- System Operations All non-maintenance activities associated with directly operating or monitoring

the solution. This includes computer operations, system administration, system security administrators, information security assessments, audits, etc.

• Travel to and from sites – Travel time to and from sites to perform any type of In-Service Management work.

#### Cost Efficiencies

In FY 2011, ATO will realize a total of \$22.4 million in cost efficiencies from the A-76 outsourcing of Flight Services in February 2005. The largest non-defense outsourcing initiative undertaken to date by the Federal government, this action will save the agency approximately \$2.1 billion over a 13 year period.

#### Strategic Management Plan

The ATO has emphasized a disciplined approach to strategy formulation and implementation for many years, initially with the Strategic Management Process (SMP) and currently with Strategy 2014. Strategy 2014 incorporates the lessons learned from SMP into a simpler, more focused process that is integrated with key business planning and financial management processes. This will be extremely critical as we rapidly transition to the advanced suite of technologies and processes required by NextGen.

The <u>ATO Strategy 2014</u> addresses the organization's key priorities for the next 5 years. Each goal will be tracked quarterly providing a complete picture of ATO's progress. These priorities are discussed in the five goal areas below:

- Goal 1 "Engaged Customers, Partners, Stakeholders and Employee Unions" focuses on achieving
  a long-term shared commitment to a sustainable and responsive air transportation system. The
  expected outcomes include improved customer, partner, and stakeholder processes and mutually
  beneficial relationships with employee unions.
- Goal 2 "People-Driven Service Excellence" focuses on fostering a service-oriented climate in
  which employees continuously learn, embrace innovation, and share accountability for success.
  The expected outcomes include having people with the right skills, in the right place, at the right
  time, and an improved work environment.
- Goal 3 "Safe, Efficient, Responsive Air Transportation System" focuses on providing a
  customer-focused, safe, efficient, and affordable air transportation system that is environmentally
  responsible. The expected outcomes include optimizing the safety and efficiency of the NAS and
  ensuring the availability of NAS Services.
- Goal 4 "New Capabilities through Technology and Tools" focuses on evolving the NAS
  infrastructure to provide new and improved capabilities. The expected outcome is advanced
  deployment of NextGen.
- Goal 5 "World-Class Administrative and Business Operations" focuses on enhancing performance
  and increased productivity through effective and responsive business operations. The expected
  outcomes include improved efficiency and quality of our processes and integrated acquisition
  activities and ATO programs and initiatives corporately prioritized and aligned with the budget.

#### Budget Request by Service Unit and Staff Office

At the beginning of FY 2009, ATO realigned into four business units: Operations, NextGen and Operations Planning, Finance, and Strategy and Performance. Within the Operations Business Unit, there are four operational service units: En Route and Oceanic Services, System Operations Services, Technical Operations Services, and Terminal Services. There are also four offices that support ATO: Office of Acquisition and Business, Office of Safety, Office of Service Centers, and Office of Technical Training. These last two offices report to the Senior Vice President of Operations.

Service Unit	FY 2011 Estimate	End of Year	FTE
Senior Vice President Operations	\$7,110,111	30,053	31,508
Vice President En Route & Oceanic	\$1,905,524	8,805	9,118
Vice President Terminal	\$2,169,803	10,538	11,373
Vice President Technical Operations	\$2,119,980	8,387	8,603
Vice President System Operations	\$593,007	1,298	1,312
Vice President Service Center	\$115,165	646	712
Vice President Technical Training	\$206,632	379	390
Other ATO Staff Offices*	\$520,517	896	1,025
TOTAL	\$7,630,628	30,949	32,533

<sup>\*</sup>Other ATO Staff Offices include: Acquisition and Business, Finance, Strategy and Performance, Safety, and NextGen and Operations Planning

Resource Summary - Air Traffic Organization (ATO)					
	FY 2009 Actual	FY 2010 Enacted	Unavoidable Changes	Discretionary Changes	FY 2011 Request
Funding (\$000):					
PC&B	4,893,641	5,105,196	299,391	-251	5,404,336
Other Objects					
Travel/Transportation	120,732	117,804	590	0	118,394
Other Services	1,545,322	1,545,461	36,378	-7,416	1,574,423
Rent/Communications/Utilities	311,487	304,484	1,512	0	305,996
Other	223,490	226,354	1,125	0	227,479
Subtotal	2,201,031	2,194,103	39,605	-7,416	2,226,292
Total	7,094,672	7,299,299	338,996	-7,667	7,630,628
Staffing					
Senior Vice President Operations	30,143	30,295	-242	0	30,053
Vice President En Route & Oceanic	8,760	8,927	-122	0	8,805
Vice President Terminal	10,693	10,658	-120	0	10,538
Vice President Technical Operations	8,380	8,387	0	0	8,387
Vice President System Operations	1,285	1,298	0	0	1,298
Vice President Service Center	646	646	0	0	646
Vice President Technical Training	379	379	0	0	379
Other ATO Staff Offices*	893	899	0	-3	896
Total	31,036	31,194	-242	-3	30,949
FTE's					
Senior Vice President Operations	31,326	31,550	-42	0	31,508
Vice President En Route & Oceanic	8,892	9,095	23	0	9,118
Vice President Terminal	11,436	11,451	-78	0	11,373
Vice President Technical Operations	8,597	8,596	7	0	8,603
Vice President System Operations	1,299	1,306	6	0	1,312
Vice President Service Center	712	712	0	0	712
Vice President Technical Training	390	390	0	0	390
Other ATO Staff Offices*	1,018	1,016	12	-3	1,025

<sup>\*</sup>Other ATO Staff Offices include: Acquisition and Business, Finance, Strategy and Performance, Safety, and NextGen and Operations Planning

32,344

Total

#### **Senior Vice President Operations (AJN-0)**

With safety clearly the most important aspect of air traffic, the ATO was realigned to ensure that each tactical organization is grouped together in a single operations unit. Day-to-day organizational synergy makes certain that knowledge is shared across all of the six groups included in the operations effort. The service units included are En Route, Terminal, Technical Operations, System Operations, Technical Training, and Service Centers. This unit is led by a senior vice president, one of the direct reports to the ATO's Chief Operating Officer.

32,566

32,533

#### Vice President En Route and Oceanic (AJE-0)

En Route and Oceanic Services (AJE) provides air traffic control operations, systems, and facilities necessary to operate, maintain, and improve the NAS. From 23 service delivery points in the U.S., Puerto Rico, and Guam, AJE controls more than 29 million square miles of airspace over the continental United States and the Atlantic and Pacific Oceans. Every day AJE ensures that thousands of positively controlled aircraft at

high altitudes en route from one terminal area to another are directed on the safest, most efficient path to their destinations. Customers include domestic and international airlines, general aviation, the Department of Defense, and the Department of Homeland Security.

AJE's almost 12,000 pieces of equipment help maintain air traffic control operations utilizing complex voice and data switching equipment, radio and microwave transmission systems, local and remotely-located radio, and radar systems. Headquarters and Technical Center employees are responsible for acquisition program management, engineering, production, logistics, testing, training, and systems and procedures implementation. Since the mid-1990s, AJE has fielded modern communications, display, and weather systems for controller use. Major acquisition programs such as ERAM and Automatic Dependent Surveillance-Broadcast (ADS-B) are replacing yesterday's equipment with flexible, resilient, scalable, and adaptive systems that will provide the platform for the NextGen. In addition, new en route separation standards, navigation procedures, and innovative routing are reducing flight time and saving fuel. AJE's efforts are saving fuel and reducing airspace congestion. AJE is saving money for air carriers and general aviation, reducing delays for passengers, and cutting airplane emissions.

Through innovative training techniques and efficient database tracking, AJE is also ensuring that a consistent progression of air traffic controllers is available to staff its facilities now and in the future. AJE has deployed high fidelity simulation systems to provide realistic training that reduces the time it takes a student to reach professional controller status.

Vice President En Route and Oceanic, AJE-0

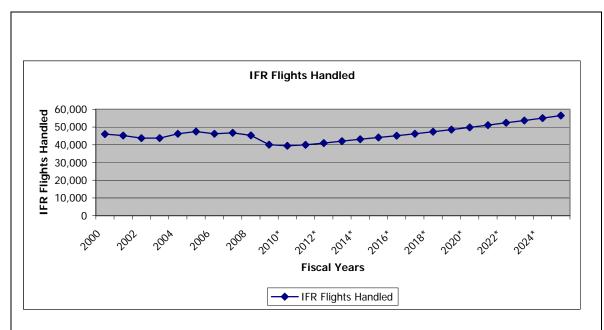
	FY 2009 Actuals	FY 2010 Enacted	Unavoidable Changes	Discretionary Changes	FY 2011 Request
·					1
Funding (\$000)					
PC&B	1,543,543	1,622,221	124,590	0	1,746,811
Other Objects					
Travel/Transportation	4,814	4,831	24	0	4,855
Other Services	138,574	147,857	739	0	148,596
Rent/Communications/Utilities	147	157	0	0	157
Other	4,552	5,080	25	0	5,105
Subtotal	148,087	157,925	788	0	158,713
Total	1,691,630	1,780,146	125,378	0	1,905,524
Staffing					
End-of-Year	8,760	8,927	-122	0	8,805
Full-time Equivalent Employment	8,892	9,095	23	0	9,118

The En Route and Oceanic Service Unit is requesting \$1,905.5 million. This request provides an additional \$124.6 million for personnel compensation, including \$73.0 million for the NATCA settlement.

Below is a map of ATO's En Route and Oceanic Service Areas and the locations of the En Route centers.



The chart below depicts the number of Instrument Flight Rules (IFR) flights handled and IFR flight hours. The number of IFR flights handled is calculated by multiplying the number of IFR departures (an en route IFR flight which originates in the center's area and enters that center's airspace) by two, then adding the number of en route IFR flyovers (an IFR flight that originates outside the center's area and passes through the area without landing).



#### Vice President Terminal (AJT-0)

The Terminal Service Unit (AJT) provides terminal air traffic control (ATC) services. It provides ATC services daily, develops ATC capabilities, monitors operational performance, manages programs in support of these services, and serves as a liaison to customers, airports, and service area operations personnel.

Terminal ATC services include both airport surface operations and terminal area operations. Airport surface operations are conducted by controllers at 509 federal and contract towers located at the nation's busiest airports. Aircraft and many other vehicles share the airport surfaces, creating a challenging environment at these airports. Terminal area operations are conducted by controllers at 164 Terminal Radar Approach Control (TRACON) facilities, which routinely handle aircraft within 40 or more miles of an airport. In many cases these facilities are combined with operations personnel shared between the facilities.

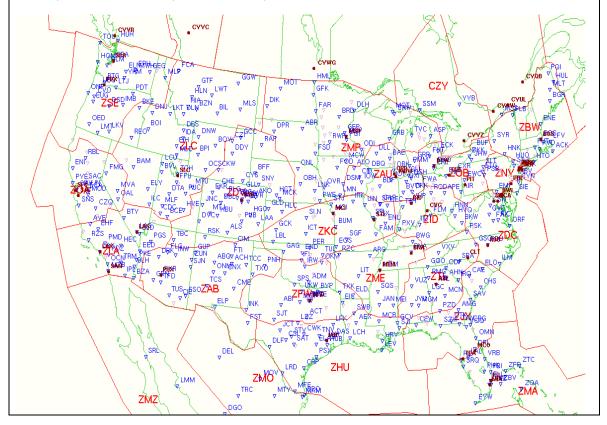
AJT is divided into three geographical service areas (Eastern, Central, and Western) to better manage the delivery of terminal ATC services. The primary function of each service area is to oversee ATC operations within its geographical area, and to ensure that quality standards established for safety, capacity, and organizational excellence are met.

Vice President	Terminal	. AJT-O
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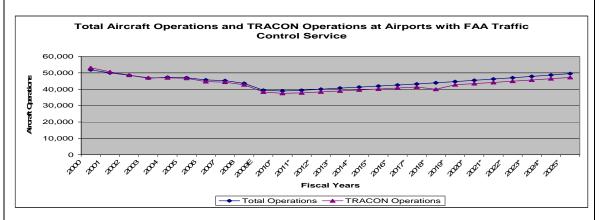
Vice i resident reminal, rui e	FY 2009	FY 2010	Unavoidable	Discretionary	FY 2011
	Actuals	Enacted	Changes	Changes	Request
Funding (\$000)					
PC&B	1,709,378	1,776,219	116,691	0	1,892,910
Other Objects					
Travel/Transportation	9,475	9,516	48	0	9,564
Other Services	215,683	247,324	9,857	0	257,181
Rent/Communications/Utilities	586	592	3	0	595
Other	8,939	9,506	47	0	9,553
Subtotal	234,683	266,938	9,955	0	276,893
Total	1,944,061	2,043,157	126,646	0	2,169,803
Staffing					
End-of-Year	10,693	10,658	-120	0	10,538
Full-time Equivalent Employment	11,436	11,451	-78	0	11,373

The Terminal Service Unit is requesting \$2,169.8 million. This request provides an additional \$116.7 million for personnel compensation, including \$69.4 million in NATCA settlement costs, and \$8.6 million for NPHO.

The map below shows the airports where FAA provides terminal services.



The chart below shows the total aircraft operations and instrument operations at airports with FAA traffic control services.



Terminal has a NPHO requirement of \$8.6 million. This covers the following programs:

**A03.05-01 Integrated Display System (IDS) Technology Refresh -** Beginning in FY 2011, FAA will incur costs in the Operations program for recurring operations and maintenance in the amount of \$300,000:

- \$100,000 for Logistics Support This includes the replenishment of spares and supply support activities associated with maintaining the legacy IDS-4 systems until replaced. The support includes ordering, replenishing, exchanging, receiving, tracking, cataloging, and inventory management of replenishment spares needed in order to operate and maintain the IDS systems at both the site and depot levels. This also includes activities related to packaging, handling, storage and transportation (PHS&T), and on-site space allocation of material. The legacy IDS-4 systems have long surpassed the end of their serviceable life. As such, replacement parts/components are more expensive and more parts/components will need to be repaired by single-source vendors in lieu of the FAA Logistics Center.
- \$200,000 for System Maintenance Support This includes corrective maintenance and repair of all IDS-4 systems; and, system security assessments and audits. FAA technicians and second-level engineering personnel maintain the systems at the sites but rely on the contractor to provide telephone and/or on-site support for proprietary system software troubleshooting and modifications. The increased costs are associated with increasing contractor costs for providing system software support for both the legacy IDS-4 systems and the replacement system. Additionally, a full security certification and accreditation is required for the legacy IDS-4 system to ensure that air traffic control information is safeguarded from improper access.

**M20.01-02 NAS Training – Equipment Modernization – Training Simulators – Tower CAB** – Beginning in FY 2011, FAA will incur costs in the Operations program for recurring operations and maintenance in the amount of \$3.1 million:

- \$1.5 million for Program Support This includes all activities associated with field-support resources, Prime Contractor system performance and maintenance, logistics support, and technical refresh management.
- \$842,871 for Commercial Depot Logistics (CDLS) Contracts This includes on-call support and depot sparing. The funding applies to all the facilities hosting the simulation system.
- \$562,969 for Second-Level Engineering This includes a support center for software and database creation, modification, documentation, hardware and software configuration management, correcting system hardware deficiencies, and reporting.
- \$224,568 for Infrastructure Support This includes the cost for additional power required for each

facility (18 Hubs and 4 Prototype sites).

These recurring costs are to support the 18 Hub sites, the four prototype sites and the FAA Academy. The FAA Academy conducts technical training for air traffic controllers, airway facilities technicians, aviation safety inspectors, and other specialists, and is responsible for internal training infrastructure. Training on the new systems being installed (resulting from NAS modernization) requires updated simulators, training media, and communications equipment. This program updates the simulators, training media, and communications equipment that significantly cut training costs and creates a well-trained technical workforce.

The NAS Training Simulator project acquired and deployed training simulators to selected air traffic facilities in the field as well as the FAA Academy. This project focuses on using technology to assist FAA in training newly hired controllers during the next 10 years in response to projected staffing requirements.

**S03.02-01 Terminal Radar Program (ASR-11)** – Beginning in FY 2011, FAA will incur costs in the Operations program for recurring operations and maintenance in the amount of \$374,000:

- \$131,000 for Corrective Maintenance In support of additional commissioned sites in FY 2009.
- \$29,000 for Systems Management Office (SMO) All activities associated with managing and planning activities at the SMO level for corrective maintenance activities.
- \$97,000 for Logistics Increased repair costs in support of antenna failures.
- \$42,000 for Second-Level Engineering All activities for hardware and software engineering support performed by contractor second level engineer.
- \$41,000 for Utilities, Building, and Grounds Upkeep and Maintenance To cover transition to Operations costs for sites commissioned in FY 2009.
- \$34,000 for Flight Inspections and Standard Instrument Approach Procedures Development In support of additional sites commissioned in FY 2009.

The ASR-11 is the integrated primary and secondary radar deployed at terminal sites. The mission of the ASR-11 investment is to replace our aging airport radar systems with a single integrated digital primary and secondary radar system. In the areas around airports, known as the terminal environment, air traffic controllers use radars to detect, locate, and track aircraft. Primary radars locate all aircraft, commercial and general aviation, with and without on-board transponders. Secondary radars locate aircraft that have transponders (usually commercial aircraft). Currently, the FAA has 225 terminal facilities that have both primary radar (ASR-9, ASR-8, or ASR-7), and a collocated, secondary radar (Mode-S, ATCBI-4, or ATCBI-5). The ASR-9 and Mode-S systems (average age 10 years) were deployed in the 1990's; ASR-8 (average age 20 years) and ATCBI-5 systems (average age 25 years) were deployed in the 1980s; and ASR-7 (average age 24 years) and ATCBI-4 systems (average age 30 years) were deployed in the 1970's.

The ASR-11 replacement combines four separate radar systems (ASR-7, ASR-8, ATCBI-4, and ATCBI-5) into one system that uses modern digital technology to support the air traffic control automation system in use today. New capabilities include digital vs. analog output, LAN architecture for data distribution, remote certification and control, and both analog and digital solid-state components (i.e., no electron tubes). An additional feature is the six-level National Weather Service (NWS) calibrated weather capability—an improvement upon the very limited weather capability in the ASR-7/8 systems. ASR-11 radars detect and track aircraft and provide superior performance including ease of maintenance, increased system availability and reliability, and improved operational performance.

Location	Date Commissioned	Description
Monterey, CA (MRY)	1/15/09	Replacement
Allentown, PA (ABE)	4/30/09	Replacement
Wilkes-Barre, PA (AVP)	5/22/09	Replacement
Sioux Falls, SD (FSD)	5/29/09	Replacement
Baton Rouge, LA (BTR)	6/12/09	Replacement
Binghamton, NY (BGM)	6/19/09	Replacement
Lexington, KY (LEX)	6/30/09	Replacement
Amarillo, TX (AMA)	7/30/09	Replacement
Moline, IL (MLI)	8/7/09	Replacement
Kahului, HI (OGG)	8/28/09	Replacement

**S09.01-00 Airport Surface Detection Equipment – Model X (ASDE-X)** – Beginning in FY 2011, FAA will incur costs in the Operations program for recurring operations and maintenance in the amount of \$3.9 million:

- \$312,000 for Logistics Support This includes supply support activities and replenishment spares to support all fielded ASDE-X systems. This includes ordering, replenishing, exchanging, receiving, tracking, cataloging, and inventory management of replenishment spares needed in order to operate and maintain the ASDE-X systems at both the site and depot levels. This also includes activities related to PHS&T, and on-site space allocation of material.
- \$665,000 for System Maintenance Support This includes both site and depot level corrective
  maintenance and repair. FAA technicians maintain the systems at the sites but rely on the
  contractor to provide labor, facilities support equipment, material, packing, handling, storage, and
  transportation for depot level repair and support.
- \$2.6 million for Second-Level Engineering This includes contract engineers to provide direct operational support via telephone technical assistance and/or on-site restoration efforts to resolve problems with the commissioned ASDE-X facilities. Their support also includes: design of modifications and performance of system optimization to improve the operational performance of the NAS ASDE-X facilities; verification that proposed software changes made by the prime contractor do not impact the operational capabilities of the system; and development of test plans and procedures to conduct system level testing of the performance of the software upgrades. Additional recurring costs include: photogrammetry (digitized and orthorectified aerial photographs) of airports that are acquired on a regular basis for the creation of new site-specific adaptations resulting from construction changes of operational movement areas; sustainment of the Program Support Facility (PSF) for organic software and hardware support; sustainment of remote connectivity between operational ASDE-X facilities and the PSF via FTI-VPN; and the contract with Sensis Corporation which is necessary to support proprietary elements of the ASDE-X system.
- \$386,000 for Infrastructure Upgrades new service at the sites listed below.

These recurring costs are for support of 19 ASDE-X commissioned systems. The ASDE-X multilateration system includes remote units installed strategically throughout the airport to provide target position and identification reports for all aircraft and vehicles equipped with transponders. Multilateration is the process of determining a target's location in two or three dimensions by triangulating the transponder signal.

The ASDE-X system is designed to aid in the prevention of accidents resulting from runway incursions. ASDE-X is capable of processing three types of sensor data providing a robust surveillance picture consisting of three dimensional target locations, target identification, and universal time. The three sensor types of ASDE-X are independent (primary surface radar), cooperative (multilateration and secondary surveillance radar), and dependent (ADS-B) surveillance sources. Radar is used to provide the independent surveillance

for all non-transponder equipped targets in line-of-sight of the radar antenna. Multilateration will provide target position and identification reports for all aircraft and vehicles having operational transponders. Automatic Dependent Surveillance - Broadcast (ADS-B) will provide accurate global positioning system (GPS) position reports for equipped aircraft. ASDE-X improves surface safety; provides surface situational awareness and positive identification of targets on the surface, including conflict detection and alerting; benefits ATC by providing a collaborative decision-making tool based on improved situational awareness; provides enhancements to increase the capabilities provided by the current ASDE-3/AMASS system; and improves the accuracy and timeliness of surveillance data. ASDE-X will reduce the risk of runway collisions, resulting in avoided fatalities, injuries, and aircraft damage and reduced taxi delays, resulting in aircraft direct operating cost savings and passenger savings. The ASDE-X system will be implemented at airports with no surface surveillance systems and airports with ASDE-3/AMASS systems.

Location	Date Commissioned	Description
Phoenix Sky Harbor International Airport	September 18, 2008	New
Los Angeles International Airport	January 29, 2009	Replacement
Ft. Lauderdale/Hollywood Airport	September 9, 2008	New
Newark International Airport	July 2009	Replacement
Boston Logan International Airport	July 2009	Replacement

**W07.01-00 Integrated Terminal Weather System (ITWS)** – Beginning in FY 2011, FAA will incur costs in the Operations program for recurring operations and maintenance in the amount of \$694,000:

- \$407,000 for Hardware/Software Engineering Support All engineering activities in support of the
  delivery of service, to include development of modifications, documentation, testing, configuration
  management, and field support. This includes the evaluation, prototype, testing, and
  implementation of technology refresh initiatives, providing engineering guidance to technicians for
  trouble shooting problems pertaining to software and hardware issues, as well as contractor
  staffing and travel as applicable.
- \$245,000 for Telecommunications Required for Federal Telecommunications Infrastructure (FTI) connectivity between ITWS systems, sensors, and remote sites.
- \$42,000 for Systems Operations Volpe distributes weather products to approved FAA and non-FAA users not directly connected to the FAA system.

ITWS is an automated terminal-area weather data processor, which provides a unified set of safety and planning weather products to air traffic supervisors, traffic management specialists, and others on a local and regional basis. The ITWS information depicts current conditions and near-term (up to 1 hour) forecasts. ITWS information is disseminated to respective towers, TRACONS, en route centers, and other users. ITWS integration and display of data from terminal weather sensors, remote weather sensors, and external processors provide analyses and short-term forecasts.

Location	Date <b>Commissioned</b>	Description
Indianapolis	May 2009	New
Las Vegas	July 2009	New
New Orleans	July 2009	New
Nashville	August 2009	New

W11.02-01 NEXRAD – Legacy, Icing, and Hail Algorithms (NLIHA) - Beginning in FY 2011, FAA will incur costs in the Operations program for recurring operations and maintenance in the amount of \$159,000:

- \$127,000 for Second-Level Engineering Support The FAA is facing increased costs to satisfy its
  commitment under the terms of the NEXRAD Tri-Agency Agreement to provide a pro-rata share of
  the technical support required by the NEXRAD Radar Operations Center (ROC). Costs to maintain
  NEXRAD include labor, facilities support equipment, material, packing, handling, storage, and
  transportation for depot level repair and support.
- \$32,000 for infrastructure support increase in the FAA's pro rata share for providing ROC building

maintenance, utilities, and other infrastructure support costs.

NLIHA represents the FAA's component of a larger NEXRAD Tri-Agency partnership that includes DOC/NWS, DOT/USAF, and DOT/FAA. Although fully commissioned by the late 1990's, the Tri-Agency team under the NWS's leadership strives to provide continuous improvement to the NEXRAD platform. These initiatives are jointly supported by the Tri-Agency participants according to terms in the NEXRAD Memorandum of Understanding, which details how each agency contributes to the overall mission. The FAA's NEXRAD program provides the means to fund the FAA's share of the overall NEXRAD mission, and to ensure that FAA priorities are included in the planning for NEXRAD sustainment and improvement.

#### Vice President Technical Operations, AJW-0

Technical Operations (AJW) supports the delivery of safe and efficient flight services to customers through responsive and cost effective maintenance of the NAS facilities, systems, and equipment.

The work consists of systems design and development, acquisition, installation, maintenance, restoration, modification, and certification; flight inspection; facilities maintenance; engineering and assignment of aeronautical frequency spectrum; safety integration; information and physical security management; and administrative and business support functions.

The dedicated staff at AJW's core work is performed by the system support centers and flight inspection field offices. They focus on optimizing NAS performance through prioritization of response based on such factors as importance of the airport or air traffic control facility that is directly or indirectly affected by the equipment or service outage. Key activities include certification, logging, maintenance, modifications, and technical documentation.

Strategic efforts and related program management is primarily provided by headquarters organizations. AJW's strategic activities in support of the FAA Flight Plan include development and implementation of the Next Generation Air Transportation System (NextGen). Developing and publishing Required Navigation Performance and Wide Area Augmentation System (WAAS) approaches are just some of AJW's contributions toward this effort.

The Technical Operations Services is made up of the following directorates:

- Safety and Operations Support provides technical support to the ATO's service units, through a
  strategy of focused engineering, policy, data and in-service management by providing the support
  structure, methodology, tools, procedures, performance monitoring and assurance, necessary for
  the proper operation and maintenance of the NAS and AJW.
- Air Traffic Control Facilities Office provides safe and effective lifecycle management of the NAS and Facilities Infrastructure including policy, guidance, programming, requirements, engineering, integration and implementation support, service life extension, and maintenance support.
- The Aviation System Standards mission is to ensure the evaluation and certification of airspace systems, procedures, and equipment for customers worldwide. The organization operates aircraft for the purpose of flight inspection.
- Navigation Services develops, acquires, deploys, maintains, sustains, and improves navigation
  products and services for the NAS. These include: GPS Satellite-Based Augmentation, GPS
  Ground-Based Augmentation, Ground Systems, Lighting Systems, and Technical Support.
- ATC Communications Services provides communications and telecommunications services
  consistent with International Civil Aviation Organization standards required for air traffic control
  within the NAS. It provides communications infrastructure and services for the Department of
  Defense (DoD) to ensure interoperability with the NAS.
- Spectrum Engineering Services obtains, assigns, and protects radio frequencies for the FAA's communication, navigation, and surveillance programs.

Technical Operations Service Areas support the delivery of safe and efficient flight services to
customers throughout the continental U.S., Alaska and Hawaii through responsive and cost
effective maintenance of the NAS facilities, systems, and equipment. The work consists of systems
design and development, acquisition, installation, maintenance, restoration, modification, and
certification; instrument flight procedures management, aeronautical charts publication, and flight
inspection; facilities maintenance; safety integration; information and physical security
management; and administrative and business support functions.

Vice President Technical Operations, AJW-0

Vice President Technical Operations	FY 2009	FY 2010	Unavoidable	Discretionary	FY 2011
	Actuals	Enacted	Changes	Changes	Request
Funding (\$000)				_	_
PC&B	1,044,892	1,087,588	35,070	0	1,122,658
Other Objects					
Travel/Transportation	46,797	47,014	235	0	47,249
Other Services	497,197	498,666	16,811	0	515,477
Rent/Communications/Utilities	285,838	278,755	1,404	0	280,159
Other	152,200	153,669	768	0	154,437
Subtotal	982,032	978,104	19,218	0	997,322
Total	2,026,924	2,065,692	54,288	0	2,119,980
Staffing					
End-of-Year	8,380	8,387	0	0	8,387
Full-time Equivalent Employment	8,597	8,596	7	0	8,603

The Technical Operations Service Unit is requesting \$2,120.0 million which includes an additional \$35.0 million for personnel compensation and \$14.2 million for NAS Plan handoff.

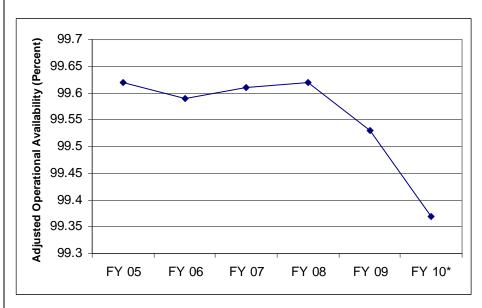
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The NAS is an inherently complex system, with multiple levels of redundancy to assure availability of key services. Technical Operations Service has established the following target for this performance goal:

These graphics represent 9,389 of 64,312 facilities and equipment maintained by the FAA.

 Sustain Adjusted Operational Availability at 99 percent for reportable facilities that support the NAS.

#### **Adjusted Operational Availability of NAS Capabilities:**



#### **Systems Maintenance Field Maintenance Performance Indicators**

Fiscal Year	Number of Facilities**	Adjusted Operational Availability	Reliability
2005	22,792	99.62%	99.90%
2006	22,860	99.59%	99.85%
2007	22,637	99.62%	99.84%
2008	22,611	99.62%	99.84%
2009	22,804	99.53%	99.85%
2010*	22,635	99.37%	99.84%

Notes:

- \*FY 2010 data thru December 31, 2009
- \*\*Operational facilities deemed reportable in FAA Order 6040.15, "National Airspace Performance Reporting System."

Technical Operations has a NPHO requirement of \$14.2 million. This covers the following program:

**A14.02-01 Instrument Flight Procedures (IFP) Automation -** NAS support funds in the total amount of \$2,234,800 are requested in order to provide adequate maintenance support for deployed Instrument Flight Procedures Automation (IFPA) software applications. More specifically, software support at \$1.8 million and \$0.4 million is required for commercial-off-the-shelf software license support. A total of 11 Information Technology contractors are required beginning in FY 2011 to support all IFPA applications, with 6 needed in support of Integrated Product Development System (IPDS) Module 1 and 5 needed in support of the remaining applications (Air Navigation, IFP, and the Automated Performance Test System).

# C06.01-00/C06.04-00 Communications Facilities Enhancements, Expansion and UHF Replacement - The Communication Facilities Enhancement programs include the equipment used for air/ground communications between air traffic control and aircraft when there are gaps in coverage, or when new routes are adopted by aircraft flying through a facility's airspace. ATO efforts in FY 2009 to provide new or relocated radio control facilities will enhance those communications. In addition, the ultra high frequency radio replacement project replaces aging equipment used to communicate with DoD aircraft during air traffic control of military operations in the United States. These FY 2009 efforts will require a

NPHO requirement of \$3,090,626 in the FY 2011 Operations account.

Various CIPs, Flight Inspection & Procedures: A \$1,585,000 increase is requested for recurring operational workload related to maintenance of IFP, periodic flight inspection of IFPs and navigational systems, and charting amendments. Continuous life-span maintenance of an IFP includes amendments, issuance of NOTAM, obstacle evaluations, and other reviews and inspections to ensure compliance with changing Flight Standards criteria. Amendments to IFPs arise out of NAVAID facility relocations, airport infrastructure changes, construction of new obstacles, criteria changes, magnetic variation changes, or user/customer requests. The IFP inventory grows annually and therefore the operations and maintenance program increases annually. The FY 2011 breakout by program/system is: WAAS, \$829,710, for new maintenance costs for IFPs published in the previous year; Other Satellite-Based (e.g., RNAV/RNP, LNAV), \$507,040, for new maintenance costs for IFPs published in the previous year; Instrument Landing System (ILS), \$186,930, for new maintenance costs for NAVAIDs commissioned or IFPs published in the previous year, and other ground-based (e.g., VOR, DME, etc.), \$61,320 for new maintenance costs for NAVAIDs commissioned in the previous year.

Various CIPs, Telecommunications Services – An increase of \$7,260,166 is requested to fund the increase in leased telecommunications operational support for new services installed or commissioned in FY 2009. Telecommunications support costs increase as new services are added within the NAS. Examples include: new STARS services at Pensacola, Columbus, Tampa, Easton, and Syracuse; new Automated Dependent Surveillance Broadcast (ADS-B) service in Colorado; and new or upgraded Weather and Radar Processor (WARP) services to Melbourne, FL, the en route centers, the David J. Hurley Air Traffic Control System Command Center (ATCSCC) in Herndon, VA, and the William J. Hughes Technical Center (WJHTC) in Atlantic City, NJ.

#### Vice President System Operations (AJR-0)

Critical to each day's successful air traffic flow, the conversations held every two hours between the major airlines and specialized FAA personnel located at the ATCSCC were the result of decades of lessons learned. System demand outstrips capacity on many days as weather, airport delays, special use restrictions, and security inflate and contract airspace corridors all over the country. ATCSCC personnel maneuver streams of aircraft over and around these obstacles by an almost constant flow of available data being provided to controllers, while also closely coordinating their actions and recommendations with the airline home offices.

AJR balances situation-specific airflow needs with issues of altitude, noise abatement, speed, and direction, ensuring optimum use of airports with minimum public concern. AJR is implementing new routes and procedures that leverage emerging aircraft navigation capabilities, including Performance-Based Navigation (PBN). AJR is responsible for authorizing unmanned aircraft (UA) operations in the NAS to ensure that approvals to fly UA do not compromise the high level of safety for other aviation, the public, and property on the ground.

The AJR Wake Turbulence Program manages the research and analysis to ensure both safety and efficiency standards reflect the best current knowledge. The state of the art is reviewed in light of technological advancements, such as Light Detection and Ranging equipment and the introduction of new aircraft such as the Airbus A380 and Boeing B747-800.

AJR Obstruction Evaluation Services conducts aeronautical studies as contained in Subpart C, Title 14, Code of Federal Regulations, Part 77, and in FAA Order 7400.2, Procedures for Handling Airspace Matters. Obstruction Evaluation studies ensure the safety of air navigation and the efficient use of navigable airspace. Aeronautical studies evaluate the effect of the construction or alteration on air traffic operating procedures; determine the potential hazardous effect of the proposed construction on air navigation; identify mitigating measures to enhance the safe and efficient use of the navigable airspace; and recommend marking and lighting configurations as well as charting of new objects to enhance pilot conspicuity.

Equally important are the requirements for AJR to coordinate with the Departments of Homeland Security

and Defense, as well as other Federal and state partners, to protect the United States and its interests from threats. AJR is responsible for mitigating the impact of aviation-related threats to national defense, homeland security, natural disasters, and disruptions to air commerce and the associated response measures (for example, airport terminal shutdowns) on the safety and efficiency of the country's aviation system. AJR uses a broad range of air traffic management tools (for example, temporary flight restrictions) to carry out this mission using air traffic controllers that are dedicated to security functions to help quickly resolve potential airborne and other threats involving the NAS.

AJR is responsible for Notices to Airmen, a notification system relaying airspace closings, airport reconfigurations, and security conditions to general aviation pilots, making AJR the pivot point in flow management and coordination of security measures.

The FSS collects and disseminates aeronautical and meteorological information, providing customized pre-flight and in-flight services to the domestic and international general aviation communities, as well as to military, air carriers, and Federal and local law enforcement. These services are provided to pilots by telephone, radio, the Internet, and face-to-face meetings.

In FY 2006, Lockheed Martin began providing these services (funded by FAA) for the continental U.S., Hawaii, and Puerto Rico. Equipment maintenance for all Government-furnished equipment (GFE) was provided by FAA through 2007. Since FY 2008, FAA has provided maintenance only on mandatory GFE, which includes FAA telecommunications infrastructure (FTI) and the remote communication outlets. The FAA will also continue to support the five FAA-owned flight service buildings at which the service provider will maintain a presence.

AFSS contract costs will be \$3.4 million lower in FY 2011, the 6<sup>th</sup> year of the Lockheed Martin contract. Lockheed Martin contract costs will account for \$755.0 million (over the remaining 5 years of the contract) of the estimated \$2.1 billion in total savings and cost avoidance over 13 years of this effort.

In Alaska, three AFSSs and 14 FSSs remain government-operated. The legacy automation systems in Alaska were replaced by the Operational and Supportability Implementation System in FY 2007 to mitigate information security and data integrity issues. This system will provide a technical bridge to the modernization of Alaska's Flight Service System which is undergoing investment analysis.

The Direct User Access Terminal service is an internet capability that provides flight planning and weather briefings to authorized users on a 24/7 basis.

#### Area Navigation (RNAV)/Required Navigation Performance (RNP)

Performance-Based Navigation (PBN) is a framework for defining navigation performance requirements (embodied in "navigation specifications") that can be applied to an air traffic route, instrument procedure, or defined airspace. PBN includes both RNAV and RNP specifications. PBN provides a basis for the design and implementation of automated flight paths as well as for airspace design and obstacle clearance. Once the required performance level is established, the aircraft's own capability determines whether it can safely achieve the specified performance and qualify for the operation.

Through NextGen, FAA is addressing the impact of air traffic growth by increasing NAS capacity and efficiency while simultaneously improving safety, reducing environmental impacts, and increasing user access in the NAS. FAA will achieve NextGen goals by continuing implementation of PBN that leverages emerging technologies and aircraft navigation capabilities.

RNAV enables aircraft to fly on any desired flight path within the coverage of ground- or spaced-based navigation aids, within the limits of the capability of the self-contained systems, or a combination of both capabilities. As such, RNAV aircraft have better access and flexibility for point-to-point operations.

Optimized Profile Descent (OPD) procedures are designed to reduce fuel consumption, emissions, and noise by allowing pilots to set aircraft engines near idle throttle while they descend. OPDs use the capabilities of the aircraft flight management system to fly, to the maximum extent possible, a continuous, descending

path without level segments. We are implementing OPDs with RNAV arrivals, where possible, to make them environmentally friendly.

Certain RNP operations require advanced features of the on-board navigation function and approved training and crew procedures. These operations must receive approvals that are characterized as Special Aircraft and Aircrew Authorization Required similar to approvals required for operations to conduct Instrument Landing System Category II and III approaches.

RNAV and RNP specifications facilitate more efficient design of airspace and procedures, which collectively result in improved safety, access, predictability, operational efficiency and environmental effects. Specifically, improved access and flexibility for point-to-point operations help enhance reliability and reduce delays by defining more precise terminal area procedures. They can also reduce emissions and fuel consumption.

RNAV procedures provide benefit in all phases of flight, including departure, en route, arrival, approach, and transitioning airspace. RNAV arrivals and departures can: increase predictability of operations; reduce controller/aircraft communications; reduce fuel burn; reduce miles flown; and reduce interaction between dependent traffic flows. RNP Authorization Required procedures, formerly referred to as RNP Special Aircraft and Aircrew Authorization Required approach procedures, offer design flexibility and enhanced performance, allowing us to mitigate the impact of obstacles on flight paths and to de-conflict traffic.

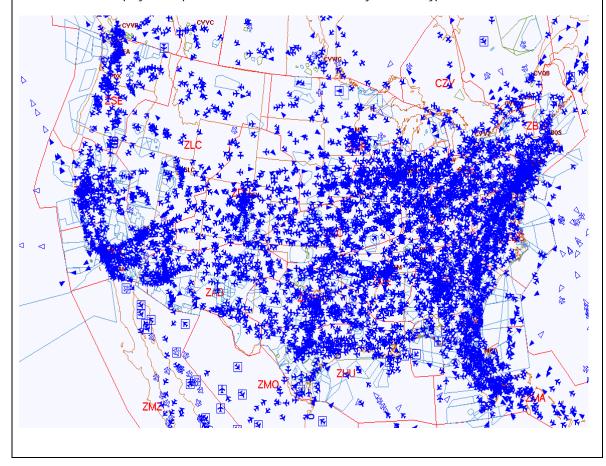
The FY 2011 budget requests \$47.3 for RNAV/RNP. This includes an increase of \$15.0 million for NextGen Operations funding.

In FY 2011, we begin integrated airspace design and associated activities, including traffic flow analysis and facilitated design and procedures optimization that will lay the framework for accelerating PBN initiatives by taking a systems approach for design of airspace and implementation of procedures. Integration of airspace and procedures provides an important systems view that: utilizes additional transition access/egress points that are not tied to ground-based navigation aids; considers concurrent development and implementation of arrivals and departures to ensure an integrated approach to procedural optimization; decouples operations between primary and secondary/satellite airports serviced by complex terminal airspace; and develops high altitude routes through congested airspace that better connect major metropolitan areas. RNAV and RNP routes and procedures developed in FY 2011 will focus on addressing RTCA Task Force Five recommendations, maximizing benefits, and accelerating NextGen concepts. Airspace redesign and procedure development will be accomplished with a geographic focus, targeting geographic areas such as Chicago, North Texas, Houston, Las Vegas, Southern California, and New York. Development efforts will include analysis and simulations, assessments of alternatives, and modeling of projected airspace and procedures benefits. FAA will also focus on tools acceleration to include additional applications of existing specialized tools and improved obstacle evaluations. Training development efforts will focus on Flight Standards and ATC workforce training on the application of new routes and procedures.

Vice President System Operations, AJR-0					
	FY 2009 Actuals	FY 2010 Enacted	Unavoidable Changes	Discretionary Changes	FY 2011 Request
Funding (\$000)					
PC&B	251,398	261,875	10,703	0	272,578
Other Objects					
Travel/Transportation	5,665	5,690	28	0	5,718
Other Services	305,709	316,907	2,525	-7,547	311,885
Rent/Communications/Utilities	281	283	1	0	284
Other	2,015	2,529	13	0	2,542
Subtotal	313,670	325,409	2,567	-7,547	320,429
Total	565,068	587,284	13,270	-7,547	593,007
Staffing					
End-of-Year	1,285	1,298	0	0	1,298
Full-time Equivalent Employment	1,299	1,306	6	0	1,312

The System Operations Service Unit is requesting \$593.0 million. This request provides an additional \$10.7 million for personnel compensation, including \$1.6 million in NATCA settlement costs, and \$15.0 million for NextGen RNAV/RNP.

The chart below displays a snapshot of controlled aircraft in the system at a typical moment in time.



System Operations has a NPHO requirement of \$1.0 million which covers the Route Availability Planning Tool (RAPT) program.

**A05.05-01 RAPT -** RAPT is a decision support tool developed by the Port Authority of New York to improve departure flow in the New York area. New York airways are tightly clustered and the proximity of adjacent arrival flows means that deviations around thunderstorms by departures cause serious disruptions to arrivals. RAPT improves departure management during Severe Weather Avoidance Plans by predicting when routes will be closed or opened based on thunderstorm movement and size and identifying alternative routes for departure. Because of its usefulness, RAPT was adopted by the FAA. The system has been categorized as a prototype and maintained using F&E funds. Due to the time the system has been in the field, it is now considered an operational legacy system. It is recommended that the system become Operational supported in FY 2011.

#### Vice President Technical Training (AJL-0)

The ATO's vision is to be the global leader in delivering the safest and most secure air traffic services. The Office of Technical Training serves as the primary organization to develop and deliver technical training programs for a workforce of over 15,400 air traffic controllers, over 6,100 air traffic technicians, and other crucial technical ATO occupations needed to effectively accomplish the FAA mission. Our goal is to deliver state-of-the-art training solutions to meet our ever changing employee demographics and air travel requirements today and through the next generation of air traffic tomorrow.

Vice President Technical Training, AJL-0

Vice Tresident Technical Training, A	FY 2009 Actuals	FY 2010 Enacted	Unavoidable Changes	Discretionary Changes	FY 2011 Request
					110 41000
Funding (\$000)					
PC&B	49,087	50,435	1,581	0	52,016
Other Objects					
Travel/Transportation	37,644	37,824	189	0	38,013
Other Services	126,165	113,088	566	0	113,654
Rent/Communications/Utilities	109	109	0	0	109
Other	2,813	2,826	14	0	2,840
Subtotal	166,731	153,847	769	0	154,616
Total	215,818	204,282	2,350	0	206,632
Staffing					
End-of-Year	379	379	0	0	379
Full-time Equivalent Employment	390	390	0	0	390

The Technical Training Service Unit is requesting \$206.6 million, including an additional \$1.6 million for personnel compensation.

#### Vice President for Service Centers (AJV-0)

The three Service Centers provide shared services to promote standardization of processes, efficiency and effectiveness which achieve results for the En Route, Technical Operations, Terminal, and System Operations service units. Each Service Center is comprised of five groups: Administrative Services, Business Services, Planning and Requirements, Operations Support, and Quality Control. The shared services model brings people together with similar expertise, allows sharing of ideas, collaboration to improve processes, and enhances communication and sharing of resources.

Vice President Service Center, AJV-	FY 2009 Actuals	FY 2010 Enacted	Unavoidable Changes	Discretionary Changes	FY 2011 Request
Funding (\$000)			_	_	
PC&B	81,465	84,581	2,649	0	87,230
Other Objects					
Travel/Transportation	6,647	6,682	33	0	6,715
Other Services	13,474	13,614	68	0	13,682
Rent/Communications/Utilities	4,446	4,462	22	0	4,484
Other	3,023	3,039	15	0	3,054
Subtotal	27,590	27,797	138	0	27,935
Total	109,055	112,378	2,787	0	115,165
Staffing					
End-of-Year	646	646	0	0	646
Full-time Equivalent Employment	712	712	0	0	712

The Service Center Service Unit is requesting \$115.2 million which includes an additional \$2.6 million for staffing compensation.

#### Other ATO Staff Offices

Senior Vice President NextGen & Ops Planning – Next Generation Air Transportation System (NextGen) and Operations Planning Services executes the mission of the FAA and ATO and, as a member of the Executive Council, establishes ATO goals, system safety and security, long-term strategies, budgets, priorities and resource allocations that support continuous improvement of service value, and achievement of performance targets. NextGen and Operations Planning maintains the NextGen plan and develops planning documentation for member agencies and keeps internal and external customers of the FAA aware of NextGen status. This Service Unit transfers technology from research programs to federal agencies with operational responsibilities and to the private sector in order to optimize safety, capacity, and security, and reduce negative environmental impacts. It delivers research and technical development necessary to improve and evolve the NAS enterprise architecture to meet requirements and implement technologies identified in the NextGen Implementation plan to transition the NAS to meet forecasted demand and it delivers and monitors the execution of the FAA plan to integrate initiatives, activities and capabilities necessary for the implementation of the NAS of the future via the NextGen Integration and Implementation office. NextGen and Operations Planning establishes and manages the NAS architecture to ensure that it meets current and future service requirements; conducts planning, analyses, research, advanced concept development, new technology development and prototyping, and systems engineering to support initial and final investment decisions; executes the corporate research, engineering and development planning, and budget process for the Administrator; ensures that the laboratories, facilities and support services of the WJHTC are available and appropriate to meet the requirements of the ATO and external customers; ensures that NAS systems and new acquisitions receive test, evaluation, verification and validation services, as appropriate, throughout their lifecycle; ensures that ATO planning activities are synchronized with internal and external partners and that they support future requirements; and develops, enhances and validates fast-time modeling tools to simulate and analyze airport/airspace capacities and overall NAS performance.

Other ATO Staff Offices *					
	FY 2009 Actuals	FY 2010 Enacted	Unavoidable Changes	Discretionary Changes	FY 2011 Request
Funding (\$000)					
PC&B	213,878	222,277	8,107	-251	230,133
Other Objects					
Travel/Transportation	9,690	6,247	33	0	6,280
Other Services	248,520	208,005	5,812	131	213,948
Rent/Communications/Utilities	20,080	20,126	82	0	20,208
Other	49,948	49,705	243	0	49,948
Subtotal	328,238	284,083	6,170	131	290,384
Total	542,116	506,360	14,277	-120	520,517
Staffing					
End-of-Year	893	899	0	-3	896
Full-time Equivalent Employment	1,018	1,016	12	-3	1,025

<sup>\*</sup>Other ATO Staff Offices include: Acquisition and Business, Finance, Strategy and Performance, Safety, and NextGen and Operations Planning

The budgets of the ATO staff offices (which include Acquisition and Business, Finance, Strategy and Performance, Safety, and NextGen and Operations Planning) are requesting \$520.5 million which includes an additional \$7.9 million for personnel compensation, and \$4.7 million for NPHO.

Senior Vice President NextGen & Ops Planning has a NPHO requirement of \$4.7 million. This covers the following programs:

**A28.01-01 Traffic Alert and Collision Avoidance System (TCAS)** - Beginning in FY 2011, FAA will incur costs in the Operations program for recurring operations and maintenance in the amount of \$750,000:

In 2011, the TCAS program office will have completed the installation of and begun transition activities for the nationally deployed TCAS monitoring nodes and central collection data center. This will allow the TCAS program office to finalize discussions with AVS on the delineation of TCAS operational data and to continue international harmonization of TCAS performance reporting activities with Euro Control, EVAIR, and Japan. This funding will support:

- 20 nationally deployed TCAS II monitoring sites and central data collection center at WJHTC;
- Continued assessment of the performance of TCAS to ensure recent logic changes do not impact the NAS in a negative manner; and
- On-going work in concert with operational service center in the interpretations of the TCAS
   Operational Performance Data (TOPA) collection results and conduct outreach activities, such as:
  - Special Reports for: 1) close encounters in NY, (for example, Biz Jets), LAX, ATL regions; 2) multi aircraft encounters; etc.

**F13.02-00 Technical Center Groundwater Treatment Plant** – Beginning in FY 2011, FAA will incur costs in the Operations program for recurring operations and maintenance in the amount of \$4.0 million:

The WJHTC is an Environmental Protection Agency National Priorities List (Superfund) site. As such the FAA's Environmental and Occupational Safety and Health (EOSH) services group provided F&E funding for the construction of groundwater treatment facilities at the WJHTC to collect contaminated groundwater and discharge clean water back to the environment. In FY 2011, funding for the operation and maintenance of those facilities is scheduled to transition to the Operations appropriation in accordance with FAA Order 2500.8A, Funding Criteria for Operations, F&E, and Research Engineering & Development Accounts.

Senior Vice President Finance – The Senior Vice President Finance provides both financial services and information technology services. Finance Services provides financial analysis and planning services; investment and business case evaluation and life cycle costing; identification and implementation of performance-based solutions for the agency; financial metrics; budget formulation/execution/audit/review services for all appropriations in ATO; and F&E budget formulation services for several other lines of business. Financial Services establishes ATO-wide standard operating procedures and serves as ATO liaison to FAA Chief Financial Officer. It oversees and evaluates competitive sourcing activities.

Information Technology (IT) Services: develops, deploys, and manages business and technical solutions to achieve ATO and FAA goals and objectives. It operates and supports secure and highly available infrastructure, desktop, and collaboration environments for ATO and FAA employees and contractors. The organization provides data and information management, hosting and data center, enterprise architecture, and information assurance services to FAA Lines of Business in support of FAA safety and operational excellence goals.

Senior Vice President Strategy and Performance - The vision of the ATO is to be the global leader in delivering the safest, most secure air traffic services while providing the greatest value to its customers, owners, and employees. Strategy and Performance provides a framework for executing and integrating the ATO's plans, programs, and activities while managing the air traffic of today and making improvements and advancements necessary to address the air traffic of tomorrow. Strategy and Performance oversees a number of ATO offices, including: ATO Communications; Organizational Effectiveness; Comptroller, Planning, and Business Services; Performance Analysis and Strategy; ATO Administration and Talent Management; Liaison and Business Development; Labor Technical Liaison; and ATO Diversity.

Office of Safety - The Office of Safety enhances the safety and success of the ATO by managing risks, assuring quality standards, and instilling an open culture of disclosure. The Office of Safety is also responsible for identifying and mitigating aircraft collision risks during the delivery of Air Traffic separation services by applying FAA's Safety Management System principles; auditing safety, quality assurance and quality control in the ATO and reporting findings to improve safety performance; integrating the functions and information of risk reduction, investigations, evaluations, independent operational testing and evaluation, safety risk management, runway safety and operational services in order to identify collision risks and influence their resolution; and providing information on assessments of operational and safety performance within the NAS.

Office of Acquisition and Business Services - The ATO vision is to be the global leader in providing the safest, most secure air traffic services while providing the greatest value to its customers, owners, and employees. The Acquisition and Business Services organization supports this vision by delivering internal services that enable ATO to effectively accomplish that mission. Acquisition and Business Services provides policy, oversight, and services in the areas of acquisition and contract administration to support ATO and the FAA in meeting their performance targets. The organization serves as the executive agent for the FAA's Acquisition Management System (AMS), Acquisition Workforce Plan, acquisition certification program, and acquisition program evaluation and oversight. It also acts as the small business advocate.

## **Explanation of Funding Changes for Air Traffic Organization (ATO)**

Dollars (\$000) FTE

5,284

Air Traffic Organization (Net change from FY 2010 Enacted Level)	\$331,329	-33			
Overview:					
For FY 2011, ATO requests \$7,630,628,000 and 32,533 FTEs in the Operations appropriation to meet its mission of moving air traffic safely and efficiently. This is an increase of \$331,329,000 (4.5 percent) and a decrease of 33 FTE (0.1 percent) from the FY 2010 enacted level.					
The FY 2011 request level reflects unavoidable pay raises and inflation, uncontrollable adjustments for NAS Handoff requirements, \$144 million for NATCA settlement costs, \$15 million increase for NextGen RNAV/RNP procedures, less \$22 million for FSS savings, as well as a base transfer of three FTEs to another FAA organization.					
The FY 2011 FTE request level consists of FY 2010 annualization, NextGen decrease of three FTEs resulting from a base transfer to a staff office.	hiring, workforce att	rition, and a			
Unavoidable Adjustments					
Annualized FTEs:	9,738	91			
This represents the net annualized costs of FY 2010 new hires and attrition.					
Annualized FY 2010 Pay Raise (GS Population):	2,221				
This pay raise has been calculated separately based on the employee population still under the General Schedule. This increase is needed to provide for the full-year cost associated with the 2.0 percent average government-wide pay raise in January 2010. The actual factor used is 2.9 (2.0 percent plus 0.9 percent average of Within-Grade increases). The FY 2010 portion of this pay raise is funded within enacted amounts; this increase covers the first quarter of FY 2011.					
Annualized FY 2010 Pay Raise (Core Comp Population):	43,550				
This pay raise has been calculated separately based on the employee population under the Core Compensation pay plan. This increase is needed to provide for the full-year cost associated with the Organizational Success Increase (OSI) and the Superior Contribution Increase (SCI) awarded in FY 2009. The OSI is 100 percent of the 2.0 percent average government-wide pay raise plus 1.0 percent (3.0 percent). The Core Compensation system awards three different pay raises—20 percent of the population receive the OSI plus a 1.8 percent SCI, 45 percent receive the OSI plus a 0.6 percent SCI, and 35 percent receive just the OSI. The FY 2010 portion of this pay raise is funded within enacted amounts; this increase covers the first quarter of FY 2011.					

Operations 45

FY 2011 Pay Raise (GS Population):

	Dollars (\$000)	<u>FTE</u>
This pay raise has been calculated separately based on the employee population under the General Schedule. This increase is required to provide for costs associated with base salary increases. The factor used is 2.3 percent, composed of the projected 1.4 percent government-wide pay raise in January 2011 plus 0.9 percent average of Within-Grade increases.		
FY 2011 Organizational Success Increase (OSI) (Core Comp Population):	86,380	
This pay raise has been calculated separately based on the employee population under the Core Compensation pay plan. This increase is required to provide for costs associated with base salary increases that are provided to employees meeting or exceeding job expectations. The factor used is 2.4 percent, composed of the projected 1.4 percent government-wide pay raise in January 2011 plus 1.0 percent for the full OSI increase (derived from the elimination of Within-Grade increases). A fundamental component of the FAA's pay-for-performance system, this increase assumes FAA will meet most of its FY 2010 performance goals.		
FY 2011 Superior Contribution Increase (SCI):	22,675	
This increase is required to provide for costs associated with base salary increases that are provided to employees in the Core Compensation system providing superior contributions to the organization. The factor used is 1.8 percent for 20 percent of the population and 0.6 percent for 45 percent of the population. The remaining 35 percent do not receive this increase.		
Non-Pay Inflation:  This increase is needed to provide for inflationary cost increases consistent with OMB guidance that uses the FY 2011 GDP price index (year over year) of 0.5 percent.	10,971	
Haranta llabla Adirectoranta		
Uncontrollable Adjustments  NAS Handoff Requirements:	28,541	
This \$28.5 million request consists of the following five components, with their corresponding amounts:	20,041	
Logistics Support: All activities associated with depot level support to NAS prime mission equipment and associated support equipment. Major systems include Integrated Display Systems Technology Refresh, ASR-11, and ASDE-X.	1,452	
<u>Second-Level Field Maintenance Support</u> : All activities required for the in-service management phase, including directly operating, providing maintenance functions (both scheduled and unscheduled), and furnishing technical and logistics support for maintenance of FAA systems, sub-systems, services or equipment. All engineering activities in support of the delivery of service, to include development of	18,700	

	<b>Dollars (\$000)</b>	<u>FTE</u>
modifications, documentation, testing and implementation of technology refresh initiatives. Also includes associated travel time required to support systems. Major systems include ASDE-X, Route Availability Planning Tool (RAPT), and the Technical Center Groundwater Treatment Plant.		
Training: All activities associated with the on-the-job training, attrition training, and refresher training of personnel who directly operate, maintain, or provide support functions. This includes contractor provided costs associated with specific training. Training costs include course conduct (including instructor and facilities costs), travel, and per diem costs for students. A major system is the Communication Facilities Expansion – UHF Replacement.	100	
Leased Telecommunications: All activities associated with maintaining, upgrading, or modifying operational and administrative communications services required to sustain the operation and maintenance of the NAS facilities. It also includes leases and other recurring telecommunication costs. Major systems are ITWS, Telecommunications Service Requirements, and Communications Facilities Enhancements.	8,255	
Flight Inspections and Procedures: All activities association with inservice flight inspections, and the development and revalidation of Standard Instrument flight procedures, flight inspection; and the compilation, replication and dissemination of charts and related paper and digital products. A major system includes the ASR-11.	34	
NATCA Arbitration Decision	144,000	
	,	· ·
At the direction of the White House, DOT Secretary LaHood implemented a binding arbitration process between the FAA and NATCA to resolve multiple outstanding issues. The panel has completed its work and has provided a final settlement for the NATCA controller's contract. As part of the agreement, FAA will increase the pay scales for air traffic controllers over a 3-year period. These increases are binding on the agency and are not subject to adjustment.  Under the agreement, in FY 2010, the air traffic controller payroll costs will increase \$66 million. The ATO will cover these costs in FY 2010 by reducing expenditures for a variety of activities and reallocating the funding to cover these costs. In FY 2011, additional requirements are \$144 million.		
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	<u>Dollars (\$000)</u>	<u>FTE</u>
In the past few years, several trends have been identified that allowed us to adjust the staffing number downwards. In FY 2008, ATO hired more controllers than what was projected in the Controller Workforce Plan. At the same time, the economic downturn led to lower traffic and attrition levels. This created an advanced hiring reserve that reduced the need for hiring in later years. Traffic continues its decade-long downward slide. Traffic levels are down more than 20 percent since reaching their peak in 2000 and are not expected to return to those levels until 2024. Currently, controller staffing is above the level it was in 2000 when traffic peaked. All of these conditions allow us to reduce the planned FY 2011 controller staffing levels while still ensuring we have enough trained controllers to meet projected demand.		
Discretionary Increases	15 000	
NextGen RNAV/Required Navigational Performance:  To support NextGen benefits, the ATO requests \$15 million increase to accelerate RNP procedures.	15,000	
The FAA will spend \$15 million to design and implement high-altitude and Terminal performance-based routes and procedures. In addition, the funding allows integration of procedures to optimize operations in and out of congested airports and airports of close proximity. High-altitude performance based routes between areas such as New York/ Philadelphia/Newark, Washington, D.C. Metro area, Atlanta/Charlotte area, Miami, North Texas/Houston area, Denver, San Francisco, Los Angeles/Las Vegas/Phoenix area, Seattle, and Chicago/Midway will be designed and implemented. These routes do not exist today and have been planned for development and deployment over the next 6-8 years. Procedures development will include optimized profile descents and unrestricted climbs where possible in places such as Chicago O'Hare, Washington Reagan National/Washington Dulles/Thurgood Marshall Baltimore International, and Atlanta Hartsfield/Charlotte. Larger redesign efforts will encompass the design and implementation of airspace redesign in addition to PBN in geographic areas like Denver. The normal schedule for a major redesign like Denver, which would include airspace, routes and procedures, may be up to 6 years. The application of these acceleration funds may further reduce the deployment time by as much as 50 percent.		
Cost Efficiencies  Flight Services Contract Savings:	-22,400	
ATO will realize a total of \$22.4 million in new cost savings from contracting out Flight Services in February 2005. This action will save the agency approximately \$2.1 billion over a 13-year period.	-22,400	
Base Transfers  NextGen and Acquisition Hiring Support:	-267	-3
ATO faces human resource challenges associated with its transition to NextGen. In the near term, it will be recruiting and hiring technical and acquisition personnel to assist in the development and deployment of systems, equipment, and procedures, as well as program management and acquisition. This base transfer of 3 FTEs to the Office of Human		

	<u>Dollars (\$000)</u>	<u>FTE</u>
Resources plus contractor support will provide additional support for NextGen and acquisition hiring.		

## **Traditional Tables for Air Traffic Organization (ATO)**

The following pages represent information traditionally provided to the Committee on Appropriations for the FAA's air traffic control functions.

#### Controller Workforce FY 1981 Through FY 2011

FY 1981	6,578	FY 1989	14,340	FY 1997	14,588	FY 2005	14,540
FY 1982	11,290	FY 1990	14,645	FY 1998	14,966	FY 2006	14,618
FY 1983	11,980	FY 1991	14,976	FY 1999	15,096	FY 2007	14,874
FY 1984	12,213	FY 1992	15,147	FY 2000	15, 153	FY 2008	15,381
FY 1985	12,968	FY 1993	14,970	FY 2001	15,233	FY 2009	15,770
FY 1986	12,615	FY 1994	14,953	FY 2002	15,478	FY 2010 Est.	15,692
FY 1987	13,007	FY 1995	14,614	FY 2003	15,691	FY 2011 Req.	15,450
FY 1988	13,960	FY 1996	14,360	FY 2004	14,934		

#### NOTES:

- (1) Actuals include Controllers and Academy students
- (2) FY 1986 thru FY 1988 data as if October 31st. September reports were not available for those years.

### **System Maintenance Overtime (\$000)**

		2009 <u>Actual</u>	2010 <u>Estimate</u>	2011 <u>Request</u>
Field Maintenance				
	Hours	280,437	290,112	296,857
	Amount	18,143	20,309	20,781
Program & Technical Support				
	Hours	50,521	52,264	53,479
	Amount	2,774	2,808	2,873
TOTAL				
	Hours	330,958	342,376	350,336
	Amount	20,917	23,117	23,654

## NAS PLAN HAND-OFF (Dollars in Thousands) Air Traffic Organization

	CIP	Service Unit	NAS Logistics	Systems Maintenance	Training	Leased Telecom	Flight Inspection	Security & Haz Materials	Aviation Safety	Total
A28.01-1	Traffic Alert and Collision Avoidance System	Operations Planning		750,000						750,000
F13.02-00	Technical Center Groundwater Treatment Plant	Operations Planning		4,000,000						4,000,000
										4,750,000
M20.01-02	Route Availability Planning Tool	System Operations		1,000,000						1,000,000
										1,000,000
A14.02-01	Instrument Flight Procedures Automation	Technical Operations		2,234,800						2,234,800
C06.01-00	Communication Facilities Expansion - Enhancements	Technical Operations				750,000				750,000
C06.04-00	Communication Facilities Expansion - UHF Replacement	Technical Operations	100,000	2,140,626	100,000	)				2,340,626
Various CIPs	Navigation Service Requirements	Technical Operations		1,585,000						1,585,000
Various CIPs	Telecommunications Service Requirements	Technical Operations				7,260,166				7,260,166
										14,170,592
M20.01-02	Training Simulators – Tower Cab	Terminal	842,871	2,287,537						3,130,408
S03.02-01	ASR-11	Terminal	97,000	243,000			34,00	0		374,000
W11.02-01	NEXRAD - Legacy, Icing, and Hail Algorithms (NLIHA)	Terminal		159,000						159,000
S09.01-00	Airport Surface Detection Equipment - Model X (ASDE-X)	Terminal	312,000	3,651,000						3,963,000
W07.01-00	Integrated Terminal Weather System (ITWS) - ITWS Development/Procurement	Terminal		449,000		245,000				694,000
A03.05-01	Integrated Display System (IDS) Technology Refresh	Terminal	100,000	200,000						300,000
	recommondy (Venesii									8,620,408
	Total		1,451,871	18,699,963	100,000	8,255,166	34,00	0 -	-	28,541,000

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### OPERATIONS APPROPRIATION

## Aviation Safety (AVS) (\$ in Thousands)

Item Title	Dollars	FTP	OTFTP	FTE
FY 2010 Enacted	1,234,065	7,403	110	7,211
FY 2010 One-Time Items	0	0	0	0
FY 2010 One-Time Items	U	U	U	U
Unavoidable Adjustments				
1. Annualized FTEs (ATO: 91, AVS: 112)	18,955			112
2. Annualized FY 2010 Pay Raise (GS Population)	5,547			
3. Annualized FY 2010 Pay Raise (Core Comp Population)	4,256			
4. January 2011 Pay Raise (GS Population)	13,198			
5. January 2011 OSI (Core Comp Population)	8,441			
6. January 2011 SCI	2,216			
7. Non-pay inflation	1,308			
Total Unavoidable Adjustments	53,921	0	0	112
Uncontrollable Adjustments				
NAS Handoff Requirements	0			
2. NATCA Arbitration Decision	0			
3. Workforce Attrition (-242 EOY/-121 FTE)	0			
Total Uncontrollable Adjustments	0	0	0	0
Diameter and Indiana.				
Discretionary Increases	10.000	40		
1. NextGen RNAV/RNP (40 EOY/ 20 FTE)	10,000	40		20
2. Continued Operational Safety (26 EOY/ 10 FTE)	2,600	26		10
Production Certification (16 EOY/ 4 FTE)  A New Cardian Cardon Buildians	1,400	16		4
4. New Service Center Buildings	0			
5. Protect FAA Information Security Infrastructure	0			
6. Impl. of NextGen Env. & Energy Tech. , Models & Metrics (3 EOY/ 2 FTE)	0			
7. Safety Inspections and Emergency Operations (110 EOY/ 54 FTE)  Total Discretionary Increases	0 <b>14,000</b>	82	0	34
Total Discretionary Increases	14,000	02		34
Cost Efficiencies				
Flight Services Contract Savings				
2. Adminstrative Effeciencies	-8,000			
Total Cost Efficiencies	-8,000	0	0	0
Base Transfers				
1. NextGen and Acquisitions Hiring Support (3 EOY/ 3 FTE)	0			
2. Labor Relations/ National Employee Safety (1 EOY/ 1 FTE)	0			
3. Safety and Hazardous Materials (1 EOY/ 1 FTE)	0			
Total Base Transfers	0	0	0	0
FY 2011 Request	1,293,986	7,485	110	7,357
	-1/2/0//00	7,100	- 110	7,007

### **Detailed Justification for Aviation Safety (AVS)**

AVIATION Safety FY 2011 Request: \$1,293,986	Aviation Safety	FY 2011 Request: \$1,293,986
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#### Overview:

The Associate Administrator for Aviation Safety (AVS) has a singular mission: to provide the safest, most efficient aerospace system in the world.

Through the continuing effort and cooperation of all the participants in the aviation industry and FAA, we have achieved the safest period in aviation history.

For this reason, we unveiled a new performance metric in FY 2008 for commercial air carrier safety – Fatalities per 100 Million Enplanements. This metric is more relevant to the flying public, as it better measures the individual risk, as low as it is, to fly. And the long-term target is no less challenging – we aim to cut this risk in half by FY 2025. We will continue to work in partnership with industry to make this vision a reality.

Today, thanks to new technology, revised rules and procedures, and increased training, not only are there fewer commercial fatal accidents each year, but the chances of survival have increased significantly. In the past four years (FY 2006 through FY 2009) the United States averaged approximately 2.5 fatal accidents per year, with an average loss of life of 33 per year. For FY09, FAA met its target of 8.4 by achieving a rate of 6.8 fatalities per 100 million persons on board.

More people perish in GA accidents each year than those who perish in US commercial air carriers. Therefore reducing the rate of fatal general aviation accidents is a top priority. In FY 2009 the FAA introduced a new GA fatal accident rate of 1.11 fatal general aviation accidents per 100,000 flight hours. This rate more accurately pinpoints safety concerns and trends. In FY 2009 the actual GA fatal accident rate per 100,000 flight hours was 1.17, which was slightly above the target level. FAA did not achieve the general aviation fatal target in FY 2009.

AVS's ability to help maintain an exemplary safety record—while providing necessary services to the growing U.S. aviation industry—continues to be a challenge. Facing increased demand for services, AVS must continue to provide the proper surveillance and oversight for a complex, global, and rapidly changing aerospace system. For this reason, in 2009, an aviation rulemaking committee, composed of FAA, labor and industry representatives, presented recommendations for an FAA "flight time and rest" rule to address concerns of pilot fatigue. Additionally, in 2009, FAA, pilot unions and senior officials agreed to major initiatives to improve safety and pilot training.

AVS is also challenged with helping the industry grow and compete with new equipment, technologies, and markets. AVS takes a systems view of safety—using a risk management approach to focus resources efficiently and effectively on significant safety concerns. Because of this view, in FY 2010, a new office was formed within AVS called the Accident Prevention Office. This new organization maximizes resources so that we can better understand current and emerging risks across the aviation community through the use of data from accident investigations, historical accidents and incidents, and voluntarily submitted information from industry programs. Safety is a continuum—and the success of the entire safety system depends on effective management in each and every phase. The three phases of the safety continuum are:

- Continued Operational Safety AVS's fundamental work is the surveillance and oversight of
  existing certificate holders. AVS assures original certification requirements are continually
  maintained. This is the most important element of what AVS does.
- Setting Standards AVS develops and establishes the safety and certification standards for the industry. By meeting those standards, the people and organizations that manufacture, operate and maintain the aerospace system have achieved a safety record that is unparalleled.
- Issuing Certifications AVS determines compliance with standards and issues certifications. The
  aviation industry depends on AVS to approve products that enhance safety and increase capacity,
  while giving the industry the means to succeed in an intensely competitive international market.

AVS aims to provide the highest level of aviation safety while meeting the needs of an extensive customer

#### base, which includes:

- Over 747,775 pilots;
- Over 368,500 mechanics;
- Approximately 6,100 operators;
- Over 1,600 manufacturers of aircraft, equipment, avionics, and other aviation-related items; and
- A fleet of roughly 228,000 active aircraft.

AVS is committed to building on this success in future years in part through the implementation of the ISO-9001 certification. ISO-9001 is an internationally recognized program designed to document and standardize business processes through the use of documented procedures, internal and external audits, and consistent review of product, process, and customer measures at all levels of the organization. AVS earned an organization-wide certificate in October 2006, and continues to maintain that certification through semiannual audits by third-party evaluators.

#### FY 2010 Program:

AVS consists of seven distinct organizational elements employing 7,403 personnel. This fiscal year two AVS organizations—the Office of Accident Investigation and the Aviation Safety Analytical Service Office merged and became the Accident Investigation and Prevention Service. Of the seven AVS organizational elements two - the Office of Rulemaking and the Accident Investigation and Prevention Service are solely Washington Headquarters elements. The other five – Flight Standards Service, Aircraft Certification Service, the Office of Aerospace Medicine, the Air Traffic Safety Oversight Service, and the Office of Quality, Integration, and Executive Services – have field structures (including some overseas offices).

AVS's seven organizations perform the following activities:

<u>Flight Standards</u> promotes aviation safety and ensures compliance with the operations and maintenance safety standards and certification standards for air carriers, commercial operators, air agencies, airmen, and civil aircraft, including aircraft registration.

<u>Aircraft Certification</u> promotes aviation safety by developing and administering safety standards governing the type, production, and original airworthiness certification of aircraft, engines, propellers, appliances and noise level certification.

<u>Aerospace Medicine</u> promotes aviation safety through medical standards and certification for airmen (pilots and air traffic controllers) and compliance and enforcement of drug and alcohol programs for employees in safety-sensitive positions both in the aviation industry and FAA.

<u>Aviation Rulemaking</u> directs and manages FAA's rulemaking program and supports the agency's regulatory priorities.

<u>Accident Investigation and Prevention Service</u> investigates aviation accidents and incidents to identify unsafe conditions and trends in the National Airspace System (NAS) and coordinates the corrective action process. The organization also provides analytical capabilities based on safety management systems principles and sound safety data analysis and process sharing, incorporating future hazardous/emerging risk assessments affecting the entire air transportation system and industry.

<u>Air Traffic Safety Oversight Service</u> provides safety oversight of ATO, including oversight of safety management systems, new acquisitions, air traffic control procedures and operations, technical operations, and personnel certification criteria.

<u>Quality, Integration, and Executive Services</u> provides overall planning, direction, management, and evaluation of AVS programs. This office also directs and manages the implementation of an ISO-9001:2000 based Quality Management System for all AVS services and offices and establishes integration policy and processes for safety systems.

Because the AVS workforce is small in comparison to the industry and public, we leverage our resources through the designee system. FAA has relied on the designee program since 1927 to help meet our responsibility of ensuring that the aviation industry meets FAA's safety standards. The designee program authorizes private persons and organizations to perform many activities acting on behalf of FAA. The use

of designees allows AVS to concentrate on the most critical safety areas, while designees conduct more routine functions. Designees also expand AVS access to technical expertise. AVS currently uses over 11,000 designees, plus another 28,000 people involved in programs such as Flight Check Pilots and Mechanics with Inspection Authority.

Much of AVS workload is demand driven. These workload drivers can be grouped into four general areas: (1) growth in aviation activity, both commercial and general aviation, by existing operators; (2) the introduction of new operators, new aircraft, new equipment, and new technology; (3) the introduction of new practices (e.g., the growth in maintenance outsourcing); and (4) the globalization of the aviation industry and the increasing need for international standardization of regulations and safety criteria.

AVS also faces new challenges in the form of aviation industry changes:

- Operations and Manufacturing complexities in commercial and general aviation activity;
- Introduction of new entrants into the industry (Unmanned Aerial Systems (UAS) and Very Light Jets (VLJs)); and
- Introduction of new equipment (Airbus 380, Boeing 787), both commercial and general aviation, by existing operators.

The economy is driving this growth:

- Low cost carriers are using new aircraft, equipment, and technologies;
- Legacy carriers are in decline, but need more oversight; and
- The industry has experienced rapid growth in maintenance outsourcing.

Safety is our priority, but our approach must change to meet our challenges. AVS has worked diligently over the years to manage budget constraints and workload demands by streamlining work processes and implementing efficiency measures. Therefore, AVS will ensure that adequate resources (staffing and dollars) remain available to support Continued Operational Safety (AVS top priority) while sequencing and prioritizing some new certification activity.

As the aviation environment and industry changes, we must change with it. The processes and systems that have served us well in the past have done a spectacular job of creating the safest aviation system in the world. To achieve the next level of safety, our traditional methods of diagnosing what went wrong during an accident or incident are not enough – we must analyze trends, data, and systems to tackle issues before they become incidents or accidents.

The FAA, with other federal agencies and operators in the NAS, is adopting a system safety approach to safety management. This approach, called a Safety Management System (SMS), relies on developing standardized language, processes, and tools to manage safety risk. SMS relies on four "pillars":

- Safety Policy Aligning procedures and processes in an organization to establish and meet safety objectives;
- 2. Safety Risk Management (SRM) Assessing risk in the system to identify and mitigate hazards;
- 3. Safety Assurance Continuously monitoring and updating the policies and activities to ensure that the processes work as intended; and
- 4. Safety Promotion Creating a safety culture that permeates every area of our work at all levels of the organization.

Implementing an SMS approach is a significant business and cultural change in the way we carry out our safety work. New safety positions require additional skills, such as risk management, systems thinking, evaluation, and analysis.

#### **FY 2010 Planned Accomplishments:**

In FY 2010, AVS continues to improve aviation safety through surveillance, compliance, and, when necessary, enforcement actions. AVS will:

- Reduce the number of commercial air carrier fatalities to no more than 8.4 per 100 million persons on board.
- Reduce the number of fatal general aviation accidents per 100,000 hours to no more than 1.10.

Reduce the number of Alaska fatal/serious injury accidents to 1.86 per 100,000 flight hours.

With regards to specific programs, AVS will:

- Submit final Advisory Circular on Fatigue.
- Deliver NPRM to OST in accordance with schedule approved by the Rulemaking Management Council
- Issue Widespread Fatigue Damage (WFD) final rule in accordance with the milestones in the FAA rulemaking schedule.
- Continue to develop the capability to monitor known safety threats through the Aviation Safety Information and Analysis System (ASIAS), including increasing the number of databases available and implementing an enterprise architecture. This system accesses and shares information safety data from a variety of systems.
- Track the implementation of 80% of FAA's FY 2010 CAST approved safety enhancements.
- Conduct System Audits of the Air Traffic Organization (ATO) at various facilities.
- Perform oversight of the AVS Quality Management System to maintain compliance and retain registration to ISO-9000 quality standards.
- Continue to overhaul our systems safety approach to adequately respond to new requirements being created by explosive industry growth, global expansion, and changing business models for producing and selling aircraft.
- Conduct certifications and surveillance activities including production, airworthiness, air operator, and air agency across the U.S.
- Plan and implement continuity of operations including inspection, surveillance, investigation, and enforcement activities.
- Provide regulatory and technical assistance to international civil aviation authorities.
- Provide certification services and support for new operators, agencies, and air carriers through sequencing of applicants.
- Continue implementation of the Cost Accounting System to provide greater insight into the costs
  of providing specific services.
- Issue guidance for ADS-B on rotorcraft installation.
- Establish a "table-top Flight Standardization Board" (FSB) for experimental amateur built aircraft to reduce GA accident rates.
- Complete draft UAS Roadmap that proposes access milestones of NAS access requirements.
- Produce and distribute flight crew briefing training modules/videos to increase pilot awareness at high risk airports identified in FY 2009 in an effort to reduce pilot deviations and runway incursions.

#### FY 2011 Budget Request:

For FY 2011, the Associate Administrator for Aviation Safety requests \$1,293,986,000 and 7,357 FTE to meet its mission, an increase of \$59,921,000 and 146 FTE above the FY 2010 requested level. This increase provides for basic pay raises and inflation for AVS base programs, as well as an increase of \$4 million for 42 additional positions and contract support for new or expanded program requirements for Flight Standards, Aircraft Certification, Aerospace Medicine, Air Traffic Oversight, and Quality and Integration Services offices. The request also includes \$10 million for 40 positions and contract support to increase efficiency in the National Airspace System (NAS) by developing guidance material such as Orders, Notices, and Advisory Circulars in support of NextGen acceleration efforts.

In FY 2011, AVS will continue to improve aviation safety through surveillance, compliance, and, when necessary, enforcement actions. AVS will:

- Reduce the Commercial Air Carrier fatal accident rate to no more than 0.010 accidents per 100,000 departures. (Note: FAA plans to phase out this performance target.)
- Reduce the number of commercial air carrier fatalities to no more than 7.9 per 100 million

persons on board.

- Reduce the number of fatal general aviation accidents per 100,000 hours to no more than 1.08.
- Reduce the number of general aviation and part 135 accidents in Alaska. This measure is being converted into a rate in FY 2010 (TBD).

With regards to specific programs, AVS will:

- Track the implementation of 39 CAST safety enhancements that will mitigate specific causal factors of accidents.
- Implement a joint information data sharing plan to aggregate and combine safety data from CAST, VASIS, and NextGen programs.
- Complete annual update of National Integrated Strategic Safety Plan across multiple government agencies to implement SMS and submit the plan to the Joint Planning and Development Office (JPDO).
- Conduct System Audits of ATO involving ten percent of ATO facilities.
- Create an AVS delegation management system and migrate designee data from current systems into this system.
- Continue to expand the introduction of civil UAS into the NAS to support national security, defense and public need for this technology, and the U.S industry's economic interests.
- Continued deployment of precision navigation through RNP procedures by supporting new approaches each year.
- Perform oversight of the AVS Quality Management System to maintain compliance and retain registration to ISO-9000 quality standards.
- Continue to implement the GA Joint Steering Committee initiatives.
- Provide the JPDO Integrated Product Teams (IPT) with a means to evaluate the effect of proposed changes on the safety of NextGen.
- Continue to overhaul our systems safety approach to adequately respond to new requirements being created by explosive industry growth, global expansion, and changing business models for producing and selling aircraft.
- Conduct certifications and surveillance activities including production, airworthiness, air operator and air agency across the U.S.
- Plan and implement continuity of operations including inspection, surveillance, investigation, and enforcement activities.
- Provide regulatory and technical assistance to international civil aviation authorities.
- Provide technical assistance and FAA/AFS seminars to working groups including China, India, Korea, Mexico, Russia, ICAO Groups, and select regional organizations.
- Provide certification services and support for new operators, agencies, and air carriers.
- Improve oversight of domestic and foreign repair stations, as the repair station industry has
  grown in both number of repair stations and complexity of the work accomplished.
- Increase efficiency in the National Airspace System (NAS) by developing guidance material such as Orders, Notices, and Advisory Circulars in support of NextGen acceleration.

## **Explanation of Funding Changes for Aviation Safety (AVS)**

Aviation Safety (Net Change from FY 2010 Enacted) \$59,921 146

**Dollars (\$000)** 

FTE

Overview:

For FY 2011, the Associate Administrator for Aviation Safety (AVS) requests \$1,293,986,000 and 7,357 FTE in Operations to meet its mission of moving air traffic safely and efficiently. The FY 2011 request corresponds to an increase of \$59,921,000 (4.9 percent) and an increase of 146 FTE (2.0 percent) over the FY 2010 enacted level.

The FY 2011 request level reflects unavoidable pay raises and inflation, staffing increases for safety programs and NextGen, as well as administrative efficiencies.

The FY 2011 FTE request level consists of annualization of 112 FTE hired in FY 2010; a net increase of 42 (14 FTE) staff for safety programs; and 40 (20 FTE) staff for NextGen RNAV/RNP support.

Unavoidable Adjustments  Annualized FTE:  This represents the net annualized costs of FY 2010 new hires and attrition.	18,955	112
Annualized FY 2010 Pay Raise (GS Population):  This pay raise has been calculated separately based on the employee population still under the General Schedule. This increase is needed to provide for the full-year cost associated with the 2.0 percent average government-wide pay raise in January 2010. The actual factor used is	5,547	
2.9 (2.0 percent plus 0.9 percent average of Within-Grade increases). The FY 2010 portion of this pay raise is funded within enacted amounts; this increase covers the first quarter of FY 2011.		
Annualized FY 2010 Pay Raise (Core Comp Population):  This pay raise has been calculated separately based on the employee population under the Core Compensation pay plan. This increase is needed to provide for the full-year cost associated with the Organizational Success Increase (OSI) and the Superior Contribution Increase (SCI) awarded in FY 2010. The OSI is 100 percent of the 2.0 percent average government-wide pay raise plus 1.0 percent (3.0 percent). The Core Compensation system awards three different pay raises—20 percent of the population receive the OSI plus a 1.8 percent SCI, 45 percent receive the OSI plus a 0.6 percent SCI, and 35 percent receive just the OSI. The FY 2010 portion of this pay raise is funded within enacted amounts; this increase covers the first quarter of FY 2011.	4,256	
FY 2011 Pay Raise (GS Population):  This pay raise has been calculated separately based on the employee population under the General Schedule. This increase is required to provide for costs associated with base salary increases. The factor used	13,198	

	<u>Dollars (\$000)</u>	<u>FTE</u>
is 2.3 percent, composed of the projected 1.4 percent government-wide pay raise in January 2011 plus 0.9 percent average of Within-Grade increases.		
FY 2011 Organizational Success Increase (OSI) (Core Comp Population):	8,441	
This pay raise has been calculated separately based on the employee population under the Core Compensation pay plan. This increase is required to provide for costs associated with base salary increases that are provided to employees meeting or exceeding job expectations. The factor used is 2.4 percent, composed of the projected 1.4 percent government-wide pay raise in January 2011 plus 1.0 percent for the full OSI increase (derived from the elimination of Within-Grade increases). A fundamental component of the FAA's pay-for-performance system, this increase assumes FAA will meet most of its FY 2010 performance goals.		
FY 2011 Superior Contribution Increase (SCI):	2,216	
This increase is required to provide for costs associated with base salary increases that are provided to employees in the Core Compensation system providing superior contributions to the organization. The factor used is 1.8 percent for 20 percent of the population and 0.6 percent for 45 percent of the population. The remaining 35 percent do not receive this increase.	_,	
Non-Pay Inflation:	1,308	
This increase is needed to provide for inflationary cost increases consistent with OMB guidance that uses the FY 2011 GDP price index (year over year) of 0.5 percent.	1,300	
Discretionary Increases		
NextGen RNAV/RNP:	10,000	20
Aviation Safety (AVS) requests \$10 million in support of NextGen efforts. This will provide funding for 40 positions and contract support to increase efficiency in the National Airspace System by developing guidance material such as Orders, Notices, and Advisory Circulars. The guidance material will provide industry and AVS field offices information to safely implement/certify new technologies and develop more efficient flight procedures, improving safe operation within the NAS.		
The 40 NextGen positions will be deployed in Flight Standards and Aircraft Certification regional offices providing expertise in aircraft and avionics certification requirements; Safety Management Systems; environmental compliance; oceanic and domestic navigation; area navigation and Required Navigation Performance; and unmanned aircraft systems operations and approvals. The positions will also provide a direct link between the policy makers in headquarters and the inspectors in the field to rapidly resolve any issues.		
The AVS component of NextGen will also require contract support in order to process environmental requests; conduct safety analyses;		

	<b>Dollars (\$000)</b>	<u>FTE</u>
support the implementation of new flight procedures; support development or appropriate guidance material and standards; and support processing of certificate applications.		
Continued Operational Safety:	2,600	10
Aviation Safety (AVS) requests funding for 10 FTE in support of continued operational safety requirements. The additional resources will provide additional survaillance on helicopter emergency medical service (HEMS) vehicles; improve the development and coordination of airworthiness directives (AD); develop standards and policies to address advanced digital rotorcraft systems; develop a Light-Sport Manufacturer's Assessment Program; increase oversight of Production Approval Holders (PAHs) based on an increase number of domestic and foreign suppliers; increase safety oversight of the Air Traffic Organization (ATO) through surveillance audits or inspections; decrease the gaps in the FAA data systems that may enable airmen who claim disability or other disqualifying conditions to continue to maintain their medical certificate; improve aviation safety through the application of regulations and standards governing the qualifications of flight simulation training devices (FSTD) and support the integration of Job Task Analysis (JTA) content (used for inspector on-the-job training) into the Flight Standards Information Management System.		
Production Certification:	1,400	4
Aviation Safety (AVS) requests funding for four FTE to support the wide ranging transformation of the entire national air transportation system to meet future demands and avoid gridlock in the sky and at airports. These resources will provide needed risk assessments and safety analyses required by the continued implementation of Enhanced Flight Vision System (EFVS), Synthetic Vision (SV) and Area Navigation (RNAV) Required Navigation Performance (RNP) Standards into the NAS and to coordinate the ICAO and international standards. The additional resources will support the increased demand for Unmanned Aircraft Systems (UAS) access to the National Airspace System (NAS) through the development of airworthiness requirements and approval processes. The requested resources will support the release of abandoned type certificate (TC) and supplemental type certificate (STC) data to individuals through the Freedom of Information Act (FOIA) process. The additional resources will also support the use of composite materials in the manufacture of aircraft fuselages, engines, and components by establishing design standards, regulations, guidance material, and policy on how to certify, inspect and maintain aircraft constructed of composites.		
Cost Efficiencies Administrative Efficiencies:	-8,000	
Aviation Safety (AVS) will achieve administrative efficiencies of \$8 million through cost reductions and avoidance in contractual services, supplies and travel. These cost efficiencies will be achieved by utilizing procurement vehicles that enable multiple tasks to be performed within a single contract, streamlining and standardizing the supply processes and monitoring travel costs.	-0,000	

AVS Primary Customer Base (General Public is our Ultimate Customer)

Air Operator Certificates: 6,110

116 Major Air Carriers -- (e.g. United Airlines)
2,350 Commuter Air Carriers/On Demand Air Taxis
161 Commercial Operators (e.g. Baltimore Orioles)
454 Foreign Air Carriers (e.g. Lufthansa)
331 External Load (Logging/Oil Platform)
2,189 Agricultural Operators
509 Public Use Authorities (State/City/Police)

Air Agency Certificates: 5,803
554 Pilot Training Schools
4,957 Repair Stations
171 Maintenance Training Schools
121 Pilot Training Centers

Aircraft: 319,549
7,705 Air Carrier Aircraft
576 Commuter Air Carrier Aircraft
12,504 On Demand Air Taxi Aircraft
207,087 General Aviation Aircraft
91,677 Inactive Aircraft

Aviation Authorities - other countries
30 Bilateral Agreements
105 Foreign Carrier Aviation Authorities
188 Accident Investigation Authorities

Check Airmen: 7,592 5,590 Part 121 201 Parts 121/135 1,801 Part 135

<u>Designees: 11,095</u> 4,656 Aircraft Certification 1,444 Flight Standards 4,995 Aerospace Medicine

Mechanics with Inspection Authority: 20,458

As of January 11, 2009

149,951 ATP 139,766 Commercial 242,597 Private 260 Recreational 2,557 Sport

Active Pilots: 747,775

85,663 Student 126,981 Foreign Pilot

Non-Pilot Air Personnel: 721,400
368,548 Mechanics & repairmen
41,948 Control Tower Operator
154,440 Flight Attendant
74,997 ground instructors
81,847 other (dispatchers/flight
navigators/ parachute riggers/flight engineers)

Flight Instructors: 93,612

<u>Airmen Medical Examinations: 438,699</u> 16,100 Special Issuances

Approved Manufacturers: 1,647

Aviation Industry Entities Covered by Anti-Drug & Alcohol Programs: 7,200

National Transportation Safety Board 75 Safety Recommendations (5-year average) 30 Major Investigations (avg/yr)(new)

ATCS Medical Clearance Exams: 20,347 17,598 Air Traffic Controller Workforce 2,749 Flight Service Station Workforcce

Occupational/Employee Health Services 48,853 FAA Employees

#### Resource Summary

#### AVS

	FY 2009	FY 2010	Unavoidable	Discretionary	FY 2011
	Actual 1	Enacted	Changes	Changes	Request
Funding (\$000)					
PC&B	908,820	972,451	46,197	6,440	1,025,088
Other Objects					
Travel/Transportation	64,640	66,141	1,432	-	67,573
Other Services	156,633	154,926	(3,036)	7,560	159,450
RCU <sup>2</sup>	8,239	8,253	413	<del>-</del>	8,666
Other <sup>3</sup>	31,763	32,295	915	=	33,210
Total	261,274	261,615	(276)	7,560	268,898
Total	1,170,094	1,234,065	45,921	14,000	1,293,986
Staffing					
EOY (FTP)	7,195	7,403	-	82	7,485
OTFTP	108	110	-	=	110
Total FTEs (Includes FTP and OTFTP)	7,116	7,211	112	34	7,357

FY 2009 derived from actual obligations.
 Rents, Communications, Utilities.
 Printing & Reproduction Services, Supplies & Materials, Equipment, Land & Structures, and Insurance Claims & Indemnities.

## Resource Summary (\$ in Thousand)

		FY 2008 Actual	FY 2009 Actual	FY 2010 Enacted	FY 2011 Change	FY 2011 Request
Flight Standards	PC&B	595,357	636,992	671,589	34,991	706,580
3	0.0.	129,046	148,908	149,873	3,550	153,423
	Total	724,403	785,900	821,462	38,541	860,003
Aircraft Certification	PC&B	157,733	168,208	176,131	9,889	186,020
	0.0.	21,823	23,689	24,121	927	25,048
	Total	179,556	191,897	200,252	10,816	211,068
Aerospace Medicine	PC&B	36,721	39,835	42,482	2,149	44,631
	0.0.	9,695	11,301	11,894	285	12,179
	Total	46,416	51,136	54,376	2,434	56,810
Accident Investigation	PC&B	4,470	5,020	0	(0)	0
	0.0.	2,037	2,234	0	0	0
	Total	6,507	7,254	0	0	0
Rulemaking	PC&B	3,322	3,644	4,813	234	5,047
	0.0.	984	1,165	1,230	61	1,291
	Total	4,306	4,809	6,043	295	6,338
Air Traffic Safety Oversight	PC&B	8,284	14,771	22,082	2,742	24,824
	0.0.	2,422	2,415	2,437	73	2,510
	Total	10,705	17,186	24,519	2,815	27,334
Aviation Safety Analysis	PC&B	2,652	3,899	0	0	0
	0.0.	3,416	4,581	0	0	0
	Total	6,068	8,480	0	0	0
Accident Investigation and	PC&B	0	0	10,023	772	10,795
Prevention Service *	0.0.	0	0	9,053	981	10,034
	Total	0	0	19,076	1,753	20,829
Quality, Integration, and	PC&B	35,882	36,451	45,331	1,859	47,190
Executive Services	0.0.	67,757	66,981	63,006	1,408	64,414
	Total	103,639	103,432	108,337	3,267	111,604
Total, Aviation Safety	PC&B	844,422	908,820	972,451	52,636	1,025,087
	0.0.	237,180	261,274	261,614	7,285	268,899
	Total	1,081,602	1,170,094	1,234,065	59,921	1,293,986

Note \* Accident Investigation and Prevention was created through merging Accident Investigation and Aviation Safety Analys As of January 10, 2010

#### Safety Critical/Operational Support Staffing (End-of-Year Employment - FTP)

Flight Standards	FY 2008 <u>Actual</u>	FY 2009 <u>Actual</u>	FY 2010 Enacted	FY 2011 Change	FY 2011 Request
9	0	0	0	4	10
Engineers	0 3,900	0 3,977	8 4,136	4 26	12 4,162
Aviation Safety Inspectors Safety Technical Specialist	3,900 420	432	4,136	0	4,102
Operational Support	662	670	652	8	660
Total	4,982	5,079	5,221	34	5,259
Total	1,702	0,017	0,221	01	0,207
Aircraft Certification	202	244	0.40	,	054
Manufacturing Safety Inspectors	222	244	248	6	254
Pilots, Engineers, and CSTAs	686 174	715 166	727 178	12 2	739
Safety Technical Specialist Operational Support	174	141	178	2	180 148
Total	1,215	1,266	1,299	22	1,321
Total	1,213	1,200	1,277	22	1,521
Aerospace Medicine					
Physicians, Physician Assistants, Nurses	56	57	55	1	56
Alcohol/Drug Abatement Inspectors	80	58	68	0	68
Safety Technical Specialist	160	208	207	3	210
Operational Support	65	39 362	39	1 5	40 374
Total	361	302	369	5	3/4
Accident Investigation	10	10	0		
Air Safety Investigators	10 19	10 18	0	0	0
Safety Technical Specialist Operational Support	5	18 5	0	0	0
Total	34	33	0	0	0
Total	34	33	Ü	Ü	Ü
Air Traffic Safety Oversight					
AOV Safety Inspectors	0	0	0	0	0
Air Traffic Controllers	28	58	58	3	61
Safety Technical Specialist	54	70	68	10	78
Operational Support Total	3 85	6 134	7 133	2 15	9 148
	85	134	133	15	148
Rulemaking	0.5	20	20	4	20
Safety Technical Specialist	25 3	28 3	32 3	1	33
Operational Support Total	28	31	35	1	3 36
	20	31	33	'	30
Aviation Safety Analysis	47	47			
Safety Technical Specialist	17	17	0	0	0
Operational Support	3 20	3 20	0	0	0
Total	20	20	U	U	U
Accident Investigation and Provention Service *		_		_	
Air Safety Inspectors	0	0	10	0	10
Safety Technical Specialist	0	0	48	0	48
Operational Support Total	0	0	9 67	1 1	10 68
TOTAL	U	U	67	'	00
Quality, Integration, and Executive Services					
Safety Critical Staff	123	116	120	-4	116
Operational Support	154	154	159	4	163
Total	277	270	279	0	279
Totals					
Safety Critical Staff	5,974	6,174	6,388	64	6,452
Operational Support	1,028	1,021	1,015	18	1,033
Total	7,002	7,195	7,403	82	7,485

Note \* Accident Investigation and Prevention was created through merging Accident Investigation and Aviation Safety Analysis As of January 8, 2010

#### **Staffing Information**

Direct FTEs	FY 2008 Actual	FY 2009 Actual	FY 2010 Enacted	Proposed Change	FY 2011 Request
Flight Standards	4,927	5,030	5,084	90	5,174
Aircraft Certification	1,205	1,251	1,272	28	1,300
Aerospace Medicine	354	358	363	7	370
Accident Investigation	30	31	0	0	0
Rulemaking	27	30	33	1	34
Air Traffic Safety Oversight	75	121	127	13	140
Aviation Safety Analysis	16	20	0	0	0
Accident Investigation and Prevention *	0	0	62	3	65
Quality, Integration, and Executive Services	278	275	270	4	274
Total	6,912	7,116	7,211	146	7,357
End-of-Year Employment (FTP)	FY 2008 Actual	FY 2009 Actual	FY 2010 Enacted	Proposed Change***	FY 2011 Request
Flight Standards	4,982	5,079	5,221	38	5,259
Aircraft Certification	1,215	1,266	1,299	22	1,321
Aerospace Medicine	361	362	369	5	374
Accident Investigation	34	33	0	0	0
Rulemaking	28	31	35	1	36
Air Traffic Safety Oversight	85	134	133	15	148
Aviation Safety Analysis	20	20	0	0	0
Accident Investigation and Prevention *	0	0	67	1	68
Quality, Integration, and Executive Services	277	270	279	0	279
Total	7,002	7,195	7,403	82	7,485

Note \* Accident Investigation and Prevention was created through merging Accident Investigation and Aviation Safety Analysis As of January 8, 2010

#### **Workload Indicators**

New Certifications, Approval, & Appointments

Flight Standards				
Workload	FY 2008	FY 2009	FY 2010	FY 2011
	Actual	Actual	Estimate	Estimate
Airmen Certification Activities	255,879	211,445	215,077	204,933
Operator Certification/Certificate Management Activities	97,323	89,269	92,833	92,826
Investigation Activities	33,214	38,714	38,999	40,643
Non-ATOS Air Operator/Air Agency Surveillance Activities*	186,383	228,157	154,750	117,684
ATOS Operator Surveillance Activities	78,700	83,889	105,694	123,950
Enforcement Investigation Activities	10,934	13,583	13,756	14,644
Education & Safety	35,922	12,976	11,102	10,760
Aircraft Registration Examinations	218,651	222,149	224,292	224,970
Airmen Certification Examinations	384,570	396,107	478,483	547,203
Percent Change	FY07 - FY08	FY08 - FY09	FY09 - FY10	FY10 - FY11
	Actual	Actual	Estimate	Estimate
Airmen Certification Activities	4.1%	-17.4%	1.7%	-4.7%
Operator Certification/Certificate Management Activities	2.9%	-8.3%	4.0%	0.0%
Investigation Activities	-5.1%	16.6%	0.7%	4.2%
Non-ATOS Air Operator/Air Agency Surveillance Activities*	-23.0%	22.4%	-32.2%	-24.0%
ATOS Operator Surveillance Activities	85.0%	6.6%	26.0%	17.3%
Enforcement Investigation Activities	-1.0%	24.2%	1.3%	6.5%
Education & Safety	10.7%	-63.9%	-14.4%	-3.1%
Aircraft Registration Examinations	-7.0%	1.6%	1.0%	0.3%
Airmen Certification Examinations	70.0%	3.0%	20.8%	14.4%
* Includes other than Part 121 carriers				
Aircraft Certification				
Workload	FY 2008	FY 2009	FY 2010	FY 2011
	Actual	Actual	Estimate	Estimate
Certificated Aircraft Types in Operation	1,014	1,016	1,025	1,025
Airworthiness Directives Issued (NPRM through final rule)	180	185	190	190
Active Representatives of the Administrator	6,190	6,200	6,200	6,200
Inspections/Audits	4,000	4,100	4,150	4,192
New Certifications, Approval, & Appointments	10,250	10,300	10,500	10,500
Percent Change	FY07 - FY08	FY08 - FY09	FY09 - FY10	FY10 - FY11
	Actual	Actual	Estimate	Estimate
Certificated Aircraft Types in Operation	0.2%	0.2%	0.9%	0.0%
Airworthiness Directives Issued	1.7%	2.8%	2.7%	0.0%
Active Representatives of the Administrator	0.1%	0.2%	0.0%	0.0%
Inspections/Audits	31.8%	2.5%	1.2%	1.0%

Operations 67

0.2%

0.5%

1.9%

0.0%

### Workload Indicators (cont.)

### Aerospace Medicine

Workload	FY 2008	FY 2009	FY 2010	FY 2011
	Actual	Actual	Estimate	Estimate
Applications Processed/Received	444,439	519,834	525,032	530,282
DWI/NDR Applications Processed	13,995	17,243	17,415	17,589
Number of AMEs	4,200	3,952	4,000	4,027
Anti-Drug and Alcohol Registrations Completed	330	270	355	359
Anti-Drug and Alcohol MIS Annual Reports	1,900	2,340	2,550	2,576
Compliance and Enforcement Inspections	1,525	2,049	1,900	1,919
Number of Drug Tests	11,500	12,527	11,000	11,027
Number of Alcohol Tests	3,500	2,348	2,418	2,791
Percent Change	FY07 - FY08	FY08 - FY09	FY09 - FY10	FY10 - FY11
	Actual	Actual	Estimate	Estimate
Applications Processed/Received	1.3%	17.0%	1.0%	1.0%
DWI/NDR Applications Processed	1.0%	23.2%	1.0%	1.0%
Number of AMEs	0.1%	-5.9%	1.2%	0.7%
Anti-Drug and Alcohol Registrations Completed	2.8%	-18.2%	31.5%	1.1%
Anti-Drug and Alcohol MIS Annual Reports	39.2%	23.2%	9.0%	1.0%
Compliance and Enforcement Inspections	23.4%	34.4%	-7.3%	1.0%
Number of Drug Tests	3.4%	8.9%	-12.2%	0.2%
Number of Alcohol Tests	4.4%	-32.9%	3.0%	15.4%
Accident Investigation and Prevention				
Workload	FY 2008	FY 2009	FY 2010	FY 2011
	Actual	Actual	Estimate	Estimate
NTSB Recommendations Received	70	97	78	80
Accidents/Incidents Investigated	46	28	48	60
Follow-Up Investigations	175	168	170	190
Special Accidents/Incidents Investigations	110	109	208	230
NTSB Hearings Participated In	2	4	4	4
FAA Recommendations Received	250	404	315	315
NTSB Requests Received	179	130	130	170
Percent Change	FY07 - FY08	FY08 - FY09	FY09 - FY10	FY10 - FY11
	Actual	Actual	Estimate	Estimate
NTSB Recommendations Received	-2.8%	38.6%	-19.6%	2.6%
Accidents/Incidents Investigated	4.5%	-39.1%	71.4%	25.0%
Follow-Up Investigations	0.0%	-4.0%	1.2%	11.8%
Special Accidents/Incidents Investigations	10.0%	-0.9%	90.8%	10.6%
NTSB Hearings Participated In	0.0%	100.0%	0.0%	0.0%
FAA Recommendations Received		• . •		
	20.8%	61.6%	-22.0%	0.0%
NTSB Requests Received	20.8% 9.1%	61.6% -27.4%	-22.0% 0.0%	0.0% 30.8%

Operations Operations

### Workload Indicators (cont.)

Rulemaking				
Workload	FY 2008	FY 2009	FY 2010	FY 2011
	Actual	Actual	Estimate	Estimate
Exemptions	417	394	450	450
Petitions for Rulemaking	20	5	10	
Rulemaking Projects	36	37	30	30
Aviation Rulemaking Advisory Committee:				
Tasks	3	2	3	3
Recommendations	3	3	3	3
Percent Change	FY07 - FY08	FY08 - FY09	FY09 - FY10	FY10 - FY11
-	Actual	Actual	Estimate	Estimate
Exemptions	-50.3%	-5.5%	14.2%	0.0%
Petitions for Rulemaking	33.3%	-75.0%	100.0%	-100.0%
Rulemaking Projects	24.1%	2.8%	-18.9%	0.0%
Aviation Rulemaking Advisory Committee:				
Tasks	50.0%	-33.3%	50.0%	0.0%
Recommendations	0.0%	0.0%	0.0%	0.0%
Air Traffic Safety Oversight Workload				
Workload	FY 2008	FY 2009	FY 2010	FY 2011
	Actual	Actual	Estimate	Estimate
Safety Analysis and Audits	32,458	97,791	125,000	150,000
Safety Incident Investigations	25,990	12,161	12,200	12,200
Air Traffic Change Approvals	11,642	17,819	17,900	18,000
Safety Report Reviews	17,408	18,198	18,500	20,000
Airmen Credentialing/Examination	18,683	27,827	28,000	28,000
Education and Safety	40,149	102,845	75,100	75,100
Percent Change	FY07 - FY08	FY08 - FY09	FY09 - FY10	FY10 - FY11
	Actual	Actual	Estimate	Estimate
Safety Analysis and Audits	129.4%	201.3%	27.8%	20.0%
Safety Incident Investigations	117.7%	-53.2%	0.3%	0.0%
Air Traffic Change Approvals	380.7%	53.1%	0.5%	0.6%
Safety Report Reviews	154.9%	4.5%	1.7%	8.1%
Airmen Credentialing/Examination	132.4%	48.9%	0.6%	0.0%
Education and Safety	56.5%	156.2%	-27.0%	0.0%

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### OPERATIONS APPROPRIATION

## Commercial Space (AST) (\$ in Thousands)

Item Title	Dollars	FTP	OTFTP	FTE
FY 2010 Enacted	15,237	72	1	71
FY 2010 One-Time Items	0	0	0	0
Un que idable Adiustments				
Unavoidable Adjustments 1. Annualized FTEs (ATO: 91, AVS: 112)	0			
2. Annualized FY 2010 Pay Raise (GS Population)	0			
Annualized FY 2010 Pay Raise (Core Comp Population)	138			
4. January 2011 Pay Raise (GS Population)	0			
5. January 2011 OSI (Core Comp Population)	274			
6. January 2011 SCI	72			
7. Non-pay inflation	26			
Total Unavoidable Adjustments	510	0	0	0
Uncontrollable Adjustments				
NAS Handoff Requirements	0			
2. NATCA Arbitration Decision	0			
3. Workforce Attrition (-242 EOY/ -121 FTE)	0			
Total Uncontrollable Adjustments	0	0	0	0
Discretionary Increases				
1. NextGen RNAV/RNP (40 EOY/20 FTE)	0			
2. Continued Operational Safety (26 EOY/ 10 FTE)	0			
3. Production Certification (16 EOY/ 4 FTE)	0			
4. New Service Center Buildings	0			
5. Protect FAA Information Security Infrastructure	0			
6. Impl. of NextGen Env. & Energy Tech. , Models & Metrics (3 EOY/ 2 FTE)	0			
7. Safety Inspections and Emergency Operations (110 EOY/ 54 FTE)	0			
Total Discretionary Increases	0	0	0	0
Cost Efficiencies				
Flight Services Contract Savings	0			
2. Adminstrative Effeciencies	0			
Total Cost Efficiencies	0	0	0	0
Base Transfers				
1. NextGen and Acquisitions Hiring Support (3 EOY/ 3 FTE)	0			
2. Labor Relations/ National Employee Safety (1 EOY/ 1 FTE)	0			
3. Safety and Hazardous Materials (1 EOY/ 1 FTE)	0			
Total Base Transfers	0	0	0	0
FY 2011 Request	15,747	72	1	71

## **Detailed Justification for Commercial Space Transportation (AST)**

#### Overview:

The Associate Administrator for Commercial Space Transportation (AST) is committed to a timely and responsive licensing and regulatory process designed to enable a safe, secure, efficient, and internationally competitive U.S. space transportation industry.

#### Goals:

- No fatalities, serious injuries, or significant property damage to the uninvolved public during licensed or permitted space launch and reentry activities.
- Encourage, facilitate and promote the growth of commercial space transportation through environmental activities and delivery of products that will improve the international competitiveness of the U.S. commercial space transportation industry.
- Maintain a leadership role within the international commercial space transportation community by participating in international forums to raise awareness of safety oversight best-practices and activities.
- Manage for results that support achievement of AST's mission and vision.
- AST's goals will be supported by:
  - Regulating commercial space launches, reentries, and operations of launch and reentry sites.
  - Implementing the National Space Transportation Policy.
  - Promoting development of new or improved U.S. commercial space launch vehicle technology.
  - Administering the newly established Center of Excellence for Commercial Space
     Transportation to foster the development of effective policies, procedures, and supporting
     technologies for the advancement of safe, efficient commercial space transportation in
     accordance with national policies and Congressional direction.
  - Executing the Congressionally-directed Commercial Space Grant Program established in FY 2010 which seeks to ensure the resiliency of the space transportation infrastructure of the United States.
  - Encouraging public-private partnerships to construct new or improved infrastructure to accommodate increasing demand for commercial space launches.
  - Strengthening U.S. international leadership by supporting and fostering the development and monitoring of agreements to advance fair and equitable international trade in space launches and encouraging the adoption and use common practices and procedures amongst spacefaring nations through continuing international dialogue.
  - Analyzing and assessing market trends and forces that impact the international competitiveness of the U.S. industry.
  - Controlling costs, improving customer service, managing resources effectively and efficiently, and carrying out a comprehensive training plan to meet the unique needs of AST's commercial space transportation technical professionals.

#### FY 2010 Program:

The mission of the Office of Commercial Space Transportation is to ensure protection of the public, property, and the national security and foreign policy interests of the United States during commercial launch or reentry activities, and to encourage, facilitate, and promote U.S. commercial space transportation.

AST carries out its safety responsibilities by evaluating license and permit applications, inspecting licensed and permitted operations, and developing rulemaking products related to commercial launch and reentry activities. AST also issues Safety Approvals for launch vehicles, reentry vehicles, safety systems, processes, services, or qualified and trained personnel.

In addition to ensuring public safety, AST leverages partnerships with academia, industry, and other government organizations to enhance the safety of launches occurring from both federal and non-federal launch sites. An example is AST's tools and analysis program, which provides analytical support to the evaluation of license and experimental permit applications, primarily in the form of trajectory and risk analyses. Key to this effort is the development of in-house expertise, the development of tools and techniques, and a strong quality assurance process.

The commercial space transportation industry is changing rapidly. Both expendable and reusable launch vehicles use completely independent operating procedures, operating locations, operational concepts, and are governed by a multitude of agencies. All of these factors present significant new safety challenges. Yet AST continues to maintain a leadership position, domestically and internationally, by remaining actively engaged with industry stakeholders and continuing to refine its internal processes to effectively and efficiently evaluate and approve safety critical launch vehicle components and systems.

Planning for human space flight has been building up steadily since Scaled Composites won the Ansari X Prize with SpaceShipOne. The initial regulatory regimes for human space flight and experimental permits were established in FY 2007, and development continues. Several companies have conducted test flights under the experimental permit regime, and there are plans to begin human space flight missions within the 2010 to 2011 timeframe. In November 2009, Masten Space Systems and Armadillo Aerospace were awarded prize money under the Northrop Grumman Lunar Lander Challenge for vehicles that can simulate the liftoff and landing of a lunar spacecraft. In October 2008, the X Prize Foundation sponsored its third X Prize Cup competition at which Armadillo Aerospace won the first level competition, garnering a \$350,000 NASA-sponsored prize. This annual event gathers many companies and/or teams to compete in spacerelated events, several of which require the competitors to have licenses or experimental permits for their vehicle operations. AST works with the X Prize Foundation through a new form of industry partnership that promotes communication, with AST receiving information about planned events and assessing their safety impact. Through the X Prize Foundation, AST is better able to ensure participants are cognizant of regulatory requirements. AST is conducting independent flight safety analyses and safety evaluations of proposed activities for future X Prize Cup events. Some of the X Prize Cup events do not require a launch license or permit, such as amateur rocket launches. In August 2006 NASA awarded Space Act Agreements under what is referred to as the Commercial Orbital Transportation Services (COTS) program to resupply and return cargo and crew to and from the International Space Station. The COTS program has provided AST with its first opportunity to exercise the reentry regulations promulgated in 2000, and to make reentry determinations. NASA awarded Commercial Resupply Services (CRS) contracts to two commercial launch providers, SpaceX and Orbital Sciences Corporation, in December 2008. The ensuing 20 CRS launches will require FAA licensing.

AST engages in various activities intended to support its mission of encouraging, facilitating, and promoting U.S. commercial space transportation transportation. AST's core business functions in this area include performing environmental projects, publishing reports on industry developments and trends, hosting stakeholder forums, managing the research and development activities associated with the Commercial Space Transportation Center of Excellence established in summer 2010, managing and executing the Congressionally-directed Commercial Space Grant program. The grant program was authorized by Congress in 1993, and with an initial appropriation of \$500,000 in the FY 2010, a Commercial Space Grant Program was formally established within AST to support the development of the commercial space transportation infrastructure in the U.S.

#### **FY 2010 Planned Accomplishments:**

#### Safety:

AST currently has 16 active licenses: 10 for launching expendable launch vehicles (ELVs) and six for operating launch sites; and three active permits. In FY 2010, AST expects to make two new licensing determinations concerning the operation of two launch sites (Cecil Field in Jacksonville,

Florida, and Launch Complex 46 at Cape Canaveral Air Force Station).

- In addition, companies taking part in NASA's COTS demonstrations, requiring launch licenses or permits, are at various stages of flight readiness. In FY 2010, AST expects to make licensing determinations concerning Space X's Falcon 9 launches, Orbital Science Corporation's Taurus II launches, and Space X's Dragon reentry.
- In FY 2010, AST expects to make two Safety Approval determinations: one for the Alaska Aerospace Corporation for its Range Safety Telemetry System, and the second for the National Aerospace Training and Research Center (NASTAR Center) and its crew training program. Additionally, AST expects to complete development of an internal policy regarding the use and development of industry standards to support AST's mission.
- As a follow-up to the license and permit process, AST will conduct safety inspections to ensure adherence to the regulatory requirements. AST conducts at least one annual inspection at each commercial launch site and, at a minimum, an inspection of launch operations at the time of flight. Currently, there are six licensed launch site operators increasing to eight in FY 2010 as mentioned earlier; AST will conduct site inspections for each licensed site operator. In addition to inspections of launch operations at the time of flight, AST may conduct inspections before and after the time of flight, verifying launch preparation and post-flight events. The number of Expendable Launch Vehicle (ELV) launches and inspections should remain the same as FY 2009.

Reusable Launch Vehicles (RLV) launches, however, are difficult to predict accurately, and several companies are planning to offer human space flight to the public within the FY 2010 to 2011 timeframe. By FY 2010 we expect that only a few will be conducted under licenses. However, we expect to see an increase in the number of amateur class launches and experimental permits as RLV vehicles and operations continue to undergo testing, training, and research and development. Estimates for RLV licensed or permitted launches range from 10 to 20. AST will inspect each permitted or licensed launch operation in FY 2010.

In FY 2010 AST anticipates it will conduct a total of 44 licensed or permitted launch operator safety inspections (launch and reentry inspections) and 7 launch site operator safety inspections (site inspections). Additional pre-launch safety inspections at various locations include:

- Flight termination system ordnance and related system acceptance and qualification, installation, and testing
- Launch rehearsals
- Readiness reviews
- Anomaly response procedure reviews and simulations
- Accident investigation procedure review
- Integrated crew exercises
- AST will carry out regulatory development projects such as explosive siting, trajectory dispersion
  methodology for piloted RLVs, and the application of GPS to space transportation technologies.
  AST plans to develop internal tools and processes utilized by AST engineering staff, including an
  enhanced risk analysis input preprocessing tool, and a report describing candidate methodology
  for characterizing vehicle probability of failure using test results. AST is also reviewing its existing
  regulations (Part 417-Launch Safety, Part 431-Launch and Reentry of an RLV, and Part 420License to Operate a Launch Site) to identify areas that should be revised or updated.
- AST will continue collaborating with DoD and NASA through the Common Standards Working
  Group to maintain common launch safety requirements at Air Force launch sites and to aid DoD's
  understanding of commercial space entrepreneurial capabilities and potential to fulfill to military
  requirements. AST will continue its collaboration with NASA on the COTS initiative and CRS
  initiatives.
- AST continues to develop the requirements for Phase 1 of the first automated Space and Air Traffic Management System (SATMS) Decision Support Tool (DST) application. The tool supports launch and reentry mission planning. SATMS represents a conceptual "aerospace" environment in which space and aviation operations are fully integrated in a modernized, efficient NAS. Demand for access to the nation's airspace by aviation users (civil, military, and general) continues to

increase. As a result, the need to improve the safety and efficiency of tools and processes is paramount to the SATMS vision. The SATMS DST will identify space vehicle airspace requirements, plan air traffic reroutes, and enable space vehicles to be tracked through the NAS. Phase 2 of the development began in FY 2009 and will include an evaluation of the initial draft requirements.

#### Capacity:

- AST continues to streamline the environmental review process in its licensing and permitting
  efforts. Based on the increase in commercial space transportation since the Commercial Space
  Launch Amendments Act of 2004, AST work with RLV operators will continue to increase in FY
  2010. This increased workload begins in the preapplication phase and continues through the
  environmental assessment, the air traffic evaluation, and the development of memorandums of
  agreement to aid new operators.
- AST's research supports development of safety regulations and standards to keep pace with a growing space industry. Each year AST makes a call for new research projects, to be accomplished during the following fiscal year, to the Commercial Space Transportation Advisory Committee (COMSTAC). COMSTAC members are senior executives from the U.S. commercial space transportation industry, including entrepreneurial firms as well as large aerospace companies; the satellite industry; space-related state government officials; academia; and representatives from space advocacy organizations. AST receives 12-15 project ideas each year and determines if they support its safety and promotion goals. The suggested projects are ranked by likelihood of a successful outcome with topics that may soon be useful in new safety practices or regulatory development. Projects often include reviewing current modeling techniques, determining the current state of technological developments, and evaluating alternative safety methods that may be proposed by the industry. The most promising two to three projects, depending on estimated cost, are pursued.
- AST will publish an Industry Developments and Concepts Report, a Commercial Space Transportation Forecast, and four quarterly launch reports to provide information about significant changes in commercial space transportation. In developing forecasts, year-in-review documents and special topic reports, AST gathers information, evaluates the sources of the data, and analyzes and displays the information clearly to inform both the public and industry. These reports are used by industry to measure its performance in the commercial market, by state governments to influence development of new space launch activities, and by the DoD and NASA as they review launch requirements. AST also conducts a public Space Transportation Conference with an agenda based on industry and government feedback.

#### Organizational Excellence:

- AST reaches out to students, teachers, and academic administrators with its Education Initiative. This program develops knowledge of the commercial space transportation industry and its career potentials, as well as increase interest in science, math, and engineering. Also, AST will participate in local school career days and educational conferences and develop educational materials for publication and the AST website. AST has further refined its approach to cooperative research with academia with the establishment of a Center of Excellence (CoE) program for Commercial Space Transportation. The CoE leverages AST's limited budget resources in a collaborative effort with universities to provide a focal point for research into CST policy, technical, and operational issues.
- AST seeks to improve its organizational performance in three areas: human resource
  management, fiscal resource management, and training. AST supports the agency's lead in
  strategic management areas, including the early dispute resolution system, workforce planning,
  and performance planning. AST will expand its efforts to obtain and incorporate a broader range
  of customer feedback in FY 2009 and will continue its scrutiny of budget requirements and
  spending in its cost control effort.
- AST will continue to strengthen the knowledge of its technical and professional staff in areas unique to space transportation. It will use a mix of commercial, government, and internally

developed courses to provide at least 3,400 student-hours of professional development and technical training for AST staff and safety inspectors. It also includes specialized training for staff members assigned to specific technical disciplines such as propulsion, structures, and environmental assessment. Additionally, other technical training in relevant topics such as system safety, systems engineering and human spaceflight will be provided to a sizable percentage of the members of the AST technical staff.

#### FY 2011 Budget Request:

For FY 2011, the Associate Administrator for Commercial Space Transportation requires \$15,747,000 and 71 FTEs to meet its mission. This is an increase of \$510,000 (3.4 percent) from FY 2010 enacted level. This increase provides for basic pay raises and inflation for AST base programs.

The FAA has licensed two launch sites in the past several years that are co-located with airports. While these launch sites are co-located with airports, project justification and other standards for space transportation infrastructure grants differ substantially from those applicable to AIP projects. It is expected, in the near term, that launch activity will increase at U.S. spaceports as commercial human spaceflight begins and that the need for space transportation infrastructure will increase. The Spaceport grants would specifically be used for developing spaceport/airport layout plans, completing preliminary site designs, establishing safe and efficient physical layouts and facilities, as well as assessing environmental impacts.

Several licenses pertaining to the conduct of launches and the operation of launch sites will be expiring in 2011, and AST projects to have at least seven customers in some phase of either the license determination or experimental permitting process. AST will continue its efforts to streamline the environmental review process in its licensing and permitting efforts. Based on the increase in commercial space transportation activity since FY 2004 and the enactment of the Commercial Space Launch Amendments Act of 2004, AST work with RLV operators will continue to increase in FY 2011. This increased workload begins in the preapplication phase and continues through the environmental assessment, the air traffic evaluation, and the development of memorandums of agreement to facilitate new operators. Additionally, several companies are implementing plans to provide the public with the means to get to space within the FY 2011 timeframe with test operations having occurred in FY 2010. Human space flight adds a complicating dimension to permit and license evaluations.

Each launch and reentry of NASA's contracted COTS and CRS activities will be licensed by AST; 4-5 flights are anticipated each year commencing in FY 2010. The unique operations and scope of these activities, and the addition of new launch sites, pose new challenges for AST's evaluation and licensing teams. Orbital Sciences plans to launch their vehicles from the Wallops Island launch facility. AST's safety inspection teams will have the responsibility of reviewing additional safety procedures and processes that had previously been under the purview of Air Force safety officials at the Eastern and Western Ranges. To maintain a fluid licensing process, AST has been consistently engaged in preliminary COTS-related activities with NASA, Air Force, SpaceX, and Orbital Sciences Corporation. This participation has included system requirements reviews, preliminary design reviews, critical design reviews, and multiple discussions concerning launch and reentry issues and regulatory requirements.

AST will conduct safety inspections to ensure licensees and permitees are adhering to the regulatory requirements. AST conducts at least one annual inspection of site operations at each of the commercial launch sites and, as a minimum, an inspection of launch operations at the time of flight. By FY 2011, the number of FAA licensed launch sites is expected to be eight. In addition to inspections of launch operations at the time of flight, inspections may be conducted before and/or after the time of flight covering activities that occur during launch vehicle preparation and verifying that required post-flight events have occurred. The number of expendable launch vehicle (ELV) launches and inspections are expected to increase from FY 2010. Furthermore, we expect to be conducting more safety inspections of reentry operations in FY 2011, and these will pose new and unique challenges. Reusable launch vehicle (RLV) launches are difficult to predict with accuracy. In FY 2011 we anticipate building upon the three experimental permit determinations. We expect many RLV launches to be conducted under experimental permits as those vehicles and operations continue to undergo testing, training, and research and

development. Estimates for RLV launches range from 10 to 20 or higher. FAA expects to see a spike in the number of permitted launch operations as a result of an increase in the number of permitted activities in FY 2010. AST also expects an increase in the number of safety approval applications submitted in FY 2010.

AST will conduct regulatory development projects and activities pertaining to U.S. commercial space transportation. Major FY 2011 activities under this program include: Explosive Siting, trajectory dispersion methodology for piloted RLVs, and the application of GPS to space transportation technologies. AST will continue to review its existing regulations (Part 417-Launch Safety, Part 431-Launch and Reentry of an RLV, and Part 420-License to Operate a Launch Site, Part 437-Experimental Permits) to identify areas that should be revised or updated.

AST will continue its collaboration with DoD and coordination with NASA through the Common Standards Working Group to maintain common launch safety requirements and other common safety standards impacting commercial launch operations at Air Force ranges and facilitate DoD's understanding of commercial space entrepreneurial capabilities. AST will continue its support and collaboration with NASA on its CRS spaceflight initiative and may seek to expand upon the AST support office collocated with the Johnson Spaceflight Center.

AST's research supports the development of appropriate safety regulations and standards to keep pace with a developing space industry. Each year a call for new research projects in support of the industry, to be accomplished during the following fiscal year, is announced within the AST office and to the members of the Commercial Space Transportation Advisory Committee (COMSTAC), RLV, and Launch Operations Support Working Groups. COMSTAC membership is made up of senior executives from the U.S. commercial space transportation industry, including entrepreneurial firms as well as large aerospace companies; the satellite industry; space-related state government officials; academia; and representatives from space advocacy organizations. AST receives approximately 12-15 project ideas each year. The projects are evaluated to determine if they support the AST safety and promotion goals. The suggested projects are ranked as to the likelihood of a successful outcome with topics that may soon be useful in the development of new safety practices, which rank highest. Projects often include a review of current modeling techniques, a literature search to determine the current state of technological developments, and evaluating alternative safety methodologies that may be proposed by the industry. The most promising two to three projects, depending on estimated cost, are pursued.

AST continues the development of the draft requirements and architecture for commercial space transportation in the National Airspace System (NAS) and its seamless operation in the emerging NextGen architecture. AST will build upon the groundwork laid in previous years and further refine the required system capabilities and required vehicle requirements in order to assure commercial space transportation equal access to other NAS users. AST's goal is to seamlessly integrate space operations into normal NextGen architectures, processes, and procedures without causing economic or procedural modifications which would create undo hardship to NAS users. By continuing efforts to normalize space transportation operations, AST can facilitate the safe, orderly growth of commercial space transportation within an integrated, established safety structure. Demand for access to the nation's airspace by aviation users (civil, military, and general) continues to increase. As a result, the need to continually improve the safety and efficiencies of tools and processes are paramount to the STM-vision. In order to fully integrate space transportation safely, AST will continue to explore the means and processes necessary to integrate safety into all aspects of the commercial space transportation flight profile, from launch to successful re-entry. This will require resolving significant issues relating to on-orbit safety, orbital debris mitigation, conjunction assessment, collision avoidance, and orbital maneuvers. This marks a maturation of regulatory authority and responsibility but one that must be addressed to accommodate commercial space flight participants and passengers.

The extensive need for effective regulation to ensure a safe and successful commercial space transportation industry demonstrated the need for systematic research and development into issues directly impacting the development of this dynamic industry. In recognition the Administrator directed the establishment of an FAA Center of Excellence for Commercial Space Transportation to explore the issues and disseminate research data to the industry. The CoE is planned to begin operations in July 2010 as a consortium of aeronautical universities under the direction of AST. Further, Congress appropriated an additional \$974K to be executed through Embry Riddle Aeronautical University to support the critical issues

impacting the growth, development, and sustainability of a safe and successful commercial space transportation industry.

AST will publish an Industry Developments and Concepts Report, a Commercial Space Transportation Forecast, and four quarterly launch reports to provide information concerning the significant changes that are taking place in commercial space transportation. In developing forecasts, year-in-review documents and special topic reports, AST gathers information, evaluates the sources of the data, and analyzes and displays the information clearly to inform both the public and the industry. These reports are used by industry to measure its performance in the commercial market, by state governments to influence the development of new space launch activities, and by the DoD and NASA as they review their launch requirements. AST conducts a public Space Transportation Conference with an agenda based on industry and government feedback that has senior level interest.

The AST Education Initiative reaches out to students, teachers, and academic administrators to develop knowledge and awareness of the commercial space transportation industry and its career potentials, as well as increase the interest and participation in the areas of science, math, and engineering. AST will participate in local school career days, educational conferences and programs, develop partnerships with other organizations, and develop materials for publication and for the AST website. AST will further refine its cooperative research with academia through the Center of Excellence for Commercial Space Transportation. The CoE leverages AST's limited budget resources in a collaborative effort with universities to provide a focal point for research into CST policy, technical, and operational issues. AST will use its recently gained experience to further explore methods to improve the safety, success, economic viability, and national security interests of the United States and the commercial space transportation industry.

AST seeks to improve its organizational performance by its efforts in three areas: human resource management, fiscal resource management, and training. AST supports the agency's lead in strategic management areas, including the early dispute resolution system, workforce planning, and performance planning. AST will expand its efforts to obtain a broader range of customer feedback and will continue its scrutiny of budget requirements and spending in its cost control effort.

AST will continue to focus on enhancing the knowledge and proficiency of its technical and professional staff in areas unique to space transportation. It will use a mix of commercial, government, and internally developed courses to provide at least 3,400 student-hours of professional development and technical training for AST staff and safety inspectors. It also includes specialized training for staff members assigned to specific technical disciplines such as propulsion, structures, and environmental assessment. Additional technical training in relevant topics such as system safety, systems engineering and human spaceflight will be provided to a sizable percentage of the members of the AST technical staff.

# **Explanation of Funding Changes for Commercial Space Transportation (AST)**

	<u>Dollars (\$000)</u>	<u>FTE</u>
Commercial Space Transportation (Net Change from FY 2010 Enacted)	\$510	
Overview:	<u> </u>	
For FY 2011, the Associate Administrator for Commercial Space Transportar FTE in Operations to meet its mission of protecting the public, property, an policy interests of the United States during a commercial launch or reentry facilitate, and promote U.S. commercial space transportation. The FY 2011 increase of \$510 (3.3 percent) over the FY 2010 Enacted level.  The FY 2011 request level reflects unavoidable pay raises and inflation.	nd national security a activity and to enco	nd foreign urage,
Unavoidable Adjustments		
Annualized FY 2010 Pay Raise (Core Comp Population):	138	
This pay raise has been calculated separately based on the employee population under the Core Compensation pay plan. This increase is needed to provide for the full-year cost associated with the Organizational Success Increase (OSI) and the Superior Contribution Increase (SCI) awarded in FY 2010. The OSI is 100 percent of the 2.0 percent average government-wide pay raise plus 1.0 percent (3.0 percent). The Core Compensation system awards three different pay raises—20 percent of the population receive the OSI plus a 1.8 percent SCI, 45 percent receive the OSI plus a 0.6 percent SCI, and 35 percent receive just the OSI. The FY 2010 portion of this pay raise is funded within enacted amounts; this increase covers the first quarter of FY 2011.		
FY 2011 Organizational Success Increase (OSI) (Core Comp Population):	274	
This pay raise has been calculated separately based on the employee population under the Core Compensation pay plan. This increase is required to provide for costs associated with base salary increases that are provided to employees meeting or exceeding job expectations. The factor used is 2.4 percent, composed of the projected 1.4 percent government-wide pay raise in January 2011 plus 1.0 percent for the full OSI increase (derived from the elimination of Within-Grade increases). A fundamental component of the FAA's pay-for-performance system, this increase assumes FAA will meet most of its FY 2010 performance goals.	2/4	
FY 2011 Superior Contribution Increase (SCI):	72	
This increase is required to provide for costs associated with base salary increases that are provided to employees in the Core Compensation system providing superior contributions to the organization. The factor used is 1.8 percent for 20 percent of the population and 0.6 percent for 45 percent of the population. The remaining 35 percent do not receive this increase.		

	<u>Dollars (\$000)</u>	<u>FTE</u>
Non-Pay Inflation:  This increase is needed to provide for inflationary cost increases	26	
consistent with OMB guidance that uses the FY 2011 GDP price index (year over year) of 0.5 percent.		

## Resource Summary

### AST

	FY 2009	FY 2010	Unavoidable	Discretionary	FY 2011
	Actual 1	Enacted	Changes	Changes	Request
Funding (\$000)					
PC&B	9,348	10,122	485	-	10,607
Other Objects					
Travel/Transportation	554	676	75	=	752
Other Services	3,895	4,104	(104)		4,000
RCU <sup>2</sup>	33	48	2	-	50
Other <sup>3</sup>	204	287	52	-	339
Total	4,686	5,115	26	-	5,141
Total	14,034	15,237	510	-	15,747
Staffing					
EOY (FTP)	67	72	-	-	72
OTFTP	1	1	-	-	1
Total FTEs (Includes FTP and OTFTP)	66	71	-	-	71

FY 2009 derived from enacted budget.
 Rents, Communications, Utilities.
 Printing & Reproduction Services, Supplies & Materials, Equipment, Land & Structures, and Insurance Claims & Indemnities.

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## OPERATIONS APPROPRIATION

## Staff Offices (\$ in Thousands)

Item Title	Dollars	FTP	OTFTP	FTE
FY 2010 Enacted	801,427	2,728	87	2,795
EV 2010 On Time House				
FY 2010 One-Time Items	0	0	0	0
Unavoidable Adjustments				
1. Annualized FTEs (ATO: 91 , AVS: 112)	0			
2. Annualized FY 2010 Pay Raise (GS Population)	4			
3. Annualized FY 2010 Pay Raise (Core Comp Population)	3,329			
4. January 2011 Pay Raise (GS Population)	8			
5. January 2011 OSI (Core Comp Population)	6,627			
6. January 2011 SCI	1,733			
7. Non-pay inflation	2,203			
Total Unavoidable Adjustments	13,904	0	0	0
Uncontrollable Adjustments				
NAS Handoff Requirements	0			
2. NATCA Arbitration Decision	0			
3. Workforce Attrition (-242 EOY/ -121 FTE)	0			
Total Uncontrollable Adjustments	0	0	0	0
Discretionary Increases				
1. NextGen RNAV/RNP (40 EOY/20 FTE)	0			
2. Continued Operational Safety (26 EOY/ 10 FTE)	0			
3. Production Certification (16 EOY/ 4 FTE)	0			
4. New Service Center Buildings	20,000			
5. Protect FAA Information Security Infrastructure	6,000	2		2
6. Impl. of NextGen Env. & Energy Tech. , Models & Metrics (3 EOY/ 2 FTE)	3,019	3		2 54
7. Safety Inspections and Emergency Operations (110 EOY/ 54 FTE)	8,022	110	•	54 56
Total Discretionary Increases	37,041	113	0	56
Cost Efficiencies				
Flight Services Contract Savings	0			
2. Adminstrative Effeciencies	0			
Total Cost Efficiencies	0	0	0	0
Dana Transfers				
Base Transfers  1. NextGen and Acquisitions Hiring Support (3 EOY/ 3 FTE)	267	3		3
Next definition Acquisitions Finishing Support (3 EST/ 31 FE)     Labor Relations/ National Employee Safety (1 EOY/ 1 FTE)	0	3		3
3. Safety and Hazardous Materials (1 EOY/ 1 FTE)	0			
Total Base Transfers	267	3	0	3
FY 2011 Request	852,639	2,844	87	2,854

## OPERATIONS APPROPRIATION

# Financial Services (ABA) (\$ in Thousands)

Item Title	Dollars	FTP	OTFTP	FTE
FY 2010 Enacted	113,681	162	0	162
EV 2010 On Time House				0
FY 2010 One-Time Items	0	0	0	0
Unavoidable Adjustments				
1. Annualized FTEs (ATO: 91 , AVS: 112)	0			
2. Annualized FY 2010 Pay Raise (GS Population)	0			
3. Annualized FY 2010 Pay Raise (Core Comp Population)	181			
4. January 2011 Pay Raise (GS Population)	0			
5. January 2011 OSI (Core Comp Population)	359			
6. January 2011 SCI	94			
7. Non-pay inflation	469			
Total Unavoidable Adjustments	1,103	0	0	0
Uncontrollable Adjustments				
NAS Handoff Requirements	0			
2. NATCA Arbitration Decision	0			
3. Workforce Attrition (-242 EOY/ -121 FTE)	0			
Total Uncontrollable Adjustments	0	0	0	0
Discount of the control of the contr				
Discretionary Increases  1. NextGen RNAV/RNP (40 EOY/20 FTE)	0			
2. Continued Operational Safety (26 EOY/ 10 FTE)	0			
3. Production Certification (16 EOY/ 4 FTE)	0			
4. New Service Center Buildings	0			
Protect FAA Information Security Infrastructure	0			
6. Impl. of NextGen Env. & Energy Tech. , Models & Metrics (3 EOY/ 2 FTE)	0			
7. Safety Inspections and Emergency Operations (110 EOY/ 54 FTE)	0			
Total Discretionary Increases	0	0	0	0
Cost Efficiencies				
Flight Services Contract Savings	0			
Adminstrative Effeciencies	0			
Total Cost Efficiencies	0	0	0	0
Base Transfers				
NextGen and Acquisitions Hiring Support (3 EOY/ 3 FTE)	0			
2. Labor Relations/ National Employee Safety (1 EOY/ 1 FTE)	0			
3. Safety and Hazardous Materials (1 EOY/ 1 FTE)	0			
Total Base Transfers	0	0	0	0
FY 2011 Request	114,784	162	0	162

### Detailed Justification for Staff Offices – ABA

Financial Services (ABA)	FY 2011 Request: \$114,784

### Overview:

The Assistant Administrator for Financial Services/Chief Financial Officer advises the agency of FAA plans and programs for budget, financial management, and performance management.

The Assistant Administrator for Financial Services:

- Provides accounting, financial, and audit liaison services.
- Manages FAA accounting systems.
- Oversees the capitalization of a multi-billion dollar asset base.
- Implements and oversees agency internal control program in compliance with OMB Circular A-123.
- Ensures that agency budgetary needs are identified and justified.
- Ensures that agency funds and resources are utilized effectively.
- Adheres to OMB Circular A-11 regarding apportionment, reapportionment, funds control, and reporting status of funds and budgetary resources.
- Develops policies, programs, standards, systems, and procedures for budget, financial, and performance management.
- Develops and manages the implementation of the organizational structure and issues administrative standards and procedures.
- Provides oversight of the agency's cost reduction efforts.
- Provides financial analysis of proposed agency actions.
- Manages cost accounting system.
- Administers OMB Circular A-76, Performance of Commercial Activities.
- Serves as the agency's Chief Financial Officer (CFO).

### FY 2010 Program:

The Assistant Administrator for Financial Services/CFO (ABA) will continue to enhance agency financial business processes through improvements to DOT's "Delphi" financial management system. In FY 2010, ABA will centralize major segments of the capitalization process to strengthen financial controls and improve the reliability of financial data. In addition, ABA plans to implement improved automated workflow and document imaging, making the capitalization process more efficient and less labor intensive. ABA will also focus on continuing to achieve a "clean audit" with an emphasis on improved internal controls. In support of the *Flight Plan*, ABA will continue to implement cost efficiency initiatives, through delivering on agency goals for cost control.

With the Human Resources organization, ABA co-leads and contributes directly to the Organizational

Excellence goal. Secondarily, ABA supports the agency's Safety, Capacity, and International goals.

## **Anticipated FY 2010 Accomplishments:**

- Continue to improve Delphi, including implementation of commitment accounting and Delphi enhancements to budget execution to better track F&E project authorizations.
- Obtain an unqualified opinion on agency financial statements with no material weaknesses.
- Improve the agency-wide cost control program continuously.
- Provide analytic, resource-based support to the agency's investment processes and negotiations with labor unions.
- Document and test internal controls over key business processes.
- Enhance financial management training agency-wide to ensure that executives and managers understand their fiscal roles and responsibilities.
- Maintain the Cost Accounting System (CAS) to improve the utility of financial information and support the user fee program.
- Ensure Flight Plan initiatives are fully funded by the beginning of FY 2010.
- Initiate agency budget formulation by providing top executives with policy options and recommendations. Guide decisions that establish the constraints and performance framework within which FAA organizations formulate their budgets.
- Collaborate with the Assistant Administrator for Aviation Policy, Planning and Environment, to
  ensure that FY 2010 business plans include financial and budget information and reflect improved
  goal attribution.
- Continue to ensure agency compliance with the Funds Control Order and the Funds Control Standard Operating Procedures implemented in FY 2007.
- Continue to implement and improve the centralized structure for oversight of reimbursable work.
- Review acquisitions of \$10 million or more to ensure the procurement represents a good investment of taxpayer resources and that appropriate alternatives were considered.
- Review conferences with costs estimated at \$100,000 or more to ensure they represent a wise investment of taxpayer dollars and proper guidelines are followed.
- Conduct investment analysis process for investments being reviewed by the Information Technology Executive Board.

## FY 2011 Budget Request:

For FY 2011, the Assistant Administrator for Financial Services/CFO requests \$114,784,000 and 162 FTE to meet its mission. This funding level will provide for pay raises and inflation.

**Capitalization:** FAA continues to integrate its capitalization process throughout FAA regions, centers, and headquarters. Program managers in headquarters spend 85 percent of the money for capital programs; however program staff in the regions coordinates the implementation of the programs. ABA will continue to integrate many of the key capitalization functions between headquarters and the regional service centers to improve financial controls throughout the process. This will continue to ensure accurate and timely asset accounting in FY 2011 and beyond.

The FAA will be better able to sustain Clean Audit opinions with no Material Weaknesses. FAA employees continue to support the following improvements:

- Accurate and timely audit-ready records throughout the year.
- Streamlined processes and elimination of redundant work.
- Consistent application of project setup and the processing of transactions.

- Enhanced internal controls to prevent inaccurate or untimely data.
- Analysis and correction of inaccurate information immediately upon detection.
- Reinforced policies and procedures for an integrated FAA wide system.

**Financial Systems Upgrades:** ABA will continue the development and implementation of FAA's financial system and reporting activities. This includes enhancements to the Funds Control Module (FCM) in support of the Reimbursable Agreements reporting process, implementation of an enhanced payroll labor analysis and reporting tool, and the required mandate by Office of Management and Budget (OMB) and Department of Transportation (DOT) to upgrade the financial system Delphi to meet government-wide goals and initiatives. Some of the major initiatives that will continue in FY 2011 are highlighted below.

The conversion to Oracle 12.FISO is another major initiative. Delphi uses Oracle's federal financial software for the core accounting system. In FY 2011, FAA will continue to work with DOT to upgrade the existing version of Delphi to 12.FISO. The FISO upgrade will require a total reimplementation of the system and complete data conversion. This represents a substantial level of effort to plan for and implement within FAA while having to maintain the existing system. Major benefits include: Federalized Project Accounting Module, Budgetary to Proprietary Accounting, Automated Prior Year Recovery and XML-based data extracts that will replace many standard reports for use with tools like Microsoft Excel, Word or Acrobat.

Business process re-engineering will be required to accommodate these major initiatives. FAA will develop processes to improve data integrity and clean up current data to prepare for the complete re-implementation and data conversion to Oracle 12.FISO.

ABA will develop a system to track FTE and Full Time Permanents (FTP) for the Operations appropriation. This system will enable FAA to have better controls on FTE levels.

**Other Program Areas:** All current executives and managers continue to need the requisite tools and training to how best use cost data in decision making. ABA will reinforce use of these skills as part of the agency-wide cost control program. ABA will continue to improve Delphi, PRISM, CAS, and Labor Distribution and Reporting (LDR) and will provide timely and accurate CAS reports. ABA will provide configuration management and other policy, procedures, and security for FAA financial management systems; assure that agency executives and managers are aware of the financial information available for their use in program analysis and decision making.

ABA will lead FAA in monitoring and reviewing contracts. Based upon internal agency and Office of Inspector General (OIG) recommendations, the Administrator mandated that the Chief Financial Officer approve any proposed acquisition of \$10 million or more. The Office of Financial Controls (AFC) will continue to conduct reviews of these acquisitions to ensure that FAA takes the proper steps to award, administer, and monitor contracts. The Office of Financial Management (AFM) will oversee the documentation and testing of controls of key business processes such as procurement, property management, and payroll to ensure the integrity of financial data and reduce the risk of cost mismanagement.

ABA will also continue to lead the agency's efforts at reducing costs and implementing business-like practices such as strategic sourcing and performance and efficiency metrics. The use of these types of processes will support the effort to create a more efficient and effective FAA.

The Office of Budget (ABU) continues to enhance its staff by filling vacant positions, which will enable ABU to increase its analytical capability. The result will be better budgeting, stronger financial oversight, and improved responsiveness to Congress, Office of Management and Budget (OMB), General Accountability Office (GAO), and the Office of the Inspector General (OIG). ABU's stronger analytical skill strengthens

performance integration and improves out-year planning.

The Office of Budget shares agency management and support for strategic and business planning with the Assistant Administrator for Aviation Policy, Planning and Environment (AEP). AEP determines agency performance measures and annual targets and works with line and staff organizations to develop core business measures and targets. The Office also monitors performance and provides feedback to performance target leads.

### OPERATIONS APPROPRIATION

# <u>Human Resource Management (AHR)</u> (\$ in Thousands)

Item Title	Dollars	FTP	OTFTP	FTE
FY 2010 Enacted	100,428	595	32	624
FY 2010 One-Time Items	0	0	0	0
- 1 = 0.10 cm c million (1.5m)				
Unavoidable Adjustments				
1. Annualized FTEs (ATO: 91, AVS: 112)	0			
2. Annualized FY 2010 Pay Raise (GS Population)	0			
3. Annualized FY 2010 Pay Raise (Core Comp Population)	651 0			
January 2011 Pay Raise (GS Population)     January 2011 OSI (Core Comp Population)	1,291			
6. January 2011 CSI (Core Comp Population)	339			
7. Non-pay inflation	143			
Total Unavoidable Adjustments	2,425	0	0	0
Uncontrollable Adjustments	0			
NAS Handoff Requirements     NATCA Arbitration Decision	0			
3. Workforce Attrition (-242 EOY/ -121 FTE)	0			
Total Uncontrollable Adjustments	<b>0</b>	0	0	0
Discretionary Increases	0			
NextGen RNAV/RNP (40 EOY/ 20 FTE)     Continued Operational Safety (26 EOY/ 10 FTE)	0			
3. Production Certification (16 EOY/ 4 FTE)	0			
4. New Service Center Buildings	0			
Protect FAA Information Security Infrastructure	0			
6. Impl. of NextGen Env. & Energy Tech. , Models & Metrics (3 EOY/ 2 FTE)	0			
7. Safety Inspections and Emergency Operations (110 EOY/ 54 FTE)	0			
Total Discretionary Increases	0	0	0	0
Cost Efficiencies				
Flight Services Contract Savings	0			
Adminstrative Effeciencies	0			
Total Cost Efficiencies	0	0	0	0
Base Transfers				
NextGen and Acquisitions Hiring Support (3 EOY/ 3 FTE)	267	3		3
NextGeri and Acquisitions Hiring Support (3 EO17 3 FTE)     Labor Relations/ National Employee Safety (1 EOY/ 1 FTE)	177	3 1		3 1
Safety and Hazardous Materials (1 EOY/ 1 FTE)	0	į		
Total Base Transfers	444	4	0	4
EV 2014 Parties	102.203	F00	22	(28
FY 2011 Request	103,297	599	32	628

### Detailed Justification for Staff Offices - AHR

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### Overview:

The mission of the Assistant Administrator for Human Resource Management (AHR) is to advise and assist the Administrator in directing, coordinating, controlling and ensuring the adequacy of FAA plans and programs for personnel, training, workforce/human capital planning and measurement, and labor relations. AHR also provides leadership, policy, and direction to FAA in Human Resource Management (HRM) policy and activities.

FAA leadership must make wise investments in human capital. We must implement strategies that result in our employees achieving a high level of performance. We must also strive to provide quality human resource management services to support the men and women of FAA charged with getting the flying public safely to their destination.

### FY 2010 Program:

People are the foundation for FAA's mission accomplishment. AHR advises on and supports the management of FAA's people. The FAA's corporate vision and goals aim for true organizational excellence as we continue our global aviation leadership role far into the 21st century. The FAA's strategic plan, called the *Flight Plan*, stresses that success will ultimately depend on the capabilities, effectiveness and efficiency of the men and women - the human capital - of FAA, to bring the *Flight Plan* to life.

AHR's human capital strategies must align strategically with FAA Flight Plan goals and vision. People are FAA's most valuable asset. Only a skilled, knowledgeable, talented, and high-performing workforce can handle the demands of achieving FAA's safety, capacity, and international aviation goals. AHR's intention is to support these goals by creating innovative, flexible, efficient, and effective personnel systems and policies.

## **Anticipated FY 2010 Accomplishments:**

- Improve the process for hiring air traffic controllers to ensure the agency has the capacity to achieve anticipated strategic staffing requirements; monitor implementation of the yearly general public announcement schedule.
- In external recruitment efforts, implement corporate strategies that result in attracting high quality candidates to FAA for employment. This will include undertaking activities to cultivate relationships and form partnerships with veterans' organizations, colleges, universities, professional organizations, and other organizations that assist the public in seeking employment opportunities; promoting and partnering with the Department of Veterans Affairs' Vocational Rehabilitation and Employment Service to place disabled veterans in a cooperative education and/or non-paid work experience at FAA.
- Enhance the Selections Within Faster Time (SWIFT) automated suite to expand its ability to accommodate additional alternative hiring methods, and more easily accommodate new job series.
- Manage and enhance the Federal Personnel and Payroll System (FPPS), Consolidated Automated System for Time and Labor Entry (CASTLE), web-based Learning Management System (eLMS) and other supporting subsystems within FAA in accordance with established timelines.
- Sustain and improve agency human capital planning and measurement processes by completing
  the annual update of the FAA Human Capital Plan; leading and/or participating in FAA and DOTlevel workgroups to conduct competency modeling and assessment, close skill gaps in agency
  mission-critical occupations through innovative human capital solutions, and report results.
- Lead the FAA Human Capital Planning Council and provide guidance and tools to sustain and

institutionalize the workforce planning process; review line of business and staff offices workforce plans to ensure alignment with FAA human capital needs and government-wide human capital management requirements.

- Develop, analyze, interpret, and report on results from agency human capital measures, including FAA separation questionnaire, employee retention metrics, management and applicant satisfaction indicators, organizational surveys (e.g. employee engagement) and government-wide hiring efficiency measures to monitor agency human capital management practices.
- Begin the process to implement the government-wide comprehensive "End-to-End" hiring
  initiative focused on improving the efficiency and effectiveness of agency recruitment, onboarding
  and external hiring processes by implementing data collection procedures and establishing
  baselines for human capital measures that assess applicant and manager satisfaction with hiring
  process, new hires feedback on recruitment, onboarding, and orientation processes, as well as
  one and two-year indicators of retention.
- Administer, analyze, interpret and communicate results from the FAA 2010 Federal Human Capital Survey (FHCS) and develop a corporate FAA action plan to improve strategic management of agency workforce.
- Provide corporate guidance and consultation to FAA organizations on developing Organizational Excellence action plans to improve employee engagement, leadership and accountability, and management of performance.
- Put in place a corporate mentoring process pilot to support employee and leadership career planning and development.
- Assist Lines of Business and Staff Offices in aligning their specialized competency models with standardized corporate competency models.
- Establish agency guidelines on mentoring.
- Make tools available to support mentoring activities in the FAA.
- Manage the operations, maintenance and enhancement of the agency web-based learning management system (eLMS) in keeping with established activity goals and timelines.
- Manage and enhance the FAA learning enterprise architecture (LEA) to provide a corporate learning infrastructure that ensures effective use of corporate resources and elimination of redundant learning systems.
- Develop and implement a marketing campaign to increase employee awareness of the Employee Leadership Success Profile, available eLMS training and careers planning guides.
- Develop and implement an ongoing training strategy for eLMS system administrators and users.
- Coordinate and manage agency wide enrollments in Federal Executive Institute, Executive Potential Program, Executive Leadership Program, and other corporate leadership development programs.
- Prepare and disseminate educational materials to meet congressionally mandated Constitution Day requirements.
- Implement online 180° assessment tools to identify critical leadership skill gaps, focus individual development, and define corporate training priorities.
- Conduct leadership skill gaps assessment; define emerging strategic challenges; and identify FY 2010 delivery priorities to meet identified needs and emerging challenges.
- Conclude core training activities and graduate the first Senior Leadership Development Program cohort. Evaluate lessons learned and initiate selection of a second cohort.
- Manage the Program for Emerging Leaders, targeting non-supervisory employees who aspire to management.
- Develop agency-wide succession planning processes to forecast leadership requirements, assess current bench strength, and develop robust candidate pipelines.
- Develop strategies for strengthening frontline leadership.
- Conduct training for employees and managers to promote the use of the new Individual Development Plan function in eLearning Management System (eLMS). Revalidate the Managerial Success Profile and Employee Leadership Development Guide.

- AHR will develop an FAA family emergency support plan to meet the requirements of Federal Continuity Directive 1 Annex A Program Plans and Procedures and Annex A, Human Capital.
- Continue effective workers' compensation program management and maintenance of cost containment obtained by consolidation of the corporate program; ensure that cost avoidance measures lead to FAA's chargeback bill increase at a lower rate than the government-wide increase; mitigate workers compensation costs through proactive management and centrally managing claims for the entire FAA.
- Implement programs and processes to attract and retain a qualified FAA workforce.
- Build the leadership capabilities of the executive corps by providing FAA Executive Series seminars, Forum for Executive Excellence, and participating in multi-agency, low-cost executive development opportunities.
- Promote the continuity of senior leadership through executive development and succession
  planning; review and update succession planning and analysis of executive positions; continue to
  project and monitor priority staffing requirements.
- Ensure that human resource executive policies and processes are kept current and support and attract a strong executive leadership cadre.
- Develop and provide labor relations training for agency supervisors and managers based on needs assessment for additional training.
- Continue to monitor labor relations service level agreements to ensure that business requirements are met.
- Use an electronic tracking system to monitor grievance processing time and reduce FY 2010 processing time by at least 30 percent from the FY 2006 baseline.
- Provide oversight and ensure compliance of all bargaining with FAA unions.
- Facilitate accurate reporting of official time through continued oversight and management.
- Support FAA efforts to prevent workplace injuries and enhance worker safety by ensuring integration of employee safety in FAA management training.
- Continue to ensure a better understanding of the accountability board and application of
  corporate policies, in order to foster a professional workplace free of harassment and other types
  of misconduct that impact the ability to accomplish FAA's mission.
- Hold FAA leadership accountable for responding to allegations falling under the scope of the accountability board order to ensure that management addresses inappropriate workplace conduct fairly and in a timely and consistent manner.
- Develop and provide policy guidance to HR Offices, managers and specialists and Line of Business/Staff Offices on FAA compensation, classification, hiring and employment, performance management and awards, leave, work hours, premium pay, HR policy web content, comprehensive policy development/issuance instructions, and on program areas such as Voluntary Leave Transfer Program, assisting with Superior Contribution Increase (SCI) appeals, establishing position requests (waivers), responding to Freedom of Information Act/Congressionals, etc.
- Provide day to day operational support and services to FAA managers on compensation, staffing, labor and employee relations, employee safety and workers' compensation programs, employee assistance program, benefits, awards, training and human resources automation.
- Implement HR operational services improvements, including evaluation of shared services centers and HR accountability reviews.
- Develop, implement and evaluate employment service level agreements to meet the requirements of our lines of businesses and staff offices.
- Maintain sick leave usage consistent with the government-wide sick leave average through continued oversight and management.
- Promote and enhance the quality of FAA childcare facilities through program assessments of FAA
  centers, providing annual training to Program Directors and Boards of Directors; developing a
  national marketing campaign to increase employee utilization; standardizing, tracking, and
  reporting childcare information.
- Promote the Employee Assistance Program (EAP) and WorkLife services to FAA employees and

their families by sponsoring quarterly promotional events, tracking participation, and assessing the need for ancillary services.

## FY 2011 Budget Request:

For FY 2011, the Assistant Administrator for Human Resource Management requests \$103,297,000 and 628 FTE to meet its mission, an increase of \$2,869,000 and four FTE above the FY 2010 enacted level. This increase provides for basic pay raises and inflation for AHR base programs.

The requested amount also reflects a net increase of \$444,000 and four FTE. Three FTE transferred from the Air Traffic Organization will support NextGen and acquisitions hiring which is a mandated process improvement effort needed to increase the effectiveness and efficiency of AHR business practices and measure the quality of service. This office works closely with many groups including other FAA offices with responsibility for safety, industry, airport authorities and the academic community. This also supports the Strategy 2013 New Capabilities through Technology and Tools Goals of 4.2. The one FTE transferred from Policy, Planning and Environment will support the employee safety program, providing program management support, contract management support and coordination of issues where employee safety and environmental protection overlap. The workload of the program has increased significantly over the past years, as AHR has led the Occupational Safety, Health and Environmental Compliance Committee (OSHECCOM) to identify and address issues that affect employee safety and health FAA-wide. This office works closely with all Lines of Business and Staff Offices in support of the Flight Plan goal to reduce workplace injuries.

In FY 2011, the Department of Transportation will administer a survey of all the modes using a subset of Federal Human Capital Survey (FHCS). The FAA will continue to participate in this survey of its human capital management practices, examine the impact of the corporate FAA FHCS action plan on agency results, and comply with section 1128 of Public Law 108-136 requirement for an annual survey of employees.

AHR will continue to provide corporate agency guidance and consultation as necessary to monitor and assess the implementation of FAA Organizational Excellence Action Plans to address employee feedback and engagement. Specifically, AHR in consultation with FAA organizations develop strategies focused on improving employee engagement drivers related to AHR organizational performance and workforce retention.

The FAA Human Capital Plan has been updated through FY 2013. AHR will continue to provide oversight for ongoing workforce planning and annual plan updates by providing workforce data, updated guidance/requirements, tools and consultation to Lines of Business and Staff Offices. Updated workforce plans will be reviewed to determine the extent to which plans identify workforce gaps in target workforces and have implemented strategies/initiatives to close those gaps. The annual update to the FAA Human Capital Plan that is based on analysis of the workforce, mission demands, human capital challenges and initiatives needed to accomplish FAA Flight Plan goals will be completed. AHR will review the operation of the FAA Human Capital Planning Council with a focus on improving agency participation in council activities; improving communication of lessons learned from workforce planning, and strengthening accountability for a more integrated approach to agency human capital planning. AHR will design and implement a Human Capital Accountability System that ensures the agency maintains a legally defensible and merit-based personnel system by consistently monitoring, assessing, evaluating and measuring the results from agency human capital management policies, programs, systems and initiatives. The accountability system will provide a structured means to maintain oversight for FAA's human capital management practices and necessary corrective actions.

AHR will continue to lead, participate on and work collaboratively with Government-wide/OPM, DOT and FAA internal work groups to conduct workforce planning and analyses, develop competency models, and conduct competency assessments for mission critical occupations/workforces including Information Technology (IT), Acquisition Specialists, Engineers, Community Planners, Human Resource Management (HRM) Specialists. Results from assessments will be analyzed, interpreted and reported to DOT, OPM and other external stakeholders to identify effective solutions for closing skill gaps in mission critical occupations/workforces; improve strategic management of agency's workforce and demonstrate

compliance with federal regulations for institutionalizing effective human capital practices.

AHR will continue to develop opportunities and participate in activities that will increase FAA's visibility as an employer of choice to current and future job seekers. This initiative will be monitored through the use of an FAA Separation Questionnaire. AHR will analyze 2010 data from the agency Separation Questionnaire and compare to previous trend data to develop results report; apply results to update metrics in the FAA Human Capital Plan; provide results to support recruitment and retention strategies; and communicate 2010 FAA Separation Questionnaire results to agency management and the workforce. AHR will work collaboratively with other interested FAA offices in marketing aviation as a career by means of school visits and appearances at other events geared toward educating young people. AHR will also cultivate relationships and form partnerships with veterans' organizations, colleges, universities, professional organizations, and other organizations that assist the public in seeking employment opportunities. In addition, AHR will improve recruitment processes for operational efficiency and reduce the time it takes to fill mission critical positions by 20 percent over the 2003 baseline.

AHR will continue to manage the operations, maintenance and enhancement of the agency web-based learning management system (eLMS) in keeping with established activity goals and timelines.

Agency requirements for training and enhanced learning opportunities continue to expand in support of leadership development initiatives, mission critical hiring and technology modernization. The learning enterprise architecture (LEA) continues to develop to meet agency requirements. AHR will continue overseeing the development of the LEA so that corporate resources are used in an effective and efficient manner.

In FY 2011, AHR will continue the comprehensive strategy to strengthen frontline leadership. This will include a more rigorous managerial selection processes, improving the timeliness and efficacy of training targeted to new probationary managers, enhancing managerial coaching and mentoring skills, and launching a web-based leadership portal to provide just-in-time advice on key supervisory and managerial issues.

To enhance the quality and effectiveness of core training for frontline, middle, and senior managers we will institute evaluation processes and introduce best practices for increasing return on investment. We will also support training in strategic planning, labor management relations, and change management to build advanced skills critical to NextGen implementation.

AHR will implement a third cohort of the Senior Leadership Development Process to build a robust pipeline of highly qualified candidates for future executive vacancies. We will also expand participation in the new Program for Emerging Leaders in order to address high turnover in frontline management ranks.

As directed by the Office of Personnel Management, we will build upon previous executive succession planning initiatives to implement a comprehensive leadership succession planning system that encompasses all levels of leadership.

AHR will continue to expand cost-effective non-technical training opportunities to build leadership competence within the FAA workforce, support professional development, and promote continuous learning. This includes leveraging online training, assessment, and mentoring.

AHR will continue to provide low cost Supervisor Skills Training to managers to improve performance in areas highlighted by the Federal Human Capital Survey as well as leave management, management of workers compensation claims, performance management, and related HR practices.

AHR will continue to implement strategies using the Baldrige Criteria for organizational Performance Excellence to provide a systems perspective across seven categories (leadership, strategy, customer focus, measurements & knowledge management, workforce engagement, process management, & results) for performance management. AHR will continue to implement actions to address the opportunities for improvement, and submit an application.

AHR will continue to use Six Sigma as a business management strategy to identify and remove the causes

of errors in business processes; implement process improvements for HR priorities.

AHR will use a business intelligence system (creating & tracking measures) consisting of skills, technologies, applications and practices to acquire a better understanding of its context and improve business decision-making. AHR will provide a performance review capability which analyzes results of performance audits and evaluations within the Office of Human Resources which determines target areas for performance improvement.

AHR provides day-to-day operational support and services to FAA managers. This includes compensation, staffing, labor and employee relations, employee safety and workers' compensation programs, benefits, awards, training and human resources automation.

AHR will implement HR operational services improvements, including evaluation of shared services centers and HR accountability reviews, and evaluate and revise employment service level agreements to meet the requirements of our lines of businesses and staff offices.

In FY 2011, AHR will continue to develop and provide policy guidance to HR Offices, managers and specialists and Line of Business/Staff Offices on FAA compensation, classification, hiring and employment, performance management and awards, leave, work hours, premium pay, HR policy web content, comprehensive policy development/issuance instructions, and on program areas such as Voluntary Leave Transfer Program, assisting with Superior Contribution Incentive appeals, establishing position requests (waivers), responding to Freedom of Information Act/Congressionals, etc.

AHR will communicate policy/program initiatives, highlights, positions and interpretations through guides, broadcast messages, position/decision papers, memos, telecons, congressionals, and/or third party hearings. Identify the need for and provide briefings/training to customer to enhance understanding of HR policy.

In FY 2011, AHR will continue to expand and enhance the Selections within Faster Times (SWIFT) automated suite to all mission-critical positions and those positions that cross-organizational lines, i.e., finance, budget, human resources, and information technology.

AHR will continue to manage the operation and maintenance within FAA of personnel and payroll automated processing by the Federal Personnel and Payroll System (FPPS).

In FY 2011, AHR will continue to enhance the standard operating procedures for the web, database and application development, setup an application helpdesk and Service Level Agreements, associate level 3-application support services contract, develop web and application skills sets, improve documentation of all systems and applications.

In FY 2011, AHR will continue to ensure appropriate annual security assessments are conducted, train AHR employees and implement Secure Zip, ensure Vera Codes are properly implemented within applications, research encryption software for AHR systems/servers, thumb drives and workstations (Vontu), and recommend every system have a designated Information Security Officer.

In FY 2011, AHR will provide Standard Operating Procedures (SOPs) and guidelines to the HR community and PMs for FAA's Enterprise Architecture reference model requirements for new and existing AHR systems. AHR will maintain and manage enterprise architecture activities for AHR systems including a configuration control board; create a baseline for applications; and implement the Change Request (CR) process. AHR will also expand System Development Life Cycle/configuration management to new AHR systems and update infrastructure and application inventory.

In FY 2011, AHR will provide day to day operational support and services to FAA managers on compensation, staffing, labor and employee relations, employee safety and workers' compensation programs, employee assistance program, benefits, awards, training and human resources automation.

AHR will continue to provide corporate executive development opportunities to build leadership capabilities within the executive corps. This will include delivery of the Forum for Executive Excellence and the FAA

Executive Series. AHR will promote participation and provide opportunities for executives to participate in low cost, government-wide executive education.

HR will continue to promote the continuity of senior leadership succession planning. Staffing and recruitment priorities will be monitored through annual review and update to the leadership succession planning, analysis, and implementation plan. AHR will also review the FAA Management Leadership Assessment process to determine applicability for implementation at the executive level.

AHR will provide policy guidance and operational support to FAA executives and senior professionals in the areas of classification, position management, staffing, compensation, development, and performance management and manage and update the Short Term Incentive (STI) automated system to implement, track, and calculate payments. AHR will review and renew other on-going STI support contract requirements.

AHR will review and make recommendations for updates to executive policies and web information. Additionally, the Executive Resources Staff will continue to assess internal processes for efficiency and effectiveness, and if necessary, will develop SOPs.

AHR will also continue to monitor nationwide grievance processing time against the baseline measured through the grievance electronic tracking system. AHR's intent is to reduce grievance processing time by 30 percent.

Oversight and compliance of all bargaining with FAA unions is an ongoing endeavor for AHR. AHR will monitor and ensure compliance of all bargaining with FAA unions in accordance with FAA Order 3710.18, Internal Coordination Requirements for Negotiating Term and Mid-Term Agreements with FAA Unions, and the Federal Service Labor-Management Statute. Briefings and training on contract administration will be conducted.

Accurate reporting of official time usage continues to be an area of cost containment focus. AHR will facilitate reporting of official time through increased oversight and management. During national term negotiations, AHR will continue to ensure that official time provisions provide an appropriate balance between the union's legitimate need and the agency's operations.

AHR will continue to monitor sick leave usage so that the agency usage remains consistent with Government –wide averages. AHR will continue to take action as necessary to remain consistent with targeted levels.

In 2011, AHR will continue to support the FAA workforce through timely and quality employee relations services such as the Employee Assistance Program (EAP) and the child care program. Support will also be provided to ensure uniform and effective handling of misconduct and poor performance cases in a timely and appropriate manner.

AHR will continue to ensure a better understanding of the accountability board and application of corporate policies, in order to foster a professional workplace free of harassment and other types of misconduct that impact the ability to accomplish FAA's mission. AHR will hold FAA leadership accountable for responding to allegations falling under the scope of the accountability board to ensure that management addresses inappropriate workplace conduct fairly and in a timely and consistent manner.

## OPERATIONS APPROPRIATION

# Regions and Center Operations (ARC) (\$ in Thousands)

Item Title	Dollars	FTP	OTFTP	FTE
FY 2010 Enacted	341,977	780	29	822
FY 2010 One-Time Items	0	0	0	0
Harristable Adharan				
Unavoidable Adjustments	0			
1. Annualized FTEs (ATO: 91 , AVS: 112)	0			
2. Annualized FY 2010 Pay Raise (GS Population)	903			
3. Annualized FY 2010 Pay Raise (Core Comp Population)	903			
<ul><li>4. January 2011 Pay Raise (GS Population)</li><li>5. January 2011 OSI (Core Comp Population)</li></ul>	1,791			
6. January 2011 SCI	470			
7. Non-pay inflation	1,212			
Total Unavoidable Adjustments	4,377	0	0	0
•	•			
Uncontrollable Adjustments				
1. NAS Handoff Requirements	0			
2. NATCA Arbitration Decision	0			
3. Workforce Attrition (-242 EOY/ -121 FTE)	0			
Total Uncontrollable Adjustments	0	0	0	0
Discretionary Increases				
1.NextGen RNAV/RNP (40 EOY/ 20 FTE)	0			
2. Continued Operational Safety (26 EOY/ 10 FTE)	0			
3. Production Certification (16 EOY/ 4 FTE)	0			
4. New Service Center Buildings	20,000			
5. Protect FAA Information Security Infrastructure	0			
6. Impl. of NextGen Env. & Energy Tech. , Models & Metrics (3 EOY/ 2 FTE)	0			
7. Safety Inspections and Emergency Operations (110 EOY/ 54 FTE)	0			
Total Discretionary Increases	20,000	0	0	0
Cost Efficiencies				
Flight Services Contract Savings	0			
2. Adminstrative Effeciencies	0			
Total Cost Efficiencies	0	0	0	0
Base Transfers				
NextGen and Acquisitions Hiring Support (3 EOY/ 3 FTE)	0			
2. Labor Relations/ National Employee Safety (1 EOY/ 1 FTE)	0			
3. Safety and Hazardous Materials (1 EOY/ 1 FTE)	0			
Total Base Transfers	0	0	0	0
FY 2011 Request	366,354	780	29	822
	300,001			

### Detailed Justification for Staff Offices - ARC

### Overview:

The Assistant Administrator for Region and Center Operations (ARC) serves as the Administrator's representative on all internal and external corporate matters within the nine regions and the Aeronautical Center. ARC determines and establishes regional organizational objectives and priorities and guides the development of and approves long-range plans; seeks opportunities to implement innovative ways to streamline administrative and operational processes to bring about efficiencies and to enhance productivity; and provides leadership for cross-organizational administrative and operational issues and projects such as NextGen. The Regional Administrators and Center Director serve as the senior agency aviation official in the regions/center, providing cross-functional oversight and integration for the agency, relations with industry, the public, and various governmental organizations, as well as leadership for lines of business support programs.

### FY 2010 Program:

ARC is a multifaceted organization that supports each of the agency's four Flight Plan goal areas: increase safety, capacity, international leadership, and organizational excellence. ARC operates the Mike Monroney Aeronautical Center and the Center for Manager and Executive Leadership where technical, administrative, and management training is conducted for each discipline within the agency. ARC also operates the Logistics Center where supply support is accomplished to sustain the National Airspace System, as well as manages leases and real estate acquisition for establishing critical operational systems and services. In Headquarters, the Aviation Logistics Organization (ALO) leads and integrates logistics initiatives and real property initiatives in support of both the FAA and the Department of Transportation (DOT). The Administrator has established area integration offices under the auspices of the Regional Administrators in the Great Lakes and Eastern regions to ensure a corporate, coordinated approach is taken in both the O'Hare Modernization Program and the New York area initiatives. The Regional Administrators serve as the principal representative of the Administrator in an FAA region and provide leadership in cross-organizational matters, representing the Agency with industry, the public and governmental organizations. Regional Administrators ensure the delivery of high-quality corporate services including special programs; executive services; and command, control and communication operations. Each of these products and services is part of the vital support infrastructure needed to maintain strong, safe, and efficient national and international aviation systems.

### **Anticipated FY 2010 Accomplishments**

- Conduct introductory resident training for all Air Traffic Control (ATC) new hires and follow-on courses at the FAA Academy consistent with the ATC Workforce Plan's increasing student numbers.
- Conduct financial operations and system support for the FAA, the DOT and other federal
  government agencies through the Enterprise Service Center.
- Deliver managerial, executive and technical training and related support services for the agency and other aviation organizations.
- Achieve a year-to-date average of less than 12 defects per 1,000 repaired assets on exchange and repair of in-house assets.
- Operate Regional/Center Operations Centers (ROCs) that provide around-the-clock, immediate command, control and communications for all incidents related to National Airspace System (NAS) continuity.
- Identify excess real property assets that are candidates for disposal, termination, replacement, renovation or transfer.
- Improve the timeliness and accuracy of financial transactions related to asset capitalization, the management of suspense accounts and account reconciliation.
- Oversee and managed infrastructure operation and maintenance programs in Washington, D.C., regional office facilities, and the Mike Monroney Aeronautical Center.

- Serve as the agency focal point for the Chicago O'Hare International Airport Modernization Program.
- Provide national leadership for the Air Tour Management Plan (ATMP) program and support environmental streamlining efforts and noise issues.
- Provide aviation safety services to the Federated States of Micronesia, the Republic of the Marshall Islands and the Republic of Palau.
- Enhance the safety, security, and capacity of aviation elements in the Russian Far East.
- Establish corporate managerial training programs that ensured resources were effectively used, aligned with agency goals and drove continuous improvement.
- Provide information technology services to ARC employees, other parts of the FAA, DOT, and other federal agencies.
- Enhance procurement, acquisition, and material management support by improving purchase card management and wireless device acquisition.
- Redesign selected managerial and executive training to build leadership competencies.
- Conduct instructor development training to prepare instructors to deliver Aviation English training and assessments to International Civil Aviation Organization standards.
- Continue International Standards Organization (ISO) implementation with a goal of achieving ARC certifications by 2011.
- Under ARC leadership, the Airport Obstruction Standards Committee (AOSC) will perform risk analysis in support of end-around taxiway approach procedures.

### FY 2011 Budget Request:

For FY 2011, the Assistant Administrator for Regions and Center Operations requests \$366,354,000 and 822 FTE to meet its mission, an increase of \$24.377 million above the FY 2010 enacted level. This increase provides for basic pay raises and inflation, for ARC base programs and one discretionary increase.

The Service Center leases for Seattle, Ft. Worth and Atlanta will expire between 2011 and 2013. Along with lease expirations, each Service Center has seen extensive growth due to the Air Traffic Organization realignment, mandated Flight Standards hiring, and Logistics support realignment. To accommodate the growth, additional satellite locations were acquired in each of the Service Centers. These additional locations increased lease costs, security costs, and IT infrastructure costs. To reduce these costs and improve overall efficiency, new Service Center facilities are being planned that would consolidate the satellite locations and the existing Service Center headquarters into three new facilities. The FY 2011 budget requests an increase of \$20 million will provide for FAA-specific security, facility, telecommunications, furniture, and equipment requirements for the Western and Central Service Center facilities being brought online over the next fiscal years. The new facilities will allow FAA to consolidate multiple leased facilities in the surrounding areas of the new buildings.

The FAA Academy at the Mike Monroney Aeronautical Center in Oklahoma City continues to be the primary provider of technical, managerial, and executive training for the Agency and is the largest training facility within the Department of Transportation (DOT). The FAA Academy is recognized and respected worldwide as the premier aviation training institution, having served international students since 1946. The FAA Academy will continue to deliver managerial and executive training as well as technical training and related support services for the agency and other aviation organizations, both domestic and international. Through resident, field, web-based curriculum, high-fidelity simulators, computer-based instruction, interactive video teletraining, and correspondence study, the Academy exceeds 40,000 course completions annually affecting every element of the FAA's technical workforce, including:

- Aviation Safety Inspectors in the areas of Aircraft Operations, Airworthiness and Maintenance, and Aircraft Certification.
- Engineers, technicians, system/environmental specialists, and programmers responsible for NAS
  reliability and safety, which includes maintenance, repair, and training for over 40,000 pieces of
  equipment.
- Newly hired air traffic controllers who receive their initial training at the Academy using state-ofthe-art classrooms and simulation systems. In 2009, the Academy conducted 128 air traffic controller precertification classes for 1,718 students.

The FAA Logistics Center, also located at the Aeronautical Center, is the primary provider for parts and logistics services in support of the National Airspace System (NAS). The FAA Logistics Center (FAALC) manages the central NAS inventory warehouses and distribution facilities for the FAA, providing routine and emergency logistics products and services to 8,000 FAA customers at 41,000 facilities and 28,000 sites, as well as to the Department of Defense (Air Force, Navy, and Army), state agencies and foreign countries. The Logistics Center provides core logistics support functions to the NAS, including:

- Supply chain management, including inventory management, for approximately 62,000 National Stock Numbers (NSNs), with an inventory value of approximately \$760 million.
- Centralized depot level overhaul, maintenance and repair of NAS Equipment, and on site overhaul and maintenance for certain large systems such as towers and radar arrays.
- Storage and distribution management of NAS assets within a 725,000 sq. ft. centralized warehouse.
- Depot level engineering support.
- Agency focal point for Depot Level Integrated Logistics planning and implementation for NAS acquisition programs.

The agency is continuously seeking to improve its core logistics support functions such as reducing NAS asset delivery times and improving repair item quality. Business management improvements and cost efficiencies will be achieved by at the Aeronautical Center by replacing the primary automation system that supports FAALC service operations, the Logistics and Inventory System (LIS). Expanding and improving system capabilities and performance will reduce operating costs by right-sizing the agency's spares inventory, better managing depot throughput and increasing visibility into vendor and parts performance. The Logistics Center is taking the lead in applying 2D barcode technology to improve NAS asset visibility and tracking throughout the supply chain. In fiscal year 2009, the Logistics Center implemented full-scale 2D bar-coding capability within the Logistics Center, and expects 50,000 assets by the end of fiscal year 2010. Life-cycle support is critical to the efficient, effective and safe operation of the NAS. As the agency moves toward NextGen technology, a fully integrated logistics support approach is vital to ensure operational efficiency well into the future.

ARC also leads the Federal Real Property Asset Management initiative. ARC's Aviation Logistics Office maintains the Department-wide inventory of real property and the data and performance measures associated with approximately 67,300 buildings, structures, and land parcels. Federal real property is tracked in FAA's Real Estate Management System which also is the repository for DOT's entire real property inventory. Assets that are surplus, are not mission critical, are in poor condition, are under-utilized, and/or reflect high annual operation and maintenance costs are considered candidates for disposition. To date, steady progress has been made in disposing of unneeded assets. The value of the FY 2007 disposed assets totaled more than \$40,000,000. During FY 2008, FAA removed almost 2,500 assets with a value that exceeded \$98,000,000. In FY 2009, FAA has removed over 2,400 assets valued over \$76,000,000.

The FAA's ability to achieve and maintain an unqualified audit opinion is a critical factor in securing the agency's financial management credibility. ARC supports the annual audit process through continuous asset capitalization activities across the three Logistics Service Areas and within FAA's Aeronautical Center. Capitalization has been a historical area of concern, most recently identified by the Department of Transportation's Inspector General issuing a material weakness regarding capitalization timeliness and accuracy. In FY 2009 ARC implemented significant improvements to the capitalization process including an extensive quality assurance process which resulted in the successful processing of over 500 assets, the clean-up of an extensive backlog of prior year projects, and the removal of the materiel weakness. Asset processing is currently being performed with a 98% accuracy rate and additional process improvements were implemented in FY 2009 to include the establishment of a \$100K threshold for capitalized assets, standardized asset descriptions, and improved coordination through a National Capitalization Program Team.

DOT has developed the High Performance and Sustainable Buildings Implementation Plan to achieve the buildings design goals of Executive Order 13423, "Strengthening Federal Environmental, Energy, and Transportation Management" and building energy and water requirements of the Energy Independence and Security Act. A sustainable building practice has become a national priority. The Department and FAA are looking to significantly reduce the negative environmental effects of constructing, operating and maintaining buildings and the first step will be conducting an initial assessment to target buildings having the greatest

opportunity to employ integrated design, optimize energy performance, protect and conserve water, enhance indoor air quality and reduce the environmental impacts of materials. An initial assessment will be conducted to identify the buildings most suitable for achieving compliance by 2015 for 15 percent of the existing buildings.

The Facilities Management staff provides administrative and operational support for FAA employees at headquarters and at the regional level, including the monitoring of all GSA space activities. At headquarters, guidance is provided on all space issues. Facilities Management oversees administrative telecommunications, personal property, motor vehicle management, and all building management activities including space and property management, nationwide rent program, parking, transit benefits, customer service desk, janitorial, building repairs, maintenance, design and construction, telecommunications management, national wireless program, building security, safety issues, and emergency evacuation plans. The goal is to provide efficient, multifaceted facilities management services that are innovative, environmentally responsive, and cost effective in support of the FAA's mission and goals. Approximately \$135 million of the request funds administrative space leases for a broad range of agency facilities including Flight Standards District Offices, Aircraft Certification Offices, Manufacturing Inspection District Offices, Certificate Management Offices, Manufacturing Inspection Satellite Offices, and the agency's Regional Headquarters Offices located throughout the United States.

In FY 2008, management of FAA's Washington Flight Program (Hangar 6) transferred to ARC from the Air Traffic Organization (ATO). This program operates three jet aircraft (an FAA-owned Gulfstream G-IV and two leased Cessna Citations) housed at Ronald Reagan Washington National Airport's Hangar 6. Twenty FAA employees, including eight pilots, six maintenance technicians, and six support personnel, staff the facility. The aircraft are used for National Transportation Safety Board (NTSB) accident investigations, authorized training/currency flights for FAA headquarters personnel, transporting high-level DOT officials, and some Research and Development (R&D) projects. In addition, Hangar 6 supports eighteen different federal agencies through Memoranda of Agreement.

ARC will continue to chair the multidiscipline Airport Obstruction Standards Committee (AOSC) which serves as the vehicle to transform outdated, inconsistent obstruction standards practices to future policy that balances operational safety, effectiveness, and economic benefit. This committee develops coordinated standards and action plans for operational improvements such as runway-taxiway separation and endaround taxiways, and also works to enhance databases and data collection tools and models to improve airport flight operations. Successful capacity implementation projects require a strong commitment to integration, collaboration, accountability and a strategic vision from all stakeholders. ARC has a proven track record of successfully delivering complex and critical projects at both Operational Evolution Partnership (OEP) airports and airports within major metropolitan areas. Under ARC's cross-agency management of the Runway Template Action Plan (RTAP) process, through the end of FY 2006 the FAA met OEP commissioning commitments on 11 new runways resulting in a system capacity increase of over 1.6 million annual operations. Regional Administrators have established regional Horizontal Integration Teams and cultivated relationships with key stakeholders at OEP airports and other metropolitan areas. ARC has repeatedly facilitated and resolved numerous critical issues that cut across multiple FAA organizations. The results have been increased levels of accountability, resource leveraging, communication and cooperation. ARC's lead role on new runway projects will focus limited agency resources on meeting key milestones needed to deliver full operational capability on these critical capacity improvement efforts. ARC has a proven track record with the advance planning, ongoing accountability and performance reviews required to meet new OEP runway capability commitments established in partnership with stakeholders. Use of the RTAP process continues to be a success, thus far yielding ten OEP runways delivered since 2001 with full operational capability on schedule.

ARC provides critical leadership and integration in implementing the agency's Capacity enhancing activities such as the Operational Evolution Partnership (OEP), the O'Hare Modernization Program (OMP) the Air Tour Management Program (ATMP) and the activities of the Airport Obstruction Standards Committee (AOSC). ARC provides regional leadership and integration for cross-organizational safety initiatives such as the Weather Cameras program. ARC works closely with the National Association of State Aviation Officials (NASAO), the Aircraft Owners and Pilots Association (AOPA), and other aviation interest groups to provide a continuous outreach program and to further Agency safety objectives and missions. The unique conditions of the Alaskan Region and its geographic neighbors has resulted in additional international leadership

opportunities for the FAA, specifically in accomplishing international outreach on new technology; influencing the setting of international standards; developing transportation and communications infrastructure in the arctic circumpolar region; and providing training and technical assistance to the Russian Far East area. ARC leadership ensures that the agency meets its commitment to provide aviation safety services to the Federated States of Micronesia and the Republic of the Marshall Islands as covered by the Compact of Free Association Act of 1985. Under a separate compact, ARC will provide support between the United States and the Republic of Palau to provide similar aviation safety services. ARC will also support the development of transportation and communications infrastructure in the Arctic Circumpolar region.

## OPERATIONS APPROPRIATION

# Information Services (AIO) (\$ in Thousands)

Item Title	Dollars	FTP	OTFTP	FTE
FY 2010 Enacted	49,278	108	6	108
FY 2010 One-Time Items	0	0	0	0
Unavoidable Adjustments				
1. Annualized FTEs (ATO: 91, AVS: 112)	0			
2. Annualized FY 2010 Pay Raise (GS Population)	0			
3. Annualized FY 2010 Pay Raise (Core Comp Population)	144			
4. January 2011 Pay Raise (GS Population)	0 285			
5. January 2011 OSI (Core Comp Population) 6. January 2011 SCI	75			
7. Non-pay inflation	167			
Total Unavoidable Adjustments	671	0	0	0
Uncontrollable Adjustments				
NAS Handoff Requirements	0			
2. NATCA Arbitration Decision	0			
3. Workforce Attrition (-242 EOY/ -121 FTE)	0			
Total Uncontrollable Adjustments	0	0	0	0
Discretionary Increases				
1. NextGen RNAV/RNP(40 EOY/20 FTE)	0			
2. Continued Operational Safety (26 EOY/ 10 FTE)	0			
3. Production Certification (16 EOY/ 4 FTE)	0			
4. New Service Center Buildings	0			
5. Protect FAA Information Security Infrastructure	6,000			
6. Impl. of NextGen Env. & Energy Tech. , Models & Metrics (3 EOY/ 2 FTE)	0			
7. Safety Inspections and Emergency Operations (110 EOY/ 54 FTE)	0	0	0	0
Total Discretionary Increases	6,000	0	0	0
Cost Efficiencies				
Flight Services Contract Savings	0			
Adminstrative Effeciencies     Total Cost Efficiencies	0 <b>0</b>	0	0	0
Total Gost Efficiencies	J .			Ü
Base Transfers				
NextGen and Acquisitions Hiring Support (3 EOY/ 3 FTE)     Labor Polations ( National Employee Safety (1 EOY/ 1 ETE)	0			
Labor Relations/ National Employee Safety (1 EOY/ 1 FTE)     Safety and Hazardous Materials (1 EOY/ 1 FTE)	0			
Total Base Transfers	0	0	0	0
FY 2011 Request	55,949	108	6	108

### **Detailed Justification for Staff Offices – AIO**

	Information Services (AIO)	FY 2011 Request: \$55,949
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### Overview:

The mission of the Office of Information Services and Chief Information Officer (AIO) is to improve managing the agency's more than \$2 billion dollar investment in Information Technology (IT). AIO is also responsible for protecting FAA's critical information systems, networks, and administrative systems from cyber terrorism and malicious activities.

## FY 2010 Program:

The FAA is responsible for providing a safe and efficient national aviation system. Within FAA, AIO has the primary responsibility to develop agency IT policy and strategy, to protect agency IT assets from cyberattacks, to ensure alignment between IT investment and agency business needs, and to improve agency IT processes. The FAA spends more than \$2.0 billion yearly on IT, the largest cost item after salaries and benefits.

Developed in concert with the agency's CIO Council and Information Systems Security Managers (ISSMs), AIO's FY 2009 Business Plan supports the FAA Flight Plan. Meeting the Business Plan targets and Flight Plan goals takes a collaborative effort from the lines of businesses and staff offices.

The FAA CIO ensures the integrity, confidentiality, and privacy of National Airspace (NAS) systems and information. CIO security related programs include Cyber Security, Privacy, IT and ISS security awareness and training, policy, standards and requirements, and system certification and compliance. The FAA CIO Cyber Security program ensures compliance with federal regulations, protection of the FAA's computer enterprise, and response to cyber incidents.

The FAA Cyber Security program is a partnership between the FAA Chief Information Officer (CIO) organization and FAA lines of business and staff offices (LOBs/SOs) with a focus on protecting our information technology (IT) infrastructure. The program is comprised of the following areas: Cyber Security Management Center (CSMC); IT and ISS awareness and training; IT research and development (R&D); policy, standards, and requirements; program evaluations; and system certification and compliance. This comprehensive Cyber Security effort offers information security awareness training of the agency's key ISS personnel, development and evaluation of policies and standards, formulation of system requirements, certification of systems and ensures their compliance with federal regulations, protection of FAA's computer enterprise, and response to computer security incidents.

AIO has developed and maintains the Cyber Security Management Center (CSMC) to proactively meet the requirements of Homeland Security Directive 7 (HSPD-7), Federal Information Security Management Act (FISMA) and related regulations. CSMC is a partnership between the FAA CIO and FAA LOBs, with a focus on protecting our information technology (IT) infrastructure.

The FAA is responsible for preventing the unauthorized disclosure or loss of personally identifiable information (PII). In FY 2009 FAA experienced a large privacy breach potentially impacting over 45,000 FAA employees, and having an effect on employee trust in the Agency. Protection against privacy breaches is a critical part of the Office of IT Enterprise Service's mission. Programs that protect personal information must be accelerated and increased to prevent further breaches. The FAA has established an enterprise wide privacy program within the CIO to integrate security and privacy within the FAA culture and infrastructure, and to ensure full compliance with federal laws, including the Federal Information Security Act (FISMA). To meet the increasing prevalence of cyber threats, AIO is significantly increasing the number of personnel working on privacy issues and policy, and is implementing more robust software and hardware protections.

IT also funds four critical programs to improve response to and prevention of security incidents: Adaptive Quarantine, Software Reliability Engineering (SRE) and Software Fault Tolerance, Certification of High Integrity Systems, and Improved Security Metrics.

# Anticipated FY 2010 Accomplishments: Cyber Security

- Achieve zero cyber security events that significantly disable or degrade FAA service.
- Improve a Security Information Management (SIM) solution that will provide the CSMC greater situational awareness through real time processing of information systems security alerts.
- Acquire, implement, and maintain ISS technologies using enterprise wide acquisition vehicles to reduce the cost of compliance with FISMA and other mandates.
- Evaluate at least three new ISS technologies and/or services for applicability across the FAA enterprise.
- Maintain the Operation Capability Demonstration on an on-going basis.
- Report all outstanding "Digital Forensic Investigations" within 90 days to AIS-1.
- Refresh existing end-of-life CSMC Technology including software and hardware.
- Enhance organizational federal employee structure to meet demand of new customers.
- Maintain and refresh end-of-life wireless intrusion detection technology within the CSMC (WIDS).

### Compliance

- Maintain the FAA Information System Security (ISS) Compliance Program by completing four (4) FAA (LOB/SO) compliance reviews.
- Complete at least 1 (ISS LOB/SO) program review.
- Complete 20 systems reviews.

### Certify IT Systems Inventory

- Ensure that all operational systems in the information technology systems inventory complete either an initial certification and accreditation (C&A) prior to deployment, a re-certification by their three year C&A anniversary date or undergo a self-assessment by September 30, 2010 if a full C&A is not required.
- Track and ensure resolution of all high risk vulnerabilities, as defined in the Department of Transportation (DOT) Cyber Security Assessment Management (CSAM) database on the first business day of the fiscal year.
- Track remediation of system vulnerabilities identified in the C&A process

### **Security and Situational Awareness**

- Ensure ISS awareness training is available to all FAA employees and contractors through a shared service center. Ninety-eight percent of all employees participate in security training.
- Provide specialized ISS training for 100% of FAA key personnel.
- Conduct onsite security training when requested by an LOB or SO.
- Hold successful IT/ISS conference for 1,000 or more FAA employee, contractor and vendor attendees.
- Provide awareness training for all FAA employees and direct support contractors.

### Logical Access and Authorization Control Service (LAACS)

- Maintain LAACS program support facilities and tools (Headquarters, Technical Center & MMAC).
- Update the LAACS OMB Exhibit 300/Exhibit 53 by August 1, 2010.
- Review Logical Access Policy, Encryption Policy, and Digital Signature Policy for any needed updates.

### **Privacy**

- Improve FAA Privacy Compliance Program implementation, testing and enforcement.
- Ensure that 100 percent of employees and contractors complete privacy security training.
- Ensure that any privacy breach response is reported to and coordinated with the CSMC.
- Develop and implement PII data encryption protocols.
- Accelerate number of systems reviewed through NIST SP 100-26 Self-Assessments or the Security Certification and Authorization Package (SCAP) process.

### Electronic Government (E-Gov) Compliance

- Continue to report E-Gov Monthly Report Card activities including FISMA, EA, FDCC, and TIC.
- Maintained satisfactory evaluation levels in the DOT and FISMA annual report.

### **Security Agreements**

 Develop agreements with a major international air traffic management authority to share cybersecurity technical and operational data, techniques, tactics, and procedures, and to work cooperatively towards better business practices.

### **Cost Reduction**

 Achieve 90 percent of approved cost control savings and avoidance target with 10-15 percent reduction in savings on strategic sources and reduction of overhead costs by 5-10 percent

### **Enterprise Architecture (EA) Conformance**

Provide support and business solutions to LOBs through the corporate FAA Enterprise Architecture, and Technical Reference Model (TRM), including IT roadmaps, specifications, standards, and requirements. Ensure that business solutions conform to requirements and regulations as measured against National Institute of Standards (NIST) directives.

- Continue to enhance FAA's enterprise architecture and solutions architecture to ensure that the
  Administrative, NAS support and NAS architecture are compatible and meet future requirements.
  Facilitate the development of a Financial Segment Architecture for the FAA Financial Services
  (ABA) organization.
- Provide core capabilities, support and business solutions to FAA LOBs through corporate IT specifications, standards, and requirements. Procure and deploy a repository tool to capture, analyze, and report on development, status and maturity.
- Develop and maintain information architecture to seamlessly share information between agencies participating in the Next Generation Air Transportation System.
- Develop a strategy to Integrate IPv6 into the FAA's networks, systems and applications.
- Develop and draft a Configuration Management Charter and Operating Procedures for the NAS Regulatory Support and Administrative systems. The NRSA CCB delegates CM authority to the LOBs.
- Continue Internet Protocol version 6 (IPv6) integration with other government initiatives, including TIC, FDCC, and HSPD-12.

### Trusted Internet Connections (TIC)

- Develop Phase I FAA Internet Access Points (IAP) Plan to reduce to three CONUS IAPs to meet OMB TIC requirement.
- Conduct requirements review to ensure the number of IAPs is based on business and security requirement without any adverse impacts.
- Update FAA tasks in the DOT TIC Transition Plan.
- Coordinate the development of enterprise-wide service based on common requirements with LOBs and the NAS staff.

### **Business Process Improvement**

- Improve processes that are critical to performing FAA mission, business functions, and acquisition programs; integrate EA with acquisitions, software development lifecycle and configuration management processes.
- Improve processes and capabilities critical to the acquisition, maintenance and operations of systems associated with NAS and NAS modernization plans and development of IT products and services.
- Provide enterprise-wide leadership for information assurance and IT strategy, governance, innovation, financial discipline, and service delivery.

### FY 2011 Budget Request:

For FY 2011, the Assistant Administrator for Information Services and Chief Information Officer (AIO) requests \$55,949,000 and 108 FTE to meet its mission. This funding level will provide for pay raises and inflation, and also provides a \$6,000,000 increase for Information System Security protection. The 2011 request supports the following activities:

### Information System Security (ISS)

The request for \$6 million covers activities to remediate moderate vulnerabilities identified for FAA information systems that support Human Resources, Finance, Security/Safety, and Air Traffic services. The various system owners identify, within their respective system Certification and Authorization documents, risks that are found in each system and categorized as high, moderate, or low. The costs to fix, or remediate, these vulnerabilities are outlined in a Plan of Action and Milestones (POA&M) document. In the last three to five years FAA has focused on its high risk vulnerabilities. Beginning in 2011 and continuing into 2014 the focus is on remediating the moderate vulnerabilities. The requested funds will cover AIO contracts that will conduct information system assessments, certifications, recertifications, and risk mitigation activities. The funding will allow FAA to handle risks to its information systems sooner, which will save out-year dollars and prevent higher and more costly system vulnerabilities and remediations.

This funding also serves to increase the reliability, availability, and integrity of the NAS systems, provide mission support and administrative information, as well as address other FAA information systems requirements. These activities will continue to carry over to FY 2012, 2013, and 2014, as well as increase as systems stay in production and annual assessments and recertifications generate more POA&Ms. There are currently 544 POA&Ms in 276 systems scheduled for moderate vulnerabilities remediation in 2010 and 2011. There are 127 scheduled for remediation in 2011. Several of the systems scheduled for remediation are mission critical NAS systems, critical AVS systems and medical applications, and essential business and security systems.

Other ISS activities ensure that all FAA information systems identify and provide information security protection equal to the risk and magnitude of the harm resulting from unauthorized access, use, disclosure, modification or disclosure of information that supports the agency, aviation safety and security, and the NAS.

This program directly supports the FY 2009-2013 FAA Flight Plan, Organizational Excellence Goal, Objective 3, and Performance Target: Achieve zero cyber security events that disable or significantly degrade FAA service. FAA additional funding for this area is critical in order to meet its goal of zero cyber security events that disable or significantly degrade FAA services. The sharp increase in "Special Threat" events and the number of alerts is proof that FAA is becoming more of a target.

Special Threat events are targeted attacks on federal government systems that pose a serious and imminent threat to those systems. These are events specific in nature, objective and patterned, and by design are hostile in intent. To date FAA has had 81 such attacks. Understanding all aspects of these events dictates that they be detected and prevented to the maximum extent to which the target (in this case FAA or other agencies) is capable. The development of the term "Special Threat" was initiated as an indirect route to allow the communication of these events, and the identification and mitigation of systems that have been compromised or affected by these sophisticated attacks.

### **Cyber Security**

The goal of this program is to achieve zero cyber security events that significantly disable or degrade FAA service. This includes:

- Enhance NAS architecture to include cyber security, harden individual NAS systems and networking elements, improve recovery rate times, and enhance boundary protection by completing remediation of vulnerabilities, improved information sharing, and systemic monitoring of systems.
- Examine, prioritize, and remediate vulnerabilities as identified in the DOT portal.
- Support the ISS Architecture and engineering Activity for NextGen. Develop a draft ISS Architecture for NextGen, enterprise services, system integration and data visualization.

### **Certify IT Systems Inventory**

FAA policy stipulates that all information systems must be recertified every three years. The Certification and Authorization (C&A) process addresses all threats and documents the actions needed to address any vulnerability. The FAA will conduct and implement the C&A process according to National Institute of Standards and Technology standards. The FAA will conduct compliance verification at the regional headquarters as well as NAS facilities.

- Ensure that all operational systems in the information technology systems inventory complete
  either an initial certification and accreditation (C&A) prior to deployment, a re-certification by their
  three year C&A anniversary date (anniversary date is defined as three years from the date of the
  Authorizing Official's signature), or undergo a self-assessment by September 30, 2011 if a full
  C&A is not required
- All systems must test their contingency plans by September 30, 2011.
- Track monthly and ensure resolution of all high risk vulnerabilities due in FY11, as defined in the
  Department of Transportation (DOT) Cyber Security Assessment Management (CSAM) database,
  on the first business day of the fiscal year, in all FAA LOBs/SOs.
- All systems must test their contingency plans

### **Security and Situational Awareness**

The Computer Security Act requires all federal employees to receive security training. The FAA must provide general and specialized security training to its more than 100,000 Federal employees and contractors who work in the information security field as well as those who have day-to-day use and access to FAA systems. Specialized information systems security training is also important to raise the security proficiency of employees responsible for identifying and fixing system vulnerabilities. The FY 2011 funding will pay for the specialized training of key FAA information systems security personnel as well as generalized security awareness training for all FAA employees.

Funding is also requested to enable the agency to comply with HSPD-7, and meet its flight plan goal to defend FAA's NAS information systems and networks against increased cyber terrorism and malicious activities by hackers and other unauthorized personnel.

- Build situational awareness by expanding the reach of the CSMC security architecture through new or improved placement of security toolset devices and applications.
- Increase wireless Intrusion Detection Systems (IDS) across the enterprise by establishing wireless IDS in Terminal Radar Approach Control facilities (TRACONS)
- Update and improve Security Awareness training to ensure effective training outcomes.
- Train and develop FAA ISS professionals by ensuring that 95 percent of all employees and contractors complete ISS awareness training.

### **Security Agreements**

 Continue to develop international agreements and memoranda of cooperation with major international air traffic management authorities to share cyber-security technical and operational data, techniques, tactics, and procedures, and to work cooperatively towards better business practices.

### **E-Gov Compliance**

The main objective under the e-Gov goal is to assure that critical electronic services and information

delivered to the users (the air traffic controllers, airline pilots, and the public) are valid and efficiently delivered. This will be accomplished through continued improvement of service delivery capabilities and development of project portfolios aimed at the key customer groups, as well as projects dedicated to improving internal efficiency and effectiveness. Specific e-Gov initiatives include EA and IT capital planning, continued agency participation in the Quicksilver program or other as designated, and continued implementation of consolidated enterprise IT services.

- Continue to ensure that IT serves as a strategic enabler for the agency, providing secure and
  efficient capabilities to store and exchange the agency's critical information.
- Maintain satisfactory evaluation levels in the DOT and FISMA annual report.

### **Enterprise Architecture (EA) Conformance**

Provide support and business solutions to LOBs through the corporate FAA Enterprise Architecture, and Technical Reference Manual (TRM), including IT roadmaps, specifications, standards, and requirements. Ensure that business solutions conform to requirements and regulations as measured against NIST directives.

- Continue to enhance FAA's enterprise architecture and solutions architecture to ensure that the Administrative, NAS support and NAS architecture are compatible and meet future requirements.
- Provide core capabilities, support and business solutions to FAA LOBs through corporate IT specifications, standards, and requirements.
- Develop and maintain information architecture to seamlessly share information between agencies participating in the Next Generation Air Transportation System.
- Continue to plan and transition FAA's Network Infrastructure to an Internet Protocol version 6 (IPv6) compatible configuration and ensure that the agency's application and systems interface with this infrastructure.
- Continue to Integrate IPv6 into the FAA's Information Resources Management strategic plan and modify FAA's Acquisition Management System (AMS) policy to include language requiring IPv6 compatibility in future networking procurements.
- Develop and implement plans to integrate network connections from LOBs into the IPv6 compliant backbone, applications and systems.
- Continue Internet Protocol version 6 (IPv6) integration with other government initiatives, including TIC, FDCC, and HSPD-12.

**Trusted Internet Connections (TIC):** The TIC initiative requires a reduction in external connections, including internet points of presence. Agencies must comply with critical TIC technical capabilities, continue reduction and consolidation of external connections to identified TIC access points, execute a Memorandum of Agreement (MOA) and Service Level Agreement (SLA) between DHS and agency CIO. The TIC load sharing strategy, plan and design must be developed and managed to meet OMB guidance. Einstein II deployment at each of the consolidated IAPs must be planned, coordinated and installed.

- Continue to reduce the number of FAA Internet Access Points per the OMB and DOT TIC Transition Plan. Ensure reduced number of IAPs is based on business and security requirements.
- Reduce to three CONUS IAPs without impacting FAA mission delivery and optimize the deployed IAP configurations.
- Develop a standard configuration IAP with failover capability and deploy.
- Coordinate with LOBs and the NAS staff on development of enterprise-wide service based on common requirements.
- Plan DOT and FAA TIC integration and extend governance model to include DOT. Develop a FAA TIC Governance model to operate enterprise services.

### **Privacy**

Following a large privacy breach in February 2009, FAA began to accelerate its Privacy Program, adding additional tasks and resources to prevent future large privacy breaches of personal data about employees or the customers served by the FAA (including pilots).

New software tools designed to discover, intercept, and warn the agency when unauthorized PII information is being stored or transmitted without proper oversight were purchased in FY2009. Starting in FY 2010 funds cover ongoing maintenance for existing software tools and licenses. FAA will also purchase six specialized software/hardware devices to secure access to the Internet through internet access points.

In FY2011, the team continues to respond to Privacy Act requests, increases the training and awareness of all employees and contractors, and updates policies and procedures in response to OMB mandates, such as the requirement to eliminate all unnecessary uses of Social Security Numbers in FAA systems.

FY2011 funds support consulting service procurements continuation so that process re-engineering efforts that began in FY2010, continue to support the evolution of the FAA's requirement to manage how it collects, stores, transmits and destroys PII data throughout the entire agency.

FY 2011 existing activities that were put in place to align the FAA Privacy Policy with FAA business processes are maintained. Updates to the existing policies and procedures are developed as needed to ensure that resources are properly allocated. The team continues to ensure that any enterprise-wide policy, standards and guidance to support the implementation of privacy solutions are developed and implemented. FAA will:

- Continue to provide Security and Privacy training to 100 percent of employees and contractors
- Continue and improve Privacy breach response and coordination with the CSMC.
- Ensure 100 percent compliance and enforcement of PII data encryption protocols, with encryption of all PII data at rest or in transit.
- Ensure that 100 percent of systems reviewed through NIST SP 100-26 Self-Assessments or SCAP processes are completed or are on schedule for completion.
- Ensure that 100 percent of systems have documented and tested Risk Assessments for all medium and high-risk PII systems as part of the SCAP process.
- Mitigate program weaknesses within planned timelines (Baseline and move towards 100 percent for improved planning timelines.)
- Ensure that 100 percent of PII systems that use Social Security Numbers (SSNs) have proper authority to do so, and that 100 percent of PII systems reduce or eliminate unnecessary use of SSNs.
- Purchase and install six Internet Protocol System (IPS) appliances to secure the Internal Access Points.

### Cost Reduction

Develop, track, and report quarterly on a comprehensive measure of its operating efficiency or financial performance. These measures will include: Cost per flight controlled, Research, Engineering, and Development (RE&D) Management Staff Efficiency Measure, Grant Administration Efficiency Measure, Direct labor costs of certification of foreign and domestic repair stations, Direct labor costs of surveillance of foreign and domestic repair stations.

- Reduce overhead costs 5-10 percent through automation of invoice processing.
- Achieve 10-15 percent savings for strategic sourcing for selected products and services.
- Continue to consolidate computer servers to improve security and reduce costs.
- Integrate Budget Planning and Program Planning to reduce costs and increase an Earned Value Management (EVM) approach to program management.

### **Business Process Improvement**

- Improve processes that are critical to performing FAA mission, business functions, and acquisition programs; integrate EA with acquisitions, software development lifecycle and configuration management processes.
- Improve processes and capabilities critical to the acquisition, maintenance and operations of systems associated with NAS and NAS modernization plans and development of IT products and services.
- Coordinate with LOBs and the NAS staff on development of enterprise-wide processes, solutions, and segment architectures where there are common requirements.

## OPERATIONS APPROPRIATION

# Office of the Administrator (AOA) (\$ in Thousands)

Item Title	Dollars	FTP	OTFTP	FTE
FY 2010 Enacted	4,205	20	4	24
FY 2010 One-Time Items	0	0	0	0
Unavoidable Adjustments				
1. Annualized FTEs (ATO: 91 , AVS: 112)	0			
2. Annualized FY 2010 Pay Raise (GS Population)	0			
3. Annualized FY 2010 Pay Raise (Core Comp Population)	31			
4. January 2011 Pay Raise (GS Population)	0			
5. January 2011 OSI (Core Comp Population)	79			
6. January 2011 SCI	16			
7. Non-pay inflation	4			
Total Unavoidable Adjustments	130	0	0	0
Uncontrollable Adjustments				
1. NAS Handoff Requirements	0			
2. NATCA Arbitration Decision	0			
3. Workforce Attrition (-242 EOY/ -121 FTE)	0			
Total Uncontrollable Adjustments	0	0	0	0
				<u></u>
Discretionary Increases				
1. NextGen RNAV/RNP (40 EOY/20 FTE)	0			
2. Continued Operational Safety (26 EOY/ 10 FTE)	0			
3. Production Certification (16 EOY/ 4 FTE)	0			
4. New Service Center Buildings	0			
5. Protect FAA Information Security Infrastructure	0			
Impl. of NextGen Env. & Energy Tech. , Models & Metrics (3 EOY/ 2 FTE)     Safety Inspections and Emergency Operations (110 EOY/ 54 FTE)	0			
Total Discretionary Increases	0	0	0	0
Total Discretionally Increases	•		· ·	U
Cost Efficiencies				
Flight Services Contract Savings	0			
2. Adminstrative Effeciencies	0			
Total Cost Efficiencies	0	0	0	0
Base Transfers				
NextGen and Acquisitions Hiring Support (3 EOY/ 3 FTE)	0			
2. Labor Relations/ National Employee Safety (1 EOY/ 1 FTE)	0			
Safety and Hazardous Materials (1 EOY/ 1 FTE)	0			
Total Base Transfers	0	0	0	0
FY 2011 Request	4,335	20	4	24

### Detailed Justification for Staff Offices - AOA

### Overview:

The office of the Administrator and Deputy Administrator leads the agency with a vision to continuously improve the safety and efficiency of aviation, while being responsive to customers and accountable to the public.

### FY 2010 Program:

In leading the Federal Aviation Administration (FAA), the Administrator oversees its employees in maintaining, operating, and overseeing the largest and most complex aviation system in the world—a system with a safety record that surpasses all others. The agency determines the regulatory and operational standards for the United States, and effectively sets the benchmark for aviation safety around the world.

### Goals include:

Increased Safety – achieving the lowest possible accident rate and to constantly improve safety; reducing the number of fatal accidents in General Aviation; and enhancing the safety of FAA's air traffic systems.

Greater Capacity – working with local governments and airspace users to provide increased capacity in the U.S. airspace system that meets projected demand in an environmentally sound manner.

International Leadership – increasing the safety and capacity of the global civil aerospace system in an environmentally sound manner.

Organizational Excellence – ensuring the success of FAA's mission through stronger leadership, a better trained workforce, enhanced cost-control measures, and improved decision-making based on reliable data.

### **Anticipated FY 2010 Accomplishments:**

- Reduce the commercial airline fatal accident rate.
- Reduce the number of fatal accidents in general aviation.
- Enhance the safety of FAA's air traffic systems.
- Increase airport capacity to meet projected demand and reduce congestion.
- Make air traffic flow over land and sea more efficient.
- Promote improved safety and regulatory oversight in cooperation with bilateral, regional, and multilateral aviation partners.
- Make FAA more effective with stronger leadership, increased commitment of individual workers to full organization-wide goals, and a better prepared, better trained, and diverse workforce.
- Improve financial management while delivering quality customer service.
- Enhance our ability to respond to crisis rapidly and effectively, including security-related threats and natural disasters.
- Continue to accelerate the modernization of the national airspace system.

### FY 2011 Budget Request:

In FY 2011, the Administrator's office requests \$4,335,000 and 24 FTE to meet its mission, an increase of \$130,000 above the FY 2010 enacted level. This increase consists of basic pay raises and inflation. Throughout FY 2011, AOA will continue to lead FAA toward achieving the agency's performance goals and

targets.		

## OPERATIONS APPROPRIATION

# Civil Rights (ACR) (\$ in Thousands)

FY 2010 One-Time Items	Item Title	Dollars	FTP	OTFTP	FTE
Unavoidable Adjustments	FY 2010 Enacted	10,977	81	4	85
Unavoidable Adjustments	EV 2010 One-Time Items	0	0	0	0
1. Annualized FTÉs (ATO: 91 , AVS: 112) 0 2. Annualized FY 2010 Pay Raise (GS Population) 0 3. Annualized FY 2010 Pay Raise (Core Comp Population) 87 4. January 2011 Pay Raise (Gore Comp Population) 0 5. January 2011 Pay Raise (Gore Comp Population) 173 6. January 2011 Pay Raise (Gore Comp Population) 173 6. January 2011 SCI (Core Comp Population) 173 6. January 2011 SCI 46 7. Non-pay Inflation 7 Total Unavoidable Adjustments 313 0 0 0 Uncontrollable Adjustments	rr 2010 One-Time Items	•	U	U	U
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1. NextGen and Acquisitions Hiring Support (3 EOY/ 3 FTE)       0         2. Labor Relations/ National Employee Safety (1 EOY/ 1 FTE)       0         3. Safety and Hazardous Materials (1 EOY/ 1 FTE)       -66       -1       -1         Total Base Transfers       -66       -1       0       -1	Paca Transforc				
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Total Base Transfers -66 -1 0 -1			-1		-1
				0	
FY 2011 Request 11,224 80 4 84					
	FY 2011 Request	11,224	80	4	84

### Detailed Justification for Staff Offices — ACR

Civil Rights (ACR) FY 2011 Request: \$11,224
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#### Overview:

The Office of Civil Rights (ACR) is committed to maintaining a model Equal Employment Opportunity (EEO) program throughout FAA in accordance with the EEO Commission Management Directive 715. ACR also provides leadership and direction in support of external program initiatives to increase Disadvantaged Business Enterprise (DBE) participation, Americans with Disabilities Act (ADA), and Title VI (prohibition of discrimination) compliance.

#### FY 2010 Base:

FAA employees maintain, operate and oversee the largest and most complex aviation system in the world, with a safety record that is second to none.

Equal opportunity in the federal workplace is critical to accomplishing this goal. It requires leadership, integration of EEO into the agency's strategic mission, management and program accountability, proactive prevention of unlawful discrimination, efficiency and responsiveness, and legal compliance to EEO mandates. The FAA federally-operated and assisted transportation programs must also ensure equal opportunity for all beneficiaries and potential beneficiaries of our programs.

ACR's performance goals focus on the strategic goal areas of Organizational Excellence and Capacity. Within the goal of Organizational Excellence, ACR will ensure that FAA maintains a Model EEO Program as required by the EEOC Management Directive on Equal Employment Opportunity. Within the goal of Capacity, ACR provided technical assistance as well as review and approve airport plans for fostering participation in the construction and concession arena by businesses owned by disadvantaged persons.

### Anticipated FY 2010 Accomplishments:

- Ensure equal opportunity for all beneficiaries and potential beneficiaries in federally operated and assisted aviation transportation programs by managing the DBE program and investigating equal access complaints against grantees under the Airport Improvement Program (AIP).
- Support airport sponsors and DBEs by conducting consultations, training and briefings on the DBE program, ADA, Title VI, Limited English Proficiency (LEP) and other civil rights regulations so that the aviation community is aware of civil rights requirements.
- Ensure airport compliance with ADA, Title VI, LEP, and other civil rights regulations by providing technical assistance to stakeholders, monitoring airport efforts and assessing complaints, measured by processing and reviewing 100 percent of complaints received in a timely manner.
- Review plans developed by airport grant recipients to ensure equal opportunities for DBE
  participation in AIP contracting and concession projects. The measure of success is ensuring 100
  percent approvals of DBE goal methodologies that have been submitted with all appropriate
  information.
- Support a timely and effective corporate approach to conflict management by providing support to
  the Center for Early Dispute Resolution (CEDR) in order to resolve conflicts before they enter an
  established process.
- Support the Chief Information Officer (CIO) and delegated offices of primary interest (OPI) efforts to improve protection for FAA's information infrastructure.
- Manage the EEO Counselor Program by maintaining an adequate active pool of counselors to
  process 100 percent of the pre-complaints by conducting basic and advanced EEO counseling
  training, as needed, to ensure a sufficient number of well-trained counselors to process 100
  percent of the pre-complaints.

- Manage the EEO Mediation Program by maintaining an adequate active pool of mediators to
  process 100 percent of the requests for mediation by conducting basic and refresher EEO
  mediation training, as needed, to ensure a sufficient number of well-trained mediators to process
  100 percent of the requests for mediation.
- Provide policy guidance, technical assistance and direct intervention to the lines of business and staff offices to assist them to resolve EEO complaints.
- Increase managerial and employee awareness with regard to EEO responsibilities and appropriate behaviors by conducting ten briefings for managers and employees per guarter.
- Conduct EEO recognition process for the FAA Administrator. Prevention includes recognizing significant contributions towards creating a Model EEO Program and reinforcing positive behavior in support of equal opportunity.
- Manage the National Federal Women's Program, National Hispanic Employment Program and the People with Disabilities Program that were created for the purpose of ensuring equal opportunity.
- Oversee the MD-715 Process for developing the annual EEO plan and monitoring agency accomplishments.
- Conduct ten on-site surveys to determine the extent to which facilities are maintaining a Model EEO Program under MD-715.
- Implement additional actions to enhance customer satisfaction with services provided by ACR.
- Work in collaboration with the Aviation and Space Education (AVSED) outreach programs and support AVSED by providing staff assistance.
- Ensure strong leadership and a well-trained, efficient ACR workforce.
- Evaluate each non-supervisory specialist vacancy as an opportunity to hire at the entry level, provided hiring at the lower level does not reduce required customer services, jeopardize MD-715 compliance, or diminish ACR's ability to accomplish activities under the Organizational Excellence Flight Plan goal.
- The ACR management team will support FAA's corporate focus on improving future Employee Attitude Survey results in the areas of communication and performance rewards and recognition.

### FY 2011 Budget Request:

For FY 2011, the Assistant Administrator for Civil Rights requests \$11,224,000 and 84 FTE to meet its mission, an increase of \$247,000 above the FY 2010 enacted level. This increase provides for pay raises and inflation for ACR base programs. The following Core activities represent the FY 2011 budget request:

- Ensure compliance with DBE policy and regulations at airports.
- Conduct more DBE compliance reviews and ensure that small and disadvantaged business enterprises are able to compete with larger companies for airport construction projects and concessions.
- Administer DBE certification training to ACR employees to ensure that the certification process is uniform nationwide and enabling ACR to increase technical assistance, guidance, and oversight of airport DBE responsibilities.
- Adjudicate external complaints from the public and other customers.
- Partner with the Airport Minority Advisory Council (AMAC) to conduct the third largest aviation training conference and partner with other organizations to conduct DBE training and provide technical assistance and consultations.
- Ensure compliance with ADA and Section 504 policy and regulations at airports.
- Manage and ensure compliance with Title VI, Limited English Proficiency (LEP), Environmental Justice (EJ) and other civil rights policy and regulations at airports

- Adjudicate external complaints from the public and other customers.
- Develop and implement Corporate and LOB/SO Organizational Excellence Action Plans that address employee feedback and engagement, and improve organizational effectiveness, accountability and performance.
- ACR will publicize the people with disabilities contract for recruiting, hiring, and placing people with targeted disabilities.
- Improve the timeliness of processing EEO pre-complaints unless the employee agrees to an
  extension or alternative dispute resolution is engaged.
- Ensure airport compliance with the American Disabilities Act.
- Standardize ACR websites making them more useful for exchanging information and conducting business.
- Implement corporate strategies that expand the applicant pool to ensure equal opportunity to all
  applicants and result in attracting high quality candidates to the FAA.
- Conduct EEOC-mandated statistical trend analyses in the areas of awards, training, and merit
  promotion to identify potential barriers to equal opportunity.
- Evaluate agency policies associated with applicant selection, employee promotions, awards, training, and merit promotion to determine if these policies are in line with EEO standards.
- Conduct trend analysis to determine if there is any evidence of disparate treatment of applicants or employees based on race, sex, national origin, or other protected categories.
- Oversee the process for developing the Annual MD-715 EEO Plan and Monitoring Agency Accomplishments.
- Manage the National Federal Women's Program, Hispanic Employment Program and the People with Disabilities Program to ensure equal opportunity.
- Ensure strong leadership and a well-trained, efficient workforce to enhance ACR's ability to provide
  a full complement of EEO services for customers as well as increase the efficiency of ACR services
  through the use of information technology.
- Ensure an EEO discrimination process that can process 100% of the allegations and inquiries regarding EEO complaints by having adequate counseling, mediation and consulting services.
- Manage the FAA EEO Formal Complaint Process and ensure that the formal EEO Complaint process
  is administered in accordance to policy and regulations by reviewing reports of investigations,
  providing consultation, and overseeing the alternative dispute resolution process.
- Manage outreach initiatives to ensure equal opportunity.
- Provide leadership, policy and direction on EEO to the agency in the area of the alternate dispute resolution program and through EEO evaluations.

## OPERATIONS APPROPRIATION

# Government & Industry Affairs (AGI) (\$ in Thousands)

Item Title	Dollars	FTP	OTFTP	FTE
FY 2010 Enacted	1,596	12	0	12
FY 2010 One-Time Items	0	0	0	0
Unavoidable Adjustments				
1. Annualized FTEs (ATO: 91, AVS: 112)	0			
2. Annualized FY 2010 Pay Raise (GS Population)	0			
3. Annualized FY 2010 Pay Raise (Core Comp Population)	14			
4. January 2011 Pay Raise (GS Population)	0			
5. January 2011 OSI (Core Comp Population)	34			
6. January 2011 SCI	7 0			
7. Non-pay inflation Total Unavoidable Adjustments	55	0	0	0
Total Gliavoldable Adjustillents	33	U	U	U
Uncontrollable Adjustments				
NAS Handoff Requirements	0			
2. NATCA Arbitration Decision	0			
3. Workforce Attrition (-242 EOY/ -121 FTE)	0			
Total Uncontrollable Adjustments	0	0	0	0
•				
Discretionary Increases				
1. NextGen RNAV/RNP (40 EOY/20 FTE)	0			
2. Continued Operational Safety (26 EOY/ 10 FTE)	0			
3. Production Certification (16 EOY/ 4 FTE)	0			
4. New Service Center Buildings	0			
5. Protect FAA Information Security Infrastructure	0			
6. Impl. of NextGen Env. & Energy Tech. , Models & Metrics (3 EOY/ 2 FTE)	0			
7. Safety Inspections and Emergency Operations (110 EOY/ 54 FTE)	0	0	0	0
Total Discretionary Increases	0	0	0	0
Cost Efficiencies				
Flight Services Contract Savings	0			
Adminstrative Effeciencies	0			
Total Cost Efficiencies	0	0	0	0
	<u> </u>			
Base Transfers				
1. NextGen and Acquisitions Hiring Support (3 EOY/ 3 FTE)	0			
2. Labor Relations/ National Employee Safety (1 EOY/ 1 FTE)	0			
3. Safety and Hazardous Materials (1 EOY/ 1 FTE)	0			
Total Base Transfers	0	0	0	0
FY 2011 Request	1,651	12	0	12

### **Detailed Justification for Staff Offices – AGI**

Government & Industry Affairs (AGI)	FY 2011 Request: \$1,651
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### Overview:

The Office of Government and Industry Affairs (AGI) serves as the administrator's principal adviser and representative on matters concerning relationships with Congress, aviation industry groups, and other governmental organizations. In concert with other agency organizations, AGI develops and reviews various plans and strategies involving these groups enhancing the promotion of aviation safety. These activities are conducted in close coordination and consultation with the Assistant Secretary for Governmental Affairs.

## FY 2010 Program:

AGI represents the first impression and indeed, sometimes the only contact Members of Congress and their staff have with the Federal Aviation Administration (FAA). This customer-oriented office, small by comparison to most every other organization in FAA, works directly for the Administrator, and is the principal linkage between the agency and the legislative branch of government.

AGI works with other staff organizations to coordinate and present FAA's legislative message. AGI works with other organizations within FAA to facilitate their relations with Congress. AGI consistently monitors and gauges the interest and needs of the Members and leadership on Capitol Hill. This relationship also extends to coordinating our legislative initiatives and responses with the Department of Transportation.

This vigorous outreach is not limited to Congress. AGI also serves as liaison with the aviation industry, from manufacturers to carriers, and with other aviation related organizations. Additionally, AGI serves as the principal point of contact for state and local governments.

### **Anticipated FY 2010 Accomplishments:**

- Participate in weekly meetings with Lines of Businesses (LOBs) and Staff Offices (SOs) to discuss and stay current on major safety policies, initiatives, and significant rulemaking activities.
- Provide appropriate and timely notification of all major notices to Congressional Members and their staff before it becomes public.
- Research legislation to determine directed actions from Congress to identify reports to be completed by FAA.
- Determine appropriate FAA organization responsible for compiling required reports, assign it as
  office of primary responsibility (OPR), and develop internal timelines for review and clearance of
  the report. Effectively communicate this information to the LOBs and SOs.
- Review and edit OPR draft reports; and facilitate agency and departmental coordination and forward final reports to AOA-1 for review and approval.
- Facilitate, coordinate and participate in all Congressional briefings on major policy, safety initiatives, rulemaking, and other issues of concern, some of which are regularly scheduled by AGI. AGI's role is to foster a better understanding of the agency's policies and programs by Members of Congress and their staff, and afford them the opportunity to interact directly with key FAA policy and decision-making officials. This proactive approach also enhances Congressional Members and their staffs' confidence in the agency's policies and programs.
- Continue to maintain and improve daily communications with OST Government Affairs.
- Provide daily activity reports on congressional contacts to AGI management officials.
- Provide weekly congressional activities report to the Administrator and senior DOT officials.
- Provide congressional activities input for inclusion in the Administrator's weekly White House Report.

Foster a strong partnership with key industry stakeholders.

## FY 2011 Budget Request:

For FY 2011, the Assistant Administrator for Government and Industry Affairs requests \$1,651,000 and 12 FTEs to meet its mission. This funding level provides for pay raises and inflation for AGI base programs. The following core activities represent the FY 2011 budget request:

- Communicate to congress on behalf of the Administrator and Management Board.
- Enhance AGI's daily interaction with LOBs, SOs, and senior management officials by proactively soliciting LOB and SO information sharing in order to improve communication regarding areas of interest or concern to congress.
- Inform key members of the Congress and their staff on FAA safety policies and initiatives.
- Manage the Reports to Congress program, and function as the agency's Report to Congress liaison with Congressional authorizing and appropriations staffs to clarify definitions of Congressional intent. Also manage the coordination process between FAA, OST, and OMB, and encourage timely LOB and SO responses to targeted deadlines.
- Assist in preparing agency officials for Congressional meetings and briefings.
- Provide OST Governmental Affairs with factual, concise, and complete information from significant AGI Congressional contacts and activities.
- Serve as focal point for Congressional follow-up on written agency responses.
- Foster strong partnerships with key industry stakeholders.
- Meet with aviation industry representatives to strengthen industry relationships.
- Communicate the administration's position on key aviation issues.

### OPERATIONS APPROPRIATION

# Communications (AOC) (\$ in Thousands)

Item Title	Dollars	FTP	OTFTP	FTE
FY 2010 Enacted	6,892	34	1	34
FY 2010 One-Time Items	0	0	0	0
Unavoidable Adjustments				
1. Annualized FTEs (ATO: 91 , AVS: 112)	0			
2. Annualized FY 2010 Pay Raise (GS Population)	0			
3. Annualized FY 2010 Pay Raise (Core Comp Population)	48			
4. January 2011 Pay Raise (GS Population)	0			
5. January 2011 OSI (Core Comp Population)	96			
6. January 2011 SCI	25 8			
7. Non-pay inflation Total Unavoidable Adjustments	° 177	0	0	0
Uncontrollable Adjustments  1. NAS Handoff Requirements	0			
NATCA Arbitration Decision	0			
Workforce Attrition (-242 EOY/ -121 FTE)	0			
Total Uncontrollable Adjustments	0	0	0	0
Dispositions with the second				
Discretionary Increases  1. NextGen RNAV/RNP (40 EOY/20 FTE)	0			
2. Continued Operational Safety (26 EOY/ 10 FTE)	0			
3. Production Certification (16 EOY/ 4 FTE)	0			
4. New Service Center Buildings	0			
Protect FAA Information Security Infrastructure	0			
6. Impl. of NextGen Env. & Energy Tech. , Models & Metrics (3 EOY/ 2 FTE)	0			
7. Safety Inspections and Emergency Operations (110 EOY/ 54 FTE)	0			
Total Discretionary Increases	0	0	0	0
Cost Efficiencies				
Flight Services Contract Savings	0			
Adminstrative Effeciencies	0			
Total Cost Efficiencies	0	0	0	0
Base Transfers				
NextGen and Acquisitions Hiring Support (3 EOY/ 3 FTE)	0			
Labor Relations/ National Employee Safety (1 EOY/ 1 FTE)	0			
Safety and Hazardous Materials (1 EOY/ 1 FTE)	0			
Total Base Transfers	0	0	0	0
FY 2011 Request	7,069	34	1	34
TT ZOTT Nequest	7,069	34		34

### Detailed Justification for Staff Offices - AOC

Communications (AOC)	FY 2011 Request: \$7,069

#### Overview:

The Office of Communications (AOC) serves as the focal point for news media inquiries, speaking for the FAA and initiating both internal and external communication programs covering the breadth of FAA issues. The office provides advice to the Administrator, Deputy Administrator, and Associate/Assistant Administrators on communication strategy and products, and prepares senior FAA officials to take part in media interviews and other public appearances. The office also manages the FAA's internal and external websites. Regional offices are maintained in eight locations to provide the same services to FAA leadership in the regions in support of public affairs work and national leadership. AOC supports internal FAA communications through various web-based publications, video and audio.

### FY 2010 Program:

AOC works with the news media to provide the public with accurate, timely, useful and important information about the agency's goals, policies, activities and operations. As part of that mission, AOC actively promotes FAA activities that deal with Safety, Capacity, International Leadership and Organizational Excellence.

In addition, AOC serves as the internal voice of FAA, providing staff and employees with daily, weekly, and periodic communication tools and news programs. AOC manages the FAA's internal and external web content, as well as the national branding program, and provides graphic design, printing and media (broadcast and video) services to the agency at large.

## **Anticipated FY 2010 Accomplishments:**

#### **Public Affairs**

- Hold at least two media roundtables to highlight FAA safety initiatives with three or more national print or television outlets.
- Conduct proactive media outreach that will result in at least seven articles, news stories or
  editorials in national publications or television coverage that positively highlight the FAA's work on
  runway safety.
- Respond to media calls within 24 hours.
- Hold at least two national media roundtables on capacity and efficiency issues with three or more national or print media outlets.
- Conduct proactive media outreach that will result in at least seven articles, news stories or editorials in national publications or television coverage that positively highlight aviation safety improvements.
- Hold at least two media roundtables to educate reporters about international leadership initiatives.

### **Internal Communications**

- FOCUS FAA: Increase readership, frequency of postings while reducing costs overall.
- Via FOCUS FAA, initiate Administrator's audio log, and News of the Week in Review audio programming.
- Provide guidance and assistance for distributing employee safety information in a variety of formats, including web-cast interviews, employee web site enhancements, broadcast messages, Focus FAA.
- Publish real time agency news on a daily basis during the Fiscal Year.
- Read and evaluate all employees' feedback and respond within 24 hours.

Conduct more than 12 webcast interviews during the Fiscal Year.

#### Website

- Publish individual Line of Business and Staff Office web publishing guidelines, procedures, and web points of contact on the employee website and provide a link from the web standards website.
- Sponsor six on-location or web-based training sessions to help employees improve web content and usability. At least three sessions must be available to FAA regional employees.
- Continue usability testing of top visited public and employee web pages and web-based applications to improve ease of use, quality of information, and task completion. Complete three major usability projects
- Combine data from web analytics program with survey data to provide holistic, strategic recommendations to improve customer and employee satisfaction.
- Achieve an average ACSI satisfaction score of 72 or better on the FAA public website.
- Answer 98 percent of questions through self-service in the FAQ knowledge base on the public website and 100 percent of questions sent to FAA experts within 30 days.

### FY 2011 Budget Request:

For FY 2011, the Office of Communications requests \$7,069,000 and 34 FTEs to meet its mission, an increase of \$177,000 above the FY 2010 enacted level. This funding level will provide for pay raises and inflation. The following activities represent the FY 2011 budget request:

#### **Public Affairs**

- Hold at least six media roundtables to highlight FAA accomplishments.
- Evaluate the use of social media to support media outreach activities.
- Conduct proactive outreach that results in media stories that positively highlight FAA initiatives.
- Increase media training for FAA executives.

### **Internal Communications**

- Continue to increase frequency of news postings on FOCUSFAA to employees.
- Develop additional video and other programming.
- Evaluate use of short-format video programming and MP3 programming formats to deliver news to employees.
- Increase readership by two percent annually.
- Strengthen FAA branding program.
- Evaluate use of social media for employee news dissemination such as blogs and Twitter etc.

#### Web Management

- Achieve an average ACSI score of 72 or better on the FAA public website for FY 2011.
- Answer 98 percent of questions through self-service in the FAQ knowledge base on the public website and 100 percent of questions sent to FAA experts within 15 days.
- Launch improved ability to find FAA regulations guidance.
- Continue FAA Web Management Training Program.
- Launch improved streaming video service for FAA internal and external customers.
- Implement strategy to ensure code security on FAA.gov, Employees.FAA.gov and Intranet.FAA.gov.
- Improve Registry and Regulatory Guidance Library Website Usability.
- Continue supporting 42 web applications for LOBs and Staff Offices.

### OPERATIONS APPROPRIATION

# Chief Counsel (AGC) (\$ in Thousands)

Item Title	Dollars	FTP	OTFTP	FTE
FY 2010 Enacted	49,202	275	9	279
FY 2010 One-Time Items	0	0	0	0
FT 2010 One-Time Items	U	0	U	U
Unavoidable Adjustments				
1. Annualized FTEs (ATO: 91, AVS: 112)	0			
2. Annualized FY 2010 Pay Raise (GS Population)	3			
3. Annualized FY 2010 Pay Raise (Core Comp Population)	385			
4. January 2011 Pay Raise (GS Population)	6			
5. January 2011 OSI (Core Comp Population)	763			
6. January 2011 SCI	200			
7. Non-pay inflation	32	0	0	0
Total Unavoidable Adjustments	1,389	0	0	0
Uncontrollable Adjustments				
NAS Handoff Requirements	0			
2. NATCA Arbitration Decision	0			
3. Workforce Attrition (-242 EOY/ -121 FTE)	0			
Total Uncontrollable Adjustments	0	0	0	0
Discretionary Increases				
1. NextGen RNAV/RNP (40 EOY/20 FTE)	0			
2. Continued Operational Safety (26 EOY/ 10 FTE)	0			
3. Production Certification (16 EOY/ 4 FTE)	0			
4. New Service Center Buildings	0			
5. Protect FAA Information Security Infrastructure	0			
6. Impl. of NextGen Env. & Energy Tech. , Models & Metrics (3 EOY/ 2 FTE)	0			
7. Safety Inspections and Emergency Operations (110 EOY/ 54 FTE)  Total Discretionary Increases	0	0	0	0
Total Discretionally Increases	U	U	0	U
Cost Efficiencies				
Flight Services Contract Savings	0			
2. Adminstrative Effeciencies	0			
Total Cost Efficiencies	0	0	0	0
Base Transfers  1. NovtCon and Acquisitions Hiring Support (2 FOV/ 2 FTF)	0			
NextGen and Acquisitions Hiring Support (3 EOY/ 3 FTE)     Leber Polations (National Employee Sefety (1 EOY/ 1 ETF)	0			
Labor Relations/ National Employee Safety (1 EOY/ 1 FTE)     Safety and Hazardous Materials (1 EOY/ 1 FTE)	0			
Total Base Transfers	0	0	0	0
FY 2011 Request	50,591	275	9	279

### Detailed Justification for Staff Offices - AGC

Chief Counsel (AGC)	FY 2011 Request: \$50,591

### Overview:

The Chief Counsel has primary responsibility for providing legal services and support to the Federal Aviation Administration (FAA) Administrator, all program offices, regional offices, and agency organizations worldwide. The office provides strategic counsel to FAA's senior management and represents the agency in federal court and before various administrative law forums.

## FY 2010 Program:

AGC provides legal services to the FAA Administrator and all agency organizations. Principal legal practice areas include: enforcement; regulations; litigation; procurement and fiscal law; airports and environmental law; personnel and labor law; international affairs; and dispute resolution (including adjudication of bid protests through the Office of Dispute Resolution for Adjudication). AGC also provides legal practice in general law applicable to the executive branch, such as Freedom of Information Act and Ethics and Privacy Act compliance. AGC attorneys represent the agency before United States federal courts and administrative forums, including the National Transportation Safety Board (NTSB), the Merit Systems Protection Board (MSPB), and the Equal Employment Opportunity Commission (EEOC).

The office's principal legal practice areas and program responsibilities integrally tie to the goals of the FAA Flight Plan. AGC supports the agency's safety goals through its role in enforcement of federal aviation regulations and support of voluntary compliance programs; drafting, review and interpretation of regulations; and litigation activity (including defense of ATC tort claims). In the capacity arena, AGC plays a significant role in both applying agency policy designed to relieve congestion at key airports and supporting the related competition goals of the DOT. AGC also plays a critical role in advising Airports (ARP) and Air Traffic Organization (ATO) about the legal and environmental implications of runway expansions, terminal improvements, and redesign of the national airspace. Further, AGC provides procurement legal services essential to getting the safety and capacity enhancing equipment and technology needed to support the national airspace system and the agency's Flight Plan. In the international goal area, AGC develops the agency position on international law issues and serves as a liaison for FAA international aviation legal matters with other government agencies and industries. Finally, in support of the agency's overall goal of achieving organizational excellence, AGC provides advice and guidance to key agency officials on personnel, labor law, and civil rights matters and the various general law disciplines applicable to all federal agencies.

AGC will continue standing-up the newly created Audit and Evaluation Office (AAE), whose function is to provide a centralized focus for safety-related complaints and other critical audits and investigations. AAE will serve as a centralized entry point for disclosures and recommendations on safety-related issues, whistleblower matters, and the various FAA hotlines. The offices will also serve as a point of contact and oversight for matters related to the DOT Office of the Inspector General (OIG), the Government Accountability Office (GAO), and the Office of Special Counsel (OSC). As AAE is stood up, it will carry out independent quality control evaluations of certain investigations and expand the intervention program to include proactive training and process change to enhance the inclusiveness of the social culture within agency organizations and to incorporate whistleblower-type contributions into the normal oversight regime of the agency.

### Anticipated FY 2010 Accomplishments:

- Support Flight Plan initiative relating to third-party development of Required Navigation Performance (RNP) Procedures.
- Prioritize and prosecute enforcement actions in accordance with FAA's safety goals.

- Implement program evaluation plan to assess targeted enforcement initiative and use of enforcement decision tool, as part of the Compliance Review Team.
- Provide training to enforcement investigative personnel.
- Support FAA rulemaking activities and improvements by ensuring rules meet legal standards and conduct monthly outreach to primary client offices.
- Complete 80 percent of critical safety rules within 90 days of first OST due date with the Office of Rulemaking (ARM).
- Complete 50 percent of new requests for interpretations within 120 days of receipt.
- Ensure timely representational legal services and, as necessary, keep administrator apprised of quarterly contingent liability matters.
- Support Flight Plan initiative related to maintaining average daily capacity at seven metropolitan airports.
- Support Flight Plan initiative to maintain scheduled progress for Environmental Impact Statements at West Palm Beach, South Suburban (Chicago), Ft. Lauderdale and Philadelphia Airports.
- Support Flight Plan initiative to increase annual service volume of the 35 Operation Evolution Partnerships (OEP) airports by at least one percent annually.
- Support Flight Plan initiative to ensure established milestones and completion dates for Southern Nevada Supplemental Airport, Houston George Bush Intercontinental, and Portland International Environmental Impact Statements (EIS) studies are met.
- Generally, docket or dismiss Part 16 complaints within 20 calendar days.
- Refine criteria used to measure effectiveness and timeliness of environmental projects and to evaluate environmental streamlining initiatives.
- Review all procurement documents sent for legal review within 10 days and conduct monthly outreach meetings with primary procurement client offices.
- Improve management and oversight of support service contract practices by implementing, monitoring and evaluating policy changes and actions with ATO and Office of Financial Services (ABA).
- Provide legal services supporting drafting and negotiation of international agreements; prepare
  the U.S. position on matters before International Civil Aviation Organization (ICAO); support the
  Aviation Insurance Program; assist FAA International Aviation (API) initiative relating to regional
  safety oversight system in the Caribbean; and support the DOT mission relating to technical
  assistance in Irag.
- The AAE Office brought the Administrator's Hotline and OIG/GAO Audit Liaison functions under its purview and began the process of aligning the Aviation Safety Hotline, Safety Issues Reporting System (SIRS), and Whistleblower Protection Program with AAE goals and objectives.
- AGC continues to stand up the AAE organization; it will increase its functions to include carrying
  out independent quality control evaluations of certain investigations. The intervention program
  will be expanded to include proactive training and process change to enhance the inclusiveness of
  the social culture within agency organizations and to incorporate whistleblower-type contributions
  into the normal oversight regime of the agency.

### FY 2011 Budget Request:

For FY 2011, the Office of the Chief Counsel (AGC) requests \$50,591,000 and 279 FTE to meet its mission, an increase of \$1,389,000 above the FY 2010 enacted level. The request provides for basic pay raises and inflation for AGC Programs.

AGC provides legal services to the FAA Administrator, all lines of business with critical program responsibilities, and all agency organizations worldwide. Our primary functions are providing legal advice, reviewing agency actions for legal sufficiency, and providing representational services. Principal legal practice areas include: regulatory enforcement; rulemaking; litigation; acquisition, commercial and fiscal law; airports and environmental law; personnel and labor law; international affairs; and alternative dispute resolution/conflict management services (including adjudication of bid protests through the Office of Dispute Resolution for Adjudication). AGC also supports programs with general applicability to executive branch agencies, including the Freedom of Information Act, Government Ethics and Privacy Act compliance; AGC houses the agency's Office of Audit and Evaluation. Significantly, AGC attorneys represent the agency before United States federal courts and various administrative forums, including the National Transportation Safety Board (NTSB), the Merit Systems Protection Board (MSPB), and the Equal Employment Opportunity Commission (EEOC). AGC also works closely with the Office of the General Counsel of the Department of Transportation (DOT) on issues that are common to modal administrations or that are of national significance to the aviation industry.

In addition to traditional legal services, AGC is responsible for two distinct internal FAA adjudicative functions, the agency's major dispute resolution practices, and the agency's Office of Audit and Evaluation. The Office of Dispute Resolution for Acquisition (ODRA) serves as the Administrator's adjudicatory body in acquisition-related matters, as well as, provides alternative dispute resolution services. A discrete segment of the office supports the FAA's civil penalty adjudication function by serving as a confidential advisor to the Administrator in his capacity as the Civil Penalty Program Decision-maker. Finally, AGC houses the recently established Office of Audit and Evaluation (AAE) which provides a centralized point of entry and coordination for safety-related complaints and other critical audits and evaluations. The offices will also serve as a point of contact and oversight for matters related to the DOT Office of the Inspector General (OIG), the Government Accountability Office (GAO), and the Office of Special Counsel (OSC). As AGC continues to stand up the new AAE organization, it will increase its functions to include carrying out independent quality control evaluations of certain investigations. The intervention program will be expanded to include proactive training and process change to enhance the inclusiveness of the social culture within agency organizations and to incorporate whistleblower-type contributions into the normal oversight regime of the agency.

The office's principal legal practice areas and program responsibilities are integrally linked to the FAA's mission and the goals of the Flight Plan. AGC directly supports the agency's safety mission by: prosecuting violations of the federal aviation regulations, as well as, providing legal support of voluntary compliance programs; ensuring that critical safety rules are both legally sufficient and completed timely; providing timely and accurate agency responses to public requests for interpretations of the regulations; assisting in FAA accident investigation activities; and vigorously representing the agency and agency personnel in air crash and other tort litigation. In the capacity arena, AGC plays a significant role in FAA's congestion management activities. AGC provides critical legal advice and representation to major program offices regarding the legal and environmental implications of runway expansions, terminal improvements, and redesign of the national airspace. Further, AGC provides acquisition and commercial legal services that are essential to development, acquisition and deployment of the safety and capacity enhancing equipment and technology needed to support the national airspace system and the agency's Flight Plan. In the international goal area, AGC develops the agency position on international law issues and provides legal support on FAA international aviation matters. Finally, in support of the agency's overall goal of achieving organizational excellence, AGC provides advice and quidance to key agency officials on personnel, labor law, and civil rights matters and the various general law disciplines applicable to all federal agencies.

In addition to the activities generally described above, the following largely represents the FY 2011 budget request:

- Support Flight Plan target to achieve an average daily airport capacity for the 7 Metro areas by:
  - Analyzing capacity and congestion policy implications of NextGen near-term and midterm improvements.
  - Implementing longer term congestion management solutions in New York area by providing timely legal review of documents and management of legal aspects of the slots program.

- o Monitoring and maintaining scheduled progress for Environmental Impact Statements at Philadelphia and Southern Nevada (located within the seven Metro areas).
- Supporting redesign of the airspace of the seven Metro areas by monitoring and maintaining schedules progress for environmental review to redesign the airspace and air traffic systems for Boston, San Francisco, Atlanta, Washington/Baltimore, and Western Corridor and providing legal advice to support ongoing implementation and representational legal services to defend the NY/NJ/PHL Metropolitan Airspace Redesign.
- Support the Flight Plan Target of increasing annual service volume at the 35 Operational Evolution Plan (OEP) airports by at least 1 percent annually by monitoring and maintaining scheduled progress for the Houston George Bush Intercontinental and West Palm Beach Airport EIS studies.
- Support the Flight Plan Target of achieving a National Air Space (NAS) on-time arrival rate of 88
  percent at the 35 OEP airports by providing legal review and guidance as needed to congestion
  action teams working to mitigate forecasted delay.
- Provide legal support for efficient administration of the Airport Improvement Program, passenger facility charge program, and airport compliance program, including legal review of policy and regulatory guidance and Part 16 determinations.
- Timely process complaints of grant noncompliance and improper diversion of airport revenue.
- Conduct recurrent training for legal staff and client offices on environmental and airport aviation issues.
- Support agency rulemaking activities by submitting to Department of Transportation (OST) 80
  percent of significant ("A") rules approved by the Rulemaking Council within 90 days of the
  scheduled date and issuing 80 percent of certain non-significant rules approved by the
  Rulemaking Council within 90 days of the scheduled date.
- Support the agency's safety agenda by providing the regulated community with timely guidance by responding to 50 percent of public requests for interpretations within 120 days of receipt.
- Prioritize and efficiently prosecute legal enforcement cases by taking the fist legal action on 80 percent of cases received during a 12 month period.
- Conduct 50 percent of informal conferences in legal enforcement actions within 90 days of receipt of a respondent's request, and 75 percent within 180 days.
- Monitor and reduce backlog of enforcement actions by maintaining a ratio of cases closed to cases received to greater than 60 percent office wide.
- Streamline the coordination and approval of significant enforcement actions by submitting 70
  percent of safety alerts to the program office for concurrence within 45 days of receipt in AGC
  headquarters.
- Enhance legal representation by providing training for new enforcement attorneys, maintaining currency of FAA Order 2150.3B, and provide refresher training to enforcement investigative personnel.
- Support FAA air crash investigation teams and represent the agency and agency personnel in all phases of air crash litigation and other tort litigation.
- Complete all tort claim analysis within six months of receipt of claim and complete agency contingent liability report by quarterly due date.
- Promote efficiency in acquisition process by completing legal review of all procurement documents within 10 days.
- Proactively provide training to contracting personnel (contract officers, specialists, and contracting officer technical representatives) at three ATO Business Service Centers on agency procurement

policies and procurement integrity.

- Provide adjudicative and alternative dispute resolution services for bid protests and contract disputes.
- Provide legal services relating to drafting and negotiation of international agreements and provide legal support for the Aviation Insurance Program.
- Provide legal assistance to FAA Program Offices on technical issues involving ICAO Standards and Recommended Practices and implementation of any new ICAO standards.
- Support Safe Skies for Africa Program.
- Meet five Flight Plan Organizational Excellence Targets involving 10 strategic activities as required.
- Provide timely representation in employment law matters by meeting all employment case deadlines before the EEOC, MSPB and federal courts.
- Provide timely advice to clients on employment law matters by responding to 80 percent of requests for opinions, advice, and training within 10 working days.
- AGC will house the newly established Audit and Evaluation Office (AAE), whose function is to
  provide a centralized focus for safety-related complaints and other critical audits and
  investigations. AAE will serve as a centralized entry point for disclosures and recommendations on
  safety-related issues, whistleblower matters, and the various FAA hotlines. The offices will also
  serve as a point of contact and oversight for matters related to the DOT Office of the Inspector
  General (OIG), the Government Accountability Office (GAO), and the Office of Special Counsel
  (OSC).
- As AGC continues to stand up the new AAE organization, it will increase its functions to include carrying out independent quality control evaluations of certain investigations. The intervention program will be expanded to include proactive training and process change to enhance the inclusiveness of the social culture within agency organizations and to incorporate whistleblowertype contributions into the normal oversight regime of the agency.

## OPERATIONS APPROPRIATION

# <u>Aviation Policy, Planning & Environment (AEP)</u> (\$ in Thousands)

Item Title	Dollars	FTP	OTFTP	FTE
FY 2010 Enacted	17,277	95	1	96
FY 2010 One-Time Items	0	0	0	0
Unavoidable Adjustments				
1. Annualized FTEs (ATO: 91 , AVS: 112)	0			
2. Annualized FY 2010 Pay Raise (GS Population)	0			
3. Annualized FY 2010 Pay Raise (Core Comp Population)	121			
4. January 2011 Pay Raise (GS Population)	0			
5. January 2011 OSI (Core Comp Population)	240			
6. January 2011 SCI	63			
7. Non-pay inflation	20			
Total Unavoidable Adjustments	444	0	0	0
Uncontrollable Adjustments				
NAS Handoff Requirements	0			
NATCA Arbitration Decision	0			
3. Workforce Attrition (-242 EOY/ -121 FTE)	0			
Total Uncontrollable Adjustments	0	0	0	0
Discretionary Increases				
1.NextGen RNAV/RNP (40 EOY/20 FTE)	0			
2. Continued Operational Safety (26 EOY/ 10 FTE)	0			
3. Production Certification (16 EOY/ 4 FTE)	0			
4. New Service Center Buildings	0			
5. Protect FAA Information Security Infrastructure	0			
6. Impl. of NextGen Env. & Energy Tech. , Models & Metrics (3 EOY/ 2 FTE)	3,019	3		2
7. Safety Inspections and Emergency Operations (110 EOY/ 54 FTE)	0			
Total Discretionary Increases	3,019	3	0	2
Cost Efficiencies				
Flight Services Contract Savings	0			
Adminstrative Effeciencies	0			
Total Cost Efficiencies	0	0	0	0
				<u> </u>
Base Transfers				
NextGen and Acquisitions Hiring Support (3 EOY/ 3 FTE)	0			
2. Labor Relations/ National Employee Safety (1 EOY/ 1 FTE)	-177	-1		-1
3. Safety and Hazardous Materials (1 EOY/ 1 FTE)	0			
Total Base Transfers	-177	-1	0	-1
FY 2011 Request	20,563	97	1	97
T P LOTT Koducot	20,503			///

### Detailed Justification for Staff Offices - AEP

Aviation Policy, Planning, & Environment (AEP) FY 2011 Request: \$20,563

#### Overview:

The Office of Aviation Policy, Planning and Environment (AEP) provides critical support to the Administrator and Federal Aviation Administration (FAA) organizations in planning and policy development, and environment and energy programs.

### FY 2010 Program:

In FY 2010, AEP will continue supporting agency initiatives in all of the goal areas, while concentrating our major efforts in Capacity, International Leadership, and Organizational Excellence. Environmental efforts will focus heavily on work to provide for a quieter, cleaner, more energy efficient aviation future under NextGen. Under the Safety and Capacity goal areas, AEP plans to assure that FAA policy and economic analysis programs support safety and capacity-enhancing initiatives of the agency, and that the agency benefits from superior decision support tools and innovative mitigation approaches to ensure strategies that allow aviation to grow in an environmentally responsible manner. Work at the International Civil Aviation Organization and with international partners will foster international environmental standards, recommended practices, and guidance for global aviation. Our activities under the goal of Organizational Excellence will revolve around supporting agency initiatives to help employees see the link between their jobs and agency goals.

### **Anticipated FY 2010 Accomplishments:**

- By September 30, 2010, at least 80 percent of the rules approved by the Rulemaking
  Management Council should be out of the agency no later than 90 days after the scheduled date.
  For a significant rule, out of the agency is when the rule is sent to the Office of the Secretary of
  Transportation (OST). For a non-significant rule, out of the agency is when the rule is issued.
- Complete the Joint Planning and Development Office (JPDO) Environmental Working Group FY 2010 work goals and plan for NextGen.
- Continue phased development of Environmental Management System (EMS) to manage environmental impacts of NextGen.
- Support assessments and measure performance of drop-in (e.g., coal-derived liquids) alternative fuels for commercial aircraft, and establish potential of using renewable alternative fuels.
- Design a framework to analyze NextGen environmental targets.
- Initiate development of policy for effective integrated use of interdependent models for aviation noise/emissions.
- Identify promising opportunities for airport Surface Management Operations (SMO) that optimize
  aircraft sequencing and timing to reduce emissions and fuel burn, and develop a new queuing
  network model of the departure processes at airports that can be used to develop advanced
  queue management strategies to decrease fuel burn and emissions.
- Support development of noise, air quality and fuel burn reduction technologies to pursue under the Continuous Low Energy Emissions and Noise (CLEEN) program.
- Complete annual assessment of number of people exposed nationally to significant aircraft noise.
- Complete annual assessment of fuel burn.
- Support completion of beta version of Aviation Environmental Design Tool (AEDT) for airport.
- Work with stakeholders on defining environmental needs for Airport Cooperative Research Program.
- Support development of research roadmaps for at least two out of six critical research areas in

- characterizing and mitigating noise impacts.
- For the remaining critical research areas in characterizing and mitigating noise impacts, support development of research roadmaps by planning and conducting workshops.
- Continue the work program to support the eighth meeting of the International Civil Aviation
  Organization Committee on Aviation Environmental Protection (ICAO/CAEP) and plan for CAEP/9
  work program.
- Support continuing efforts to develop web-based media for interacting with the public on aircraft noise issues, and assess its effectiveness.
- Support effort to establish metrics that characterize human health and welfare impacts of aviation to better inform policy decisions and environmental assessments and achieve NextGen.
- Support efforts to advance noise propagation models to better capture effects of air turbulence, meteorology, terrain, and the characteristics of low-frequency noise.
- Refine EMS to conform to Executive Order 13423.
- Roll-up the Lines of Business cost and performance baseline developed in FY 2008 to set EMS targets for future years.
- Conduct two EMS External Audits and compile the Administrator's EMS management review.
- Support campaign to collect Particulate Matter (PM) and Hazardous Air Pollutants (HAPs) profiles and measurements to isolate sources.
- Continue assessing the relative effect of various emissions on climate forcing functions to apply to ICAO/CAEP analyses.
- Support assessing whether there are unique health effects, particularly for NextGen scenarios, associated with PM emissions and HAPs from aviation sources, with specific focus on the aircraft engine.
- Support assessing uncertainty of impact of aviation on climate change with special emphasis on the effects of contrails.
- Support assessment of aviation impacts on regional air quality.
- Support development of guidance on dispersion modeling (i.e., assessment of aviation-related emission concentrations that affect air quality).
- Develop systematic guidance on assessing climate change in FAA documents prepared under the National Environmental Policy Act.
- Study NextGen environmental review needs to develop more effective and efficient environmental reviews of airport and airspace proposals consistent with the National Environmental Policy Act and the regulations for the Council on Environmental quality.
- Hold a forum on current environmental trends and modernization issues for FAA National Environmental Policy Act (NEPA) specialists.
- Publish the annual FAA Aerospace Activity Forecast.
- Publish Long Range Aerospace Forecast.
- Publish the Terminal Area Forecasts.
- Publish the Air Route Traffic Control Center (ARTCC) forecasts.
- Publish US Airmen Statistics.
- Publish 95 percent of daily and monthly reports from Air Traffic Operations Network (OPSNET),
   Air Traffic Activity Data System (ATADS), Enhanced Traffic Management System Counts (ETMSC),
   and Terminal Area Forecast (TAF) on time.
- Plan and conduct the 35<sup>th</sup> Annual Aviation Forecast Conference.
- Publish and distribute quarterly report highlighting aviation industry traffic and revenue trends to internal AEP and/or FAA customers.
- Respond to agency customer requests for information and insights with regard to analyses, statistics, and recommendations on aviation industry issues.

- Issue premium and non-premium insurance policies no later than the effective date of the policies.
- E-business electronic access to insured air carriers and Department of Defense (DoD) will be available 90 percent of the time.
- Insurance policy reconciliations will be initiated within the time conditions set forth in each air carrier's policy of insurance and a refund or additional collection implemented no later than 120 days after receipt of reconciliation data from each air carrier or the availability of allotted budget, whichever is later.
- Complete environmental analysis of a proposed Grand Canyon overflights plan, and manage aviation issues at other national parks.
- Complete Benefit Cost Analysis (BCA) for contract towers and approaches as requested by ATO.
- Complete 85 percent of Airport Office (ARP) BCA within the timeframe agreed upon in the service level agreement (SLA).
- Conduct policy option analyses to support CAEP/8.
- Complete significant demonstration of clean and quiet operations with an international partner.
- Provide inputs on assigned Interagency Group on International Aviation (IGIA) items.
- To the extent possible, ensure economic policies and guidance adopted by ICAO reflect U.S. reviews.
- Support program of action for international aviation to address climate change.

### FY 2011 Budget Request:

For FY 2011, the Office of Aviation Policy, Planning and Environment requests \$20,563,000 and 97 FTEs to meet its mission, an increase of \$3,286,000 above the FY 2010 enacted level. This increase will provide for pay raises and inflation, and also includes a discretionary increase of \$3,019,000 and two FTEs for implementation of NextGen Environmental & Energy Technologies, Models, & Metrics. This funding request will cover payroll compensation and benefits (PC&B), travel, training, and new equipment costs for three EOY/ two FTEs plus contract costs to support the implementation of NextGen environmental and energy policies, standards, guidance, and new technologies, including policy and technical support to FAA lines of business to facilitate implementation. The additional positions are needed to support the implementation through adoption into policies, standards, guidance, and operational programs of environmental and energy research and development results/products in areas of new aircraft technologies and operational procedures, alternative fuels, advanced decision support models, evolving health and welfare targets and metrics. This request also includes a base transfer of one EOY/FTE from AEP to Human Resource Management (AHR) to support the employee safety program.

In FY 2011 AEP will continue supporting agency initiatives in all of the goal areas, while concentrating our major efforts in Capacity, International Leadership, and Organizational Excellence. Environmental efforts will focus heavily on work to provide for a quieter, cleaner, more energy efficient aviation future under NextGen. In support of International Leadership, AEP represents the United States on various panels, committees and working groups of the International Civil Aviation Organization and in other international forums on harmonized environmental standards, practices and guidance materials. Our activities under the goal of Organizational Excellence will revolve around supporting agency initiatives to help employees see the link between their jobs and agency goals.

- Perform economic analyses of agency rulemaking and regulatory projects to promote safety in the aviation and commercial space industries. By September 30, 2010, at least 85 percent of the rules approved by the Rulemaking Management Council should be out of the agency no later than 90 days after the scheduled date. For a significant rule, out of the agency is when the rule is sent to OST. For a non-significant rule, out of the agency is when the rule is issued.
- Complete JPDO Environmental Working Group FY 2011 work goals and plan for NextGen.
- Issue Aviation Environmental and Energy Policy for NextGen to address aircraft noise, air quality, climate change, water quality, and energy.

- Continue phased development of Environmental Management Systems (EMS) to manage environmental impacts of NextGen.
- Support assessment of aviation alternative fuels and Continuous Lower Energy Emissions and Noise (CLEEN) technologies and NAS infrastructure relationships and integration benefits.
- Support planning for comprehensive "drop-in" aviation alternative fuel demonstration.
- Develop guidance for effective and efficient environmental reviews of NextGen airport and airspace proposals consistent with the National Environmental Policy Act and the regulations of the Council on environmental Quality.
- Refine guidance on assessing climate change in FAA documents prepared under the National Environmental Policy Act.
- Continue development of policy for effective integrated use of interdependent models for aviation noise/emissions.
- Establish in house modeling capability, with an environmental modeling lab, for effective application of NextGen environmental decision support tools.
- Support efforts to design and test airport SMO that optimize aircraft sequencing and timing to reduce emissions and fuel burn.
- Support efforts to conduct component and integrated system level analyses for technologies identified under the CLEEN program.
- Support the transition of NextGen environmental research results/products into environmental policies, standards, and guidance.
- Support noise research and land use reviews, and issue new guidance based on results.
- Initiate development of policy recommendations regarding congestion management initiatives at capacity constrained airports.
- Coordinate efforts to reassess which metropolitan areas will have the most impact on the total
  aviation system delays. Goals are to determine any necessary changes to the target areas and
  airports based on changes in growth or capacity, and to mitigate delays.
- Lead the implementation of FAA reauthorization as required by statute. Develop, provide analysis
  and technical assistance on draft legislative proposals and implement legislation on current and
  new programs as necessary for the reauthorization.
- Develop and analyze forecasts of Aviation Trust fund revenues and expenditures at least twice a
  year. Develop and analyze proposals for alternatives to current tax structures.
- Update Air Traffic Organization cost allocation as activity and cost accounting data becomes available.
- Complete annual assessment of number of people exposed nationally to significant aircraft noise.
- Complete annual assessment of fuel burn.
- Support efforts to further advance Aviation Environmental Design Tool (AEDT) and initiate model assessment by Deign Review group in preparation of Tools public release.
- Support efforts to further advance Environmental Design Space tool to include additional vehicles for environmental tradeoff analyses.
- Work with stakeholders to identify additional environmental needs for Airport Cooperative Research Program.
- Support effort to establish metrics that characterize human health and welfare impacts of aviation to better inform policy decisions and environmental assessments.
- Support effort to advance noise propagation models to better capture effects of air turbulence, meteorology, terrain, and the characteristics of low-frequency noise.
- Support efforts to explore environmental control algorithms that will enable Continuous Descent Arrival (CDA) implementation at higher traffic levels and still reduce fuel burn, emissions, and noise.
- Support efforts to develop a fuel-optimal, multi-flight-level conflict resolution algorithm and

initiate a simulation study for demonstrating en route traffic operations that reduce fuel burn and emissions.

- Use Lines of Business cost and performance baseline to set EMS targets for future years.
- Conduct EMS External Audits and compile the Administrator's EMS management review.
- Support efforts to complete data analysis and reporting related to the continued collection of PM and HAPs profiles and measurements to isolate sources.
- Support efforts to complete assessment of the relative effect of various emissions on climate forcing functions to apply to ICAO/CAEP analyses.
- Support efforts to complete assessment of any unique health effects, particularly for NextGen scenarios, associated with PM emissions and HAPs from aviation sources, with specific focus on the aircraft engine.
- Support efforts to continue assessment of uncertainty of impact of aviation on climate change with special emphasis on the effects of contrails.
- Support efforts to continue assessment of aviation impacts on regional air quality.
- Support efforts to complete development of guidance on dispersion modeling (i.e., assessment of aviation-related emission concentrations that affect air quality).
- Support efforts to complete development and implementation of guidance materials for assessing HAP emissions associated with airport sources, particularly aircraft.
- Support efforts to complete development and implementation of guidance materials for assessing greenhouse gas emissions associated with airports.
- Develop and publish an annual FAA Aerospace Activity Forecast out to FY 2030 which forms the basis for NextGen.
- Develop and publish the Terminal Area Forecasts to support agency business planning for, among other things, controller workforce planning.
- Develop and publish additional aerospace forecasts, including a long-range Aerospace Forecast and ARTCC forecast to support agency and NextGen planning needs.
- Develop forecasts to support International Civil Aviation Organization (ICAO) traffic forecast needs.
- Develop and publish a wide variety of statistics on the National Airspace system, its components, and its performance providing a basis for NextGen.
- Develop and publish quarterly report highlighting aviation industry traffic and revenue trends.
   Perform analyses, collect statistics, and provide recommendations on aviation industry issues as requested.
- Publish 95 percent of daily and monthly reports from OPSNET, ATADS, ETMSC, and TAF on time.
- Publish and distribute quarterly report highlighting aviation industry traffic and revenue trends to internal AEP and/or FAA customers.
- Respond to agency customer requests for information and insights with regard to analyses, statistics, and recommendations on aviation industry issues.
- Issue premium and non-premium insurance policies no later than the effective date of the policies.
- E-business electronic access to insured air carriers and DoD will be available 90 percent of the time.
- Insurance policy reconciliations will be initiated within the time conditions set forth in each air carrier's policy of insurance and a refund or additional collection implemented no later than 120 days after receipt of reconciliation data from each air carrier or the availability of allotted budget, whichever is later.
- Complete a Grand Canyon overflights plan, and manage aviation issues at other national parks.
- Complete BCA for contract towers and approaches as requested by ATO.
- Complete 85 percent of ARP BCA within the timeframe agreed upon in SLA.

- Conduct policy option analyses for CAEP/8.
- Support efforts to continue significant demonstration of clean and quiet operations with an international partner.
- Provide inputs on assigned Interagency Group on International Aviation (IGIA) items.
- To the extent possible, ensure economic policies and guidance adopted by ICAO reflect U.S. reviews.
- Support efforts to advance elements in the noise research roadmaps for the critical research areas in characterizing and mitigating noise impacts.
- Accomplish majority of U.S. positions for CAEP.
- Support efforts to continue to assess effectiveness of web-based media for interacting with the public on aircraft noise issues.
- Support program of action for international aviation to address climate change.

## OPERATIONS APPROPRIATION

## International Aviation (API) (\$ in Thousands)

Item Title	Dollars	FTP	OTFTP	FTE
FY 2010 Enacted	18,323	69	1	65
FV 2040 Over Time I have				
FY 2010 One-Time Items	0	0	0	0
Unavoidable Adjustments				
1. Annualized FTEs (ATO: 91, AVS: 112)	0			
2. Annualized FY 2010 Pay Raise (GS Population)	0			
3. Annualized FY 2010 Pay Raise (Core Comp Population)	166			
4. January 2011 Pay Raise (GS Population)	0			
5. January 2011 OSI (Core Comp Population)	330			
6. January 2011 SCI	87			
7. Non-pay inflation	33			
Total Unavoidable Adjustments	615	0	0	0
Uncontrollable Adjustments				
NAS Handoff Requirements	0			
2. NATCA Arbitration Decision	0			
3. Workforce Attrition (-242 EOY/ -121 FTE)	0			
Total Uncontrollable Adjustments	0	0	0	0
Discontinuos Insurant				
Discretionary Increases  1. NextGen RNAV/RNP (40 EOY/20 FTE)	0			
2. Continued Operational Safety (26 EOY/ 10 FTE)	0			
3. Production Certification (16 EOY/ 4 FTE)	0			
New Service Center Buildings	0			
Protect FAA Information Security Infrastructure	0			
6. Impl. of NextGen Env. & Energy Tech. , Models & Metrics (3 EOY/ 2 FTE)	0			
7. Safety Inspections and Emergency Operations (110 EOY/ 54 FTE)	0			
Total Discretionary Increases	0	0	0	0
0 1500				
Cost Efficiencies 1. Flight Services Contract Savings	0			
Adminstrative Effeciencies	0			
Total Cost Efficiencies	<b>0</b>	0	0	0
Base Transfers				
1. NextGen and Acquisitions Hiring Support (3 EOY/ 3 FTE)	0			
2. Labor Relations/ National Employee Safety (1 EOY/ 1 FTE)	0			
3. Safety and Hazardous Materials (1 EOY/ 1 FTE)	0			
Total Base Transfers	0	0	0	0
FY 2011 Request	18,938	69	1	65

#### Detailed Justification for Staff Offices – API

#### Overview:

The Assistant Administrator for International Aviation (API) is responsible for coordinating U.S. leadership in the international aviation community and advancing safety internationally by broadening our strategic relationships, providing targeted technical assistance, and promoting harmonized safety solutions in an environmentally friendly manner.

The United States has long been a leader in the international aviation community. The FAA operates the largest and most complex aviation system in the world, controlling almost half of the world's air traffic. The FAA certifies more than two-thirds of the world's large jet aircraft and provides direct or indirect aviation assistance to more than 130 countries. While international air travel to the United States has increased by 15 percent over the last five years, the number of fatalities has decreased 18 percent in the same period. U.S. industry is continuously developing and implementing new technologies to create a safer, more efficient global airspace system. The United States is also the largest contributor of technical and financial support to the International Civil Aviation Organization (ICAO), which represents 190 of the world's civil aviation authorities.

### FY 2010 Program:

API has identified four performance targets to ensure that FAA remains the world leader in aviation. These performance targets are:

<u>CAST Safety Enhancements</u>: Work with the Chinese aviation authorities and industry to adopt 27 proven Commercial Aviation Safety Team (CAST) safety enhancements by FY 2011. This supports China's efforts to reduce commercial fatal accidents to a rate of 0.030 fatal accidents per 100,000 departures by FY 2012. The goal of working with China's Aviation Authority to adopt 27 CAST Enhancements by FY 2011 began in FY 2007 and breaks out as follows:

FY 2007, the goal was seven, API achieved ten.

FY 2008, the goal was five, API achieved five.

FY 2009, the goal was five, API achieved five.

FY 2010 Target: four CAST Safety Enhancements

FY 2011 Target: four CAST Safety Enhancements

International Aviation Development Projects: By FY 2013, arrange commitments for external funding for at least 35 aviation development projects (seven per year). Beginning in FY 2009, the goal to secure 35 aviation development projects by FY 2013 was a refinement of goals for securing external funding for aviation projects. The refinement changes API focus from dollar amounts and reflects the desire to increase the number of aviation projects in order to provide this type of assistance to more countries. In FY 2008, still under the dollar amount metric, API secured a total of 12 new projects, four of which were in the same country. Beginning in FY 2009, API is only counting by project with a maximum of one per country, which will make the goal more difficult to reach. Based on past performance conducting this type of work (though by a different measure), API believes this is a stretch, but reachable goal. The seven year goal of a total of 35 programs reflects what will be an increasing level of difficulty in reaching out to new areas for development projects. FY 2011 Target: seven projects

<u>NextGen Technology</u>: By FY 2013, expand the use of NextGen performance-based systems and concepts to five priority countries. With five so far, the overall goal is complete, however, NextGen expansion to other countries remains a priority. The goal of expanding the use of NextGen performance-based systems and concepts to five priority countries by FY 2013 was initiated in FY 2005 and breaks out as follows:

FY 2005, one - the goal and the actual achieved

FY 2006, one - the goal and the actual achieved

FY 2007, one - the goal and the actual achieved FY 2008, one - the goal; actual achieved: two FY 2009, one - the goal and the actual achieved

FY 2010 Target: one country. FY 2011 Target: one country.

<u>Aviation Leaders</u>: By 2013, work with at least 18 countries or regional organizations to develop aviation leaders to strengthen the global aviation infrastructure. FAA will strengthen civil aviation authorities and global safety by creating and promoting targeted developmental opportunities for civil aviation leaders to enhance management, technical, and organization skills. The goal of developing aviation leaders with at least 18 countries began in 2009 and breaks out as follows:

FY 2009, two - the goal; actual achieved: seven

FY 2010 Target: three countries FY 2011 Target: four countries FY 2012 Target: four countries FY 2013 Target: five countries

To achieve these performance targets, API will coordinate FAA international activities among the lines of business (LOB), with our bilateral partners, regional multinational aviation safety organizations, and ICAO. The ultimate objective is to make air travel as safe and efficient abroad as it is at home.

### Anticipated FY 2010 Accomplishments:

- Work in partnership with the FAA lines of business, the Department of State (DoS) and the donor community to support the Civil Aviation Assistance Team in Afghanistan
- Correlate essential USG Standards and Recommended Practices (SARPS) change objectives to the ICAO budget.
- Continue implementation of presidential international civil aviation safety programs.
- Provide leadership in expanding the FAA's Aviation Cooperation Program (ACP) to support the creation
  of government and industry partnerships to facilitate the transfer of aeronautical products, services,
  and technologies to key developing regions.
- Negotiate and conclude international agreements with global aviation partners for safety and capacity enhancement.
- Provide continued support for the development of a regional safety oversight organization with the East African Community.
- Strengthen civil aviation authorities and global safety by creating and promoting targeted developmental opportunities to civil aviation leaders to enhance management, technical and organization skills.
- Work through ICAO and regional aviation organizations in the western hemisphere to enable member countries to reach greater compliance with ICAO safety standards through training and technical assistance. API is currently working with a number of countries on a variety of training and assistance programs (e.g., Pilot Licensing Exams, Inspector Training Systems, and Airworthiness Inspector Training).
- Work with FAA Lines of Business to develop international aviation projects. Examples include
  China Aviation Safety Symposium, Caribbean definitional mission for specific follow-on safety
  training, and an African Regional Safety Conference. Arrange external funding for these projects
  and others, and conduct outreach activities to transfer aviation development knowledge.
- Present the U.S. position on aviation environmental concerns and encourage the adoption of U.S. environmental policy and practices in aviation by international aviation authorities and industry stakeholders.
- Expand the use of NextGen technologies, in particular, GPS technologies and procedures, to five more priority countries.

### FY 2011 Budget Request:

For FY 2011, the Assistant Administrator for International Aviation requests \$18,938,000 and 65 FTEs to meet its mission. This amount will provide for pay raises and inflation.

The following activities represent the FY 2011 budget request:

- Identify and provide technical assistance and training and strengthen mutually beneficial partnerships with key civil aviation authorities throughout the world.
- Continue implementation of presidential international civil aviation safety programs for Africa, Asia, the Americas, and the Middle East.
- Expand the technical capabilities (e.g. safety oversight, airport, etc.). of the Civil Aviation
  Assistance Team in Kabul, Afghanistan, with funding from other U.S. government (USG) and
  international lending sources.
- Support creation of government and industry partnerships to facilitate the transfer of aeronautical products, services, and technologies to key developing regions.
- Establish coordinated safety agendas throughout the world to improve aviation safety.
- Prioritize agency efforts to improve ICAO Standards and Recommended Practices (SARPs) to reflect advances in U.S. technologies, practices and procedures, and work with the international community to implement SARP changes.
- Provide U.S. leadership to facilitate the modernization of ICAO operations and guidance to the global aviation community.
- Identify and provide technical assistance and training to regional organizations to strengthen the capabilities of at least four regional aviation organizations to meet international safety and efficiency standards.
- Establish an effective partnership with the European Union and the European Aviation Safety Agency (EASA) to ensure the highest level of cooperation for aviation safety and an efficient exchange of products, services, and technologies.
- Influence international aviation safety, capacity, and efficiency by strategically promoting FAA recommendations and policies at key international venues.
- Work with FAA Lines of Business to develop seven international aviation projects. Arrange
  external funding for these projects, and conduct outreach activities to transfer aviation
  development knowledge.
- Work with ATO and strategic partners throughout the world to promote the expansion of NextGen supporting systems, technologies and operational enhancements. The scope covers GPS technologies, navigational aids, and other technologies.

### OPERATIONS APPROPRIATION

# Security and Hazardous Materials (ASH) (\$ in Thousands)

Item Title	Dollars	FTP	OTFTP	FTE
FY 2010 Enacted	87,591	497	0	484
FY 2010 One-Time Items	0	0	0	0
Unavoidable Adjustments				
1. Annualized FTEs (ATO: 91 , AVS: 112)	0			
2. Annualized FY 2010 Pay Raise (GS Population)	1			
3. Annualized FY 2010 Pay Raise (Core Comp Population)	598			
4. January 2011 Pay Raise (GS Population)	2			
5. January 2011 OSI (Core Comp Population)	1,185			
6. January 2011 SCI	311			
7. Non-pay inflation	108			
Total Unavoidable Adjustments	2,205	0	0	0
Uncontrollable Adjustments				
NAS Handoff Requirements	0			
NATCA Arbitration Decision	0			
3. Workforce Attrition (-242 EOY/ -121 FTE)	0			
Total Uncontrollable Adjustments	0	0	0	0
Total officiality Adjustments	<u> </u>		<u> </u>	J
Discretionary Increases				
1. NextGen RNAV/RNP (40 EOY/20 FTE)	0			
2. Continued Operational Safety (26 EOY/ 10 FTE)	0			
3. Production Certification (16 EOY/ 4 FTE)	0			
4. New Service Center Buildings	0			
5. Protect FAA Information Security Infrastructure	0			
6. Impl. of NextGen Env. & Energy Tech. , Models & Metrics (3 EOY/ 2 FTE)	0			
7. Safety Inspections and Emergency Operations (110 EOY/ 54 FTE)	8,022	110		54
Total Discretionary Increases	8,022	110	0	54
Cost Efficiencies				
Flight Services Contract Savings	0			
2. Adminstrative Effeciencies	0			
Total Cost Efficiencies	0	0	0	0
Base Transfers				
NextGen and Acquisitions Hiring Support (3 EOY/ 3 FTE)	0			
2. Labor Relations/ National Employee Safety (1 EOY/ 1 FTE)	0			
3. Safety and Hazardous Materials (1 EOY/ 1 FTE)	66	1		1
Total Base Transfers	66	1	0	1
FY 2011 Request	97,884	608	0	539

### Detailed Justification for Staff Offices - ASH

#### Overview:

The Office of Security and Hazardous Materials (ASH) has the primary responsibility for protecting employees, contractors, facilities, and assets; emergency operations; contingency planning; and the safe transportation of hazardous materials in air commerce.

### FY 2010 Program:

Protecting FAA's critical infrastructure is a national and homeland security concern that continues to receive high-level attention. ASH develops and implements policy to protect FAA employees, contractors, facilities, and assets. ASH conducts assessments and inspections at facilities to determine compliance with facility security, communications security, and classified and sensitive information orders and directives. ASH manages the ID Media Program for the agency and conducts suitability investigations of employees and contractors, as well as investigations of employees, nonemployees, contractors and airmen suspected of violating FAA orders and regulations. ASH develops and implements policy centrally at FAA Headquarters on the certification and accreditation of National Security Systems and open/close storage secure rooms, develops and implements policy on the protection and control of Export Controlled Information (ECI) and maintains the Administration's Electronic Keying Facility (EKF) for classified cryptographic material.

ASH's Hazardous Materials Safety Program is one of three offices within the FAA that has oversight of safety related aviation operations, which if not properly funded or staffed has the potential to cause a catastrophic failure to aviation safety and possible loss of life to the traveling public. ASH's Hazardous Materials Safety Program develops and implements national policy on the transport of hazardous materials by air through regulatory inspections, training, and outreach to those involved in the hazardous materials industry worldwide. Further, the hazardous materials program performs regulatory oversight of hazardous materials training programs and manuals for each Part 121 and 135 certificate holder. This comprises at least 123 Part 121 air carriers and over 2,500 Part 135 air carriers. In addition, ASH has compliance and enforcement responsibility for over 100,000 shippers that offer hazardous materials for shipment on aircraft. The program's objectives are to achieve the lowest possible accident and incident rate and constantly improve aviation safety while decreasing any unnecessary risks to the traveling public as well as to cargo aircraft operations. This can be achieved by preventing hazardous materials accidents and incidents aboard aircraft before they occur by decreasing all unnecessary risks.

ASH provides crisis management support by employing an integrated system of policy, procedures, personnel, facilities, and communications to ensure that FAA officials have timely and adequate information to plan, direct, and control all aspects of essential operations. Serving as the hub of the national network of operations centers, the Washington Operations Center Complex (WOCC) collects information, provides decision support, and coordinates activities essential to the daily conduct of FAA activities. In times of national emergencies, natural disasters and major incidents, WOCC functions as an action center for concentrated and accelerated agency efforts. Finally, ASH issues policy and guidance for Continuity of Operations (COOP) planning and implementation, serves as the command authority for secure telecommunications (secure telephone equipment, secure fax and defense message system) for all FAA offices, and supports the national security responsibilities of FAA.

### **Anticipated FY 2010 Accomplishments:**

- Continue to enhance the safety of the transport of hazardous materials in aviation by working to resolve regulatory issues with the Pipeline and Hazardous Materials Safety Administration (PHMSA) and provide support with studies, rulemaking and other documentation.
- Conduct 900 outreach efforts to shippers of critical HAZMAT commodities.
- Conduct over 8,000 hazardous materials regulatory inspections as follows:

- 5,114 shipper and repair station assessments, and
- 3,119 air carrier station inspections.
- Conduct the following inspections at FAA facilities:
  - 96 facility security assessments,
  - 358 facility security inspections,
  - 64 Communication Security (COMSEC) inspections,
  - 73 classified information inspections, and
  - 23 Technical Surveillance Countermeasures (TSCM) surveys or inspections.
- Implement a web-based incident reporting system for use by FAA personnel.
- Build and test the core infrastructure data processing and storage capabilities to support the FAA
  Identification Management System (IDMS) as envisioned in the Federal Information Processing
  Standards (FIPS) 201-1. This will provide required validation of Personal Identity Verification (PIV)
  cards issued to FAA employees and contractors.
- Continue PIV card issuing at FAA Headquarters and large offices in the Regions. Establish 100+ satellite PIV card issuing stations at smaller work sites in the Regions.
- Complete 95 percent of investigations based on Department of Transportation Office of Inspector General (DOT/OIG) Hotline complaints within DOT/OIG specified timelines, excluding those investigations prolonged for reasons beyond the investigator's control
- Complete 95 percent of investigations with a potential impact on safety, accountability board investigations, and all other hotline complaints within 30 workdays excluding those investigations prolonged for reasons beyond the investigator's control.
- Initiate regulatory investigations on all airmen involved in the sale or distribution of illegal drugs and aircraft involved in illegal activity within 30 days of knowledge of that activity.
- Support law enforcement investigations involving airmen and aircraft.
- Ensure that a national emergency operations plan and structure exists to support national and regional operations during any incidents of national significance.
- Ensure that COOP facilities and procedures are continually available and regularly exercised to maintain continual facility operational capability.
- Maintain the WOCC to ensure a 24/7 agency-wide integration of critical, time sensitive information support for FAA senior leadership, the NAS and National Security Emergency Preparedness.
- Ensure the availability of command and control communications support to WOCC and regional entities FAA-wide.
- Deliver international dangerous goods courses as requested on International Civil Aviation Organization (ICAO) requirements for shipping hazardous materials by air transport.
- Improve cyber security by ensuring 100 percent of operational and deployed systems in inventory have completed current certification and accreditation (C&A) and undergo a self-assessment if C&A is not needed.
- Develop a digital integrated communication system on the Emergency Operations Network (EON) providing timely and accurate information to senior policy officials.
- Migrate existing COMSEC program to an electronic keying environment.
- Establish an automated visitor control program for domestic and foreign visitors at FAA facilities.
- Inspect and accredit open/close storage secure rooms and classified work areas.
- Update existing Classified/Unclassified Information/COMSEC policies to reflect transition to full electronic processing environment.

### FY 2011 Budget Request:

For FY 2011, Security and Hazardous Materials requests \$97,884,000 and 539 FTEs to meet its mission, an increase of \$10,293,000 above the FY 2010 enacted level. This increase will provide for pay raises and inflation for ASH base programs and one base transfer. The request also includes \$8.0 million for 110 new

positions to enhance safety inspections and emergency operations:

The Intelligence Watch Section of the National Security and Intelligence Coordination Division is intended to provide 24/7 intelligence support to FAA operators and decision-makers. Aviation operations occur domestically and overseas 24 hours a day, and FAA must be able to respond to events in the Air Domain around the clock. Currently, the National Security and Intelligence Coordination Division does not have the capability to provide immediate, on-site intelligence support to the FAA Administrator and Lines of Business after regular duty hours. The most severe consequence of not funding this program is the continued inability of the National Security and Intelligence Coordination Division to provide on-site, immediate, decision-quality intelligence information outside of normal duty hours and, most notably, during a crisis or developing aviation security incident.

Since 2004, the FAA has seen a growth in Federal hiring of 154 percent; mostly represented by the Air Traffic hiring surge that began last year. This hiring surge is not a short-term event as Air Traffic has announced its intention to hire and train at least 17,000 controllers between now and 2017. While the workload supporting this hiring has correspondingly increased, there has been no increase in the ASH personnel security specialist resources that provide the processing, tracking, and adjudication of national security and suitability investigations required for each employment candidate. The hiring surge and reinvestigation of on board employees for higher security clearance require a boost to the Personnel Security System (PSS) workforce. Additional funding requested will enhance effective service delivery and administration of a capable FAA personnel security program.

The Office of Hazardous Materials (ADG) is responsible for regulatory oversight of the Federal Aviation Administration's Hazardous Materials Safety Program in accordance with the Hazardous Materials Regulations within 49 CFR Parts 171-179, as well as, 14 CFR, and ICAO's International Technical Instructions. To facilitate an increase in safety and compliance by all parties involved in transporting hazardous materials onboard passenger and cargo aircraft, and to establish an oversight program for the 14 CFR hazardous material requirements codified in February 2007, the Office of Hazardous Materials will be changing the way it approaches compliance and enforcement by implementing its oversight responsibilities of all Part 121 and 135 air carriers as well as Part 145 repair stations within the AFS inspection processes for certification and oversight to verify compliance. This interactive process also incorporates ADG into FAA's Safety Management Systems (SMS) for certificate holder oversight. This will require substantial increases in resources for the Hazardous Materials Safety Program to meet the FAA's Flight Plan of a fully implemented hazardous material safety oversight program throughout the aviation community. These funds are needed for the additional budget increases for critical safety enhancements and the appropriate oversight needed to comply with the FAA's SMS system. It will also help to alleviate ADG from any current and future liabilities that are inherent to the FAA's hazardous materials program.

Security and Hazardous Materials will enforce the hazardous materials regulations in the aviation sector issued by the Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) under 49 CFR as well as the Federal Aviation Regulations in 14 CFR that govern the issuance of certificated entities hazardous materials manuals and training programs. Enforcement of 14 and 49 CFR within the National Airspace System is a responsibility which is specific to FAA's authority. FAA's inability to conduct adequate oversight of Part 135 operators, coupled with the need to comply with international obligations and agency mandates that call for implementation of a Safety Management System (SMS), necessitate the additional funding requested in this submission. Security and Hazardous Materials will also prioritize outreach efforts to target shippers of critical commodities to ensure the public, industry, and air carrier operators are educated about shipping hazardous materials by air. Finally, ASH will conduct inspections of:

- Shippers of hazardous materials that were identified during routine air carrier inspections.
- Air carriers that ship hazardous materials by air.
- Repair stations that ship hazardous materials by air.

 Shippers of hazardous materials by air that have been prioritized into risk-based categories using information shared with all DOT modal administrations.

ASH will also coordinate efforts with the Transportation Security Administration to address hazardous materials discovered as the indirect result of increased baggage and cargo security screening at airports.

ASH develops and implements policy and establishes requirements to protect FAA federal and contractor workforces, FAA facilities, systems, and operations. ASH will standardize and automate employee and contractor identification media issuance agency wide, strengthen procedures and processes for identity proofing, investigation, and media issuance affecting all FAA worksites and provide Public Key Infrastructure (PKI) and Card Management System (CMS) services in support of all Personal Identity Verification (PIV) cards in use throughout the agency.

ASH will ensure that employment, or continued employment of persons in FAA will promote the efficiency of the service and safeguard national security. This program ensures all employees; applicants and contractors have the appropriate background investigation as required by Executive, DOT, and FAA Orders. It also ensures that they receive fair and equitable treatment; are granted national security clearances when needed; and serves as the adjudicative authority in all agency security clearance denials and revocations.

ASH will investigate all allegations of misconduct by FAA employees and contractors. ASH will also conduct regulatory investigations on all airmen and aircraft involved in illegal drug activity or in threatening national security by using the NAS to commit criminal acts. ASH will provide support to law enforcement investigations involving airmen and aircraft.

The FAA is the largest contributor of technical and financial support to ICAO, which represents 190 of the world's civil aviation authorities. ASH will work with our international partners to disseminate our experience, expertise, and new technologies to ensure a safer and more secure global airspace while implementing presidential international civil aviation safety programs for Africa, Asia, the Americas, and the Middle East.

ASH will conduct facility security assessments and inspections at FAA staffed facilities to determine the status of the facility security management program and compliance with FAA Order 1600.69. ASH Servicing Security Specialists will provide national level security expertise to FAA facilities to ensure security measures counter developing threats at all FAA facilities. ASH will conduct TSCM surveys and inspections to determine compliance with FAA Order 1600.12.

ASH will inspect and assess all areas that store, handle, and/or process Classified National Security Information (C/NSI), Communications Security (COMSEC), Export Controlled Information (ECI) and Sensitive/Controlled Unclassified Information (CUI) to determine compliance with FAA Orders 1600.2, 1600.8, 1600.75, and other applicable FAA or Federal directives, and National Security Agency (NSA)/United States Air Force (USAF) directives. These assessments will include interviews and on-site refresher training (as needed) with FAA employees and contractors who routinely handle C/NSI or CUI as a part of their regularly assigned duties.

To ensure the protection and control of export controlled information (ECI) in the electronic environment, ASH will develop security and disclosure policy and procedures regarding FAA participation for exchanges of export controlled information, foreign visits, assignments and personnel exchanges, and security oversight for cleared personnel assigned overseas or with international organizations.

ASH will continue to develop and refine existing policies and procedures concerning the safeguarding of C/NSI, COMSEC, and CUI. In support of this effort, ASH will establish a National Security Systems (NSS) program to support the FAA owned computer systems, and the Electronic Key Management System (EKMS) to facilitate secure transmission of classified information across the NAS infrastructure. The NSS program will ensure that every FAA owned computer system that processes and/or transmits classified information is accredited through an established Certification and Accreditation (C&A) process that is in compliance with the guidance established by the Committee for National Security Systems (CNSS).

ASH will also develop, refine, and administer a comprehensive C/NSI, COMSEC, and CUI outreach and

education program that will train FAA employees and contractors whose duties involve and require the protection of C/NSI, COMSEC, and CUI.

ASH will conduct extensive preliminary inquiries into every occurrence of an alleged mishandling of C/NSI, COMSEC, and CUI. ASH will also direct and advise FAA Managers, employees, contractors, and security professionals on the corrective measures to take after a confirmed incident of mishandling occurs involving C/NSI, COMSEC, and/or CUI.

ASH will ensure that all FAA Special Compartmented Information Facilities (SCIF) and all classified information networks and communications systems meet required Director, Central Intelligence Directives (D/CID) or Intelligence Community Directives (ICD).

ASH will ensure that a national emergency operations program and structure exist to support national and regional operations during any Incidents of National Significance (natural or technological disasters, pandemic influenza outbreaks, terrorism incidents, and widespread communications outages). ASH will ensure the structure provides national level management, training, exercises and policy guidance on emergency readiness and response. ASH will also ensure the availability of command and control communications support through the WOCC and regional entities. This will be accomplished through:

- Planning, procurement, engineering, design, testing, and implementation of FAA-wide command and control communications, including classified messaging equipment.
- Ensuring that continuity of operations facilities and procedures, for example communications and logistics, are continually available and regularly exercised through readiness exercises and training, maintaining continual facility operational capability, and COOP Cadre management.
- Directing and providing guidance for the development, testing, and implementation of the agencywide plan to sustain essential government services during a pandemic influenza outbreak.
- Ensuring that all personnel have adequate access to and training in the operation of secure communications equipment by providing national level management, training and policy guidance on the FAA-wide secure voice and facsimile program, and support various classified programs.
- Providing comprehensive response during national emergencies to include natural disasters, terrorist events, military mobilizations, and pandemic influenza.

ASH will further improve its cyber security by assuring the confidentiality, integrity, and availability of information and information systems. This will be accomplished by ensuring that all newly developed systems have completed, current Certification & Accreditation (C&A) and undergone a self-assessment if C&A is not required; recertified systems in the inventory; and remediate high vulnerabilities as identified in the Enterprise Security Portal (ESP).

# **Explanation of Funding Changes for Staff Offices**

	<u>Dollars (\$000)</u>	<u>FTE</u>
Staff Offices (Net Change from FY 2010 Enacted)	\$51,212	59
Overview:  For FY 2010, the Assistant Administrators for the 12 staff offices request \$8 meet their respective missions. The FY 2011 request corresponds to an inc percent) and an increase of 59 FTE (2.1 percent) over the FY 2010 enacted. The FY 2011 request level reflects unavoidable pay raises and inflation; pro FAA base transfers.  Unavoidable Adjustments  Annualized FY 2010 Pay Raise (GS Population):  This pay raise has been calculated separately based on the employee population still under the General Schedule. This increase is needed to provide for the full-year cost associated with the 2.0 percent average government-wide pay raise in January 2010. The actual factor used is 2.9 (2.0 percent plus 0.9 percent average of Within-Grade increases).	rease of \$51,212,000 d level.	0 (6.4
The FY 2010 portion of this pay raise is funded within enacted amounts; this increase covers the first quarter of FY 2011.		
Annualized FY 2010 Pay Raise (Core Comp Population):  This pay raise has been calculated separately based on the employee population under the Core Compensation pay plan. This increase is needed to provide for the full-year cost associated with the Organizational Success Increase (OSI) and the Superior Contribution Increase (SCI) awarded in FY 2010. The OSI is 100 percent of the 2.0 percent average government-wide pay raise plus 1.0 percent (3.0 percent). The Core Compensation system awards three different pay raises—20 percent of the population receive the OSI plus a 1.8 percent SCI, 45 percent receive the OSI plus a 0.6 percent SCI, and 35 percent receive just the OSI. The FY 2010 portion of this pay raise is funded within enacted amounts; this increase covers the first quarter of FY 2011.	3,329	
FY 2011 Pay Raise (GS Population):	8	
This pay raise has been calculated separately based on the employee population under the General Schedule. This increase is required to provide for costs associated with base salary increases. The factor used is 2.3 percent, composed of the projected 1.4 percent government-wide pay raise in January 2011 plus 0.9 percent average of Within-Grade increases.		

Operations 147

6,627

FY 2011 Organizational Success Increase (OSI) (Core Comp Population):

This pay raise has been calculated separately based on the employee

	<b>Dollars (\$000)</b>	<u>FTE</u>
population under the Core Compensation pay plan. This increase is required to provide for costs associated with base salary increases that are provided to employees meeting or exceeding job expectations. The factor used is 2.4 percent, composed of the projected 1.4 percent government-wide pay raise in January 2011 plus 1.0 percent for the full OSI increase (derived from the elimination of Within-Grade increases). A fundamental component of the FAA's pay-for-performance system, this increase assumes FAA will meet most of its FY 2010 performance goals.		
FY 2011 Superior Contribution Increase (SCI):	1,733	
This increase is required to provide for costs associated with base salary increases that are provided to employees in the Core Compensation system providing superior contributions to the organization. The factor used is 1.8 percent for 20 percent of the population and 0.6 percent for 45 percent of the population. The remaining 35 percent do not receive this increase.		
Non-Pay Inflation:	2,203	
This increase is needed to provide for inflationary cost increases consistent with OMB guidance that uses the FY 2011 GDP price index (year over year) of 0.5 percent.	2,200	
Discretionary Increases		
New Service Center Building:  The Service Center leases for Seattle, Ft. Worth and Atlanta will expire between 2011 and 2013. Along with lease expirations, each Service Center has seen extensive growth due to the Air Traffic Organization realignment, mandated Flight Standards hiring, and Logistics support realignment. To accommodate the growth, additional satellite locations were acquired in each of the Service Centers. These additional locations increased lease costs, security costs, and IT infrastructure costs. To reduce these costs and improve overall efficiency, new Service Center facilities are being planned that would consolidate the satellite locations and the existing Service Center headquarters into three new facilities. The FY 2011 budget requests \$20 million to begin the transition.  Regions and Center Operations (ARC) requests funding for FAA-specific security, facility, telecommunications, furniture, and equipment requirements for the Western and Central Service Center facilities being brought online over the next fiscal years. The new facilities will allow FAA to consolidate multiple leased facilities in the surrounding areas of the new buildings.	20,000	
Protect FAA Information Security Infrastructure:  Information Services (AIO) requests funding to complete critically required Certification & Accreditation packages, Contingency Plan Tests, and Annual Assessments. Unfunded amounts affect the needed implementation of the Enterprise Logical Access and Authorization Control Service (LAACS) solution in alignment with DOT's implementation	6,000	

	<u>Dollars (\$000)</u>	<u>FTE</u>
of the FIPS 201 Personal Identity Verification and NIST Special Publication 800-53, Security Policy Control Standards, for FAA employees and contractors.		
Implementation of NextGen Environmental & Energy Technologies, Models & Metrics:	3,019	2
Office of Aviation Policy Planning and Environment (AEP) requests funding for two FTE and contract support to initiate transition of maturing NextGen environmental and energy research and development to implementation.		
In FY 2011, AEP will initiate transition of maturing NextGen environmental and energy research and development to implementation. These positions and contract funds are needed to support the implementation-through adoption into policies, standards, guidance, and operational programsof environmental and energy research and development results/products in areas of new aircraft technologies and operational procedures, alternative fuels, advanced decision support models, evolving health and welfare targets and metrics. Efforts include policy and technical support to FAA lines of business to facilitate implementation. More specifically, staff and contract funding will enable us to hire an aviation energy specialist to deal with policy, program guidance, and operational support for high visibility aviation energy and related climate issues plus provide contract support for operational aspects of implementing solutions to deal with global energy and climate issues; an economist plus contract support for specialized environmental and energy benefit/cost analysis including support for developing and supporting U.S. positions in the international arena; an aviation emissions specialist plus contract support for emissions/noise certification advancement and alternative fuels certification activities; an environmental specialist for policy/guidance plus contract support to develop transformational policy positions and guidance enabled by advances in aircraft technology, decision support models, and shifting environmental imperatives (for example, potential cap-and-trade policies and alternatives, scope for considering Federal phaseouts of noisier or dirtier aircraft, transitions of FAA noise programs into broader noise and emissions programs); and a technical specialist plus contract support to enable in-house modeling capability for effective and efficient application of new NextGen environmental decision support models for emissions, climate, fuel burn, noise benefits and costs, including staffing a modeling lab to per		
Safety Inspections and Emergency Operations:	8,022	54
Office of Security and Hazardous Material (ASH) requests funding for 54 FTE to facilitate an increase in safety and compliance by all parties involved in transporting hazardous materials onboard passenger and cargo aircraft, and to establish an oversight program for the 14 CFR hazardous material requirements codified in February 2007. Funding requested will enable the Office of Hazardous Materials (ADG) to change the way it approaches compliance and enforcement by implementing its oversight responsibilities of all Part 121 and 135 air carriers as well as Part 145 repair stations within the Flight Standards (AFS) inspection		

	<u>Dollars (\$000)</u>	<u>FTE</u>
processes for certification and oversight to verify compliance. This interactive process also incorporates ADG into FAA's Safety Management Systems (SMS) for certificate holder oversight. The requested resources will enable FAA to meet the Flight Plan goal of a fully implemented hazardous material safety oversight program throughout the aviation community.		
Base Transfers		
NextGen and Acquisitions Hiring Support:	267	3
The Air Traffic Organization (ATO) has requested the Human Resources Management Office, ACT-10 located at the William J. Hughes Technical Center, be assigned to handle all personnel actions for the NextGen and Operations Planning organization (AJP). Additionally, Acquisition and Business Services (AJP) has asked for support for corporate recruitment.		
Labor Relations/ National Employee Safety:	0	0
The Office of Aviation Policy, Planning and Environment will transfer one EOY/FTE and \$177,000 to the Office of Human Resource Management to support the employee safety program, providing program management support, contract management support and coordination of issues where employee safety and environmental protection overlap. The workload of the program has increased significantly over the past years, as AHR has led the Occupational Safety, Health and Environmental Compliance Committee (OSHECCOM) to identify and address issues that affect employee safety and health FAA-wide. This office works closely with all Lines of Business and Staff Offices in support of the Flight Plan goal to reduce workplace injuries.		
Safety and Hazardous Materials:	0	0
The Office of Civil Rights will transfer one EOY/FTE and \$66,000 to the Office of Safety and Hazardous Materials.		

### Resource Summary

### **Staff Office Total**

	FY 2009 Actual <sup>1</sup>	FY 2010 Enacted	Unavoidable Changes	Discretionary Changes	FY 2011 Request
Funding (\$000)					
PC&B	333,106	360,752	4,148	6,287	371,187
Other Objects					
Travel/Transportation	16,768	16,890	533	-	17,423
Other Services	243,671	249,355	6,816	10,754	266,925
RCU <sup>2</sup>	152,886	158,275	(17,471)	20,000	160,804
Other <sup>3</sup>	15,976	16,155	20,145	-	36,299
Total	429,302	440,675	10,023	30,754	481,452
Total	762,408	801,427	14,171	37,041	852,639
Staffing					
EOY (FTP)	2,613	2,728	3	113	2,844
OTFTP	90	87	-	-	87
Total FTEs (Includes FTP and OTFTP)	2,634	2,795	3	56	2,854

### Resource Summary

#### ABA

	FY 2009 Actual <sup>1</sup>	FY 2010 Enacted	Unavoidable Changes	Discretionary Changes	FY 2011 Request
Funding (\$000)	2				
PC&B	19,391	19,940	(2,868)	-	17,073
Other Objects					
Travel/Transportation	368	379	19	-	398
Other Services	85,348	87,602	3,814	-	91,415
RCU <sup>2</sup>	5,851	6,017	301	-	6,318
Other <sup>3</sup>	(410)	(257)	(163)	-	(420)
Total	91,158	93,741	3,971	=	97,711
Total	110,549	113,681	1,103	-	114,784
Staffing					
EOY (FTP)	136	162	-	=	162
OTFTP	1	=	-	=	-
Total FTEs (Includes FTP and OTFTP)	125	162	-	=	162

<sup>1</sup> FY 2009 derived from actual obligations.

<sup>2</sup> Rents, Communications, Utilities.

<sup>3</sup> Printing & Reproduction Services, Supplies & Materials, Equipment, Land & Structures, and Insurance Claims & Indemnities.

### Resource Summary

### AHR

	FY 2009 Actual <sup>1</sup>	FY 2010 Enacted	Unavoidable Changes	Discretionary Changes	FY 2011 Request
Funding (\$000)					
PC&B	67,707	71,749	2,671	-	74,420
Other Objects					
Travel/Transportation	1,620	1,465	3	-	1,467
Other Services	23,555	23,621	191	=	23,812
RCU <sup>2</sup>	230	212	1	-	213
Other <sup>3</sup>	2,582	3,381	3	-	3,385
Total	27,987	28,679	198	-	28,877
Total	95,694	100,428	2,869	-	103,297
Staffing					
EOY (FTP)	577	595	4	-	599
OTFTP	38	32	-	-	32
Total FTEs (Includes FTP and OTFTP)	605	624	4	-	628

### Resource Summary

### ARC

	FY 2009 Actual <sup>1</sup>	FY 2010 Enacted	Unavoidable Changes	Discretionary Changes	FY 2011 Request
Funding (\$000)	riotaar		e.iaiigee	onangee	rtoquoot
PC&B	96,110	99,519	(6,232)	-	93,287
Other Objects					
Travel/Transportation	7,472	7,737	109	=	7,845
Other Services	75,337	77,942	8,299	=	86,241
RCU <sup>2</sup>	144,137	149,249	(17,904)	20,000	151,345
Other <sup>3</sup>	7,207	7,530	20,106	-	27,636
Total	234,153	242,458	10,609	20,000	273,067
Total	330,263	341,977	4,377	20,000	366,354
Staffing					
EOY (FTP)	820	780	-	-	780
OTFTP	17	29	-	-	29
Total FTEs (Includes FTP and OTFTP)	824	822	-	-	822

FY 2009 derived from actual obligations.
 Rents, Communications, Utilities.
 Printing & Reproduction Services, Supplies & Materials, Equipment, Land & Structures, and Insurance Claims & Indomnities Indemnities.

### Resource Summary

### AIO

	FY 2009	FY 2010	Unavoidable	Discretionary	FY 2011
	Actual 1	Enacted	Changes	Changes	Request
Funding (\$000)					
PC&B	14,551	15,840	4,105	-	19,946
Other Objects					
Travel/Transportation	1,101	1,178	59	-	1,237
Other Services	29,421	30,980	(3,557)	6,000	33,423
RCU <sup>2</sup>	417	446	22	-	468
Other <sup>3</sup>	779	833	42	-	875
Total	31,718	33,438	(3,434)	6,000	36,003
Total	46,269	49,278	671	6,000	55,949
Staffing					
EOY (FTP)	92	108	-	-	108
OTFTP	5	6	=	=	6
Total FTEs (Includes FTP and OTFTP)	93	108	-	-	108

### Resource Summary

#### AOA

	FY 2009 Actual <sup>1</sup>	FY 2010 Enacted	Unavoidable Changes	Discretionary Changes	FY 2011 Request
Funding (\$000)					
PC&B	3,003	3,381	270	-	3,651
Other Objects					
Travel/Transportation	69	80	10	-	90
Other Services	1,363	702	(172)	-	530
RCU <sup>2</sup>	3	3	1	-	4
Other <sup>3</sup>	34	39	22	-	61
Total	1,469	824	(140)	=	684
Total	4,472	4,205	130	-	4,335
Staffing					
EOY (FTP)	23	20	-	-	20
OTFTP	1	4	-	=	4
Total FTEs (Includes FTP and OTFTP)	24	24	=	-	24

<sup>1</sup> FY 2009 derived from actual obligations.

<sup>2</sup> Rents, Communications, Utilities.

<sup>&</sup>lt;sup>3</sup> Printing & Reproduction Services, Supplies & Materials, Equipment, Land & Structures, and Insurance Claims & Indemnities.

### Resource Summary

### ACR

	FY 2009 Actual <sup>1</sup>	FY 2010 Enacted	Unavoidable Changes	Discretionary Changes	FY 2011 Request
Funding (\$000)					
PC&B	8,524	9,634	166	-	9,800
Other Objects					
Travel/Transportation	409	468	37	-	505
Other Services	711	525	89	-	614
RCU <sup>2</sup>	43	50	15	-	65
Other <sup>3</sup>	248	300	(60)	-	240
Total	1,412	1,343	81	-	1,424
Total	9,937	10,977	247	-	11,224
Staffing					
EOY (FTP)	75	81	(1)	-	80
OTFTP	1	4	-	-	4
Total FTEs (Includes FTP and OTFTP)	75	85	(1)	-	84

### Resource Summary

#### AGI

	FY 2009	FY 2010	Unavoidable	Discretionary	FY 2011
	Actual 1	Enacted	Changes	Changes	Request
Funding (\$000)					
PC&B	1,228	1,516	48	-	1,565
Other Objects					
Travel/Transportation	5	26	2	_	28
Other Services	_	20	2		20
	9	-	-	-	-
RCU <sup>2</sup>	6	8	2	-	9
Other <sup>3</sup>	45	46	3	-	49
Total	65	80	7	-	86
Total	1,292	1,596	55	-	1,651
Staffing					
EOY (FTP)	9	12	-	-	12
OTFTP	1	-	-	-	-
Total FTEs (Includes FTP and OTFTP)	10	12	-	_	12

FY 2009 derived from actual obligations.
 Rents, Communications, Utilities.
 Printing & Reproduction Services, Supplies & Materials, Equipment, Land & Structures, and Insurance Claims & Indomnities Indemnities.

### Resource Summary

### AOC

	FY 2009 Actual <sup>1</sup>	FY 2010 Enacted	Unavoidable Changes	Discretionary Changes	FY 2011 Request
Funding (\$000)					
PC&B	5,044	5,330	160	-	5,490
Other Objects					
Travel/Transportation	71	86	5	-	91
Other Services	1,194	1,365	2	-	1,367
RCU <sup>2</sup>	61	60	-	-	60
Other <sup>3</sup>	84	51	10	-	61
Total	1,410	1,562	17	-	1,579
Total	6,454	6,892	177	-	7,069
Staffing					
EOY (FTP)	32	34	-	-	34
OTFTP	-	1	-	-	1
Total FTEs (Includes FTP and OTFTP)	31	34	-	-	34

### Resource Summary

### AGC

	FY 2009 Actual <sup>1</sup>	FY 2010 Enacted	Unavoidable Changes	Discretionary Changes	FY 2011 Request
Funding (\$000)			<u>_</u>	<u>_</u>	·
PC&B	36,618	42,727	1,990	-	44,717
Other Objects					
Travel/Transportation	1,424	1,150	100	-	1,250
Other Services	4,559	4,365	(754)	-	3,611
RCU <sup>2</sup>	99	95	3	-	98
Other <sup>3</sup>	902	865	50	-	915
Total	6,984	6,475	(601)	-	5,874
Total	43,602	49,202	1,389	-	50,591
Staffing					
EOY (FTP)	248	275	-	-	275
OTFTP	9	9	-	-	9
Total FTEs (Includes FTP and OTFTP)	253	279	-	-	279

Indemnities.

### Resource Summary

### AEP

	FY 2009 Actual <sup>1</sup>	FY 2010 Enacted	Unavoidable Changes	Discretionary Changes	FY 2011 Request
Funding (\$000)					
PC&B	10,913	13,332	184	270	13,786
Other Objects					
Travel/Transportation	224	262	16	-	278
Other Services	2,110	3,450	62	2,749	6,261
RCU <sup>2</sup>	71	72	-	-	72
Other <sup>3</sup>	242	162	5	-	167
Total	2,648	3,945	83	2,749	6,777
Total	13,560	17,277	267	3,019	20,563
Staffing					
EOY (FTP)	80	95	(1)	3	97
OTFTP	-	1	-	-	1
Total FTEs (Includes FTP and OTFTP)	72	96	(1)	2	97

### Resource Summary

#### API

	FY 2009 Actual <sup>1</sup>	FY 2010 Enacted	Unavoidable Changes	Discretionary Changes	FY 2011 Request
Funding (\$000)				<u> </u>	·
PC&B	11,065	11,796	419	=	12,216
Other Objects					
Travel/Transportation	1,393	1,390	42	-	1,432
Other Services	4,657	4,494	135	-	4,629
RCU <sup>2</sup>	413	508	15	-	523
Other <sup>3</sup>	367	135	4	-	139
Total	6,830	6,527	196	-	6,722
Total	17,895	18,323	615	-	18,938
Staffing					
EOY (FTP)	60	69	-	-	69
OTFTP	4	1	-	-	1
Total FTEs (Includes FTP and OTFTP)	62	65	-	-	65

<sup>1</sup> FY 2009 derived from actual obligations.

<sup>2</sup> Rents, Communications, Utilities.

<sup>3</sup> Printing & Reproduction Services, Supplies & Materials, Equipment, Land & Structures, and Insurance Claims & Indemnities.

### Resource Summary

### ASH

	FY 2009 Actual <sup>1</sup>	FY 2010 Enacted	Unavoidable Changes	Discretionary Changes	FY 2011 Request
Funding (\$000)					
PC&B	58,952	65,986	3,233	6,017	75,237
Other Objects					
Travel/Transportation	2,613	2,670	131	-	2,801
Other Services	15,407	14,309	(1,292)	2,005	15,023
RCU <sup>2</sup>	1,554	1,557	74	-	1,630
Other <sup>3</sup>	3,896	3,069	124	-	3,193
Total	23,469	21,605	(962)	2,005	22,647
Total	82,421	87,591	2,271	8,022	97,884
Staffing					
EOY (FTP)	461	497	1	110	608
OTFTP	13	-	-	-	-
Total FTEs (Includes FTP and OTFTP)	460	484	1	54	539

FY 2009 derived from actual obligations.
 Rents, Communications, Utilities.

Printing & Reproduction Services, Supplies & Materials, Equipment, Land & Structures, and Insurance Claims & Indemnities.

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# FACILITIES AND EQUIPMENT (AIRPORT AND AIRWAY TRUST FUND)

For necessary expenses, not otherwise provided for, for acquisition, establishment, technical support services, improvement by contract or purchase, and hire of national airspace systems and experimental facilities and equipment, as authorized under part A of subtitle VII of title 49, United States Code, including initial acquisition of necessary sites by lease or grant; engineering and service testing, including construction of test facilities and acquisition of necessary sites by lease or grant; construction and furnishing of quarters and related accommodations for officers and employees of the Federal Aviation Administration stationed at remote localities where such accommodations are not available; and the purchase, lease, or transfer of aircraft from funds available under this heading, including aircraft for aviation regulation and certification; to be derived from the Airport and Airway Trust Fund, \$2,970,000,000, of which \$2,478,000,000 shall remain available until September 30, 2013, and of which \$492,000,000 shall remain available until September 30, 2011: Provided, That there may be credited to this appropriation funds received from States, counties, municipalities, other public authorities, and private sources, for expenses incurred in the establishment, improvement, and modernization of National Airspace Systems: Provided further, That upon initial submission to the Congress of the fiscal year 2012 President's budget, the Secretary of Transportation shall transmit to the Congress a comprehensive capital investment plan for the Federal Aviation Administration which includes funding for each budget line item for fiscal years 2012 through 2016, with total funding for each year of the plan constrained to the funding targets for those years as estimated and approved by the Office of Management and Budget.

# FACILITIES AND EQUIPMENT (AIRPORT AND AIRWAY TRUST FUND)

# Program and Financing (in millions of dollars)

T-lE	tion and at CO 0107 0 7 402	EV 2000	EV 2010	EV 2011
Identifi	cation code: 69-8107-0-7-402	FY 2009 Actual	FY 2010 Estimate	
	Obligations by program activity:	7100001		
	Direct program:			
00.01	Engineering, development, test and evaluation	310	489	674
00.02	Procurement and modernization of (ATC) facilities and equipment	1,508	1,726	1,523
00.03	Procurement and modernization of non-ATC facilities and equipment	123	117	149
00.04	Mission support	239	240	261
00.05	Personnel and related expenses	460	470	
01.00	Subtotal, direct program	2,640	3,042	3,099
09.01	Reimbursable program	94	140	
10.00	Total new obligations	2,734	3,182	3,239
	Budgetary resources available for obligation:			
21.40	Unobligated balance carried forward, start of year	1,016	1,203	1,097
22.00	New budget authority (gross)	2,860	3,076	3,110
22.10	Resources available from recoveries of prior year obligations	67		
22.30	Expired unobligated balance transfer to unexpired account	3		
23.90	Total budgetary resources available for obligation	3,946	4,279	,
23.95	Total new obligations	-2,734	-3,182	-3,239
23.98	Unobligated balance expiring or withdrawn	-9		
24.40	Unobligated balance carried forward, end of year	1,203	1,097	968
24.41	Special and trust fund receipts returned to Schedule N	52		
24.51	Expired unobligated balance carried forward, start of year (special and trust	130		
	funds)			
24.52		120		
	funds)			
	New budget authority (gross), detail:			
40.26	Discretionary:	2 742	2.026	2.070
40.26	Appropriation (trust fund)	2,742	2,936	•
58.00	Spending authority from offsetting collections: Offsetting collections (cash)	75 42	140	
58.10	Change in uncollected customer payment for Federal sources (unexpired)	43	140	
58.90	Spending authority from offsetting collections (total discretionary)	118	140	
70.00	Total new budget authority (gross)	2,860	3,076	3,110
72.40	Change in obligated balances: Obligated balance, start of year:	1 706	1 020	2 121
72.40 72.10		1,786	1,830	•
73.10 73.20	Total new obligations	2,734	3,182	•
73.40	Total outlays (gross)	-2,541 -58	-2,881	•
73.45	Recoveries of prior year obligations	-56 -67		
74.00	Change in uncollected customer payment for Federal sources (unexpired)	-43		
74.10	Change in uncollected customer payment for Federal sources (unexpired)	19		
74.40	Obligated balance, end of year	1,830	2,131	
77.70	Outlays (gross), detail:	1,030	2,131	2,299
86.90	Outlays from new discretionary authority	1,046	1,343	1,366
86.93		1,482	1,510	
	Outlays from mandatory balances	13	28	-,
87.00	Total outlays (gross)	2,541	2,881	
07100	Offsets:	2/3 11	2/001	3,0,1
	Against gross budget authority and outlays:			
	Offsetting collections (cash) from:			
88.00	Federal sources	6	47	47
88.40	Non-Federal sources	75	93	
88.90	Total, offsetting collections (cash)	81	140	
- 5.55	Against gross budget authority only:	31	_ 10	
88.95	Change in uncollected customer payments from Federal sources (unexpired)	43		
88.96	Portion of offsetting collections (cash) credited to expired accounts	-6		

	Net budget authority and outlays			
89.00	Budget authority	2,742	2,936	2,970
90.00	Outlays	2,460	2,741	2,931
95.02	Unpaid obligation, end of year	1,945		

Funding in this account provides for the deployment of communications, navigation, surveillance, and related capabilities within the National Airspace System (NAS). This includes funding for several activities of the Next Generation Air Transportation System, a joint effort between the FAA, NASA, and the Departments of Defense, Homeland Security and Commerce to improve the safety, capacity, security, and environmental performance of the NAS. As the organization primarily responsible for air traffic infrastructure, the Air Traffic Organization receives and manages 95 percent of the funding in this account. The funding request for FY 2011 supports FAA's comprehensive plan for modernizing, maintaining, and improving air traffic control and airway facilities services.

# Object Classification (in millions of dollars)

		FY 2009	FY 2010	FY 2011
Identific	ation code: 69-8107-0-7-402	Actual	Estimate	Estimate
	Direct obligations:			
	Personnel compensation:			
11.11	Full-time permanent	308	325	338
11.13	Other than full-time permanent	4	5	6
11.15	Other personnel compensation	9	10	11
11.19	Total personnel compensation	321	340	355
11.21	Civilian personnel benefits	80	85	90
12.10	Travel and transportation of persons	41	35	37
12.20	Transportation of things	2	3	3
12.32	Rental payments to others	72	34	35
12.33	Communications, utilities, and miscellaneous charges		41	42
12.40	Printing and reproduction		1	1
12.52	Other services	1,739	1,966	1,983
12.60	Supplies and materials	31	43	45
13.10	Equipment	216	310	320
13.20	Land and structures	128	178	182
14.10	Grants, subsidies, and contributions	10	6	6
19.90	Subtotal, direct obligations	2,640	3,042	3,099
29.90	Reimbursable obligations	94	140	140
99.99	Total new obligations	2,734	3,182	3,239

### **Employment Summary**

	FY 2009	FY 2010	FY 2011
Identification code: 69-8107-0-7-402	Actual	Enacted	Estimate
Direct			
1001 Civilian full-time equivalent employment	2,736	2,968	2,968
Reimbursable			
2001 Civilian full-time equivalent employment	40	55	55

#### **EXHIBIT III-1**

# FACILITIES and EQUIPMENT SUMMARY BY PROGRAM ACTIVITY Appropriations, Obligations Limitations, and Exempt Obligations (\$000)

	FY 2009 ACTUAL*	FY 2010 ENACTED	FY 2011 REQUEST	CHANGE <u>FY 2010-</u> <u>2011</u>
Engineering, Development, Test and Evaluation Air Traffic Control Facilities and	345,100	520,742	708,522	187,810
Equipment.  Non-Air Traffic Control Facilities	1,768,290	1,581,244	1,377,892	(203,352)
and Equipment. Facilities and Equipment Mission	141,800	131,917	150,456	18,539
Support	226,405	232,300	241,100	8,800
Personnel and Related Expenses	460,500	470,000	492,000	22,000
TOTAL	2,942,095	2,936,203	2,970,000	33,797
FTEs Direct Funded	2,736	2,968	2,968	0
Reimbursable	40	55	55	0

### **Program and Performance Statement**

This account provides funds for programs that improve operational efficiency, constrain costs, modernize automation and communication technology and systems, and deal with aging facilities. Particular emphasis is placed on en route and terminal air traffic control, satellite navigation and landing systems, and communications.

Funding is organized within the following activity areas of FAA:

- Activity 1: Engineering, development, test and evaluation;
- Activity 2: Procurement and modernization of air traffic control facilities and equipment; procurement and modernization on non-air traffic control facilities and equipment;
- Activity 3: Procurement and modernization of non-Air Traffic Control facilities and equipment; and
- Activity 4: Facilities and equipment mission support.

As the organization primarily responsible for air traffic infrastructure, the performance based Air Traffic Organization (ATO) receives and manages 95 percent of the funding in this account. The remaining five percent of the funding is for Aviation Safety (AVS), Information Services (AIO), and Regions and Centers (ARC).

\* Includes funding provided by the American Recovery and Reinvestment Act of 2009. This Act provided supplemental funding of \$200 million to Facilities & Equipment

### EXHIBIT III-2

# FACILITIES and EQUIPMENT SUMMARY ANALYSIS OF CHANGE FROM FY 2010 TO FY 2011 Appropriations, Obligation Limitations, and Exempt Obligations

Item	Change from FY 2010 to FY 2011	FY 2011 PC&B by Program	FY 2011 FTEs by Program	FY 2011 Contract Expenses	Total
FY 2010 Base		11010 00			
Facilities and Equipment Appropriations, Obligations, Limitations, and Exempt Obligations		\$425,013	2,968	\$1,862,108	\$2,936,203
Adjustments to Base					
Annualized FY 2010 Pay Raise (GS Population)	\$4,144	\$4,144			
Annualized FY 2010 Pay Raise (Core Comp Population)	924	924			
FY 2011 Pay Raise (GS Population)	14,663	14,663			
FY 2011 OSI (Core Comp Population)					
FY 2011 SCI					
Non-pay Inflation	12,566		0	9,311	
Subtotal, Adjustments to Base	\$32,287	\$19,731	0	\$9,311	\$32,287
New or Expanded Programs					
Engineering, Development, Test and Evaluation	186,810			184,204	
Air Traffic Control Facilities and Equipment	(212,850)			(212,287)	
Non-Air Traffic Control Facilities and Equipment	17,832			17,832	
Facilities and Equipment Mission Support	7,675			7,675	
Personnel and Related Expenses	2043			2,043	
Subtotal, New or Expanded Programs	\$1,510	\$0	0	(533)	1,510
Total FY 2011 Request	\$33,797	\$444,744	2,968	\$1,870,886	\$2,970,000

		<u>Amount</u>	<u>Page</u>
Activity	1, Engineering, Development, Test and Evaluation		
1A01	Advanced Technology Development and Prototyping	\$25,500,000	9
1A02	NAS Improvement of System Support Laboratory	\$1,000,000	17
1A03	William J. Hughes Technical Center Facilities	\$13,000,000	19
1A04	William J. Hughes Technical Center Infrastructure Sustainment	\$7,500,000	21
1A05	Next Generation Network Enabled Weather (NNEW)	\$28,250,000	23
1A06	Data Communications in support of Next Generation Air Transportation System	\$153,300,000	26
1A07	Next Generation Transportation System Demonstration and Infrastructure Development	\$27,000,000	29
1A08	Next Generation Transportation System – System Development	\$95,000,000	32
1A09	Next Generation Transportation System – Trajectory Based Operations	\$58,600,000	40
1A10	Next Generation Transportation System – Reduce Weather Impact	\$43,202,000	46
1A11	Next Generation Transportation System – Arrivals/Departures at High Density Airports	\$57,000,000	51
1A12	Next Generation Transportation System – Collaborative ATM	\$75,500,000	58
1A13	Next Generation Transportation System – Flexible Terminals and Airports	\$80,700,000	66
1A14	Next Generation Transportation System – Safety, Security and Environment	\$8,000,000	75
1A15	Next Generation Transportation System – Systems Networked Facilities	\$35,000,000	78
Tota	al, Activity 1	\$708,552,000	
A - 1!!1-	. O. D		
	2, Procurement and Modernization of Air Traffic Control Facilitie in Route Programs	s and Equipment	I
2A01	En Route Automation Modernization (ERAM)	\$132,300,000	84
2A02	En Route Communications Gateway (ECG)	\$6,000,000	87
2A03	Next Generation Weather Radar (NEXRAD)	\$6,700,000	90
2A04	Air Traffic Control Command Center (ATCSCC) – Relocation	\$2,100,000	92
2A05	ARTCC Building Improvements/Plant Improvements	\$36,892,000	94
2A06	Air Traffic Management (ATM)	\$16,500,000	96
2A07	Air/Ground Communications Infrastructure	\$7,600,000	99
2A08	Air Traffic Control En Route Radar Facilities Improvements	\$5,300,000	101
2A09	Voice Switch and Control System (VSCS)	\$15,600,000	103
2A10	Oceanic Automation System	\$4,000,000	105
2A11	Next Generation Very High Frequency Air/Ground Communications System (NEXCOM)	\$49,850,000	108
2A12	System-Wide Information Management (SWIM)	\$92,000,000	111
2A13	ADS-B NAS Wide Implementation	\$176,100,000	114
2A14	Windshear Detection Services	\$1,000,000	118
2A15	Weather and Radar Processor (WARP)	\$2,100,000	120
2A16	Collaborative Air Traffic Management Technologies	\$35,900,000	122
2A17	En Route Modernization (ERAM) – Post Release 3	\$5,000,000	124
	Ferminal Programs		
2B01	Airport Surface Detection Equipment – Model X (ASDE-X)	\$4,200,000	126
2B02	Terminal Doppler Weather Radar (TDWR) – Provide	\$8,600,000	129
2B03	Standard Terminal Automation Replacement System (STARS) (TAMP Phase 1)	\$22,000,000	131
2B04	Terminal Automation Modernization/Replacement Program (TAMR Phase 3)	\$20,000,000	133
2B05	Terminal Automation Program	\$3,900,000	135
2B06	Terminal Air Traffic Control Facilities – Replace	\$114,600,000	137
2B07	ATCT/Terminal Radar Approach Control (TRACON) Facilities – Improve	\$45,600,000	140
2B08 2B09	Terminal Voice Switch Replacement (TVSR) NAS Facilities OSHA and Environmental Standards Compliance	\$11,500,000 \$26,000,000	142 144
2B19	Airport Surveillance Radar (ASR-9) Service Life Extension Program (SLEP)	\$3,000,000	144
2B10 2B11	Terminal Digital Radar (ASR-11) Technology Refresh	\$3,000,000 \$4,100,000	146 148
2B11 2B12	Precision Runway Monitors (PRM)	\$4,100,000 \$950,000	150
2B12	Runway Status Lights (RWSL)	\$55,000,000	150
2B13 2B14	National Airspace System Voice Switch (NVS)	\$30,200,000	154
2B15	Next Generation Voice Recorder Replacement Program	\$9,400,000	156
2B16	Integrated Display System (IDS)	\$8,700,000	158
		+2/, 00/000	_50

2B17	Airport Surveillance Radar (ASR-8) – Service Life Extension Program (SLEP)	\$2,600,000	160
2B17	Integrated Terminal Weather System (ITWS)	\$5,500,000	162
2B19	Terminal Automation Modernization /Replacement Program (TAMR Phase 2)	\$3,100,000	164
2B20	Remote Maintenance Monitoring (RMM)	\$6,500,000	166
2B21	Mode S Service Life Extension Program (SLEP)	\$1,500,000	168
2021	Plode 3 Service Life Extension Program (SEE)	Ψ1,300,000	100
c.	Flight Service Programs		
2C01	Automated Surface Observing System (ASOS)	\$6,700,000	170
2C02	Flight Service Station (FSS) Modernization	\$21,400,000	172
2C03	Weather Camera Program	\$3,200,000	175
d.	Landing and Navigational Aids Program		
2001	VHE Omnidirectional Padia Panga (VOP) with Distance Measuring Equipment	¢E 000 000	177
2D01	VHF Omnidirectional Radio Range (VOR) with Distance Measuring Equipment (DME)	\$5,000,000	177
2D02	Instrument Landing System (ILS) – Establish	\$7,800,000	179
2D02 2D03	Wide Area Augmentation System (WAAS) for GPS	\$95,000,000	181
2D03	Runway Visual Range (RVR)	\$5,000,000	185
2D04 2D05	Approach Lighting System Improvement Program (ALSIP)		187
2D03 2D06		\$5,000,000 ¢4,100,000	189
	Distance Measuring Equipment (DME)	\$4,100,000	
2D07	Visual Navaids – Establish/Expand	\$3,800,000	191
2D08	Instrument Flight Procedures Automation (IFPA)	\$600,000	193
2D09	Navigation and Landing Aids – Service Life Extension Program (SLEP)	\$6,000,000	196
2D10	VASI Replacement – Replace with Precision Approach Indicator	\$4,000,000	198
2D11	Global Positioning System (GPS) Civil Requirements	\$58,500,000	200
2D12	Runway Safety Areas – Navigational Mitigation	\$20,000,000	202
e.	Other ATC Facilities Programs		
		1.5.5.5.5.5.5	
2E01	Fuel Storage Tank Replacement and Monitoring	\$6,300,000	204
2E02	Unstaffed Infrastructure Sustainment	\$14,100,000	206
2E03	Aircraft Related Equipment Program	\$9,000,000	208
2E04	Airport Cable Loop Systems – Sustained Support	\$7,000,000	210
2E05	Alaskan NAS Interfacility Communications System (ANICS)	\$12,100,000	212
2E06	Facilities Decommissioning	\$6,400,000	214
2E07	Electrical Power System – Sustain/Support	\$95,000,000	216
_			
10	tal, Activity 2	\$1,377,892,000	
Activi	y 3, Procurement and Modernization of Non-Air Traffic Control Fa	cilities and Equip	ment
	Support Programs	• •	
3A01	Hazardous Materials Management	\$20,000,000	219
3A02	Aviation Safety Analysis System (ASAS)	\$14,600,000	221
	Logistics Support System and Facilities (LSSF)	1	
3A03 3A04	National Air Space Recovery Communications (RCOM)	\$11,500,000 \$15,000,000	224
			226
3A05	Facility Security Risk Management	\$17,000,000	229
3A06	Information Security	\$15,200,000	231
3A07	System Approach for Safety Oversight (SASO)	\$23,400,000	235
3A08	Aviation Safety Knowledge Management Environment (ASKME)	\$14,800,000	237
3A09	Data Center Optimization	\$1,956,000	242
b.	Training, Equipment and Facilities		
3001	Aeronautical Center Infrastructure Modernization	¢15 000 000	244
3B01		\$15,000,000	244
3B02	Distance Learning	\$2,000,000	246
To	tal, Activity 3	\$150,456,000	
1.0	iai, Activity 3		

#### Activity 4, Facilities and Equipment Mission Support a. System Support and Support Services \$32,300,000 4A01 System Engineering and Development Support 248 4A02 Program Support Leases \$38,600,000 250 4A03 Logistics Support Services (LSS) \$11,000,000 252 Mike Monroney Aeronautical Center Leases 4A04 \$16,600,000 253 4A05 Transition Engineering Support \$15,000,000 255 Frequency and Spectrum Engineering 4A06 \$2,600,000 257 Technical Support Services Contract (TSSC) \$22,000,000 259 4A07 4A08 Resource Tracking Program (RTP) \$4,000,000 260 Center for Advanced Aviation System Development (CAASD) 4A09 \$80,700,000 262 Aeronautical Information Management Program 4A10 \$18,300,000 266 Total, Activity 4 \$241,100,000 Activity 5, Personnel Compensation, Benefits, and Travel 5A01 Personnel and Related Expenses \$492,000,000 269

**Total, All Activities** 

\$2,970,000,000

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
1A01	Advanced Technology Development and Prototyping	\$25,500,000	Various	A-28, M-08, M-46, M-47, S-09, W-10

<u>FAA Strategic Goals:</u> Increased Safety - To achieve the lowest possible accident rate and constantly improve safety. Objective 1 - Reduce commercial air carrier fatalities; Objective 2 - Reduce the number of fatal accidents in general aviation; and Objective 3 - Reduce the risk of runway incursions.

Greater Capacity: Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

Organizational Excellence – Ensure the success of the FAA's mission through stronger leadership, a better trained and safer workforce, enhanced cost-control measures, and improved decision-making based on reliable data. Objective 4 - Make decisions based on reliable data to improve our overall performance and customer satisfaction.

<u>Description of Problem:</u> The FAA's mission is to provide the safest and most efficient aerospace system in the world. As the leading authority in the international aerospace community, FAA is responsive to the dynamic nature of customer needs and economic conditions. A key element of this mission is the safe and efficient use of airspace. To accomplish this mission, FAA's Advanced Technology Development and Prototyping program develops and validates technology and systems that support air traffic services. These initiatives support the goals, strategies, and initiatives of the agency's Flight Plan, including the requirements associated with the evolving air traffic system architecture and improvements in airport safety and capacity.

For FY 2011, \$25,500,000 is requested for the following activities:

### 1. Runway Incursion Reduction Program (RIRP) - ATDP - (\$5,000,000):

<u>Description of Solution:</u> Reducing the risk of runway incursions is a key FAA safety goal and remains on the National Transportation Safety Board's (NTSB) "Most Wanted" list of critical safety issues. During 2007, FAA convened aviation industry stakeholders to a "Call to Action" session to establish near, mid and long-term action plans to mitigate the continuing risk of runway incursions. Several areas of increased technology development emphasis emerged from that session, with the RIRP remaining the principal vehicle for initial development, demonstration, evaluation and establishment of implementation programs for these initiatives. The reduction of high-hazard runway incursions remains the key safety objective as specified in FAA's Flight Plan. The RIRP will remain the catalyst to initiate acquisition activities to facilitate transition of promising safety technologies that have reached a level of maturity deemed appropriate for NAS transition and implementation.

The requested funding will support delivery of performance targets outlined in the FAA Flight Plan and ATO Safety Business Plan. Specifically, the funds will support (1); completion of Low Cost Ground Surveillance (LCGS) pilot program operational trials; (2); completion of the Runway Intersection Lights operational trials, (3); development of a low cost runway status lights (RWSL) system design for application at non-ASDE-X airports; (4); sustainment of Runway Status Light (RWSL) test beds until replaced by production program.

<u>Benefits:</u> The demonstration, evaluation and transition of mature runway safety technologies will reduce the incidence of high-hazard (Category A/B) incursion and ultimately reduce the risk of a runway collision. Early development, testing and maturation of viable technologies result in reduced technical, cost and acquisition schedule risk, with early delivery of runway safety benefits.

#### 2. System Capacity, Planning, and Improvements - ATDP (\$4,100,000):

<u>Description of Solution:</u> The program will provide data which will be used to develop and analyze airport solution sets contained in the NextGen Implementation Plan; implement the performance-based navigation roadmap by developing Area Navigation (RNAV) and Required Navigation Performance (RNP) routes and procedures; and support the 35 OEP airports' master plans for airfield improvement. Additional studies will analyze the effects of new equipment, technology, and high altitude airspace redesign on delays and congestion. These efforts will be sustained by the use of the Performance Data Analysis and Reporting System (PDARS), Design Team Studies, and Capacity and International Benchmark reports. U.S. aviation policy objectives will be furthered by means of participation in international organizations such as the Civil Air Navigation Services Organization (CANSO) and ICAO. PDARS Staffing Analysis will be used by FAA decision-makers to effectively and efficiently operate with a better prepared, better trained, safer, diverse workforce. These programs collectively drive the achievement of the Office's mission and its support of the Agency.

Benefits: Capacity studies identify the operational benefits and delay-reduction cost savings of capacity enhancement alternatives. Program output includes: flight operational data for use in performance analysis; system safety, delay, flexibility, predictability, and user access performance measures on a daily basis; and travel times within geometric areas and for route segments (arrival fix to runway, runway to departure fix, etc.). Output also includes methodologies and prototypes for measuring the benefits of airport, airspace, and procedural enhancements. PDARS is the Air Traffic Control System Command Center's (ATCSCC) primary tool for accessing radar data and provides an objective tool for operational planning, assessment and support of flow management initiatives. Integration of PDARS with Airport Surface Detection Equipment (ASDE-X); Out, Off, On, and In time (OOOI) data; restrictions data; and playbook scenarios will help to reduce ground delays. These enhancements, which encompass the final phase of PDARS development and are an ATO community requirement, are critical for analyzing surface operations and baselining OEP performance. PDARS is a well-accepted and often-used tool at all major ATC facilities. The impact will be realized on assessments of such issues as wake turbulence mitigation, New Large Aircraft (NLA), Very Light Jets (VLJs), reduced separation criteria, and alternative flow management methods.

#### 3. Operations Concept Validation - ATDP (\$4,000,000):

Description of Solution: The project objective is to provide a well-defined and well-understood "validated" operational concept based on system modeling and simulation. This work evaluates and incorporates lessons learned from the recent delivery of decision support tools to provide guidance on how advanced decision support and operational enhancements will be integrated into the NAS. The program develops and exercises advanced analysis capabilities to consider the benefit and operational feasibility of technological and procedural changes. In particular, the program is analyzing the methods for more flexibly managing airspace and taking advantage of the differences between high and low altitude work, new opportunities for flow based trajectory management, and the expanded role of Traffic Flow Managers in managing airspace capacity versus limiting demand. It is looking at new ways of cost effectively expanding tower services and remotely providing tower services, and looking at effective ways to manage optimized descent profiles into terminal airspace. It looks at leveraging automation to change roles and responsibilities of NAS airspace users and service providers. Simulation and human-in-the-loop experimentation are used to integrate this new guidance revealing the type, update rate, and display requirements that need to be established to ensure optimum controller performance. The work program has three thrusts: 'Operational Concept Development, Concept Validation, and Concept System Design.

Operational Concept Development extends the high level concept of operations and the early validation efforts into detailed concepts of operation for the evolution of Air Traffic Management. Efforts include development of concepts for domains, phase of flight and concepts of use for individual systems as well as classes of enablers such as surveillance. The activity includes interaction with RTCA's Working Groups and the Joint Program Development Office (JPDO) to ensure the concepts are acceptable to the community (as well as providing the FAA's contribution to RTCA funding from this line). The ATS concepts are used extensively in activities such as enterprise architecture, initial and final requirement documents (e.g., ERAM, TFM-M, ADS-B, Data Communications and New Voice Switch) and in investment analysis (the Portfolio activity).

Concept System Designs assess the operational design implications of future concepts with respect to the type, display and immediacy of information. Concept development and conceptual system design provide the

basis for validation activities and the derivation of requirements. Concept Validation efforts use the conceptual system design to evaluate the performance requirements for information management to support the next generation of ground and airborne support systems. The project extends the development of performance measures to validate the operational improvements of future concepts. Associated with the changes in roles and responsibilities are opportunities for restructuring the services provided by air traffic control facilities to best support the re-aligned roles of humans in the NAS as enabled by new automation and communication capabilities.

The FY 2011 funding request will be used for concept development, concept validation including benefits and safety analysis, and requirements development for lower level NAS concepts, such as requirements development and transition planning for flow based trajectory management, concept validation of airspace concepts, concept validation activities for automated tower services and remotely staffed tower services, and analysis and validation of requirements for optimized profile descent decision support capabilities. These activities will include validation of concepts for ground—ground and air-ground communications to support transfer of information and change the air traffic control paradigm, as well as to validate assumptions about flight deck evolution.

<u>Benefits:</u> The program uses analyses and associated white papers to validate whether future system requirements meet NextGen goals, including the flight data processing evolution in En Route Automation Modernization (ERAM), data communications, the future voice switch, changes in surveillance requirements and associated procedures, establishment of new roles and responsibilities to support increased productivity, etc.

#### 4. NAS Weather Requirements (\$1,000,000):

<u>Description of Solution:</u> One of FAA's top priorities is predicting and responding to weather. In today's National Airspace System (NAS), weather is responsible for 70 percent of delays over 15 minutes and contributes to 24 percent of accidents and 34 percent of fatalities. Up to 2/3 of weather delays are avoidable, based on a recent assessment completed by the FAA RE&D Advisory Committee. Despite a continuous flow of improvements available through aviation weather science and implementation solutions aimed at providing better weather information, the significant impact of weather on aviation remains. Weather is often the tipping point for delay and safety in NAS operations. As air traffic levels are expected to increase in the NextGen era.

This funding supports contract services to identify future demand for services, identify technological opportunities to address that demand, identify projected supply of services, perform gap analysis, perform mission needs analysis, develop functional and performance requirements and validate requirements through users workshops, demonstrations and simulations. It also supports planning, analysis and documentation studies in support of initial investment decisions for new or modified aviation weather capabilities. Included are (1); requirements cutting across FAA, NWS, and Department of Defense (DoD) boundaries, roles and responsibilities in providing weather support, (2); analysis of and plans for integration of weather information into decision support systems, and (3); standards development for surface and airborne observations, forecasts, and dissemination for both U.S. practices and ICAO Standards and Recommended Practices (SARPS).

This program funds contract support to develop performance requirements for weather research and development and for transitioning weather research into operations including evaluation of human factors, compatibility of new technology with procedures, and analysis of the impact of new information on controller and pilot workloads.

The requested funds will be used to analyze and perform technical planning support to develop mission analysis, needs analysis, functional requirements, and performance requirements for NAS users and to harmonize U.S. aviation weather requirements and standards globally. The 2011 work will focus on:

Requirements. FAA lacks a comprehensive set of aviation weather requirements that are (1); responsive to the needs of controllers, pilots, dispatchers and airport operators and (2); optimized to guide integrated development and production by FAA, NWS, and commercial providers of weather observations, forecasts dissemination capabilities and integration into operational decision support procedures and tools capabilities to meet the needs of NextGen. Requirements for existing systems are often redundant and

insufficient to meet the needs of NextGen. FAA also lacks the capability to continually upgrade these requirements as NextGen concepts mature. FAA will plan and develop workshops, demonstrations and simulations to assist in completed detailed performance requirements in later years. FAA will also begin work to plan and implement a baseline on the quality of weather products in the NAS.

- Integration. The current weather infrastructure cannot support the integration requirements of NextGen. The NextGen concept for weather is to move from the current human provided or human overseen efforts to new tools that automatically ingest weather data and include that data in a decision process. Aviation weather information is not well integrated into decision support processes or tools. NextGen will rely much more heavily on automated decision support tools (DSTs), migrating from current human-centered decision making using weather information. FAA will begin work to identify requirement needed to modify decision support tools
- Strategic Planning. As the Agency moves towards the NextGen transition, policies must be developed and implemented, standards must be developed and implemented and research must be planned to help move the tools necessary for the future through the transition. Current research efforts/levels are inadequate to develop requirements, policies and standards necessary to support NextGen. Domestic user guidance (regulations, advisory circulars, and information manuals) are not harmonized with NextGen and SESAR requirements and projected operations. FAA will complete safety studies and prepare Research Evolution Planning documents, develop standards for Terminal Area Forecasts and complete an annual review of ASOS Service Standards.
- Global Harmonization. Currently the U.S. has filed over 50 aviation weather differences with ICAO reflecting a lack of global harmonization. The changes envisioned with the implementation of NextGen will generate additional, necessary external work with ICAO as well as domestic regulatory guidance necessary to align aviation weather systems and services. International requirements and ICAO SARPS are not harmonized with NextGen and SESAR requirements and projected operations. FAA will complete a strategic plan and roadmap for global interoperability.

<u>Benefits:</u> A large amount of work accomplished by the program is geared toward the movement of aviation weather products, including safety risk management functions from R&D into operational use.

Accomplishment of the work in this budget line will allow:

- Increased RE&D/F&E Activity-1 productivity from better R&D priority management areas.
- Improved weather information (observations/forecasts) for increased NAS operational safety, efficiency and capacity.
- Consolidation of processors, resulting in reduced operating costs.
- Open architecture enabling lowered development costs.
- Reduced communications costs with simultaneous improvement in product access resulting from Network Enabled Operations.
- Reduced equipage and training costs for air carriers resulting from closer conformance with global standards.

#### 5. Airspace Management Program (AMP) (\$1,000,000):

<u>Description of Solution:</u> The goal of regional and national airspace redesign efforts is to address congestion and delays in our nation's busiest airports. We accommodate growth by enhancing the efficiency and reliability of the NAS. Airspace redesign efforts seek to optimize Terminal, En Route and Oceanic airspace by redesigning airspace in NY/NJ/PHL, Chicago Airspace Project (CAP), Western Corridor, Houston Area Air Traffic System (HAATS), and with HAAM. F&E funding is planned for NY/NJ/PHL, CAP, Western Corridor, High Altitude Airspace Management (HAAM) and national integration efforts of the program office. Airspace redesign efforts will modernize airspace in support the new flows associated with new runways in Chicago and in Las Vegas.

For FY 2011, Airspace Redesign requests \$1,000,000 to provide the following:

- Infrastructure changes resulting from the airspace redesign supporting the Chicago and New York/Philadelphia metropolitan areas.
- Infrastructure changes resulting from the airspace redesign supporting the Western Corridor project.

- Infrastructure changes resulting from the airspace redesign supporting the High Altitude Airspace Management project.
- Engineering analyses of operational feasibility of airspace concepts supporting transition to NextGen.

Benefits: The airspace redesign projects supported by these FY 2011 F&E funds are projected to deliver as much as \$121 million of direct operating cost benefits by 2015. These benefits are realized through the reduction of restrictions, shorter flight distances, more fuel efficient routes, and reduced delays. The most significant benefits will be in the key metropolitan areas. Airspace redesign in New York and Philadelphia metropolitan areas will reduce delays by 20 percent in the next 10 years, based on today's flight statistics. In Chicago, airspace redesign will ensure return on the runway investments. With airspace changes and the new runway, delays can be reduced by as much as 60 percent. Airspace redesign will also provide internal FAA benefits. Without airspace redesign, sector splitting and growth in the number of sectors will be the only methods to manage complexity and congestion, increasing operations costs by millions every year. Reducing the number of sectors in the HAAM program through standardization and reallocation of airspace boundaries could provide a minimum of \$20 million of annual FAA cost savings.

#### 6. ATO Strategy and Evaluation (\$2,000,000):

<u>Description of Solution:</u> Several of the FAA's computer models are obsolete and cannot support NextGen planning activities. This program is developing two new models to rectify this shortfall:

- An Airport Capacity Model for use in analyzing new airport capacity-related projects. The proposed model will facilitate rapid analysis of airport improvements, demand changes, and ATM technology insertions. In addition to being used for NextGen planning, the model will be used for runway capacity studies and investment analyses. The model will also be used by aviation consultants and the academic community, providing a standard for airport capacity analyses. Development of the model will be completed by the second quarter FY 2011.
- A System-Wide NAS Model to replace the existing National Airspace System Performance Analysis Capability (NASPAC) model. A new system-wide model is required to analyze advanced ATM concepts and aid with NextGen program trade-off studies, investment analyses, and NAS performance analyses. The new model will support the Office of NextGen Implementation and Integration, Office of Performance Analysis and Strategy, Office of Research and Technology Development (concept validation), ATO Finance (investment analysis), and the JPDO. Additionally, FAA and NASA contractors and the academic community may use the model. This effort will be completed by FY 2013.

<u>Benefits:</u> This program will provide computational tools to identify and evaluate potential strategies, and to improve decision-making throughout FAA and the aviation community. For example, the Chicago O'Hare Modernization Project is estimated to cost approximately \$7 billion. A new airport capacity model will help to ensure that this money is spent wisely and will reduce the cost of the required analyses. Also, the FAA's existing system-wide simulation model NASPAC cannot accommodate new ATM procedures planned for NextGen (such as Continuous Descent Approaches and 4D trajectories) or even existing Traffic Flow Management procedures (e.g., Ground Delay Programs, Airspace Flow Programs, time-based metering, Severe Weather Avoidance Programs, etc.). NASPAC is thus inadequate for assessing current NAS performance, and is also inadequate for NextGen planning. A new system-wide model will address these shortcomings.

#### 7. Dynamic Capital Planning (\$2,500,000):

<u>Description of Solution:</u> The Dynamic Capital Planning tools will allow Air Traffic Organization (ATO) to make optimal decisions based on best business practices and provide verification for our owners (DOT, OMB and Congress) of aggressive approval thresholds and management of the Capital programs. The requirements analysis for selecting Dynamic Capital planning tools is being evaluated through the ATO Office of Finance and includes tools to address the following focus areas: quantitative economic value and internal benefits validation; milestone tracking and schedule modeling; performance measurement; auditing and trend analysis; earned value through program life cycle; field implementation planning; and post-implementation analysis for corporate lessons learned results.

For FY 2011, \$2,500,000 is requested for the following activities: modification of the tools and continued support of program evaluation through all phases of the acquisition life cycles; contractor maintenance support, and updating documentation related to the tool.

<u>Benefits</u>: This program will allow the agency to better allocate resources and add management performance and accountability to the Capital program. The program will be in place by FY 2012 support the number of recommended actions to improve the management and performance of the Capital program by the Office of Management and Budget (OMB).

#### 8. Wind Profiling and Weather Research Juneau (JAWS) (\$1,300,000):

<u>Description of Solution</u>: An FAA report to Congress in February 1995 determined severe upper air turbulence and wind shear raised potential hazards for aircraft executing tight arrival and departure procedures in the Juneau, Alaska area. The report directed FAA to study the problem of wind shear, terrain-induced turbulence and intense horizontal and vertical rotors. After the study, the FAA Flight Standards group restricted flight operations for commercial carriers and required the development of a detailed "go-no-go" Operational Specification (OpSpec). To assist in providing the needed wind data for commercial carrier use to comply with the OpSpec, the Juneau Airport Wind System (JAWS) program was initiated in 1997. The prototype system has proven to provide increased capacity and safety for Juneau area flight operations activities.

Currently, JAWS is preparing a business case for the useful segment from FY 2010 – FY 2014 to deploy the end-state JAWS that includes acceptable technical, schedule and cost parameters. JAWS is an on-site system in Juneau, Alaska consisting of a wind sensors network to provide information on winds and turbulence. The system will include a basic anemometer network (initially developed by National Center for Atmospheric Research (NCAR) and Wind Profilers (vertical-looking radars) to increase situational awareness of winds up to 6,000 feet and to aid in providing turbulence alerts for a larger margin of safety. The prototype system will be transitioned to an end-state system that the FAA can safely incorporate into the NAS.

<u>Benefits:</u> JAWS provides both safety and capacity benefits. Three significant incidents involving transport aircraft that occurred during turning departures between 1993 and 1995 led to the implementation of wind restrictions and the need for JAWS. These wind restrictions along with additional routes have mitigated the safety risk significantly. In addition, general aviation users rely on JAWS for wind information and receive this information via the Juneau Automated Flight Service Station (AFSS) and National Weather Service.

The benefit of JAWS was derived from wind measurements providing the ability to conduct departures and arrivals that are wind-restricted or would otherwise be denied. The FAA tracks the number of Required Navigation Performance (RNP) operations that could not have been conducted via an alternative route. In addition, Alaska Airlines provided data as to the number of turning departures that were conducted. Estimates of 850 annual flight disruptions would be through the use of JAWS. This is a conservative number in that it applies only to flights that could not have operated on alternative route that do not require wind measurements. With additional research into a wind warning system, JAWS has the potential to address another 28-to-35 flights annually that are currently disrupted due to the adverse wind conditions.

### 9. Traffic Collision and Avoidance System (TCAS) (\$2,500,000):

<u>Description of Solution:</u> As new procedures are developed to support NextGen, collision avoidance will need to evolve to work in concert with these procedures. In the near term, minor changes to TCAS may be sufficient to support smaller, mid-term operational changes. However, it is likely that collision avoidance will evolve and become an integral part of an air-to-air systems capability; thus, the distinction between "collision avoidance" and "separation assurance" may become blurred as these systems evolve.

In FY 2010, the TCAS program will initiate the transitioning of TCAS 7.1 to an operational service unit and begin changing focus and direction towards addressing the future of TCAS within the NextGen portfolio. It will become part of the Safety, Security, and Environment Solution Set, as defined by the OEP. While new procedures are developed to support NextGen, collision avoidance needs to evolve so that the system works in concert with these procedures. It is likely that collision avoidance will evolve and become an integral part of an air-to-air systems capability

For FY 2011, the TCAS will complete the transition to TCAS 7.1 as a operational service unit and bridging into the NextGen solution set portfolio. What will be needed are the final comprehensive assessments to prove to both the controllers and operators that the overall operations are safe when performed in a manner consistent with the intended function of the equipment.

Areas to support development of the next generation collision avoidance system are outlined below:

- Appling the defined collision avoidance algorithm improvements at the benchmarked level of safety based on evolving airspace improvements and the introduction of new NextGen procedures.
- Continue to support the TCAS monitoring capability and update the U.S. airspace model to support global mitigation strategies for collision avoidance functions.
- Move to the next level of investigate into the potential for saturation of 1090 Mhz due to proliferation of ADS-B, Very Light Jets (VLJs) and Unmanned Aircraft Systems (UASs).
- Develop the initial requirement documents for NextGen operations to evaluate compatibility of current TCAS (v7.0/7.1) and NextGen ACAS.
- Continue the development of an integrated approach between separation assurance and collision avoidance, with special attention to the safety case in joint cooperation with the ADS program office.
- Continued the investigation in how to reduce costs for collecting, managing, and publishing TCAS safety information, thereby, improving customer/user/stakeholder satisfaction.

The safety complexities of developing improved collision avoidance will be weighed against the plans to implement new applications and other aspects of the changing airspace as NextGen begins to unfold (i.e., compatibility with avionics equipage trends).

<u>Benefits:</u> All aspects of the program will not change, in that TCAS will focus between elements of other safety analysis systems and will continually support improved surveillance (i.e., ADS-B, Hybrid Surveillance, etc).

Exploration of new potential suppliers of data elements required for the collision avoidance capabilities and the accuracy and integrity of that data.

TCAS is focused on safety issues related to collision avoidance systems, its ability to resolve near-midair encounters, and pilot's ability to react correctly to issued TCAS instructions.

### 10. Operational Modeling Analysis and Data (\$1,500,000):

<u>Description of Solution</u>: The Operational Modeling Analysis and Data program provides support and oversight for operational modeling activities within the ATO. The ATO manages the extraordinarily complex National Airspace System (NAS), and uses a variety of models of the different parts of the NAS, as well as models of the entire system, in conducting analyses to understand NAS performance. Nearly all of the operational units within the ATO require models for operational and capital investment planning. This program will provide support to model users within the ATO by funding the development of existing and new models and by providing standardized input data that these models require. This program will also provide guidance and assistance in the use of models to answer operational needs.

This program has three key activities:

- Support for the development and maintenance of ATO operational models.
- Analytical support for model users to provide timely analytical support and to ensure the appropriate use of operational models.
- The development of a data repository to provide the assumptions that model users can draw upon to ensure consistency in operational analysis.

<u>Benefits</u>: The analyses conducted with these models will help determine the policy and investment decisions made by the ATO. This program will help ensure that these decisions are based on validated, well-maintained models, using a consistent set of assumptions.

### 11. ATDP – In-Service Engineering (\$600,000):

In-service engineering allows for immediate response to emerging technology solutions. Funding is requested for ongoing engineering support of all prototyping efforts.

### APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$607,912.0 ¹
FY 2010 Appropriated		42,800.0
FY 2011 Request		25,500.0
FY 2012-2015		<u> 119,300.0</u>
Total	Various	\$795,512.0

### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost (\$000)
1. Runway Incursion Reduction Program and IOT&E		\$5,000.0
2. System Capacity, Planning and Improvements		4,100.0
3. Operations Concept Validation		4,000.0
4. NAS Weather Requirements		1,000.0
5. Airspace Management Program		1,000.0
6. ATO Strategy and Evaluation		2,000.0
7. Dynamic Capital Planning		2,500.0
8. Wind Profiling and Weather Research Juneau		1,300.0
9. Traffic Collision Avoidance System (TCAS)		2,500.0
10. Operational Modeling Analysis and Data		1,500.0
11. In Service Engineering		600.0
Total	Various	\$25,500.0

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<sup>&</sup>lt;sup>1</sup> The FY 2001 appropriation has been adjusted to reflect the rescission amount pursuant to P.L. 106-554. Includes reduction pursuant to P.L. 108-7, February 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
1A02	NAS Improvement of System Support Laboratory	\$1,000,000	1	F-14

<u>FAA Strategic Goal</u>: Organizational Excellence – Ensure the success of the FAA's mission through stronger leadership, a better trained and safer workforce, enhanced cost-control measures, and improved decision-making based on reliable data. Objective 3 - Improve financial management while delivering quality customer service.

<u>Description of Problem:</u> The FAA's centralized set of laboratories located at the William J. Hughes Technical Center provide the infrastructure for research, development, testing, and field support to the FAA's Capital Investment Plan (CIP) programs. It is necessary to modify, upgrade, and reorganize the Laboratory infrastructure as CIP projects and their supporting systems are delivered, installed, and eventually removed. The Technical Center Lab infrastructure encompasses approximately 160,000 square feet in the main building and numerous outlying buildings and remote sites.

<u>Description of Solution:</u> The Technical Center's System Support Laboratory provides the environment to implement, test, and integrate new systems into the National Airspace System (NAS). Once accepted, the systems become part of the test bed and are used to provide support to the operational field sites over the life-cycle of the operational systems. To maintain a viable test bed, it is periodically necessary to upgrade and enhance those portions of the facilities that support the systems and form an integral part of the test bed. Electronic switching systems are used to permit replication of the myriad-fielded system configurations and to permit multiple parallel testing configurations to run with a minimum of system components. The switching systems must be upgraded, enhanced, and expanded to meet the changing needs of system deliverables.

In FY 2009, \$1,000,000 was appropriated for system support laboratory improvements, such as auxiliary power upgrades for the NAS Laboratories, 20-year laboratory facilities master plan, upgrades to the Elwood, NJ radar site, and equipment upgrades to En Route Job shop facility. In FY 2010, \$1,000,000 was appropriated for various improvements to the Laboratory systems in order to support CIP programs.

For FY 2011, \$1,000,000 is requested for continued improvements to the Laboratory systems in order to support critical National Airspace System (NAS) programs.

<u>Benefits:</u> The program improves FAA's centralized state-of-the-art laboratory environment that supports the implementation, testing, and integration of new NAS systems prior to their delivery to the various FAA field sites. A single, centralized support laboratory helps FAA eliminate the cost of establishing and maintaining multiple laboratories for each project, program, Service Unit, and Line of Business.

#### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$45,855.8 <sup>1</sup>
FY 2010 Appropriated		1,000.0
FY 2011 Request		1,000.0
FY 2012-2015		4,000.0
Total	<del></del> 1 <sup>2</sup>	\$51,855.8

<sup>&</sup>lt;sup>1</sup> Excludes \$2,000,000 appropriated in FY 2000 under Technical Center Facilities. Includes \$250,000 reduction of the FY 2002 funds pursuant to supplemental P.L. 107-206, January 23, 2002. Includes reduction pursuant to P.L. 108-7, February 20, 2003.

<sup>&</sup>lt;sup>2</sup> All work/services to be performed at FAA William J. Hughes Technical Center.

## COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

	Locations/	Estimated Cost
Activity Tasks	<u>Quantity</u>	<u>(\$000)</u>
Integration/Implementation of NAS Laboratory	1 1	\$1,000.0
integration, implementation of NAS Laboratory	<u> </u>	φ1,000.0

 $<sup>^{\</sup>rm 1}$  All work/services to be performed at FAA William J. Hughes Technical Center.

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
1A03	William J. Hughes Technical Center Facilities	\$13,000,000	1	F-14

<u>FAA Strategic Goals:</u> Organizational Excellence – Ensure the success of the FAA's mission through stronger leadership, a better trained and safer workforce, enhanced cost-control measures, and improved decision-making based on reliable data. Objective 3 - Improve financial management while delivering quality customer service.

<u>Description of Problem:</u> The FAA's centralized set of laboratories located at the William J. Hughes Technical Center provide the infrastructure for research, development, testing, and field support to FAA's Capital Investment Plan (CIP) programs. These laboratories provide around the clock operations support to En Route, Terminal, and other Air Traffic Control (ATC) facilities throughout the nation. It is necessary to sustain these Laboratory systems in configurations and capabilities that match field sites that currently exist or are planned for the future. CIP programs and field sites depend on these laboratories to fulfill their mission.

<u>Description of Solution:</u> For FY 2011, \$13,000,000 is requested to sustain FAA's laboratory test beds and will be used for hardware and software support, software licensing fees, and other costs associated with operating these multi-user facilities. These laboratories include the en route and terminal test beds; navigational, scan radar, and automated tracking sites; communications switching equipment; the aircraft fleet (flying laboratories); aircraft simulation systems such as the target generator, cockpit simulators, Integration and Interoperability Facility and the Human Factors Laboratory. Additionally, funding includes the Technical Strategies and Integrations verification and validation (V&V) project including establishment, implementation, and integration of a common V&V approach for the ATO under the auspices of the Acquisition Executive Board V&V working group.

<u>Benefits:</u> The support is necessary for the successful development and implementation of various programs of the CIP. In addition, ATC field facilities support mission will continue throughout the transition from today's system to the full implementation of FAA's modernization efforts. These facilities provide in-house testing required to ensure new systems and modifications are thoroughly evaluated in an integrated environment to minimize problems prior to field deployment. A stable funding source obviates the need for each program office to establish and sustain the infrastructure needed to support their programs and fielded systems. This has been a proven method to sustain the Test Beds and to minimize FAA costs.

#### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$180,354.5 <sup>1</sup>
FY 2010 Appropriated		12,000.0
FY 2011 Request		13,000.0
FY 2012-2015		48,000.0
Total	1 2	\$253,354.5

<sup>&</sup>lt;sup>1</sup> Includes \$2,477,500 appropriated in FY 2000 for Technical Center Infrastructure Sustainment and \$2,000,000 in FY 2000 for NAS Improvement of System Support Laboratory. Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.

<sup>&</sup>lt;sup>2</sup> All work and services to be performed at FAA William J. Hughes Technical Center.

# COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

<u>Act</u>	ivity Tasks	Locations/ Quantity	Estimated Cost (\$000)
1.	Hardware Sustainment		\$943.6
2.	Software Licenses and Support		216.3
3.	Sustainment, Engineering and Support Services		9,590.0
4.	Parts, Supplies and Equipment		1,330.1
5.	Pilot Training		420.0
6.	Technical Strategies and Integration Project Support Services	<u></u>	500.0
Tot	al	1	\$13,000.0

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
1A04	William J. Hughes Technical Center Infrastructure Sustainment	\$7,500,000	1	F-16

<u>FAA Strategic Goals:</u> Organizational Excellence – Ensure the success of the FAA's mission through stronger leadership, a better trained and safer workforce, enhanced cost-control measures, and improved decision-making based on reliable data. Objective 3 - Improve financial management while delivering quality customer service.

<u>Description of Problem:</u> The William J. Hughes Technical Center (WJHTC) owns and operates test and evaluation facilities, research and development facilities, administrative and storage facilities, and numerous project test sites. The Technical Center must keep the Central Utilities Plant (CUP), utility distribution systems, and the building infrastructure in operating order. The WJHTC must also comply with International Building Codes, the National Fire Codes (NFC), the Americans with Disabilities Act (ADA) and current energy policies.

Electrical testing during a 2005 planned power shutdown revealed that the Building 300 substations were in marginal condition. The Building 300 roof and skylights are at the end of their useful lives, have no warranties, and have been maintenance nightmares. A private engineering firm's 20 year master plan for 34 buildings, completed in July of 2008, identified significant deficiencies.

Description of Solution: For FY 2011, \$7,500,000 is requested for the following activity tasks:

<u>Electrical Upgrades to Building 300:</u> This project replaces three marginal electrical substations, identified during an October 2005 planned power shutdown, that are beyond their useful lives per the American National Standards Institute (ANSI). This project also implements the first year electrical recommendations of an engineering firm's 20 year master plan for 34 buildings and it improves the reliability of electrical power to not only the Center but also the ATC Laboratory Area, which houses the NAS Test Bed, BCP and eventually NextGen.

<u>Building 300 Roof and Skylight Replacement – Phase 1:</u> This project will replace a roofing system that is beyond its useful life of 15 years with a system that will be more appropriate for the facility. The project will significantly reduce roof maintenance costs, as many as 10 leaks have occurred after a single, heavy rainstorm and identifying the source of a leak can require the removal of approximately 10,000 square feet of roofing area. It will also replace skylights that are original, have been leaking for a number of years and have become discolored, with skylights that are twice as energy efficient photovoltaic panels.

<u>Benefits:</u> The modifications will ensure the continued reliable operation of the WJHTC by replacing aged mechanical, electrical, and life safety equipment and required utility and other support systems before serious problems occur. The work will also improve life cycle infrastructure planning, update certain facilities, facility support systems and utility distribution systems; reduce energy consumption on a per square foot basis; and enable the Center to support changing FAA programs and missions. The program incorporates best business practices and adopts industry standards.

## APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$47,234.4 <sup>1</sup>
FY 2010 Appropriated		5,500.0
FY 2011 Request		7,500.0
FY 2012-2015		23,700.0
Total	<del>1</del>	\$83,934.4

### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost (\$000)
1. Electrical Upgrades to Building 300		\$5,800.0
2. Building 300 Roof and Skylight Replacement – Phase 1		1,700.0
Total	1	\$7,500.0

<sup>&</sup>lt;sup>1</sup> Excludes \$2,477,500 appropriated in FY 2000 under Technical Center Facilities. Includes \$750,000 reduction of the FY 2002 funds pursuant to supplemental P.L. 107-206. January 23, 2002. Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
1A05	NextGen Network Enabled Weather (NNEW)	\$28,250,000	Various	G-4W

<u>FAA Strategic Goal:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> In today's National Airspace System (NAS), weather is responsible for 70 percent of delays over 15 minutes and contributes to 24 percent of accidents and 34 percent of fatalities. Up to 2/3 of weather delays are avoidable, based on a recent assessment completed by the FAA RE&D Advisory Committee. Despite a continuous flow of improvements available through aviation weather science and implementation solutions aimed at providing better weather information, the significant impact of weather on aviation remains. Weather is often the tipping point for delay and safety in NAS operations, and air traffic levels are expected to increase in the NextGen era.

Weather information is needed for air traffic management and flight operations decisions. These decisions range from the planning of individual flights, to the management of individual terminals and airspaces, to managing the capacity of the NAS. Collaboration among decision makers is required to resolve the constraints brought about by weather. Air Traffic Management (ATM), Flight Operations Center (FOC), and flight deck operational decision makers are unable to collaborate effectively in order to make the strategic and tactical decisions of the day. The current procedures for making these decisions are either labor intensive, and/or rely on multiple inputs in order to infer the required decision. The system is unable to support these decision makers due to gaps in today's weather dissemination system; incomplete, inaccurate, and inconsistent weather forecasts; and gaps and inaccuracies in weather observations used to depict current weather conditions and to support forecast generation.

Problems to be addressed in NextGen are:

- Weather information not accessible to all users and cannot be manipulated in accordance with user specific needs.
- Clear, accurate, consistent, complete, and unambiguous aviation weather information not available.
- Weather products lacking the spatial or temporal resolution required for decisions involving key weather phenomena that impact aviation.
- Inability to automatically develop and display the impact of weather on current or future NAS capacity.
- Weather data not well integrated into either manual procedures or automated decision support tools (DST).

These problems collectively represent shortcomings in the FAA's current aviation weather capabilities and are addressed in several weather RPDs including weather observation improvements, weather forecast improvements, NNEW, and R&D activities.

NextGen Weather Dissemination Problem:

Presently, a consolidated weather data dissemination architecture does not exist within the FAA. The development of stovepipe systems has severely limited universal access to weather data. Until NextGen there has not been a general requirement within the FAA for weather systems to potentially share the same information and interact directly with ATM systems. This lack of requirement has led to a portfolio of FAA weather systems that lack a standardized approach to disseminating and accessing weather information.

There are several problem areas to be addressed:

- Isolated data. In today's FAA, weather information produced by one FAA weather system is generally only available to users of that particular system. Information gathered by one system is not easily shared with other systems or their users.
- Overlapping and redundant data. The multitude of different weather systems can provide inconsistent information about the weather in the same single point (lat, long, alt) in the NAS at any particular time. This architecture of overlapping systems has resulted in conflicting weather information and the lack of shared situational awareness.
- Weather information is not well integrated into automated decision support tools.
- Software standards are not utilized. Developing different systems with incompatible software prevents sharing of weather information.
- Inefficient point-to-point communications. The lack of standardization and inability to share information has led to an inefficient use of telecommunications.

<u>Description of Solution:</u> The NextGen Implementation Plan is establishing a broad framework for the services, technologies, policies, procedures, and methods of operation that must be implemented by 2025 to achieve the plan's national goals. This vision establishes improved weather capabilities as a key element of the national strategy for supporting air transportation and enhanced operational decision making between now and 2025, including improved weather dissemination capabilities.

The NextGen Network Enabled Weather (NNEW) effort will develop the standards necessary to support universal user/system access to needed weather information. It will enable the seamless access to standard weather data sets by all NextGen users by establishing the 4-Dimensional (4-D) Weather Data Cube. The 4-D Weather Data Cube will be a shared, 4-dimensional (three spatial dimensions and time) virtual database consisting of extensive sets of weather information including data that will be designated to be the single authoritative source for weather information used in the NAS. It will provide consistent, tactical and strategic-level weather information that will be accessible by all NAS stakeholders. The databases that the 4-D Weather Data Cube will consist of will be distributed among multiple, physical locations and suppliers that are connected and accessible by communication networks supported by World Wide Web concepts and technology. NNEW is responsible for establishing the information management capabilities necessary for the operations of the network-enabled 4-D Weather Data Cube. There will be demonstration efforts to resolve key technical questions and reduce implementation risk of a network-enabled weather environment to the FAA and external system users. This will include assurance that NNEW is fully compatible and consistent with the evolved System-Wide Information Management (SWIM) infrastructure. This will also serve to define open standards and requirements necessary for overall NextGen weather dissemination compatibility.

For FY 2011, \$28,250,000 is requested to develop the Web Feature Services Reference Implementation and the Web Coverage Services Reference Implementation, develop Service Adapters for candidate IOC publisher/subscriber systems, updates to the initial planning OMB Exhibit 300 not to include the attachments, and Initial Investment Analysis work.

#### Benefits:

#### FAA Savings:

Reduced Facilities and Equipment (F&E) and Operations (OPS) costs by use of open standards for weather data access and format

F&E cost avoidance: New NextGen subscribers will reuse weather data access software documentation and code.

- Ops costs avoidance: Greatly streamlines software update and change management strategies.
- Ops costs avoidance: Reduces communications lines required by weather data subscribers.

#### User/AOC Reduced User Costs:

- Eliminates need for unique interfaces to support access to weather information.
- Collaboration improved by having common access by all decision support tools.

#### FAA Productivity:

- Improved productivity and reduced TFM workload and stress.
- Collaboration improved between FAA and airlines by having common access to virtual weather data base.
- Allows efficient retrieval of weather data needed directly by decision support tools.

### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$27,000.0
FY 2010 Appropriated		20,000.0
FY 2011 Request		28,250.0
FY 2012-2015		<u>145,400.0</u> <sup>1</sup>
Total	Various	\$220,650.0

### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost (\$000)
1. Network Enabled Weather		\$28,000.0
2. Independent Operational Test and Evaluation		<u>250.0</u>
Total	Various	\$28,250.0

<sup>&</sup>lt;sup>1</sup> Future requirements under review.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
1A06	Data Communications in support of Next Generation Air Transportation System (NextGen)	\$153,300,000	Various	G-1C

<u>FAA Strategic Goals:</u> Greater Capacity — Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> Air traffic management in the National Airspace System (NAS) is dependent upon rapid reliable communications between air traffic controllers and pilots. The present voice-based air/ground infrastructure will not support traffic growth beyond 2020. Since controllers currently communicate with pilots using voice, revisions to aircraft flight paths are made through multiple instructions or lengthy verbal exchange. This process is time and workload intensive, limits efficient use of aircraft and airspace, and is prone to verbal communication errors. Increased controller workload and flight delays are the result, which impact the capacity of the NAS. Many of the transformational improvements associated with the Next Generation Air Transportation System (NextGen), including trajectory-based flight and net-centric operations, cannot be achieved using the present voice system.

<u>Description of Solution:</u> For FY 2011, \$153,000,000 is requested for Final Investment Analysis (FIA) management and planning technical support; ERAM system engineering and specifications development; Tower Data Link Services (TDLS) automation specifications development; screening information request (SIR) development data communications network services; systems engineering; standards development; avionics validation, prototype and demonstration support; integration, test planning and laboratory development; operational capability and integration support, and human factors for NextGen Concept of Operations (CONOPS). Data Communications will bridge the gap between current voice-only air traffic control, and the data-intensive NextGen. To ensure the NAS has the capacity to grow, Data Communications will implement services that maximize controller productivity, reduce operational errors associated with voice communications, and enable new air traffic services and reduce delays. Data Communications is comprised of automation enhancements for air traffic control message generation and exchange (hardware and software), and the communications data link between ground and airborne users.

The FAA will accelerate the transition to data communications with the introduction of digital revised departure clearances. This will reduce the aircraft gate and taxi delays associated with delivery of clearances, an improvement that will get aircraft off the ground sooner and reduce controller workload.

The Data Communications program is taking a two-phase approach to the TDLS (Terminal Data Link Services)-Data Communication network enhancements. Phase I will establish ground infrastructure (software and hardware) and will be aimed at offering services to aircraft equipped with currently available Future Air Navigation System (FANS) 1/A+ avionics and Very High Frequency Digital Link (VDL) Mode-2. Phase I completion of operational test and evaluations is planned for FY 2012, with Initial Operational Capabilities (IOCs) in FY 2013. Phase II of the TDLS-Data Comm enhancements will create the ability to offer additional services to aircraft equipped with SC-214/Air Traffic Network (ATN) avionics, with a planning FY 2014 milestone for IOC.

The benefits from Data Communications will begin with implementation of revised departure clearance and grow rapidly in concert with the deployment of en route automation enhancements. The Data Communications plan calls for multi-stage, incremental development and deployment, so the program anticipates planning activities and costs as subsequent program segments proceed through the investment analysis process. Initially, data communications will provide an additional means for two-way exchange between controllers and flight crews for air traffic control clearances, instructions, advisories, flight crew

requests and reports. Eventually, the majority of communications will be handled by data communications for appropriately equipped users. Automated data communications will support the NextGen vision by enabling

air traffic control to issue an entire route of flight with a single data transmission directly to an aircraft's flight management system. This Data Communications program will progressively move the NAS toward NextGen by building incremental capabilities that reduce unit costs while enhancing capacity and safety.

Since Data Communications is in the planning phase, cost, schedule, and performance data reflect the current program plan, which will continue to be refined as the planning is completed.

For FY 2011, an additional \$300,000 is requested for Independent Operational Test and Evaluation (IOT&E).

<u>Benefits:</u> Data communications are at the heart of NextGen advanced airspace management concepts. The operations and services enabled by data communications will allow more efficient, strategic management of the airspace, enabling the Agency to meet the growing demand for air travel, all while improving operational and life-cycle costs for both airspace managers and users.

Current analog voice communications contribute to operational errors due to miscommunications, stolen clearances and delayed messages due to frequency congestion. In FY 2004 and FY 2005, approximately 20 percent of en route operational errors were voice communication related. Of those, 30 percent of the high severity operational errors were deemed to be communications-related. With substantial aircraft equipage, data communications will significantly reduce communications-related operational errors and improve the safety of air travel.

Data communications will enable air traffic controller productivity improvements, and will permit capacity growth without requisite cost growth associated with equipment, maintenance, and labor. As a result, unit costs (the resources necessary to provide air traffic management service per aircraft operation) will decrease. Data communications will enable these benefits by automating repetitive tasks, replacing voice communications with more accurate, less workload-intensive data communications, and enabling ground systems to use real-time aircraft data to improve traffic management efficiency. Several studies suggest that with 70 percent of aircraft data-link equipped, exchanging routine controller-pilot messages and clearances via data can enable controllers to safely handle approximately 30 percent more traffic. This increase in traffic handling ability has a direct correlation to reduced delays and increased capacity - recent benefits analysis suggests airline operations will benefit from reduced flight times, improved on time performance and the opportunity to expand flight schedules. Data communications enabled NextGen services, including 4D trajectories and conformance management, will further improve capacity and efficiency by shifting air traffic operations from short-term, minute-by-minute tactical control, to more predictable and planned strategic traffic management.

#### **APPROPRIATION SUMMARY**

	<u>Locations</u>	<u>Amount (\$000)</u>
Appropriated (FY 1982-2009)		\$36,200.0
FY 2010 Appropriated		46,700.0
FY 2011 Request		153,300.0
FY 2012-2015		1,899,300.0 <sup>1</sup>
Total	Various	\$2,135,500.0

<sup>&</sup>lt;sup>1</sup> Future requirements under review.

## COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

	Locations/	Estimated Cost
Activity Tasks	<u>Quantity</u>	<u>(\$000)</u>
1 FID Management Plane's a		±0.020.0
FID Management Planning		\$8,930.0
2. SIR Evaluation - DCNS		3,250.0
3. System Engineering		4,060.0
4. Standards Development		4,060.0
5. Avionics Valid/Prototype, and Demo Support		10,000.0
6. Integration and Testing		4,200.0
7. DCNS Systems Integrator		6,000.0
8. DCNS Air/Ground Service Implementation		15,750.0
9. Spectrum Repacking		2,970.0
10. Specifications Development/Prime Contract Award		66,790.0
11. TDLS Award		20,600.0
12. Data Comm Demos/Proto/HF		2,370.0
13. Software Development for early implementation of TDLS		4,020.0
14. Independent Operational Test and Evaluation		300.0
Total	Various	\$153,300.0

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
1A07	NextGen Demonstrations and Infrastructure Development	\$27,000,000	Various	G-8M, M-49

<u>FAA Strategic Goal:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

Description of Problem: The Federal Aviation Administration (FAA) Next Generation Air Transportation System (NextGen) Demonstration and Infrastructure Development program was established to assist in transforming the National Airspace System (NAS) to meet the vision of the future NAS as defined by the Joint Planning and Development Office (JPDO). Led by the Advanced Technology Development and Prototyping (ATD&P) Group, this program is designated to integrate demonstration projects and programs, provide validation of mature solutions, and demonstrate implementation alternatives for the NAS, as well as sustain the ATD&P NextGen demonstration sites. This program provides agility and flexibility in demonstrating alternative technologies. and concepts, while supporting procedure and standards development, as well as providing for the integration of near-term emerging technologies, procedures and / or customers' initiatives with on-going demonstrations. The demonstration program leverages the individual project demonstrations and supports the integration of these individual projects into multiple-domains designed to capture the synergies that are needed to provide timely NAS transformation. The ATD&P NextGen demonstration and infrastructure development program also directly supports emerging technology solutions and airspace customer solutions that will allow the FAA to define how future air traffic and airport operations will be managed, how the environment will be protected and enhanced, and how improvement to efficiency, safety and capacity can be achieved near-term. The ATD&P demonstration and development program directly supports how the NAS will evolve and operate in the mid term timeframe and beyond, and how the long-term objectives of validating 4-Dimension Trajectory Based Operations (4-D TBO) for all NAS domains will be accomplished.

The United Nations IPCC allocates only 2-3 percent of today's global carbon dioxide (CO2) emissions to aviation. While its overall contribution is relatively small, aviation is considered one of the few rapidly-growing contributors. Efforts to minimize the industry's environmental impacts will be complicated by anticipated increases in both domestic and international air transportation operations.

Environmental impacts resulting from aircraft noise and emissions could emerge as a significant constraint on aviation industry growth. Cooperation to address the industry's environmental challenges could both maximize aviation's collective environmental improvements, and mitigate the potential adverse effects that environmental impacts and society's concerns may impose on industry growth.

Reduced energy consumption and engine emissions are core aviation business principles. Since 1970, the number of airline passengers transported in the United States has tripled while community exposure to significant aircraft noise has decreased almost 95 percent. Aircraft today are 60 percent more fuel efficient than the fleet operating 40 years ago. Progressively stringent aircraft noise and emission standards have been established over the past three decades. These include a phase out of Stage 1 and Stage 2 airliners. Airports have voluntarily implemented noise abatement and emission control programs, supported by airport improvement funding and passenger facilitation charges. As of 2007, the U.S. airline industry is moving 12 percent more passengers and 22 percent more freight than it did in 2000, with 5 percent less fuel burned and commensurate emissions reductions.

With increasing demand the need grows to achieve peak throughput performance at the busiest airports and in the busiest arrival/departure airspace. Capability improvement via new procedures to improve airport surface movements, reduce route spacing and separation requirements, and improve overall tactical flow management into and out of busy metropolitan airspace is needed to maximize traffic flow and airport usage. Essentially the problem is getting the right aircraft to the right runway in the right order and time to minimize its individual impact on the system and maximize the use of these airports. Thus operations are conducted to achieve maximum throughput while facilitating efficient arrival and departure. Inefficiencies in any aspect of

the operation reduces the total use of the capacity and, because of high demand, causes excessive compounding of delay.

Operation of Unmanned Aircraft Systems (UAS) in the NAS is strictly controlled. Operators of UAS must apply to FAA for authorization to engage in flight activities and operations must be specifically authorized. Applications are reviewed by elements of the Air Traffic Operations organization and the Aviation Safety Unmanned Aircraft Program Office to ensure that approval to fly unmanned aircraft, regardless of size, will not compromise the high level of safety for other aviation and the public and property on the ground. Operators must apply for a Certification of Authorization or Waiver (COA) to operate an unmanned aircraft. UAS flights are not permitted over populated areas and no hazardous material may be carried or objects dropped outside of Restricted Area Airspace. Other restrictions may be applied that hamper the accomplishment of the UAS operator's mission. The COA process has been implemented until concerns over the safety of UAS operations can be allayed. The demonstration project is part of the process to prove the viability of UAS to operate safely in the NAS without undue risk. The ultimate goal is that UAS have unfettered access to the NAS. Unfettered access to the NAS for DoD UAS is a growing imperative. Future civilian demand is anticipated.

The following shortfalls in the existing NAS need to be considered and resolved:

- The integration of individual-domain (intra-domain) which would allow for end-to-end (or multi-domain) demonstration and testing.
- The immediate (near-term) integration of new emerging technologies, or applications into existing or planned demonstrations.
- NAS near-term demonstration initiatives supporting government / industry partnership demonstrations.
- The sustainment of the individual or end-to-end (multi-domain) demonstration sites.
- Costs for new towers for medium-sized airports have approached \$30 million per airport. With several
  hundred towers needing repair or expansion, the total annual operating costs are, or will exceed, budget
  expectations by a substantial margin. Runway safety enhancements need to keep pace with traffic
  growth and demand.

<u>Description of Solution:</u> NextGen demonstrations will be conducted in close cooperation with both internal FAA and JPDO. Demonstration, developmental, and validation activities, transforming technology resources (demonstration sites and end-to-end demonstration activities) will include the following for FY 2011:

- Environmental: International Air Traffic Interoperability (\$7,000,000):
  - Continued demonstrations of trajectory-based management in the arrival domain to collect benefits data for a reduction in the carbon footprint of aviation operations.
  - Flight demonstrations across the Atlantic to provide requirements and standards for future automation upgrades.
  - Surface management improvement demonstrations to reduce taxi times for less fuel consumption.
- Unmanned Aircraft Systems (UAS) 4D Trajectory Based Demonstration (\$6,500,000):
  - Flight trials will be conducted in Florida to facilitate the need for integration of DoD and other governmental agency UAS operations into the NAS. Demonstrations provide a means to validate and prove concepts and establish confidence in the safety case for UAS. Demonstrations support ongoing work of RTCA Special Committee 203 (SC-203) which is developing performance requirements for operation of UAS in the NAS. This work will lay the foundation for the Minimum Aviation System Performance Standards (MASPS) for UAS and other regulatory criteria leading to the safe operations of UAS in the Next Generation Air Transportation System (NextGen).
- Future Planning Demonstrations (\$10,500,000):
  - Additional demonstrations based on the NextGen Demonstration Plan will be planed and developed in FY 2010 for execution in FY 2011. Demonstration activities may include collaborative decisionmaking across multiple Air Navigation Service Providers (ANSPs).
- Joint Planning Development Office (JPDO) (\$3,000,000)
  - The JPDO will sponsor special studies and analyses conducted at the NGATS Institute, as well as support the multi-agency Joint Planning Environment that provides a transparent web-based view of Enterprise Architecture and Integrated Work Plan information.

<u>Benefits:</u> The NextGen Technology Demonstration program is a development effort to support the transformation of the NAS to 4-D trajectory management and a performance-based system. The program provided integration and demonstration of alternate technologies and concepts, while supporting procedures and standards development, integration of near-term emerging technologies and airspace customers' initiatives with on-going scheduled demonstrations. This program provides a vehicle to test concepts and leverage individual transformational program and project technology to create multi-domain cohesive demonstrations to capture the synergies needed to transform the NAS in an expedited manner. The evaluation of technology and the collaboration between public/private industry partners, Air Navigation Service Providers, customers, and owners will continue into perpetuity.

#### **APPROPRIATION SUMMARY**

	<u>Locations</u>	<u>Amount (\$000)</u>
Appropriated (FY 1982-2009)		\$78,000.0
FY 2010 Appropriated		33,773.7
FY 2011 Request		27,000.0
FY 2012-2015		<u>120,000.0</u> <sup>1</sup>
Total	Various	\$258,773.7

#### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
<ol> <li>International Air Traffic Interoperability</li> <li>Unmanned Aircraft Systems (UAS) 4D Trajectory</li> </ol>		\$7,000.0
Based Demonstration		6,500.0
3. Future Planning - Demonstrations		10,500.0
4. JPDO Program Management	<u></u>	<u>3,000.0</u>
Total	Various	\$27,000.0

<sup>&</sup>lt;sup>1</sup> Future requirements under review.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
1A08	Next Generation Air Transportation System (NextGen) – System Development	\$95,000,000	Various	G-1M, G-6M, G-7M, M-25

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem</u>: In 2003 under Public Law 108-176, Congress created a multi-agency Joint Planning and Development Office (JPDO) to manage work related to the Next Generation Air Transportation System (NextGen) to meet air traffic demand by 2025. The JPDO's 2004 Integrated Plan identified three key performance targets to achieve the desired capability by 2025. These are (1); satisfy future growth in demand up to three times current levels; (2); reduce domestic curb-to-curb transit time by 30 percent; and (3); minimize the impact of weather and other disruptions to achieve 95 percent on time performance. Achieving these targets by 2025 is a challenge. In addition, an increase in demand of three times the current levels could cause a similar increase in the number of accidents, aircraft noise and emissions, and air traffic controller workload. This line item provides the research and development required to resolve these potential problems.

The solution involves four areas of research and development – safety, capacity, human factors, and environment. The safety research includes expanding information sharing and data analysis to identify and mitigate risks before they lead to accidents. The capacity research develops new air traffic management systems to support NextGen measures and NextGen concepts to determine if they achieve the targets for 2025; and develops flexible airspace categories to increase throughput. The human factors research provides higher efficiency levels in air traffic control and identifies the new role for controllers as more responsibility shifts to the flight crew. The environmental research explores new procedures, and adapts new technologies and fuels into the National Airspace System (NAS) to reduce emissions, fuel burn, and noise; and includes demonstrations, methods to adapt the current infrastructure, and estimates of costs and benefits.

## 1. <u>Air Traffic Control/Technical Operations Human Factors (Controller Efficiency and Air Ground Integration)</u> (\$10,000,000):

Description of Solution: Automation and technology must work in concert with the humans in the system to meet the targeted efficiency levels. This program targets the integration and harmonization of the various NextGen concepts into a workable solution that intelligently adds the many new capabilities, decision support tools and automation to the diverse NextGen actors' workstations to achieve the desired performance outcome. Human factors aspects of existing air traffic control systems are a limiting factor for traffic loads. Projected traffic loads will exceed the capability of our current mode of air traffic control when traffic levels exceed approximately 130 percent of 2004 levels (baseline). Achieving the capacity targets of NextGen and achieving self-separation between aircraft by the flight crew requires significant changes in the roles and responsibilities between pilots and controllers and between humans and automation. Integration of air and ground capabilities poses challenges for the air traffic service provider and the flight crew. A core human factors issue is to ensure that safety is maintained. Information on intent as well as positive information on delegation of authority must be clear and unambiguous; and analyses of new types of human error modes are required to manage safety risk in the changing environment.

For FY 2011, the program will conduct an evaluation of human factors requirements and human performance outcomes in an integrated simulation (in collaboration with the Human Factors Air-Ground Integration project) involving air traffic controllers using NextGen tools and workstations. The simulation will link to the Human Factors Air-Ground Integration simulation with pilots using Data Comm and other advanced flight deck components. The program will continue development of integrated workstations for en route, TRACON, and tower with the intent of moving toward a common workstation for en route and TRACON to enable NextGen

concepts where the two domains converge to provide a comprehensive service. Work on the collaborative aspects of NextGen between the traffic flow and NAS users will continue from the human factors perspective. Preliminary results of the NextGen human error analysis and results of human factors requirements for alerts and decision support tools will be delivered.

<u>Benefits:</u> The human component is arguably the most important and least addressed part of NextGen. In the system engineering context the NextGen system is incomplete and is at risk of inadequate performance. This program will measure the human performance benefits of NextGen as each of the components converge at the workstation – which is the point of delivery of air traffic services. This program will also address the air ground integration issues that stem from the interactions between the actors in the NextGen system. Unless benefits are measured with the human in the loop the benefits are not based on the total system.

Quantitative benefits data will be developed during the course of human-in-the-loop simulations. Each simulation will establish baseline performance and compare to performance under the new configuration. Human performance is measured in terms of number of macro elements such as aircraft being managed, airport or sector throughput, controller workload, and situation awareness. Other performance measures relate to task performance and micro measures such as number of keystrokes or time to visually scan a display to extract an element of information. Qualitative benefits data will be developed to address the acceptability of technology and procedures. Efficiency measures will likely be qualitative.

This program will assure that the workstations, decision support tools and automation used by air traffic personnel support the delivery of operational improvements. Without this program the scores of decision support tools and automation will converge on the controller and will suffer from lack of use, misuse, and abuse. The relationship between the actors in the NextGen NAS must be understood so that roles and responsibilities are in alignment with authority and policy and can be fully exercised.

## 2. <u>Environment and Energy – Environmental Management System and Advanced Noise/Emissions Reduction (\$15,000,000):</u>

<u>Description of Solution:</u> The environmental research provides new and advanced aircraft and engine technologies, alternative jet fuels and operational procedures to reduce fuel burn, and emissions and noise impacts towards achieving NextGen environmental goals. A critical component of this research includes explorations, simple demonstrations as well as methods to integrate these environmental impact mitigation and energy efficiency options with the NextGen infrastructure in a costs-beneficial manner. It will also provide ways to adapt the NAS infrastructure to fully exploit the benefits of these environmental mitigation and energy efficiency options. This research program will also support development and implementation of Environmental Management System (EMS) which will manage NextGen related environmental impacts both at the organizational and enterprise levels.

Environment and Energy – Environmental Management System. Robust aviation growth will cause commensurate increases in fuel burn, and noise, and emissions impacts unless effective and cost-beneficial mitigation measures are implemented. The NextGen environmental goal is to achieve environmental protection that allows sustained aviation growth. Knowledge of human health and welfare impacts of aviation noise and emissions and their related health and welfare impacts metrics to enable appropriate means are critical to mitigate these environmental effects. These numerous highly complex environment and energy issues are interrelated, dynamic, and evolving. This complexity and change requires a framework that adapts to feedback and system changes to continually optimize mitigation approaches by well developed and demonstrated environmental impacts metrics. The strategic EMS will move the air transportation system toward the achievement of long-term goals through the establishment of management system elements at an enterprise and organizational level. It will support improved data and data-flow to enable better decisionmaking, which in turn, will enable technology, operational procedures, and policy to be refined, applied and adapted to cost effectively meet the needs of real operating conditions.

<u>Environment and Energy – Advanced Noise and Emission Reduction.</u> Robust aviation growth will cause commensurate increases in fuel burn, and noise, and emissions impacts unless effective and cost-beneficial mitigation measures are implemented. The potential for environmental damage could restrict capacity growth and prevent full realization of NextGen. Effective and proven capabilities as well as NAS-wide implementation of advance technologies, alternative jet fuels and improved operational procedures are the key to reduce

significant environmental impacts while improving the energy efficiency of the system. This program element provides the interface between NextGen Environment and Energy Research and Development program designed to develop fuel burn, noise and emissions reduction options and the EMS which will manage the NextGen environmental impacts. This program also provides the interface between demonstration of new operational procedures in the NAS and exploration and early demonstration of procedures specifically targeted at environmental benefits.

<u>Benefits</u>: Manage environmental impacts of NextGen through EMS based on development and demonstration of solutions to mitigate noise and emissions and increase fuel burn efficiency. Each research element in this line item has a target for the year 2016 that involves a demonstration. The demonstrations will prove concepts and show that it is possible to meet the target operationally by the year 2025.

<u>Environment and Energy – Environmental Management System.</u> By 2016, this program element will provide system knowledge and processes to implement and manage NextGen system alternatives in the cost-beneficial manner to achieve environmental protection that allows sustained aviation growth. This program element will combine progress on environmental improvements relative to advance technologies, alternative jet fuels and improved operational procedures developed under related programs into a comprehensive Environmental Management System approach. Progress will be measured by demonstrating no environmental constraints at 166 percent capacity by 2011; at 230 percent capacity by 2013; and finally at 300 percent capacity by 2016. Research and development supports operational implementation by 2025.

<u>Environment and Energy – Advanced Noise and Emission Reduction.</u> By 2016, this program element will demonstrate that aviation noise and emissions can be significantly reduced in absolute terms in a cost-beneficial way and proven ways of managing uncertainties in noise, health and climate impacts to levels that enable more informed action. Progress will be measured by demonstrating (under the following program element) no environmental constraints at 166 percent capacity by 2011; no environmental constraints at 230 percent capacity by 2013; and finally no environmental constraints at 300 percent capacity by 2016. Research and development supports operational implementation by 2025.

#### 3. New Air Traffic Management (ATM) Requirements (\$23,000,000):

<u>Description of Solution:</u> In FY 2010, the FAA must continue developing the capabilities needed to make required capabilities supportive of NextGen solution sets. These capabilities are highly dependent on technologies that accurately predict and monitor the location, intent of aircraft and provide this information to other pilots, controllers, and other stakeholders. Some of the aspects of the NextGen Concept of Operations depend upon the aircraft as a participant in efficient, safe air traffic management both in-flight and on the airport surface. These capabilities also rely on procedures that keep traffic flowing smoothly in all weather and visibility conditions both in-flight and on the airport surface. The NextGen New ATM research initiative will result in enhanced methods of determining safe separation while optimizing capacity, for all flight regimes and all aircraft. The new ATM requirements program will identify and develop the operational requirements for the following programs:

### Traffic Collision Avoidance System (TCAS)

Analysis, requirements, pseudo-code-supports provide effective collision risk safety net in an environment
of closely spaced parallel RNP route from top-of-descent to the runway.

### Common Trajectory Requirements and Implementation Strategy

- Identify Trajectory Differences.
- Evaluate Need and Fidelity.
- Propose Standard for Exchange.
- Analyze System changes and Allocations.

#### RNAV/RNP via Data Communications

- Delivery across data communications-requirements.
- On the fly" development, evaluation and delivery.

#### New Radar Requirements

Weather Radar Replacement (WRR) Engineering Trade Studies

<u>Benefits:</u> This program element conducts research to develop systems that support the capacity enhancements for seven solution sets of NextGen. By 2015, the research will demonstrate that the planned system can handle growth in demand up to three times current levels; demonstrate that gate-to-gate transit time can be reduced by 30 percent; and demonstrate that the system will allow achievement of a 95 percent on-time arrival rate. Progress on the research will be measured under the following program element. Research supports operational implementation by 2025.

#### Benefits include:

- International standards and validated technologies for air-ground data communications in L-band for continental flight domains, air-ground and ground-ground data communications in C-band for airport surface operations, and air-ground data communications in SatCom bands for oceanic, polar and remote operations.
- Networking layers standards for international interoperability of data communications across the physical and datalink standards proposed for use in L-band, C-band and SatCom bands.
- 4. Operations Concept Validation (Validation Modeling) (\$10,000,000):

Description of Solution: The Operations Concept Validation Program addresses the FAA's goal for capacity and the DOT Reduced Congestion Strategic Objective to "Advance accessible, efficient, inter-modal transportation for the movement of people and goods." It also supports the FAA's National Aviation Research Plan goal for a "Fast, Flexible and Efficient" system that safely and quickly moves anyone and anything, anywhere, anytime on schedules that meet customer needs. The program supports these goals by developing and validating future end-to-end (flight planning through arrival) operational concepts with special emphasis on researching changes in roles and responsibilities between the FAA and airspace users (e.g., pilots and airlines), as well as the role of the human versus systems, that will increase capacity and improve efficiency and throughput. It fits within the Air Traffic Organization's pathway 4, "Ensure Viable Future" to assure a sustainable and affordable Air Transportation System for the future by developing future operational concepts that will decrease workload and increase reliance on automation for routine tasking, and new procedures both on the ground and in the air to increase efficiency of the NAS. Furthermore, this program works toward developing operational methods that will meet the NextGen goal of expanding capacity by satisfying future growth in demand (up to three times capacity) as well as reducing transit time (reduce gate-to-gate transit times by 30 percent and increasing on-time arrival rate to 95 percent).

As proposed system alternatives for NextGen develop, there must be an understanding of the economic and operational impact of the proposed solutions. This requires a thorough understanding of how the aerospace system operates, the impact of change on system performance and risk, and how the system impacts the nation. There must be methods, metrics, and models that demonstrate whether or not the proposed solution contributes to increased capacity, reduced transit time, or increased on time arrivals; and if so, how much the solution contributes. The demonstration must address the combined solution as a system in terms of its progress toward and ultimate achievement of the NextGen targets. This program will conduct research to identify and validate changes to current air traffic management operations that will foster increased system capacity, efficiency, and throughput. Concept validation activities will ensure the future concepts are feasible, will realize expected benefits and identify the human factors implications of the concepts. Validated operational concepts will identify technical and operational requirements, such as airspace, procedures, and Communications, Navigation, Surveillance, and Automation requirements, needed to realize the capacity gains.

For 2011, the program will develop an end-to-end concept and performs validation activities for operational changes for NextGen solution sets. Specific concept elements will be validated through simulation and modeling, including human-in-the-loop simulations.

<u>Benefits:</u> By 2016, this program element will provide system knowledge to understand economic (including implementation) and operational impact (with respect to capacity improvements) of NextGen system alternatives. It will measure the proposed NextGen system alternatives to determine whether or not the system meets the capacity targets of NextGen. It will develop methods, metrics, and models to measure capacity improvements. Progress will be measured by demonstrating capacity increases to 166 percent current levels by 2011; 230 percent by 2013; and 300 percent by 2016.

### 5. Systems Safety Management Transformation (\$18,000,000):

<u>Description of Solution</u>: In 2003 under Public Law 108-176, Congress created a multi-agency Joint Planning and Development Office (JPDO) to manage work related to the Next Generation Air Transportation System (NextGen) to meet air traffic demand. This increase in capacity must be accomplished while continuing to (1); maintain aviation's record as the safest mode of transportation, (2); improve the level of safety of the U.S. air transportation system, and (3); increase the safety of worldwide air transportation Achieving these targets by 2025 is a challenge. This line item provides the research and development required to improve safety as air traffic grows. This will be accomplished through an integrated safety management approach that will provide a proactive means for building safety into the air transportation system we are developing and safely managing it through the transition. Key to this transformation will be the development of cutting-edge operational data analysis capabilities for the identification of safety issues. This research will promote expansion of the U.S. capability to meet national and international safety goals and objectives with less oversight of individual carriers.

Achieving NextGen will require a full-scale transformation of the NAS, because our current system simply is not scalable to handle the required changes. A fully successful NextGen system is dependent on careful examination and integration of what technologies and responsibilities should reside with the aircraft and what technologies and responsibilities should reside on the ground. At the same time, safety will remain the top priority of FAA. Transforming the system will require a thorough understanding of the operational impact (with respect to safety) of system alternatives. While pursuing three times current levels of capacity, FAA will continue to pursue reduced fatality rates.

For FY 2011, the program will continue the development of methodologies and technologies that enable evolutionary safety assessments (assessments throughout the implementation lifecycle) of proposed NextGen concepts, algorithms, and technologies. Further refinement and evolution of system knowledge to understand economic and operational impacts of NextGen system alternatives with respect to safety will be provided. An initial roadmap of capabilities for a National Level Safety Assessment will be in place and evaluated among NextGen stakeholders. The research will identify the interface, data sharing needs and operational scenarios of NextGen stakeholders in supporting a more comprehensive National Level System Safety Assessment which proactively identifies emerging risks/hazards across the air transportation system. The ASIAS program continues to evolve to meet the needs of stakeholders in the areas of vulnerability discovery, national level system safety assessments, and individual implementation of Safety Management Systems within their organizations. National level methods to identify emergent risk, integrate the impact of forecast system changes into the risk assessment and management process, and develop tools with which to evaluate the impacts of the NextGen portfolio on system risk are developed. Safety management capabilities are adapted for use within individual stakeholder organizations to begin implementation of the NextGen concept of "systems of systems" to provide proactive, collaborative and comprehensive safety while NextGen capabilities are being introduced. Safety Management Systems (SMS) research continues in refining and deploying capabilities that support he full integration of SMS within the aircraft/aircraft avionics OEM and NextGen JPDO member organizations. The System Safety Assessment capabilities are further defined to meet the needs of planned NextGen implementation plans and member organizations. Operational Safety Assessments are conducted to determine future operational requirements that need to be considered for risk analysis.

Benefits: Research and development identifies constraints and barriers, and separates solutions that are effective from those that are not. In FY 2014, the capabilities to perform a National Level System Safety Assessment that will proactively identify emerging risk across the NextGen will be demonstrated. The demonstration will prove the capabilities are on track to meet operational targets by the year 2025. The benefits are: (1); capacity increased to three times current levels; (2); curb-to-curb transit time reduced by 30 percent; (3); on time performance increased to 95 percent; (4); noise and emissions reduced in a cost effective way to allow three times capacity; (5); air traffic controller efficiency increased to three times current levels; (6) aerospace-related fatality rate reduced commensurate with capacity increase; and (7) understanding of economic and operational impact of system alternatives. Benefits for the items in the FY 2010 request are as follows:

This program contributes to reducing the fatality rate commensurate with increases in capacity under NextGen. By 2015, this program element will provide system knowledge to understand economic (including implementation) and operational impact (with respect to safety) of NextGen system alternatives. The research outcomes include an infrastructure that enables the free sharing of de-identified, aggregate safety

information that is derived from various government and industry sources in a protected, aggregated manner; and demonstration of a National Level System Safety Assessment working prototype that will proactively identify emerging risk across the NextGen. Research supports operational implementation by 2025.

### 6. Wake Turbulence (Re-categorization) (\$3,000,000):

<u>Description of Solution:</u> In FY 2010, \$2,000,000 was appropriated to continue the development of a new safe, but more capacity efficient set of wake separation standards. The last full review of wake separation standards used by air traffic control occurred nearly 20 years ago in the early 1990's. Since then, air carrier operations and fleet mix have changed dramatically, airport runway complexes have changed and new aircraft designs (A-380, very light jets, unmanned aircraft systems) have been introduced into the National Airspace System (NAS). The 20 year old wake separation standards still provide safe separation of aircraft from each other's wakes but no longer provide the most capacity efficient spacing and sequencing of aircraft in approach and en-route operations. This loss of efficient spacing is causing an unnecessary gap between demand and the capacity the NAS can provide.

Recently work was done with the air traffic control wake separation standards to accommodate the A380 class of aircraft and work continues to address introduction of other large aircraft. This project will build on that joint work and accomplish a more general review to include regional jets, unmanned aircraft systems, microjets, etc. The work is phased, starting with optimizing the present "1990's" air traffic control wake separation standards to reflect the change in fleet mix that has occurred over the last 20 years. By 2010, the project will have a set of recommendations for international review that focuses on changes to the present static standards. To accomplish this, the project will develop enhanced analysis tools to link observed wake behavior to standards, determine safety risk associated with potential new standards relative to existing standards; simulate and validate new separation standards; integrate the work being accomplished by EUROCONTROL; and conduct analyses to link wake transport and demise characteristics to aircraft flight and surrounding weather parameters.

The next phase of this project will develop by 2014, sets of air traffic control wake separation standards whose application would depend on flight conditions and aircraft performance; resulting in being able to get more aircraft into and out of airports and in the same volume of airspace. By 2020, the final phase of the project will have developed the aircraft and ground based capabilities required to achieve the NextGen concept of safe, efficient dynamic pair-wise separation of aircraft. The dynamic pair-wise separation capability will allow the densest feasible safe packing of aircraft in a given airspace.

FY 2011 begins the next phase of the Wake Re-Categorization project, which by 2014 will develop sets of airport specific air traffic control wake separation standards whose application would depend on flight conditions and aircraft performance; being able to move more aircraft into and out of airports within the same volume of airspace. By 2020, the final phase of the project will have developed the aircraft and ground based capabilities required to achieve the NextGen concept of safe, efficient dynamic pair-wise separation of aircraft. The dynamic pair-wise separation capability will allow the densest feasible safe packing of aircraft in a given airspace.

<u>Benefits:</u> This project will contribute to the NextGen target of handling growth in air traffic demand of up to three times the current levels. The project will focus on re-categorization of wake separation standards in three steps. By 2010, it will provide static safe capacity efficient changes to the present air traffic control wake separation standards, using the six current aircraft weight categories adjusted to account for fleet mix changes. These changes are projected to allow some airports to increase their arrival and departure rates by several aircraft per hour. By 2014, the project will develop an alternate set of wake separations standards and procedures for use under specific conditions to safely place more aircraft in the same volume of airspace. By 2020, the project's outcomes will support dynamic, pair-wise wake separation of aircraft - which will provide the most capacity efficient aircraft spacing that is theoretically possible. If the development of a means to dynamically pair-wise separate aircraft proves successful, operational implementation of the dynamic capability is projected to be in the 2025 time frame.

#### 7. NextGen Operational Assessments (\$10,000,000):

<u>Description of Solution:</u> The transition to NextGen requires the conduct of operational assessments to ensure that safety, environmental, and system performance considerations are addressed throughout the integration

and implementation of NextGen. Such assessments are particularly important as the NextGen program begins to evaluate current airspace design and as new procedures are developed and implemented within the NAS. In FY 2010, funding is requested to conduct system safety assessments, environmental-specific assessment and environmental model advancements, system performance management, and system risk management activities.

For FY 2011, the program will develop, evaluate and implement further enhancements for the NextGen regional scale analysis capability in the AEDT. Develop, evaluate and implement further enhancements for the NextGen regional scale analysis capability in the APMT. Continue initial NAS-wide environmental assessment and identify needs for further improvements in NextGen environmental assessment. The program will also enhance the Safety Model and the Operational Performance Model to support NextGen Operational Assessments.

<u>Benefits:</u> This project will contribute to system safety enhancements across the NAS, aircraft emissions and noise reduction, capacity, efficiency, and delay reduction.

#### 7. Staffed NextGen Towers (SNT) (\$6,000,000):

<u>Description of Solution:</u> The air traffic in the United States (U.S.) is expected to increase significantly over the next several decades. Some high-end estimates indicate that by the year 2025 the total passenger enplanements may more than double and total aircraft operations may triple in comparison to the traffic today. In the next 10-15 years, most U.S. tower facilities will reach the end of their useful life. The cost of new tower construction is escalating and is rapidly reaching a point where requirements are exceeding budgets. The FAA has to develop new operational concepts to increase capacity and address the predicted growth in airport tower operations while still addressing the cost prohibitive nature of replacing air traffic control towers with new towers. Runway safety (reduced runway incursions) also needs to be enhanced to keep pace with traffic growth.

To achieve the end-state configuration for the proposed Staffed NextGen Tower (SNT) capability, implementation will be done in three phases: Supplemental Configuration, Flexible Configuration, and Full SNT Configuration. The Supplemental SNT, Phase 1, provides surface and tower services through the use of an integrated display certified for separation assurance based on surveillance data as an enhancement to the current control paradigm. Under the Supplemental Configuration of SNTs, Air Navigation Service Provider (ANSP) personnel will remain in the existing tower cab and will use the integrated display to increase airport capacity under IMC. By operating in this initial phase of SNT, ANSP personnel will gain valuable experience in the use of the new display. The Flexible SNT, Phase 2, provides surface and tower services either from a ground-level SNT facility or from the tower cab. The SNT facility provides advanced surface management and decision support tools to the ANSP. Such an operation will give ANSP personnel confidence in SNT operation because the existing tower will be available as a backup to SNT. The Full SNT, Phase 3, provides surface and tower services exclusively from a ground-level SNT facility. The SNT facility provides advanced surface management and decision support tools.

For FY 2011, \$6,000,000 is requested for standards and alternatives development in support of an initial investment decision and OMB Exhibit 300 documentation to ensure the timely implementation of SNT into the NAS. This request will also fund the sustainment of the SNT equipment installed at a field site (TBD) and allow for refinement and analysis to be conducted at the field site in support of the initial investment decision.

<u>Benefits:</u> With SNT, there will be an increased throughput in low visibility and night conditions. Operational efficiency will be increased through enhanced technical capability and the flexibility of workforce management. The enhanced technology and implementation of decision support tools will improve efficiency and safety in runway incursion alerting, taxiway conformance monitoring and deviation alerting, electronic flight data management, consolidation of weather information, and emergency management. SNTs will also reduce facility operational and construction costs and provide air traffic services to additional airports with low incremental costs.

## **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$41,400.0
FY 2010 Appropriated		66,100.0
FY 2011 Request		95,000.0
FY 2012-2015		441,200.0
Total	Various	\$643,700.0

## COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

	_ocations/ <u>Quantity</u>	Estimated Cost (\$000)
<ol> <li>ATC/Technical Ops Human Factors</li> <li>Environment and Energy (EMS and Noise/Emissions Reduction)</li> <li>New ATM Requirements</li> <li>Operations Concept Validation - Validation Modeling</li> <li>Systems Safety Management Transformation</li> <li>Wake Turbulence - Re-categorization</li> <li>NextGen Operational Assessments</li> <li>Staffed NextGen Towers</li> <li>Total</li> </ol>	      Various	\$10,000.0 15,000.0 23,000.0 10,000.0 18,000.0 3,000.0 10,000.0 6,000.0 \$95,000.0
Total	various	φ53,000.0

<sup>&</sup>lt;sup>1</sup> Future requirements are under review.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
1A09	Next Generation Air Transportation System (NextGen) - Trajectory- Based Operations (TBO)	\$58,600,000	Various	G-1A, G-1N

<u>FAA Strategic Goal:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> Trajectory Based Operations (TBO) is a shift from clearance based to trajectory based control. Aircraft will fly negotiated trajectories, and air traffic control moves to management by trajectory; the traditional role of the pilots/controllers will evolve due to the increase in automation, support, and integration. TBO focuses primarily on en-route and oceanic operations, although the effects of TBO will be felt in all phases of flight.

Currently, separation is handled by controllers using radar screens to visualize trajectories and make cognitive operational judgments, with some automation decision support to help identify and resolve future conflicts. With an increasing diversity of aircraft characteristics, using a single set of equipment-based separation standards for all aircraft encounters is becoming increasingly inefficient and limits capacity. This is especially true for aircraft (such as UAS, A380) that may need larger separations to maintain overall airspace safety levels. Human limitations constrain efficiency and expansion of service as sectors have shrunk to the point of diminishing returns in many places. Human limitations drive costs as well. An ability to handle more diverse traffic, with fewer impacts to operator desired performance profiles, while lowering unit costs as needed.

Flights are managed in today's system primarily by voice communication. Separation is handled by controllers using radar screens to visualize trajectories and make operational judgments. These judgments are turned into clearances often expressed as vector coordinates - all handled by two-way radio. Decision support tools aid the controller by predicting potential future conflicts and aid in evaluation but there effectiveness is limited by the use of voice – workload and voice limitations on complexity. Separation management remains much as it was when the radar was first introduced into the system. Human limitations constrain efficiency and expansion of service as sectors have shrunk to the point of diminishing returns in many places. Human limitations drive costs as well. A separation management that can handle more, diverse traffic, with fewer impacts to user desired performance profiles, while lowering unit costs is needed.

As demand has grown, especially in the airspace surrounding and between major metropolitan areas, the current fixed airspace routings and large separations limit airspace capacity and tactical management of major flows. En route congestion has become a major constraint on the system as the inflexibility of the system to airspace adjustments makes tactical flow in the face of demand congestion or major weather disturbances difficult. Due to the limitations in automated prediction capability and voice communication, separation standards remain, for the most part fixed and conservative, which restricts capacity to the overall system.

The current flight data management system and the current navigation systems do not support the flexibility that is needed from both a planning and execution perspective. Trajectory management means that true 4-D trajectories can be exchange and monitored and that the system can support the exchange of multiple alternative trajectories in both separation management and tactical flow. This requires a capability beyond that of the current flight plan which was developed in an era of human only interpretation and planning. Trajectory management and full use of the airspace also requires that aircraft can navigate off fixed routes and that new routes can be developed and published with minimum distances between. Keeping aircraft on historic routings with historic between route separations limits the use of airspace capacity in general and specifically to address weather and congestion limitations.

Supporting activities or projects that are being performed:

1. Separation Management - Separation Automation Enhancements (D-Side and R-Side) (\$18,600,000):

<u>Description of Solution:</u> Currently, controllers using radar screens and limited computer decision support visualize trajectories to make cognitive judgments on how to maintain static separation standards between aircraft. The static separation standards allow humans to reduce the cognitive variability in this highly complex task to ensure separation. With an increasing diversity of aircraft characteristics, using a single separation standard for all aircraft encounters is becoming increasingly inefficient, and it limits capacity. Conflict Alert in En Route Automation Modernization (ERAM) is embedded in the Surveillance Data Processing (SDP) subsystem and has a short parameter time look-ahead (~90-120 seconds) based on a track-vector "Headlight" projection.

Performance-based services are a basic principle of NextGen: the more sophisticated the capabilities of the aircraft, the more likely the pilots can get their preferred trajectory. The performance-based concept calls for separation standards to vary according to aircraft capabilities and pilot training. This activity will result in a set of separation standards requirements and algorithms to implement them. This includes changes to automation, procedures, and training. This also funds an analysis of performance-based data processing to see if it is appropriate for lowering separation minima. Performance-based data processing is a way to integrate all information about an aircraft's path and location to provide full situational awareness and predict possible problems.

Developing new automation Conflict Alert (CA) and Conflict Probe (CP) algorithms and changing the controller workstations to support the new information are on the critical path of many NextGen technologies. Completion of this task enables successful completion of other TBO goals, as well as broader NextGen objectives.

For FY 2011, \$18,600,000 is requested to:

- Develop a prototype for Wake Vortex Separation
- Analysis on extended three nautical mile separation and Performance Based Navigation (PBN)
   Conformance Monitor and Alert.
- Complete prototype development for PBN Route Offset
- Complete prototype evaluations for Conflict Probe on the R-Side and Conflict Alert Safety Improvements.
- Develop requirements for D-Side computer-human-interface (CHI) Enhancements
- Produce engineering and enterprise architecture artifacts to support investment analysis during the preimplementation phase of this effort.

#### Benefits:

- Safety Enhancement En Route Separation Management automation enhancements will improve the
  reliability and utility of trajectory prediction, strategic conflict predication and tactical conflict alerting
  function for controllers and make them available at all positions where they are needed, thus enhancing
  safety by reducing the likelihood of operational errors.
- Capacity Utilization As traffic levels increase, the controllers' ability to maintain safe separation becomes a limiting factor, often resulting in the imposition of traffic restrictions that limit airspace capacity utilization. Research results (e.g. Mitre, NASA) indicate that the controllers' ability to handle increased traffic levels is enhanced by additional automation assistance. Enhanced Separation Management automation assistance in the NAS is expected to allow controllers to handle traffic growth without increasing restrictions and delays.
- Ensuring a Viable future Increasing the accuracy, reliability and availability of En Route Separation
   Management automation will build a foundation for the more extensive use of automation to safely manage air traffic in the future with less controller intervention.

## 2. <u>Separation Management – High Altitude (\$3,000,000):</u>

<u>Description of Solution:</u> This activity is to develop the mid term automation decision support tool and display requirements for air traffic controller separation management in high altitude trajectory based airspace. It will identify cognitive support and display change requirements for early transition to a high altitude specialty and will develop and validate automation changes needed to implement a new high altitude operating concept that will create a more flexible high altitude airspace concept by increasing staffing flexibility, reducing training time, and enabling traffic peaks to be handled by fewer controllers. In FY 2010, \$7,000,000 was requested to conduct research into operational requirements associated with cognitive support and display changes that

provide local knowledge information on the controller's display or eliminate the need for local knowledge by automating the associated tasks. This work will evaluate whether the design is acceptable and meets the operational requirements needed to implement a new high altitude operational concept. Initial operational concept development and validation efforts have concluded that in high altitude airspace, the local knowledge information needed is considerably less than in lower altitudes (only 55 out of 102 knowledge items versus nearly 100 percent for other airspace) and that different operating strategies can be used to more dynamically adjust staffing and airspace to meet demand and reduce operating costs. By providing local knowledge through information accessible through the controller display and other tools, there will be increased flexibility in the assignment of airspace to controllers; increasing overall productivity and flexibility to deal with weather and congestion events. This activity will work to define and develop the information display and decision support tool changes to provide this local knowledge and conduct human-in-the-loop simulations with controllers to assess the effectiveness of the information content and automation and display changes to enable rapid training (in terms of hours) of controllers to safely and efficiently control the airspace.

For FY 2011, \$3,000,000 is requested to:

 Continue validation and development of requirements for automation decision support tools for High Altitude concept.

<u>Benefits</u>: The benefits associated with implementing a universal or generic high altitude airspace management concept will be increased flexibility in the assignment of high altitude airspace which will increase overall productivity and flexibility to deal with weather and congestions events. These changes will increase capacity, especially in reaction to congestion events and weather, and reduce FAA operating costs in the form of lower air traffic controller operations costs, lower air traffic controller training costs, and increased staffing flexibility.

#### 3. Trajectory Management - Oceanic (\$5,000,000):

<u>Description of Solution:</u> TBO integrates trajectory planning, management, and execution across the spectrum of time horizons from strategic planning to tactical decision making. Strategic aspects of trajectory management include the planning and scheduling of user operations and the corresponding planning and allocation of NextGen resources to meet demand. Overall flows are managed strategically and tactically, as necessary, to ensure safety, security, and efficiency of operations. Tactical components of trajectory management include the evaluation and adjustment of individual trajectories to synchronize or limit access to airspace system assets. Separation assurance to provide safe separation among all aircraft is also included.

TBO represents a shift from clearance-based control to trajectory-based control. In the new high-performance ATM environment, aircraft will transmit and receive precise data, to include aircraft routes and the times aircraft will cross key points in the airspace. With Data Communications, this same precise information will also be available to pilots and controllers on the ground. These improvements primarily result from the utilization of the new decision support capabilities, and the integration of traffic flow management. In the Oceanic environment some of the TBO capabilities have been implemented. This activity looks at enhancing the capabilities and taking advantage of aircraft and ground capabilities to investigate and validate new concepts in support of TBO.

For FY 2011, \$5,000,000 is requested to:

- Continue the expansion of existing Oceanic TBO activities, to prepare for the operational trials (such as ADS-C In-Trail Procedure in the Pacific, in-fight optimization) and the refinement of mid-term and longer-term objectives
- Web-Enabled Collaborative Trajectory Planning (CTP) activities will focus on prototype requirements and refinement of business case/benefits analyses.
- The Oceanic Trajectory Management-4D (OTM-4D) activities will focus on pre-departure prototype development (such as traffic distribution, profile de-confliction, and requirements for hardware and software components of the prototype).
- The OTM-4D In-Flight activities will focus on the business case/benefit analysis and requirements for Ocean21 based on the results of previous operational trials. Oceanic Airspace Management activities will focus ConOps/ConUse, functional requirements of automation, as well as the initial prototype requirements.
- The Oceanic Separation Below 30/30 activities will be directed towards preparation for implementation based on previous results.

#### Benefits:

- Increased Capacity/Efficiency: Aircraft will fly more efficient, user-preferred routes. Increased system precision and enhanced automation support the more efficient use of flight levels so that aircraft can more closely fly routes that maximize the airlines' goals for fuel efficiency, aircraft operations, and schedule. Reduced separation standards for aircraft that provide state and intent data will lead to fewer predicted problems, and as a result, fewer diversions from the preferred routing. Reduced separation standards will also result in increased capacity within flow constrained airspace, allowing more aircraft to fly through those areas, rather than being rerouted or delayed to avoid them.
- Reduced Environmental Impact: Oceanic TBO 4-D trajectory optimization has the potential to provide significant fuel efficiencies and reducing aircraft emissions. Early trials in FY 2008 and FY 2009 validated the fuel savings for trans-Atlantic flights as part of the Atlantic Interoperability Initiative to Reduce Emissions. As a result of less fuel burns, the Oceanic TBO 4-D trajectory optimization will allow for reduced environmental impacts.
- Other benefits: In addition to supporting increased flows, TBO enables collaboration between the Air Navigation Service Providers (ANSP) and operators to maximize utility of airspace to meet ANSP productivity and operator goals. TBO is seen as a key enabler to increase ANSP productivity, so services can be provided at a much lower per operation cost. Around major airports, TBO is flexibly managed, significantly reducing the "footprint" of today's airspace to only the active arrival and departure corridors, and allowing improved access to other trajectory-based and non-trajectory-based flights in the vicinity.

#### 4. Capacity Management - NextGen Distance Measuring Equipment (DME) (\$4,500,000):

<u>Description of Solution:</u> This DME program will provide near term support for a trajectory based and performance based operational requirements and will be functionally capable of providing the signal in space to fill the coverage gaps and meet the redundancy requirements for new GPS/RNAV/RNP procedures. This DME will have availability greater than 99.95 percent, a mean time to repair of less than one-half hour, a mean time between failures of 14,231 hours, and a mean time between outages of 15,193 hours. It will be configurable for low, intermediate, and high power with single or dual equipment and will be commissioned accordingly.

The functionality of this DME, while providing a higher transponder capacity, better reliability/maintainability, and the most current solid state technology, is exactly the same as the DMEs currently in the NAS. The most important function of the DME is the reply delay requirement used by the airborne interrogator to obtain slant range. This function has been consistent since the 1950's and will continue to be consistent in this DME.

For FY 2011, \$4,500,000 is requested to:

- Engineering and technical services/support
- Procure 20 DME/DME Systems for RNAV/RNP
- Commission two DME/DME locations for RNAV/RNP.

<u>Benefits:</u> The NextGen DME program maps to the FAA goal of Reduced Congestion by increasing NAS capacity to meet projected demand. The program provides a near term solution that requires no new avionics equipment and installing DMEs in appropriate locations to meet the 99.9 percent RNAV service availability requirement in the enroute structure and at OEP airports. There are 61 new DME locations to fill the coverage gaps and 87 existing locations that require a redundant system to meet the 99.9 percent service availability requirement. Filling the gaps and meeting the redundancy requirement will provide critical backup services for new GPS/RNAV/RNP procedures.

#### 5. Trajectory Management - Conflict Resolution Advisories (\$2,500,000):

<u>Description of Solution:</u> This activity includes the analysis, prototyping, pre-implementation activities and software development activities to implement conflict resolution advisories. Conflict resolution advisories will first be implemented using voice and data in a mixed equipage environment, and ultimately will be transmitted solely via data in certain airspace. The implications for changing controller roles and responsibilities will be explored and the requirements for automation, decision support systems and data communications will be identified. Modeling and analysis will be conducted to support benefits analysis and human in the loop simulations will be conducted to determine the impact on the controllers and pilots. Technical transfer activities are performed to transfer the CAASD solution to the system developer.

It investigates the impacts of various equipage levels on the benefits associated with this solution as well as on controller workload and task performance. Future en route airspace will be subdivided to accommodate mixed levels of aircraft performance. High performance aircraft will directly connect via air-ground data communications to the flight management system, facilitating electronic data communications between the ATC automation and the flight deck automation. As a first step and in mixed performance airspace, the controller will still be responsible for aircraft separation by responding to problems predicted by the ATC automation. Instead of monitoring the sector airspace display to predict potential problems and mentally calculating problem resolutions, the automation will not only predict the problems but determine the best solution. The controller will transmit the solution via voice initially, and then via data link. This level of automation support helps manage controller workload as a means of safely dealing with the predicted increases in traffic volume. This activity will prototype earlier and easier resolutions capabilities (such as preprobed altitude and speed amendments) that can be transferred verbally by controllers and evaluate the impact these have on the Computer Human Interface (CHI) design and system performance and conduct research into more complex issues for future implementation such as vector advisories as well as the role of the human versus automation in voice clearance, mixed voice and data communications environments, and data communications only.

For FY 2011, \$2,500,000 is requested to:

- Continue engineering evaluations and prototyping of conflict resolutions for more basic aircraft maneuvers.
- Conduct first set of human-in-the-loop experiments with initial approach for conflict resolutions to
  examine the feasibility and impact that basic conflict resolution advisories have on the Computer-Human
  Interface (CHI) design and system performance including controller performance.

<u>Benefits:</u> Automated problem prediction and resolution will allow the controller to handle more aircraft because predicted problems will be resolved strategically, reducing the number of situations that demand multiple time-critical actions. The addition of data communications as the means to transmit resolutions to the aircraft will further reduce controller workload.

Benefits: This activity supports the acceleration of the development of advanced ADS-B airborne applications.

Separation Management – Risk Mitigation (Automation Platform Interface Requirements) (\$25,000,000):

<u>Description of Solution:</u> This activity will support the assessment and risk mitigation activities for interfacing automation systems in support of the Advanced ADS-B applications.

For FY 2011, \$25,000,000 is requested to conduct risk mitigation activities associated with ADS-B interface requirements to various automation platforms, such as Terminal Automation Modernization and Replacement (TAMR).

<u>Benefits:</u> This activity will support risk mitigation for interfacing automation systems and the acceleration of Advanced ADS-B applications.

#### APPROPRIATION SUMMARY

	<u>Locations</u>	<u>Amount (\$000)</u>
Appropriated (FY 1982-2009)		\$39,500.0
FY 2010 Appropriated		63,500.0
FY 2011 Request		58,600.0
FY 2012-2015		89,000.0 <sup>1</sup>
Total	Various	\$250,600.0

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<sup>&</sup>lt;sup>1</sup> Future requirements are under review.

## COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

<u>Act</u>	ivity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1.	Separation Management – Separations Auto Enhancements		\$18,600.0
2.	Separation Management - High Altitude		3,000.0
3.	Trajectory Management - Oceanic		5,000.0
4.	Capacity Management - NextGen DME		4,500.0
5.	Trajectory Management - Conflict Resolution Advisories		2,500.0
6.	Separations Management – Risk Mitigation		<u>25,000.0</u>
Tot	al -	Various	\$58,600.0

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
1A10	Next Generation Air Transportation System (NextGen) - Reduce Weather Impact	\$43,202,000	Various	G-4M

<u>FAA Strategic Goal:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> In the National Airspace System (NAS), weather is responsible for 70 percent of delays over 15 minutes and contributes to 24 percent of accidents and 34 percent of fatalities. Up to 2/3 of weather delays are avoidable, based on a recent assessment completed by the FAA RE&D Advisory Committee. Despite a continuous flow of improvements available through aviation weather science and implementation solutions aimed at providing better weather information, the significant impact of weather on aviation remains. Weather is often the cause for delay and safety in NAS operations, and air traffic levels are expected to increase in the NextGen era.

Weather information is needed for air traffic management and flight operations decisions. These decisions range from the planning of individual flights, to the management of individual terminals and airspaces, to managing the capacity of the NAS. Collaboration among decision makers is required to resolve the constraints brought about by weather. Air Traffic Management (ATM), Flight Operations Center (FOC), and flight deck operational decision makers are unable to collaborate effectively in order to make the strategic and tactical decisions of the day. The current procedures for making these decisions are either labor intensive, and/or rely on multiple inputs in order to infer the required decision. The system is unable to support these decision makers due to gaps in today's weather dissemination system; incomplete, inaccurate, and inconsistent weather forecasts; and gaps and inaccuracies in weather observations used to depict current weather conditions and to support forecast generation.

#### Problems to be addressed in NextGen are:

- Weather information not accessible to all users and cannot be manipulated in accordance with user specific needs.
- Clear, accurate, consistent, complete, and unambiguous aviation weather information not available.
- Weather products lacking the spatial or temporal resolution required for decisions involving key weather phenomena that impact aviation.
- Inability to automatically develop and display the impact of weather on current or future NAS capacity
- Weather data not well integrated into either manual procedures or automated decision support tools (DST).

## Weather Problem for Weather Observation Improvements

The current weather observing infrastructure cannot provide the resolution required for the NextGen era. There are gaps as well as redundancies in the coverage of the atmosphere. The performance of these observing systems varies widely. The end result is an observing network which is not as cost-effective, accurate, or consistent, and cannot meet the needs for accurate user determination of the current conditions or for automated generation of accurate weather forecasts.

The demands of NextGen capabilities (e.g. Trajectory-based Operations, Super-Density Operations) drive the need for higher quality, more highly resolved, more adaptable observations of the airspace. To discriminate useable airspace from airspace closed off by flight hazards requires weather observations of the requisite coverage, refresh rate, accuracy, and spatial resolution. A full study to optimize the observational network for NextGen needs to be completed, but it is expected that fine-scale numerical weather models of the future will demand progressively higher resolution and more rapidly updated observational data.

Observations will be the foundation of NextGen weather services. The future state of the atmosphere cannot be accurately predicted without first assessing current conditions. Weather observations have two uses in the NAS: as primary data upon which to base tactical aviation decisions (e.g., avoid an imminent hazard), and as data inputs for numerical weather models and forecast algorithms. For instance, eddy dissipation rate observations from airborne sensors can serve both to provide warnings of turbulence hazards and to feed turbulence forecast algorithms.

The current observing network, including both FAA and non-FAA systems, is inadequate to needs of NextGen for the following reasons:

- Non-optimized observing platforms result in over-sampling in some areas, and data gaps in others.
   Especially in the upper air, observations tend to be scarce and not well distributed, rendering portions of the airspace unobserved. Without confirmatory observations areas of suspected hazard may needlessly close off large areas usable airspace.
- Observational data provide insufficient resolution. Resolution requirements for NextGen observations are
  not homogeneous across the national airspace, but are tailored to the domain, with higher resolution and
  frequent updates required near terminal areas, coarser resolution and less frequent updates needed en
  route and over the ocean. Overall, NextGen will require much higher resolution of current conditions than
  available from present sensors.
- Observational data is gathered (and sometimes over-gathered) inflexibly according to schedule, rather than adaptively, according to operational need. Adaptive control of network observations, whereby refresh rate and resolution of sensors are adapted in real time to meet dynamic changes in weather or decision-making requirements is needed. With adaptive control observational frequency will be event-driven, rather than schedule-driven, as is the case now (e.g., hourly surface observations, 12-hourly radiosondes, 30-minute satellite scans). When weather is benign, observational intensity can be relaxed. When weather presents a threat and/or when flight activity is heavy, more frequent, intensive observations will be required to support precise decision making. Adaptive control is a means of dynamically adjusting observational intensity where and when it is needed.
- Lack of an overarching observational strategy against which to evaluate emerging sensors technologies to make cost-effective decisions for implementation.

#### Weather Problem for RWI Weather Forecast Improvements

Current forecast capabilities are insufficient to meet the anticipated needs of DSTs and operational decision makers in the NextGen era for following reasons:

- Current forecasts lack the accuracy or resolution (both spatial and temporal) needed by users for decisions involving key weather phenomena impacting aviation.
- There is little data information to indicate the confidence level of weather forecast information with regard to specific airspaces or trajectories.
- The weather information provided is not in a form useable by ATM DSTs such as indices that indicate the severity of forecast weather conditions for various parameters (e.g., icing, turbulence) and the impact of the conditions on various aircraft types and configurations.
- Weather forecasts for the same phenomena impacting aviation are often inconsistent, duplicative, or do not correctly indicate the probability of forecast phenomena.
- The legacy processing systems are typically closed architectures, and incompatible with each other. They are limited in their ability to expand to ingest and process the massive amount of observation and modeling data needed to expand forecast horizons accurately to eight hours or more.
- The system software is tailored to specific applications, which are tailored to single domains and limited in their ability to satisfy multiple domain users. The software infrastructure cannot be readily modified and new types of inputs cannot be accommodated.
- The weather infrastructure cannot support the integration requirements of NextGen. As stated above, the individual legacy components have satisfied the needs of single domains; however, a large user community demands an enterprise view to provide the overall capability needed by this weather community.

#### 1. Weather Observation Improvements (\$9,402,000):

<u>Description of Solution:</u> Reduce Weather Impact (RWI) Weather Observation Improvements is tied to a set of NextGen operational improvements that define weather-related enhancements needed to realize the goals of the NextGen Implementation Plan. Improvements of the observational network will benefit other NextGen solution sets, including trajectory based operations, collaborative air traffic management, and high density operations. RWI Weather Observation Improvements will:

- Optimize observing platforms to include legacy and future systems. Determine the right sensor mix among ground, airborne, and other sensing sources to provide a more complete, consistent, and cost effective measurement of the atmosphere.
- Provide observational data of requisite space and time resolution for NextGen. Focuses on an aviation
  weather sensor network that provides the spatial and temporal resolution needed to improve the quality
  of current and forecast weather impact information for all operational decision makers and satisfy
  NextGen aviation requirements.
- Develop adaptive sensing technologies and strategies.
- Develop an observational strategy to guide acquisition of emerging sensing technologies.

For risk reduction and ease of transition these technologies will be evaluated for scientific correctness, safety, and operational suitability. Working with appropriate scientific, modeling, and user communities, current sensor information and dissemination short falls will be identified and evaluated. There will be efforts toward investigating technologies for optimizing, and improving aircraft weather sensing reporting. There will be evaluations for increased and improved use of satellite weather information. A subset of these candidate observation technologies will be targeted for early implementation and demonstrations of the viability of these technologies will be conducted.

For FY 2011, \$9,402,000 is requested to focus on automated sensor technology solutions that meet the NextGen functional and performance requirements for ground- and airborne-based weather sensing technologies. Sensor performance gap identification activities will continue and plans for demonstrations and proof of concept activities associated with these efforts will be created to support weather observation-related investment decisions outlined in the Weather Roadmap.

For FY 2011, \$12,200,000 is requested under Systems Development for the Weather Radar Replacement effort. Activities will focus on engineering/trade studies, technology research and concept of use development, T/R module demonstrations, and multi-vendor technology demonstrations

### Benefits:

- Provides a more complete, consistent, cost effective measurement of the atmosphere.
- Provides the required spatial and temporal resolution needed to improved the quality of current and forecast information.
- Improved observation will improve forecast accuracy and timeliness enabling specific trajectory based operations and improve optimal routing and re routing.

### Sustain capacity in bad weather:

 Improved observation networks will improve forecast timeliness and accuracy and will enable specific trajectory based operations and improved optimal routing and re routing.

#### Reduced user costs (User-AOC):

- Improved weather information especially pertaining to primary air routes and alternates, will reduce fuel costs and costs of aircraft cancellations and diversions due to unforeseen, adverse weather.
- Improved weather information will reduce passenger delays.

#### • FAA Safety Benefits:

Improved observations, provided for integration into operational decision making will improve safety by enabling pilots and FOCs to plan or re-plan around hazardous weather, and will enable ATM to plan or re-plan traffic flows around hazardous weather.

#### 2. NextGen Weather Forecast Improvements (\$33,800,000):

<u>Description of Solution:</u> RWI Weather Forecast Improvement is tied to a set of NextGen operational improvements that define weather-related enhancements needed to realize the goals of the NextGen Implementation Plan. Advanced forecasts will benefit other NextGen solution sets, including trajectory-based operations, collaborative air traffic management, and high-density operations. Specifically RWI Weather Forecast Improvements will provide:

- Transition to operations reliable, highly resolved forecasts of aviation-relevant weather that meet the needs of users and their decision support tools.
- Forecast information in a form useable by ATM DSTs such as indices that indicate the severity of forecast conditions for various parameters (e.g., icing, turbulence) and the impact of the conditions on various aircraft types and configurations.
- Scalable and expandable processor architecture serving multiple domains with capacity to support the intensive processing demands of advanced applications.
- Portable, non-proprietary, open software applications to sustain legacy functionality and meet NextGen requirements.
- Probabilistic forecasts with regard to specific airspaces or trajectories.
- Support to weather integration requirements of NextGen.

The capacity of the NAS has reached its practical limit. NextGen represents the plan to improve the ability of the NAS to respond to future demand. NextGen operations will enable expansion of today's capacity by using automation to better manage, among other things, the uncertainties associated with weather and minimize associated airspace capacity limitations. Improved forecast capabilities effectively integrated into decision support tools will provide the necessary information to effectively manage the NAS in adverse weather conditions.

RWI Weather Forecast Improvements activities, in FY 2010 involve preparation of forecast improvement packages using standardized software techniques for ease of implementation by DSTs. The FY 2010 effort is part of an evolutionary solution in which several major NextGen capabilities are planned with the first capability implementation beginning in FY 2013. This includes the evaluation of a 0-6 hour convective forecast, as well as evaluations of improvements to icing and turbulence forecast capabilities. Evaluation and engineering studies will be conducted to determine the most effective solution for a processing capability to support these advanced forecast applications. For example, the Weather and Radar Processor (WARP) will be migrated from current architecture to an enhanced architecture to support NextGen, including software modifications to modularize the system. The implementation of these changes will enable the replacement of legacy weather forecast system capabilities including CIWS and WARP. FAA will continue to support existing NAS users while evolving to these capabilities.

For FY 2011, \$33,800,000 is requested for initial Investment Analysis of Segment 1 (includes complete update to preliminary portfolio requirements, detailed analysis of alternatives, and initiate market surveys of commercial forecast capabilities); continue development and evaluation of the NextGen Weather Processor (NWP) to include preparation for initial operational demonstration capability, continue development and evaluation of 0-8hr convective weather forecast application to include probabilistic information and winter weather; continue evaluation and transition from R&D current and forecast 4-dimensional grids of icing, turbulence, ceiling and visibility; continue development and evaluation of weather impact information suitable for integration into candidate decision support tools to include planning for initial operational demonstrations of capabilities.

#### Benefits:

- Sustain capacity in bad weather:
  - Improved forecast timeliness and accuracy will enable specific trajectory based operations and improved optimal routing and re routing.
  - Improved forecast storm cloud tops will enable more efficient use of high altitude airspace.
  - Automated accurate forecasts of storm impacts out to eight hours or beyond will enable more advanced planning, efficient use of sectors and airspace, and decreased tactical re routing and diversions.

- Improved FAA productivity and reduced TFM workload and stress by having improved weather impact determination via decision support tools:
  - Improved weather impact mitigation planning, and optimal sector loading.
  - Improved quality of controller decisions and reduce controller workload during bad weather, thus improving productivity.
  - En route and terminal controllers will be able to provide precise and timely information on hazardous weather to pilots and to anticipate and quickly respond to pilot requests for deviations around hazardous weather.
- Reduced user costs (User-AOC):
  - Improved weather information especially pertaining to primary air routes and alternates, will reduce fuel costs and costs of aircraft cancellations and diversions due to unforeseen, adverse weather.
  - Improved weather information will reduce passenger delays.
- FAA Safety Benefits:
  - Improved forecast accuracy and flight trajectory weather information.
  - Improved weather forecasts, provided for integration into operational decision making will improve safety by enabling pilots and FOCs to plan or re-plan around hazardous weather, and will enable ATM to plan or re-plan traffic flows around hazardous weather.

#### APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$14,400.0
FY 2010 Appropriated		35,600.0
FY 2011 Request		43,202.0
FY 2012-2015		<u>351,100.0</u> <sup>1</sup>
Total	Various	\$444,302.0

#### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. Weather Observation Improvements		\$9,402.0
2. Weather Forecast Improvements		33,800.0
Total	Various	\$43,202.0

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<sup>&</sup>lt;sup>1</sup> Future requirements are under review.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
1A11	Next Generation Air Transportation System (NextGen) – Arrivals / Departures at High Density Airports	\$57,000,000	Various	G-2A, G-2M

<u>FAA Strategic Goal:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

Description of Problem: The High Density Arrivals / Departures and Airports initiative is a program focused on the development of trajectory-based terminal operations and flow management in support of Next Generation Air Transportation System (NextGen). The primary goal of high density initiative is to increase the throughput of the nation's busiest airport terminal areas. The term "high density" is used to describe airport operations in which the spacing between aircraft has been reduced significantly below what is required today and what will be provided by the NextGen Flexible Terminal and Airports (see separate Resource Planning Data document). The High Density initiative expands on the capabilities of the Flexible Terminal and Airports program by developing traffic flow management and metering technology to provide greater throughput. Major areas of focus will include: 1) High density corridors with reduced separation to provide trajectory based transitions to match airport arrival capacity; 2) Enhanced surface technologies to support Traffic Flow Management (TFM); 3) Parallel Runway Operations with reduced lateral separation; 4) Digital taxi clearance and conformance monitoring for trajectory-based operations (TBO) and safety; and 5) Expansion of terminal separation procedures throughout the arrival and departure airspace (Big Airspace). High Density operations encompass all operations from the gate to the en route structure and from the en route structure to the gate (Surface, Departures and Approaches). High Density Operations will require higher performance navigation and communication capabilities than those required for Flexible Terminal Airspace.

The Flexible Terminal and Airports initiative capabilities includes dynamically configurable airspace (flexible airspace) in conjunction with tailored arrivals and departures, development of "equivalent visual" approach procedures, digital aircraft communication (data link), surface trajectory management, low visibility taxi and departure operations, taxi conformance to enhance safety, collaborative decision support tools to enhance capacity, safety and efficiency. A major metric of this program will be increased capacity without a corresponding increase in human resources.

In addition to the developmental activities within the Flexible Terminal and Airports, the initiative will also leverage many ongoing FAA programs, including Automated Dependent Surveillance - Broadcast (ADS-B), Area Navigation / Required Navigation Performance (RNAV/RNP), Traffic Management Advisor (TMA), Traffic Flow Management (TFM), System Wide Information Management (SWIM), future automation interfaces and data communications efforts to provide greater capacity while balancing safety, security and environmental requirements. Other programs will need to be initiated to support High Density Arrival / Departure Terminals and Airports such as Surface Decision Support Systems (SDSS).

With increasing demand the need grows to achieve peak throughput performance at the busiest airports and in the busiest arrival/departure airspace. Capability improvement via new procedures to improve airport surface movements, reduce route spacing and separation requirements, and improve overall tactical flow management into and out of busy metropolitan airspace is needed to maximize traffic flow and airport usage. Essentially the problem is getting the right aircraft to the right runway in the right order and time to minimize its individual impact on the system and maximize the use of these airports. Thus operations are conducted to achieve maximum throughput while facilitating efficient arrival and departure. Inefficiencies in any aspect of the operation reduces the total use of the capacity and, because of high demand, causes excessive compounding of delay.

## 1. Trajectory Management - Surface Tactical Flow (\$10,000,000):

<u>Description of Solution:</u> Airport surface efficiency can be greatly enhanced using surface traffic management (STM) technology. STM is considered a critical step toward trajectory-based operations (TBO) on the airport surface, one of the NextGen High Density Airport solution sets. STM will provide airport decision makers with shared situational awareness along with decision support tools to assist in surface flow optimization. STM involves the use of surface surveillance data, airline data, and decision support tools to enable a collaborative information exchange among surface stakeholders. This technology can be readily applied to airports with existing and future ASDE-X installations. STM involves the shared situational awareness of all aircraft on the airport surface.

 Trajectory Management - Surface Tactical Flow capabilities will be developed in multiple segments in support of the Tower Flight Data Manager (TFDM) program, the implementing platform for many of the surface-related improvements. The following provides an overview of these capabilities:

	Mid Term Year 2018	Far Term Beyond 2018
Manual what-if analysis of	Previous capabilities plus:	Previous capabilities plus:
configuration change		
	Recommendations for	Snow impact planning
	configuration changes	capability
Airport Authority		
	airport configuration	
or departures,	Previous capabilities plus:	Pervious capabilities plus:
	Impact of runway assignment	Use optimization criteria
leparture fix	Automotic undate of munusu	including effects of
Alternate runwaya based on		arrivals to assign runway
iser preferences	configuration change	
Peal-time rupway	Arrival rupway profesence cent	
	, ·	
	to approach control	
Controllers	Dynamic information about	
	arcernative raniways	
	Departure runway assignment	
Robbins Robbin		Recommendations for configuration changes  Stochastic optimization of airport configuration  Wide-area configuration  advisories, including multiplex and team coordination  Previous capabilities plus:  Impact of runway assignment passed on ser preferences  Patient of runway assignment when airport configuration change  Arrival runway preference sent to approach control

Tools	Near Term 2015	Mid Term Year 2018	Far Term Beyond 2018
Departure	Flight specific assessment of	Previous capabilities plus:	Previous capabilities
Routing tool	weather or traffic		
provides	management impact for filed	Evaluation of alternate	
assessments	departure route	departure routes	
of departure			
routes	Evaluation of pre-coordinated	Sharing of route assessment	
particularly	routes for acceptability	with aircraft via data	
relative to weather and	relative to weather and TMI	communications	
traffic flow	Sharing of route assessments		
constraints.	with Flight Operations Center		
Coriocianicoi	(FOC) including delay impacts		
Taxi Routing	Dynamic taxiway and runway	Previous capabilities plus:	Previous capabilities plus:
tool considers	information for situational		·
many factors,	awareness	Controller selection of pre-	Automated generation of
such as		defined 2D taxi routes	optimized 4D surface taxi
aircraft			route with times (at
current		Controller modification of 2D	surface waypoints, hold
position and		taxi routes	shorts)
user preferences,		Controller entry of non-	Generate route that is
to enable pre-		standard 2D taxi routes	conflict free with all
planned and		Standard 2D taxi routes	vehicles
coordinated		Addition of hold-short and give	
airport surface		way for taxi routes	Integrate surface and
trajectories			airborne 4D trajectories
and controller		Automation recommendation	
monitoring of		of optimized 2D taxi routes	Taxi conformance
taxi		Conformation	monitoring 4D
conformance.		Conformance monitoring and non-conformance of optimized	Send 4D taxi routes to
		2D taxi routes and hold-shorts	flight operators and
		2D taxi routes and noid shorts	cockpit when data link is
		Provide assigned taxi routes to	available
		flight operators and to cockpit	
		when data link is available	Taxi conformance
			monitoring for conflict
		Taxi route requests from pilot	with vehicles on active
		for de-icing, refueling, user	movement area
		preferences	
		New taxi route developed	
		when airport configuration	
		changes	
		Integration with runway status	
		lights (RWSL)	
		Non-serificant L.	
		Non-conformance alerts communicated to cockpit	
Tools	Near Term 2015	Mid Term Year 2018	Far Term Beyond 2018
Scheduling	Runway sequences	Previous capabilities plus:	Previous capabilities plus:
and	Transfer Sequences		1 1 CYTOUS CUPUDITICIS PIUSI
Sequencing	Use of flight operator	Predicted and actual non-	Pro-active automation
concept	provided data (predicted	compliance of surface schedule	assistance for de-icing
considers all	pushback, gate assignment)		

resource constraints and optimizes	Display of flight-specific Traffic management	Departure queue and surface schedule	Scheduling for fully integrated airborne and surface trajectory
the use of surface	constraints	Controlled event times for flights	operations
resources to meet demand,	Interface with ramp towers and flight operators	Sharing of flight-specific	
in collaboration with NAS stakeholders.		surface constraints with other air traffic domains	

Additionally, data exchange, or sharing of flight readiness data, is a key concept of the STBO capabilities. This operational data exchange covers a wide range of strategic and tactical data flows between FAA and external users, for example, flight operators, Airport Authorities and ramp towers. This data exchange is necessary for shared situational awareness of the surface environment and to directly support surface operations.

For FY 2011, \$10,000,000 is requested to:

- Plan for and conduct demonstrations of the capabilities noted above.
- Document findings of the demonstrations and support the development of shortfall analyses, concepts of use, requirements, and Enterprise Architecture products for eventual technical transfer to the Tower Flight Data Manager program, the implementing program for these capabilities.
- Prepare for the demonstration, evaluation, and engineering activities for FY 2012.

#### Benefits:

- Increased capacity and reduced costs from reduction in delays due to better traffic flow on the ground and fewer delays.
- Reduced risk of runway incursion and increased situational awareness for pilots and controllers. Digital taxi clearances with conformance monitoring further enhances surface safety.
- Increased reliability and on-time performance of scheduled carriers. Delays are reduced, making ground operations more predicable.
- Fuel and emissions reduction due to shorter engine run times on the surface. Aircraft ground sequencing can be planned and predicted, then executed with minimum engine run time.
- 2. Trajectory Management Surface Conformance Monitoring (\$4,000,000):

<u>Description of Solution:</u> Airport surface efficiency and safety will be greatly enhanced using surface traffic management (STM) technology with taxi conformance capabilities. Advanced taxi clearance delivery and monitoring provides an immediate improvement to the safety on the airport surface, and reduces the demand for controller voice communication. It is a critical step toward trajectory-based operations (TBO) on the airport surface, a critical part of the NextGen High Density Airport concept. Taxi conformance monitoring (TCM) will provide direct alerts to pilots when they have deviated from a taxi clearance and will provide alerts to the ground controller, as well. Direct alerts to the pilot improve safety by eliminating the need for the controller to inform the pilot of the deviation. Clear unambiguous displays of taxi clearances will improve situational awareness for flight crews and facilitate efficient operations even in periods of reduced visibility so airport capacity is not reduced.

The solution required to support TCM will provide an ATCT automation infrastructure to support additional enhancements in safety and efficiency. TCM will rely on electronic flight strip and other human-computer interface capabilities for the controller, as well as system-wide information management (SWIM). Using a digital delivery of taxi instructions ensures both ATC and the flight crew clearly understand the taxi route, hold points, and destination. By overlay of these instructions on a cockpit moving map and using alert logic, flight crews will receive constant feedback on the conformance to the taxi clearance.

For FY 2011, \$4,000,000 is requested to:

- Plan for and conduct high-fidelity initial taxi conformance simulation.
- Updated concept of operations, requirements, standards, and procedures for eventual technical transfer to the Tower Flight Data Manager program, the implementing program for these capabilities.

#### Benefits:

- Improved tools processes and procedures reduce controller work load while satisfying safety and capacity requirements.
- Increased capacity and reduced flight costs due to a reduction in delays. Better traffic flow by ground traffic; fewer delays due to increased capacity.
- Increased safety due to reduced risk of runway incursions and increased situational awareness for pilots and controllers. Digital taxi clearances with conformance monitoring further enhance surface safety.
- Increased reliability and on-time performance of scheduled carriers. Delays are reduced and ground operations are more predicable.
- Reduced emissions due to shorter engine run times on the surface. Aircraft ground sequencing can be planned and predicted, then executed with minimum engine run time.
- 3. <u>Trajectory Management Arrival Tactical Flow (\$20,000,000)</u>: (Note: The Trajectory Based Operations, Trajectory Management En Route (Point-in-Space Metering) project is being integrated into this project beginning in FY 2011).

<u>Description of Solution:</u> Arrival Tactical Flow will enable the proliferation of key metering capabilities, building upon the Traffic Management Advisor system and expanding the use of technologies designed to precisely balance demand and capacity in all phases of flight in a collaborative fashion. Additionally, engineering analysis will be conducted to determine whether and how metering technologies should be integrated into existing core NextGen platforms.

#### For FY 2011, \$20,000,000 is requested to:

- Design, develop, test, and implement the following new capabilities: extended metering, metering using RNAV/RNP routing, integrated departure and arrival capability, integration and display of enhanced weather data, and preview trial capability.
- Conduct concept engineering for the following concepts: partial slot reallocation, surface movement data, and improved scheduling during reroutes.
- Analyze and implement a system re-architecture of Traffic Management Advisor (TMA) to accommodate new functionality.
- Assess the technical and cost impact of enhanced data sharing between TMA and the En Route Automation Modernization (ERAM) system, and enhanced controller metering aids.
- Analyze architectural changes necessary to reconcile TFM and ERAM trajectory models as compared to the trajectory modeler of TMA/TBFM.
- Calculate cost and benefit ROMs of the various approaches to possibly integrating TMA/TBFM into ERAM and/or TFMS.
- Conduct investment analysis activities in support of NAS Enterprise Architecture decisions.

#### Benefits:

- Increased capacity.
- Improved efficiency at high density terminal areas.
- Provide users with more efficient and consistent arrival/departure routing, and fuel efficient operations.
- Reduced fuel burn and engine emissions therefore decreasing user operational costs.
- Shared situational awareness among all partners improving data gathering, collaborative decision-making and NAS impact assessment in security operations.
- 4. Capacity Management Integrated Arrival and Departure Operations (\$8,000,000):

<u>Description of Solution:</u> Integrated Arrival and Departure Operations addresses the FAA's goal for capacity and the DOT Reduced Congestion Strategic Objective to "Advance accessible, efficient, inter-modal transportation for the movement of people and goods." It also supports the FAA's National Aviation Research Plan goal for a "Fast, Flexible and Efficient" system that safely and guickly moves anyone and anything,

anywhere, anytime on schedules that meet customer needs. The program supports these goals by improving operational efficiencies in major metropolitan areas through expanded use of three-mile separation standards and the current minima for diverging courses in all arrival and departure airspace, dynamic airspace reconfiguration of bi-directional arrival/departure routes, and improved traffic flow management. These operational changes will enable creation of additional area navigation arrival and departure routes. The program also calls for integrating arrival and departure airspace systems into one control service as well as one facility.

Implementation of these operational changes will require funding for airspace design and analysis, safety assessments, cost-benefits analyses, test site selection activities, automation trade-off analyses, concepts of use, computer-human interface studies and simulations, requirements development and validation, preproduction validation activities, transition strategy plans, procedures development, program management support, and the design, development and implementation of software changes including Surveillance Data Processing, Traffic Management Advisor, and Flight Data Processing upgrades and Computer-Human-Interface changes.

For FY 2011, \$8,000,000 is requested to:

- Develop and refine functional automation requirements needed to support the expansion of terminal separation standards, dynamic airspace reconfiguration, and improved traffic flow management, to include identifying possible changes to existing/planned surveillance, flight data, conflict probe, computerhuman interface, and traffic flow capabilities and systems.
- Develop controller operational procedures, operational scenarios and Human-In-The-Loop simulations to refine operational procedures and identify/validate operational and technical requirements.
- Support the development of documentation needed to support airspace redesign efforts.

<u>Benefits:</u> Based on the rough order of magnitude concept validation cost-benefit analysis, implementation of this program at seven BA facilities covering eight major metropolitan areas was found to be highly cost beneficial, with an estimated benefit/cost (B/C) ratio of 6.8, based on the total estimated present value aircraft operating cost and passenger time savings benefits of \$2,680 million and costs of \$396 million. If passenger value of time was excluded from the calculation, implementation of the BA concept was still estimated to be highly beneficial, with an estimated B/C ratio of 3.8, based on total estimated present value benefits of \$1,485 million and costs of \$396 million. All sites evaluated are expected to be cost beneficial, with B/C ratios ranging from 2.8 to 11.7. The concept validation research also showed that this operational change would lead to a decrease in controller workload enabling more traffic to be handled with the same workload ratings as today, and decrease in the number of conflicts.

### 5. <u>Trajectory Management - Tailored Arrivals (Oceanic) (\$2,500,000):</u>

<u>Description of Solution:</u> The Tailored Arrivals (TA) project supports the implementation of optimized profile descents (OPDs); leveraging the data-link clearance capability within the Ocean 21, Advanced Technologies and Procedures (ATOP) automation system to issue unique, fuel friendly clearances to oceanic aircraft that are equipped with FANS equipment. The concept is extensible to domestic aircraft when data-link becomes available in the aircraft and in the ground automation systems. The optimized profile decent (OPD) profile transmitted to the aircraft is not a published STAR or RNAV/RNP procedure but is a clearance given to the aircraft which adds dynamic flexibility to the arrival operation and conserves navigation database capacity. This approach to issuing arrival clearances before TOD via data-link is consistent with the future direction of NextGen Trajectory Based Operations.

For FY 2011, \$2,500,000 is requested to:

- Develop, coordinate, validate, and implement TAs at select coast airports in the NAS.
- Support training, procedure development, and safety analysis.

## Benefits:

- Reduction in fuel usage, emissions, and noise.
- Increased flight path predictability.

- Reduction in frequency and duration of voice communication.
- 6. Trajectory Management Surface Traffic Data Sharing (\$12,500,000):

<u>Description of Solution</u>: Surface Traffic Data Sharing will enable the sharing of aircraft movement data between the ANSP and NAS stakeholders at selected airports, enabling improved collaborative decision making, enhanced efficiency, and increased common situational awareness, in addition to developing the foundational infrastructure necessary for advanced Surface Trajectory-Based Operations (STBO). These advanced STBO capabilities include improved departure queue management, taxi conformance monitoring, and arrival/surface/departure integration to optimize available capacity, leveraging the operational capabilities developed by other NextGen surface and data sharing initiatives.

Additionally, this capability will enable the sharing of surface data with ANSP Decision Support Tools (DST), enabling improvements in DST performance, surface capacity management, and collaborative decision making.

For FY 2011, \$12,500,000 is requested to:

- Design and develop the data exchange standards, requirements, processes, and procedures needed to govern the sharing of surface data.
- The technical infrastructure to efficiently and securely share this surface data will be designed and tested.

#### Benefits:

- Improved collaborative decision making
- Increased reliability and on-time performance of NAS users
- Reduction in fuel usage, emissions, and noise
- Increased capacity and reduced costs from reduction in delays due to better traffic flow on the ground and fewer delays
- Increased efficiency through the integration of surface data with ANSP DSTs

#### APPROPRIATION SUMMARY

	<u>Locations</u>	<u>Amount (\$000)</u>
Appropriated (FY 1982-2009)		\$18,200.0
FY 2010 Appropriated		51,800.0
FY 2011 Request		57,000.0
FY 2012-2015		<u>219,800.0</u>
Total	Various	\$346,800.0

#### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

A -L	. No. Table	Locations/	Estimated Cost
ACT	<u>ivity Tasks</u>	Quantity	<u>(\$000)</u>
1.	Trajectory Management-Surface Tactical Flow		\$10,000.0
2.	Trajectory Management-Surface Conformance Monitoring		4,000.0
3.	Trajectory Management-Arrival Tactical Flow		20,000.0
4.	Capacity Management-Integrated Arrival and Departure Ops		8,000.0
5.	Trajectory Management-Tailored Arrivals (Oceanic)		2,500.0
6.	Trajectory Management-Surface Traffic Data Sharing		12,500.0
Tot	al	Various	\$57,000.0

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
1A12	Next Generation Air Transportation System (NextGen) - Collaborative Air Traffic Management (CATM)	\$75,500,000	Various	G-5A

<u>FAA Strategic Goal:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> Collaborative ATM (CATM) covers both the strategic and tactical interactions with the customers to manage demand when the desired use of capacity cannot be accommodated. CATM includes the flow programs as well as collaboration on procedures that will establish balance by shifting demand to less desirable capacity alternatives (e.g., routings, altitudes, and times). The major demand and capacity imbalances will be worked collaboratively between the air traffic managers and flight operators. Critical to enabling this capability is information distributed by System-Wide Information Management (SWIM).

CATM represents an opportunity to evolve towards a fully integrated and tactically managed ATM system exploiting the potential of system support in a closed loop environment, while increasing opportunities for the exploitation of technical systems by human operators. Furthermore, CATM takes a first opportunistic step in addressing the need to change controller focus to network needs rather than individual aircraft, and airlines need to provide an optimum profile to be followed by the pilot, providing for system stability.

The current system uses relatively blunt tools to manage demand and capacity imbalances. The tools do not "share" objectives for flights nor do they have a common picture of the structure and status of NAS. While great strides have been made in the management of flow, this lack of common objectives, status and structure constrains improvement. The system needs to minimize the over constraint demand and assure efficient operations once constrained. Constraining flights needlessly costs carriers and the traveling public time and money. On the other hand, failing to accurately forecast constraints and manage demand when they are warranted also generates costs. Users have limited ability to specify their preferred alternatives when a constraint is required; creating a need to allow input from them on resolving imbalance issues.

The overall philosophy driving the delivery of CATM services in NextGen is to accommodate flight operator preferences to the maximum extent possible and to impose restrictions only when a real operational need exists, to meet capacity, safety, security, or environmental constraints. CATM strives to adjust airspace and other assets to satisfy forecast demand, rather than constraining demand to match available assets. If constraints are required, maximizing user opportunities to resolve those constraints, based on their own preferences, is a goal.

1. <u>Flight and State Data Management – Common Status and Structural Data (Separation, Tactical, Strategic</u> Trajectory Management) (\$14,000,000):

<u>Description of Solution:</u> The Common Status and Structure Data program will address information and capability gaps within aeronautical information to achieve the NextGen shared situational awareness and trajectory based operations vision. Program activities will focus on five NextGen operational improvements:

- On-Demand NAS Information: Provide real time access to NAS status.
- Assignment of Airspace for Special Use in High Altitude: Better airspace management. Synchronization of airspace status.
- Continuous Flight Day Evaluation: Provide performance metrics real time.
- Provide full flight plan constraint evaluation with feedback: Provide new flight planning capabilities that consider NAS constraints.
- Trajectory Flight Data Management: Real time trajectory management accounting for all aspects of NAS including real time status and constraints.

To achieve these operational improvements, the program will address the following objectives and associated strategies:

- Objective 1: Deliver an integrated source of aeronautical information that supports tactical and strategic situational awareness.
  - Strategy 1: Develop harmonized conceptual and exchange models for NAS information including flow constraint information that supports tactical and strategic situational awareness.
  - Strategy 2: Orchestrate aeronautical information flows and processes to obtain high quality and timely information to support tactical and strategic situational awareness.
  - Strategy 3: Develop a capability to provide a common operating picture of the national airspace system to support tactical and strategic situational awareness.
  - Strategy 4: Develop a capability to provide aeronautical information service to users and other automation systems.
- Objective 2: Deliver comprehensive pilot briefing and flight planning service incorporating NAS status and NAS constraint information that improves planning NAS operations.
  - Strategy 1: Provide a standard set of briefing and planning services that can be used by external and internal air traffic systems.
  - Strategy 2: Provide a GA Pilot Briefing Toolset.
  - Strategy 3: Provide services and tools to support flight plan validation and filing based on complete NAS status information.
- Objective 3: Deliver forecasting and benchmarking operational performance tools to improve air traffic management.
  - Strategy 1: Develop a data warehouse of NAS information to support benchmarking and forecasting.
  - Strategy 2: Provide an executive information system to provide Business Intelligence (BI) capabilities to management and facilities for evaluating performance at the local and national level.
  - Strategy 3: Develop benchmarking, forecasting and real-time metrics and services to support tactical and strategic situational awareness.
  - Strategy 4: Develop tools to measure and monitor changes to the NAS that reduce or constrain NAS
    capacity and safety.

### For FY 2011, \$14,000,000 is requested to:

- Analysis on Policy requirements for data sharing.
- Develop final enterprise architecture artifacts.
- Develop final business case for AIM Segment 2.
- Develop final service level agreements.
- Updates to the international AIXM data standard.
- Support the development of Concept of use of AIM for each business units.
- Develop initial interface requirements documents.
- Limited fielding of prototype of digital capture and collaboration system.
- Develop SWIM compliant ICD.

<u>Benefits:</u> Quantitative benefits have not yet been determined. It is expected that this program will claim a portion of the benefits attributed to operational improvements listed in section 1.2. Benefits are expected to be in the following areas:

- Safety
  - Reduction in accidents attributable to pilot briefing errors or missing information.
  - Reduction in accidents caused by violation of NAS flow constraints and restrictions.
  - Reduction in operational errors caused by airspace violations.
- Capacity and Efficiency
  - Airplane operator savings because of better information leading to improved flight planning and pilot briefing.
  - Airplane operator savings because benchmarking and forecasting reduces departure and en route delays.

- ATC operational savings because of better information leading to improved traffic and flow management.
- ATC operational savings because of access to near-real-time NAS performance information.
- Cost Savings
  - Reduction in maintaining multiple data systems.
  - Migration from point to point operations to a network enabled operations.
- 2. Flight and State Data Management Advanced Methods (\$6,000,000):

<u>Description of Solution:</u> NextGen will benefit from a number of infrastructure enhancements, procedural changes, and system improvements that will enhance capacity and alleviate congestion. These include improvements in the flight deck and avionics, vehicle performance, communications, navigation, and air traffic control and management service provider capabilities. In the area of advanced methods for Traffic Flow Management (TFM), tools will be developed in this program; Integration of Weather, and common indexing of NAS resources. These tools will help solve the problem of how to guide flights in capacity-constrained scenarios.

The integration of weather into TFM decision support tools will allow decision makers to identify flow problem areas due to congestion and severe weather. Once a problem has been identified, solutions can be developed and evaluated. One of the keys to a more robust NAS capable of adapting to minimize the negative impacts of weather on capacity include flexible traffic management around weather constraints, improved weather and traffic (coupled) prediction, and increased situational awareness between the flight deck, the air navigation service provider, and the airline operational control.

A common NAS indexing system maps NAS resources into a common index for fast and efficient search and retrieval. Automation systems and decision support tools can probe the 4D trajectory against the NAS index system to test against outages, congestion areas, special use airspace, weather cells, etc. The retrieval of the information will be fast and efficient to support strategic operations.

The activity to define Probabilistic TFM includes the development of a concept of use for the capability, followed by analyses of current operational procedures and the migration toward more strategic flow operation with the area flow planner. Modeling and simulation of probabilistic TFM scenarios to support the development of high level requirements and interfaces document for DST.

For FY 2011, \$6,000,000 is requested to:

#### Integration of Weather into ATM

- Refine weather information for collaborative decisions in decision support tools.
- Define standard exchange formats for inclusion into decision support tools.

### <u>Probabilistic TFM – Area Flow Program</u>

Develop advanced algorithms to support the area flow decision support tool.

### Unified Flight Planning Filing

Continue assessment of fuzzy performance and common reference to the ATM domain.

Benefits: Key benefits for Advanced Methods for TFM include:

- Improved situational awareness for traffic managers.
- Improved prediction performance for TFM decision support systems.
- Improved decision heuristics for airspace demand management.
- Coupled weather and traffic prediction.
- Flexible TFM around weather constraints.
- 3. Capacity Management- Dynamic Airspace (\$3,500,000):

<u>Description of Solution:</u> Flexible Dynamic Airspace will reconfigure airspace for demand/capacity predictions to make as much airspace capacity available as possible, where and when it is required, which is fundamentally different from today's system where the airspace is a rigidly structured network of navigation aids, sectors, and special use airspace. The goal of Flexible/Dynamic airspace configuration research is to better serve users' needs by tailoring the availability and capacity of the airspace by creating a dynamic airspace configuration function that will provide the service provider a new degree of freedom to accommodate the airspace requests of users.

The Airspace Resource Management System (ARMS) is a distributed system which maintains the mapping of functional airspace volumes to frequencies and radios and in turn the mapping to operational positions. Any proposed change in airspace volume is tested by ARMS to ensure that there is radio coverage including testing for gaps. ARMS supports the assignment of the new volumes to positions and provide the frequency map to the automation for display of frequency in support of handoff actions. Since ARMS is a national distributed system, the frequency, radio and airspace assignments to position can occur both inter and intra-facility. Triggering events for ARMS evaluation and change include: adjustments to airspace to offset weather airspace, load-sharing and load-shifting to maximize productivity, remapping of airspace in contingency and continuity operations, and long term collocations and consolidation considerations. ARMS will also manage NAS voice and data link communication links as well as managing ground to ground as well as air to ground communications.

The activity to define ARMS includes the development of a concept of use for the capability, followed by analyses of current procedures and the evolution to ARMS. Modeling and simulation of dynamic airspace scenarios to support the development of high level requirements and interfaces document for DST.

For FY 2011, \$3,500,000 is requested to:

Analyses of Case Study of Spectrum Coverage and Implementation Analysis.

Benefits: Key Benefits from Dynamic Airspace and Capacity Management (Flexible Dynamic Airspace, ARMS):

- Reduced controller workload.
- Reduced coordination activities.
- More balanced traffic.
- Greater user flexibility.
- Decreased fuel burn.
- Reduction in delays.
- Increased capacity.

## 4. <u>Flow Control Management – Strategic Flow Management Integration (Integration Execution of Flow Strategies into Controller Tools) (\$14,200,000):</u>

<u>Description of Solution</u>: Flight planners or an operator's flight planning automation interact with a common flow strategy and trajectory analysis service, available to all NAS stakeholders, that enables common situational awareness of current and projected NAS status and constraints. In addition to having common services to understand the potential effects on a trajectory or the effects of a flow strategy, operators and the ANSP can collaborate on the selection of both capacity management and flow contingency management strategies that balance NAS performance objectives with Flight operators goals. All of the parties have a common understanding of overall national goals and desired performance objectives for the NAS. A transparent set of strategies is in place to achieve overall performance objectives, including airspace management to maximize capacity when demand is high and, as required, flow management initiatives to ensure safe levels of traffic are not exceeded when capacity limits are reached.

For FY 2011, \$14,200,000 is requested to:

- Refine Active Aircraft Re-routes concepts.
- Develop Active Aircraft re-route requirements.
- Analyses, simulation, and white papers on active aircraft re-routes functions.

<u>Benefits:</u> Key benefits from the collaborative environment in the NextGen include the following:

- Airspace operators benefit from improved collaborative decision-support tools, which better assess the potential impacts of decisions, reducing the likelihood of unintended consequences. Better decision support also increases the ability to maintain capacity in the presence of uncertainty. Less-conservative operational decisions are made because decision-support capabilities can better integrate large amounts of data over multiple time horizons.
- A larger percentage of operators will participate in the collaboration process than do currently. Today's process is characterized by poor information distribution capabilities and is limited by verbal negotiations. Flight operators gain benefits in efficiency, access, and overall performance, in addition to other national needs which are accommodated effectively.
- Because decision-makers will have more information about relevant issues, and improved automation tools, decisions can be made more quickly, required lead times for implementation can be reduced, responses can be more specific, and solutions can be more flexible to change.
- Information exchange is more clearly targeted to the appropriate decision makers, reducing workload and unnecessary actions by those not affected. Machine-to-machine negotiation replaces labor-intensive, voice, or text-based processes.
- Management of airspace security is integrated into overall collaboration and decision-making.
- Participants are assured of data privacy and protection, so that sensitive or proprietary information can be shared in a way that helps to achieve their objectives while improving overall ATM performance.
- Improved strategic capability based on dynamic information flows as opposed to static processes.

#### 5. Flight and State Data Management - Flight Object (\$10,000,000):

<u>Description of Solution:</u> An information sharing mechanism, such as the Flight Object, needs to be developed in order to enable information sharing among various users and stakeholders in the NAS this allows for better coordination, situational awareness, and collaborative decision-making. Flight Object supports trajectory based operation objectives to improve capacity, efficiency, safety, and cost. Flight Object will provide standard information to be shared across flight domains and user systems, and is envisioned to support more integrated and coordinated flow planning to ensure collaboration throughout the flight. Key parts of the Flight Object are:

- The information contained in the filed flight plan.
- The converted (expanded) route with applied restrictions, routes, etc.
- Flight plan trajectory (the 4D path the flight intends to follow)-includes crossing key aeronautical elements, such as restrictions, and volumes of airspace.
- Aircraft actual trajectory (the 4D path the flight has been observed to follow thus far along with maneuvers it might take to get back to flying according to the original, filed intent).
- Mode S address or beacon code allocated to the flight.
- Pairing information (to a track).
- Control information (current Flight Information Region (FIR) controlling, current local sector controlling, stages of handoff/ transfer of control, point-out information.
- Interim altitude assignments, holds, intent information, etc.

As the system evolves, the Flight Object should allow the evolution of shared flight information in such a way as to enable advanced operations. In particular, future concepts are being proposed that would require the following information elements:

- Aircraft parameters (e.g. weight, target airspeed, control mode) obtained via downlink to assist ground automation in predicting more precise aircraft trajectories.
- Four dimensional cleared trajectories. These need not be synchronized fully with the FMS trajectory. For certain airspace, trajectory-following performance may require these to be identical.
- Alternative and preferred flight paths and 4D trajectories. When a user does not obtain their preferred trajectory, preferred flight paths may be maintained in the Flight Object to allow reversion to these should an existing constraint be mitigated. Multiple alternative flight plans, paths and 4D trajectories could be maintained during a negotiation process.
- Operator preferences. While these have yet to be fully defined, a description of the operator's flight
  objectives could assist ground automation tools in selecting alternative paths. These may include
  elements such as: cost index, target descent speeds, level of turbulence to be avoided, required
  stabilization point on approach, flight priority information, etc. Some additional level of protection would

be required for this information. Gate assignment information, taxi paths, runway assignments and preferences allow surface movement planning.

 Probability information. Pre-departure flight paths may be computed for advanced traffic flow management tools. These descriptions of the flight path can be maintained in a Flight Object.

Once a Flight Object is created, updates to flight data object will be based on the rules specified by the users. It is expected that, access rights to each part of the Flight Object will be determined based on the authority that each user has given the phase of flight.

For FY 2011, \$10,000,000 is requested to:

- Develop engineering and Enterprise Architecture Artifacts Use cases, Initial requirements, Benefits Report
- Develop system alternatives and allocation.
- Flight Object Management System (FOMS) Concept.
- Demonstrate the international flight object usage outside the laboratory environment.
- Develop initial Safety Management System (SMS) for flight object.

<u>Benefits</u>: The Flight Object provides an opportunity for achieving increased operational efficiency by sharing common flight information elements among many different ATM capabilities. Sharing common information elements using the Flight Object has a number of potential benefits:

- Facilitate NextGen gate-to-gate 4D collaborative flight management concept.
- Facilitate NextGen global interoperability and harmonization.
  - Common Flight Objects contain all pertinent flight data.
  - Optimized resource utilization.
  - On-demand data transfer optimizing data loading for subscribers.
- Ease of NAS-wide information sharing via SWIM.
- Acceleration of future capabilities and technology development.
- Increased situational awareness.
- Accuracy and availability of latest flight information.
- Consistent flight planning and transition in multiple ATM system domains.
- Improved on-going traffic management initiatives and decision making.
- 6. <u>Flow Control Management Strategic Flow Management Enhancement (Enhancing the Strategic Flow Program) (\$7,800,000):</u>

<u>Description of Solution:</u> Currently flow strategies developed from the various decision support tools used by the Traffic Management Units (TMU) are manually intensive because the tools are not integrated. Traffic

Management specialists have to work out the impacts of multiple Traffic Management Initiatives (TMI), and the solutions may not be optimal because the current tools do not support analyzing the linkages between multiple TMIs. This project would allow TMU specialists to automatically explore various reroute options and the impact of multiple TMIs and how they fit with efforts to accommodate NAS customer preferences. By automating this process, much more rapid flight reroutes can be developed, which would lead to fewer delays and less congestion.

The primary goal of Air Traffic Management (ATM) is addressing demand/capacity imbalances within the NAS. The FAA needs to improve implementing Traffic Management Initiatives (TMI) such as Ground Delay Programs (GDP), Airspace Flow Programs (AFP), Ground Stops (GS), Reroutes, and Miles-In-Trail (MIT). To improve TMIs, more sophisticated modeling capabilities will be used to assess the impact of implementing a combination of TMIs, determine the value of user feedback data, and project the impact of TMIs on overall NAS efficiency. The modeling results will be shared with the aviation community when evaluating these initiatives. Automate and enhance post analysis capabilities can feed the results back to the TMU originating the initiative. This project provides a solution that allows electronic negotiation with aviation users to manage congestion.

For FY 2011, \$7,800,000 is requested to:

- Refine concept of use for strategic flow management.
- Analyses and white paper of strategic flow management.
- Modeling and simulation of strategic flow management.

Benefits: Key benefits from Strategic Flow Management Enhancement

- Reduced delays and smaller buffers improving resource utilization.
- Better integration of stakeholders leading to improved business processes.
- Increased predictability and flexibility leading to better access for business users.

#### 7. Networked Enabled Operations (NEO) (\$2,000,000):

<u>Description of Solution:</u> The majority of Aviation Command and Control (C2) systems relies on complex communications to relay information within a terminal area, but do not always lend themselves to transporting this information to remote users. The emphasis of networked enabled operations (NEO) Spiral 3 (SP3) is to examine existing and emerging FAA standards that can be applied to distribute vital information to remote users. In this FAA evolving era of Information Age Transformation, major advancements in sensors and communications are being driven by innovative and novel Web-based technical approaches, through Service Oriented Architecture (SOA) design principles. The FAA business and alternative analysis resulted to be delivered by NEO Project SP3 is to highlight those FAA standards that will provide situational awareness and common shared information shared services (data displays) through the use of SOA approaches to start showing NextGen Strategy by 2015.

NEO SP3 will demonstrate how information sharing and collaboration across multi-agency domains can be accomplished by leveraging existing technology and investments for NextGen transformation. The program will apply lessons learned from NEO SP1 and 2 emerging capability demonstrations that are traceable to the NextGen Baseline Operational Improvement (OI) Roadmap. These transformational concepts are the next building blocks for the NextGen concept. SP3 demonstrations will explore net-centric capabilities and collect additional data to enhance the NEO business case and validate JPDO-developed models/simulation for NextGen.

For FY 2011, \$2,000,000 is requested to:

- Develop an information exchange protocol and architecture with interagency aviation stakeholders.
- Flight Operational Trials planning, as needed.

Benefits: FAA Cost Savings and Avoidance.

- NEO SP3 will derive operational benefits for efficiency from practical, low risk, near-term implementation
  of concepts that use current and expected future capabilities. These near-term concepts are designed to
  directly support system capabilities required to meet future capacity needs.
- NEO's goals and objectives encompass the development several operational trials. The technical results from these trials will provide the foundation for near-term operational success.
- NEO's focus will be on operationally improved efficiency, found through the fielding of a common valueadded service for domestic operations and phasing into international flow and flight. NEO flight trials will facilitate a better understanding of information management functions using SWIM.
- NEO will improve distribution of information to the traffic management centers (domestic and international). Fielding of a consolidation of current systems into the next generation weather distribution capability will provide a better understanding of shared information exchanges using SWIM.

In addition to these tangible benefits, FAA will also avoid cost through the following mechanisms: The ability to test and validate new operational concepts using information made readily available through NEO operational flight trial demonstrations, and other agencies' global test bed connectivity. This capability will reduce the risks associated with new capabilities and increase the confidence of cost and benefits forecasting.

8. Flight and State Data Management - Concept Development for Integrated National Airspace Design and Procedure Planning (\$18,000,000):

<u>Description of Solution:</u> The Integrated National Airspace Design and Procedure Planning will enable the FAA to develop the infrastructure and framework to assess and develop an integrated airspace and procedure implementation plan. The Integrated National Airspace and Procedure Implementation Plan will align with NextGen mid term capabilities and FAA strategic plan. This activity will include development of a framework for implementation of national airspace and procedures. It will also include enhancements of existing infrastructure to assess the overall impact to NAS operations. Trade analyses will be apply to assess alternatives (implementation schedules) for the implementation plan.

For FY 2011, \$18,000,000 is requested to:

- Analyses to develop a framework for Integrated National Airspace Design and Procedure Planning.
- Enhancements to existing infrastructure (models and tools) to support impact assessments.
- Coordination with stakeholders on proposed implementation.
- Develop initial concept for best equipped, best served.

<u>Benefits:</u> An integrated implementation plan for airspace design and procedures will ensure FAA resources are applied on airspace design and procedure developments to enable the NextGen mid term capabilities.

#### APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$27,700.0
FY 2010 Appropriated		44,640.8
FY 2011 Request		75,500.0
FY 2012-2015		<u>190,000.0</u> <sup>1</sup>
Total	Various	\$337,840.8

Activity Tasks	Locations/ <u>Quantity</u>	(\$000)
Common Status and Structure Data		\$14,000.0
2. Advanced Methods		6,000.0
3. Dynamic Airspace		3,500.0
4. Strategic Flow Management Integration		14,200.0
5. Flight Object		10,000.0
6. Strategic Flow Management Enhancement		7,800.0
7. Networked Enables Operations (NEO)		2,000.0
8. Integrated NAS Design and Procedure Planning		18,000.0
Total	Various	\$75,500.0

<sup>&</sup>lt;sup>1</sup> Future requirements are under review.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
1A13	Next Generation Air Transportation System (NextGen) - Flexible Terminals and Airports	\$80,700,000	Various	G-6A, G-6N

<u>FAA Strategic Goal:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 – Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> Flexible terminal airspace and airports provides the capability to dynamically change airspace and airports to provide greater capacity, efficiency and safety. Today airspace is static while in the future terminal airspace and airports will be dynamically managed. Aircraft will have to be appropriately equipped to operate in Flexible Airspace.

Flexible terminal airspace and airports encompasses the majority of the terminal operation areas and airports within the NAS. It is anticipated that all high-density terminals and airports will be capable of flexible operations when demands warrant. At terminals and airports where traffic demand decreased from high-density to a lower density, the operations will "flex" or transition to lower density operations. Lower density operational requirements are not as stringent as high-density operations affording greater access to a wider class of users, while still maintaining equivalent levels of safety and efficiency. Both trajectory-based and classic operations may be conducted within flexible terminal and airports. It is anticipated that a significant number of airports will remain exclusively classic in operations.

Flexible Terminals and Airports include activities to improve both pilot and controller situational and the general use of RNAV/RNP routings. Operations within flexible terminal airspace and airports are a mix of IFR/VFR traffic with aircraft types ranging from airline transport to low-end general aviation. Airports in these areas are towered and non-towered, depending on the traffic demand. In the future many of these airports will experience higher traffic demand due to a migration of air traffic to smaller satellite airports in high population areas in the effort to avoid traffic congestion. In addition, there is a renewed interest in personal transportation including the increase in personal aircraft for pleasure and business and the emergence of ondemand air taxi services utilizing very light jets (VLJs). The Flexible Terminal and Airports initiative will meet the requirements of both the high and non-high density terminals and airports. It is anticipated that some low density/low complexity (usually class C and D) airports will remain classic.

Flexible terminal operations are a mix of Instrument Flight Rules (IFR) and Visual Flight Rules (VFR) traffic with aircraft types ranging from airline transport to low-end general aviation. Airports in these areas are towered and non-towered, depending on the traffic demand. In the future, many of these airports will experience higher traffic demand due to a migration of air traffic to smaller satellite airports in high population areas in the effort to avoid traffic congestion. In addition, there is renewed interest in personal transportation including the increase in personal aircraft for pleasure and business and the emergence of on-demand air taxi services utilizing very light jets (VLJs).

Inflexible airspace structures, reservations and routes have resulted in the inefficient use of airspace and the airports themselves. The continuing growth of aircraft air and ground movement is projected to exceed the capacity of the system, causing serious delays and gridlock. This has required the need for improved terminal area management.

A primary NextGen objective is the ability to achieve the most efficient use of airspace and airports based on actual needs and, where possible, to avoid permanent airspace and route segregation. In addition to the adaptation of the airspace structure to traffic flows and the implementation of area navigation, a major objective strategy is the implementation of the flexible terminal airspace concept on the airport surface.

### 1. Separation Management - Wake Turbulence Mitigation for Departures (WTMD) (\$1,000,000):

Description of Solution: NextGen Flexible Terminal Environment - Wake Turbulence Mitigation (WTM) includes several research spin-off activities including this WTM for Departures (WTMD) program. NASA studied wake turbulence formation, dissipation, and transport properties in order to detect and predict the presence of wake turbulence near runways. Based on research findings, techniques are now available to safely determine when reduced time separation to allow wake turbulence to dissipate between departing aircraft on Closely Spaced Parallel Runways (CSPR) would be appropriate. Reduced waiting time to depart provides more capacity over time, especially valuable at times of peak demand. Ten Operational Evolution Partnership (OEP) airports are candidates for WTMD service. WTMD service is derived from a Wind Forecast Algorithm (WFA) that ingests both current, local surface wind observations from the FAA Automated Surface Observing System (ASOS), and local, low altitude wind forecasts from the National Weather Service, Rapid Update Cycle (RUC) model. A steady and favorable crosswind in relation to the CSPR is sufficient to safely allow less waiting time between departures, than is mandated without WTMD information. WTMD will notify ATC Supervisors when crosswinds are favorable. The ATC Supervisor may then opt to allow reduced departure spacing. WTMD will alert ATC Supervisors and Local Controllers when favorable crosswinds cease. WTMD technical alternatives address options on how the WFA may be hosted and how the WTMD information will be displayed on existing ATC Tower "glass." Reuse of existing NAS display/processor systems to host WTMD may prove cost effective.

For FY 2011, \$1,000,000 is requested to perform safety risk management analyses and perform test and evaluation of wake turbulence mitigation departure procedures.

Benefits: The WTMD Program offers approximately \$20 million per year in Airline Operator Cost (AOC) savings and approximately \$30 million per year in Passenger Value of Time (PVT) savings (ATO-R estimate) once implemented at ten target sites. The business case will multiply the annual benefits over years of service life (till 2032) and apply economic factors for then-year, risk adjusted dollar values by site. Precise cost estimates per site will also be estimated. Positive B/C ratio with margin will indicate whether a site is justified to obtain WTMD service. At present 17 OEP airports have closely spaced parallel runways (CSPRs). Preliminary down selection leaves 10 targeted OEP airports as most likely to enjoy a positive B/C ratio based, in part on how often they reach peak departure demand. Runway operational trends now allow independent operation if parallel runway centerlines are apart by 3,000 feet or greater. Insufficient surveillance response time to respond to position errors dictates that CSPRs may not operate independently (wingtip-to-wingtip) Aircraft must stagger usage, alternating left and right on CSPRs. Safe departure from CSPRs behind heavy aircraft and their jet blast requires a waiting period to allow any wake vortices to dissipate. Wake vortices drift down wind. If steady crosswinds of sufficient speed are present, the downwind runway wake can be predicted to move away from the upwind runway, dissipating and relocating much faster than usual under calm wind conditions. Safe departure spacing/timing on the upwind runway after a heavy downwind departure may be lessened, if a reliable means of keeping track of favorable crosswinds in relation to the CSPRs is provided to ATC Supervisors. WTMD alerts ATC supervisors of favorable crosswind conditions. ATC Supervisors may opt for shorter waits. Less wait amounts to less delay, more capacity, less fuel consumption quicker taxi time, shorter ground holds, and greater terminal efficiency promoting higher peak demand

### 2. <u>Separation Management – Closely Spaced Parallel Runway Operations (\$6,000,000):</u>

<u>Description of Solution:</u> Closely Spaced Parallel Operations (CSPOs) will develop functional architecture and functional requirements for independent and parallel approaches. This initiative will identify potential alternatives for meeting functional requirements such as; application of new technologies to current standards, revalidation of the blunder model for today's environment and the transition to NextGen, and application of emerging technologies to current standards. Finally, CSPOs will identify areas where research, simulation, and demonstrations should be conducted.

For FY 2011, \$6,000,000 is requested to examine alternative proposals for further reductions of separation standards in runway spacing, conduct simulator trials and perform data collection and analyses of alternative proposals, and draft safety risk management system documentation to update 7110.65 for independent operations. Funding will be used to continue modeling, simulation and analyses to complete safety case and initiate safety management system process for proposed changes to operations and standards. Refine Nontransgression zone and no obstruction zone report for parallel ILS approaches for proposed changes to

operations and standards, and refine blunder assumptions via modeling and analyses; and to support simulator and flight evaluation of integrated GLS and ADS-B.

Benefits: CSPAs will provide the following benefits:

- Higher quality of surveillance without fundamental change in current procedures.
- Maintain airport/runway capacity in lower visibility conditions.
- Improve NAS efficiency.
- Decrease user operational costs.
- Decrease emissions.
- Instantaneous awareness for both Pilot and Controller of blundering aircraft.
- 3. Flight and State Data Management Surface, Tower, and Terminal Systems Engineering (\$22,500,000):

<u>Description of Solution:</u> In support of the Surface Traffic Management Initiative, this task will analyze concepts and methodologies to support more efficient and safer movement and control of air traffic in the terminal airport arena and ensure smoother transition into and out of the NAS operational airspace.

Initial surface scheduling improvement enhances surface operation at target airports through automationassisted surface management. Surface operations are improved by expediting surface traffic movements and reducing departure queues.

Efficiency of surface movement is increased through the use of automation, on-board displays and data link of taxi instructions on arrival and departure to properly equipped aircraft to reduce delay and environmental impacts and improve safety. It assumes development of surface automation that is fully integrated with airborne operations and applies this to surface management operation. Surface optimization automation includes activities such as runway snow removal, aircraft de-icing and runway configuration. Automation optimizes surface throughput and data links taxi instructions to aircraft.

Arrival and departure flows and surface operations are more effectively planned and managed through integrated advanced decision support tool. This develops an Integrated Arrival/Departure and Surface Traffic Flow Manager for improved decision-making and flow management. These decision support tools enable flow managers to work collaboratively with flight operators and with flow contingency managers to effectively manage high-capacity arrival and departure flows in the presence of various weather conditions. Real-time information distribution enhances operational efficiencies, such as distribution of runway breaking action reports. The arrival/departure decision support tool will make more efficient use of runways through real-time depiction of arriving and departing aircraft. The improvement increases efficiency of arrival, departing aircraft and safety of surface traffic movement, with corresponding reduction in environmental impacts which will lead to a reduction in delays.

For FY 2011, \$22,500,000 is requested to refine and extend the TFDM and A/DMT Concept of Operations, the functional and system-level design requirements and the cross-domain information exchange requirements. This will be accomplished by means of analysis, laboratory human-in-the-loop tests and field trials using an engineering development model for TFDM and A/DMT. Information exchange requirements between the tower/terminal functions and en route, traffic flow management, and flight-operations center will be demonstrated and refined. Integration concepts for legacy tower systems, displays and keyboards will be developed and demonstrated to enhance control tower workflow processes. Funding will be used to update alternative analysis proposals and assess acquisition risks; continue modeling, simulation and analyses to support the safety case; and draft preliminary safety management documentation. This work will support requirements development and validation in preparation for investment decisions and solution development activities.

<u>Benefits:</u> The objective of this initiative is to develop a set of decision support tools to improve the management of airport arrival/departures. The benefits realized are aligned with NextGen goals. These benefits include:

 Increased airport capacity. Controller decision support and monitoring aids will lead to more optimized runway assignments, departure sequencing, departure routing and runway configuration selection for given arrival demand and weather constraints in an effort to reduce delays.

- Reduced environmental impacts. More efficient arrival and departure profiles, reduced departure runway
  queues and reduced engine-on time during taxi-in, taxi-out operations will reduce airport emissions and
  customer fuel burn.
- Reduced weather impacts. Airport capacity and efficiency will be maintained during a wider range of weather conditions (convection, snow, reduced visibility) with fewer unexpected drops in capacity.
- More accurate take-off time predictions. Improved NAS demand predictions and the appropriate implementation of necessary traffic management initiatives.
- Improved airport configuration planning. Better informed and timelier decisions on runway configuration changes considering weather constraints and predicted arrival and departure demand.
- Taxi conformance safety monitoring. Avoid blunders resulting in runaway incursions during taxi and alert ATC and pilot to developing unsafe conditions.

## 4. <u>Trajectory Management – Arrivals (RNAV/RNP with Three Dimensions and Required Time of Arrival)</u> (\$7,000,000):

<u>Description of Solution:</u> As the FAA transitions to NextGen, aircraft will increasingly be assigned to Required Navigation Performance (RNP) area navigation (RNAV) routes and have modern avionics that include Flight Management Systems (FMS) capable of executing Required Time of Arrival (RTA) instructions. The RTA capability provides a powerful time-based control mechanism for use with the trajectory-based operations concept. In particular, RTA's have the potential for common use during certain situations such as management of arrival traffic to an airport. Time-based metering is a key scheduling technique for use in managing arrivals and employment of the RTA capability at an arrival-oriented waypoint (such waypoints could include top-of-descent, an arrival fix during the descent, and the runway threshold) can provide a mechanism to implement the scheduled times. The use of RTAs is attractive in that they take advantage of existing capabilities expected to become more widespread throughout the fleet. The FMS computes a cost benefit change to the original trajectory to meet the RTA. In addition, the FMS can "independently self deliver" to the RTA, thus reducing significantly the coordination needed between the user and ATC. Finally, since the FMS actively and directly "controls" the aircraft to meet the RTA, very accurate arrival is possible with minimal human intervention.

For FY 2011, \$7,000,000 is requested to evaluate the ability of aircraft to accurately meet vertical constraints and required time of arrival - Evaluate the advantages and disadvantages associated with imposing vertical constraints and required time of arrival in different congestion scenarios from the aircraft operator and ATM perspectives, evaluate Data Comm capabilities for aircraft messaging for Required Time of Arrival (RTA), reroutes, waypoint verification data integrity, perform safety analysis and report, and conduct in-flight trials and report using data communications capabilities for RTA.

### Benefits: RNAV/RNP with 3D and RTA will:

- Reduce controller workload and improved productivity.
- Enhance reliability, repeatability and predictability of operations, leading to increased throughput.
- Increase schedule reliability through more consistent access and throughput in all weather conditions.
- Improve efficiency and flexibility by increasing use of operator-preferred trajectories NAS-wide, altitudes.
- 5. Separation Management Approaches (Ground Based Augmentation System) (\$14,500,000):

<u>Description of Solution:</u> LAAS will provide all-weather approach capabilities to aircraft within line-of-sight distances from airports using GPS error corrections and integrity information. The corrections are delivered to aircraft via a very high frequency (VHF) Data Broadcast (VDB) signal.

LAAS will satisfy the all-weather approach and landing (as well as surface navigation) capability with significant improvements in service flexibility (i.e. capacity), safety, and user operating costs. High quality navigation services will be provided with a minimum investment in ground facilities compared to existing technology, resulting in savings to the U.S. Government. Aircraft operators will benefit from reduced fuel expenses due to more direct terminal area routing and improved access to airports during extremely low visibility operations.

LAAS will allow for increased flexibility in the Terminal Area by eliminating the capacity constraint due to ILS critical areas and allowing reduced aircraft separation in all weather conditions. Similarly, LAAS would allow for increased capability to the air traffic management system by providing the capability to use continuous descent approaches and curved-segmented approaches in extremely low visibility conditions.

A single LAAS system will be capable of providing precision approach capabilities to multiple runways. LAAS can provide precision approach service to all runways at those airports, including those not currently served by ILS. LAAS can also be installed at airports that currently do not have precision approaches due to ILS siting constraints.

The FAA to continue analysis and testing necessary to validate Category-III ground facility requirements and assess acquisition risks. This work will consist of requirements maintenance, preparation for investment decisions and initial solution development activities.

For FY 2011, \$14,500,000 is requested for implementation of NextGen ground based augmentation system (GBAS) at the Nations busiest airports (OEP, adjacent metropolitan) to achieve capacity and efficiency benefits by integrating area navigation (RNAV) and required navigation performance (RNP) capabilities with the Category-I GBAS landing system (GLS) capability. The project scope includes GBAS ground equipment, site survey and preparation, installation & checkout, facility approval, instrument approach design, flight inspection, avionics integration and user equipage incentives, controller and maintainer training, safety risk management approval, and coordination with all applicable authorities.

The NextGen GBAS project completed system design approval (SDA) of a Category-I (vertical guidance to a 200' above the runway) GBAS in September 2009 as an incremental step towards development of a Category-III (vertical guidance to the runway surface) GBAS by 2012. The improvements needed to achieve Category-III, are expected to require a software upgrade for the GBAS ground station and user avionics that have been installed and operating in the NAS.

Activities in order to achieve deployment include: Develop GBAS Category-III Prototype, Initiate GBAS Federal Procurement, Deploy GBAS Category I systems, publish RNAV/RNP – GLS procedures, Continue integration of GBAS avionics, Continue to work towards completion of GBAS Category III system design approval (SDA).

This funding will accelerate implementation of the GLS capability, avionics approvals, user equipage, procedure development, and the availability of Category-III GBAS. The air carriers will accrue capacity and efficiency benefits associated with RNAV/RNP-GLS at the Category-I level in parallel as the Category-III software upgrades are developed.

Benefits: The benefits are further summarized below:

<u>Cost Avoidance</u> - The FAA will incur lower annual maintenance costs for LAAS, as a single LAAS ground installation will service all runway ends at an airport compared to the current technology that requires multiple ILS systems at a given airport. With LAAS, the FAA will obtain cost avoidance benefits of reduced maintenance and life cycle costs, and avoid re-capitalization of aging ground base navigation systems (ILS, VOR, DME and NDB).

<u>Productivity</u> - LAAS reduces arrival and taxi delays. LAAS will maintain VMC/MVMC airport operations in IMC. LAAS in combination with RNAV and RNP procedures will allow for predictable flight paths in the terminal area which could potentially reduce pilot controller communications workload and the variability in the time and distance flown in the terminal area and lead to more flexible routing.

<u>Savings</u> - A single LAAS Ground Facility (LGF) can provide service to all runways ends at an airport compared to the need to purchase and install a separate ILS for each runway end at an airport. The number of ILS systems and their design complexity makes the ongoing costs of supporting these systems higher than those for LAAS. A LAAS cost analysis was performed in 2006 with the purpose to establish the potential long-term cost benefit of the Local Area Augmentation System (LAAS). The study demonstrates that net life-cycle cost savings begin to accrue if two ILSs are divested for every one LAAS station installed at each of the 118 identified airports. The net life cycle cost savings for a most likely LAAS cost scenario is \$300 million, with end-state annual cost savings of \$20 million. Any additional ILS divestment represents additional cost savings over the timeframe of the model.

<u>User (Airlines)</u> - LAAS will reduce the number of flight disruptions in a terminal area by improving ceiling and visibility minima. Lower minima can result in fewer flight cancellations, fewer diversions to alternate airports, and fewer inclement weather delays. The LAAS can provide fewer arrival and taxi delays than the ILS. LAAS can permit takeoff operations in low visibility, which reduces departure delays for properly equipped aircraft. LAAS in combination with RNAV and RNP procedures will allow for predictable flight paths in the terminal area which will lead to more flexible routing in the terminal area, reduced fuel cost, and reduced flight times. LAAS may also reduce a pilot's workload by requiring fewer communications with ATC. The most recent LAAS benefits analysis quantified the Airlines Direct Operating Cost savings to be \$638.9 million over 20 years.

<u>User (Passenger)</u> - A reduction in flight time equates to savings for both airlines and passengers. LAAS will reduce the number of airline disruptions (delays, cancellations, and diversions). The amount of savings to passengers was quantified by IBM in the LAAS Benefits Analysis as Passenger Time Savings (PTS) and was estimated to be \$795.8 million over 20 years.

The benefits to NextGen are increased flexibility in the Terminal Environment to enhance pilot and controller situational awareness and improve surface event management. The activities support providing initial aircraft-to-aircraft ADS-B applications, a low cost ground based augmentation system, environmental sensitive and efficient procedures, and more. The "other than" High Density Airports which will see benefits for the NextGen investments are very important to system-wide efficiency and performance of the air transportation system as a whole. The ultimate goal of flexible terminals is to provide separation capabilities that support the full use of each runway in nearly all weather conditions. This is necessary for the highest density airports to meet demand and at lower demand airports to provide viable business cases to users as alternatives to using high density airports and/or providing new service to a community. Basic NextGen benefits achieved include:

- Increased efficiency of arrival and departure operations.
- Improved usage of runway capacity.
- Improved airport access.
- Improved safety.

Other Benefits that GBAS can provide include providing precision approaches which are fuel efficient, with low noise and emissions to support access through high density airspace to the runway.

#### 6. Separation Management - Approaches (NextGen Navigation Initiatives) (\$1,500,000):

<u>Description of Solution:</u> This program will provide the required engineering studies, analyses and associated services to support continued development and updates to the Navigation Enterprise Architecture Roadmap strategy, schedules, resource estimates, and technical and operational impact assessment for navigation services. It includes the creation, development, and baselining of specifications and standards to support acquisition programs for navigation aids (such as ILS, RVR, VOR, DME and others). As well as development of benefit cost studies required. These efforts are essential to the introduction of new technologies that will improve NAS performance and efficiency, reduce acquisition and life cycle costs, and allow realization NextGen benefits.

For FY 2011, \$1,500,000 is requested to develop and baseline specifications and initiating solution development including acquisition and testing of navigation aid equipment.

<u>Benefits:</u> Improved Efficiency: Reducing delays in the NAS and providing relief to choke points and areas such as New York through introducing modifications/improvements of new equipment at these sites obtaining near term NextGen benefits. This will increase service to meet user needs, while maintaining safety and improving efficiency, and will allow for reduction in costs without reduction in service to NAS users. These programs will allow for full implementation of RNAV/RNP, key NextGen services.

<u>Capacity and Delay</u>: Navigation services are critical to maintaining and increasing capacity at airports throughout the NAS. We must ensure that operational requirements for en route routes and terminal procedures that are supported through the delivery of services that support Required Navigation Performance (RNP), Area Navigation (RNAV), and other standards. These new requirements are driving the evolution of navigation systems to support new, improved, and innovative service-orientated solutions that will be realized in new navigation aids designs, modifications and revisions to the existing FAA suite of navigation systems,

and the ability to provide greater service reliably. In this manner we will help to ensure that navigation equipment issues will not result in operational delays. Benefits will be are calculated by comparing the capacity/delays (+/-) before or without the availability of the navigation services provided with the capacity/delays when the navigation services are available.

### 7. Separation Management - Approaches (Optimize Navigation Technology) (\$1,500,000):

<u>Description of Solution:</u> The Navigation systems to be improved include all existing approach lighting systems, other lighted navigation aids, precision and non-precision approach systems, and terminal and en route navigation systems. The new technology efforts will include analyses of the physical, electrical (electronic) and economic characteristics of these systems to determine what type of technology insertion or changes in the system would result in improved efficiency.

Two initiatives will focus on the current Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR). These lights are required when pilots are making Category I precision approaches in the NAS. The first initiative is to replace the existing incandescent lamps with Light Emitting Diode (LED) technology, without modifying the rest of the MALSR system. The second initiative is to redesign the entire MALSR system to include LED technology, and solid state switching and electrical distribution technology. This technology redesign will provide a more reliable lighting system (with at least two times the mean time between failures) that will consume approximately one-third of the electrical energy that existing MALSR systems with incandescent lamps and mechanical switching and distribution system use.

LED Lamps have been under prototype development for some time. In order to gain the full benefits of modernizing the MALSR, the second initiative for a complete MALSR redesign of the power and control system is needed to optimize efficiency and reliability. Development of a new system is estimated to take approximately three years.

A third initiative is to develop an LED based Precision Approach Path Indicator (PAPI) to replace incandescent based Visual Approach Slope Indicators (VASI) and existing PAPI Systems in the NAS. This redesigned system would improve efficiency and reliability and result in cost savings.

For FY 2011, \$1,500,000 is requested to conduct activities to design, test and demonstrate new LED based approach lighting systems including switching/control and power distribution; and to begin to identify, analyze, and develop suitable prevention and mitigation strategies related to potential safety hazards between aircraft enhanced vision systems and new airport lighting technologies.

### Benefits:

- Reduce power consumption.
- Longer life (i.e., 50,000 hours vs. 2,000 hours).
- Low maintenance cost.
- Reduction of installation cost (i.e., smaller wires, and less complex electronic control cabinets).
- Sharper light output.

### 8. Flight and State Data Management – Avionics (\$1,300,000):

<u>Description of Solution:</u> This project intends to conduct engineering and research towards the development of initial requirements, concept of operations, and certification standards for cockpit moving map avionics that support automated taxi delivery, conformance monitoring and surface separation management. This capability represents the cockpit component of the Trajectory Management - Surface Conformance Monitoring project. It also represents a stand-alone capability to support surface separation in NextGen Flexible Terminal operations.

This effort is designed to show the potential safety and workload benefits that can be achieved through a comprehensive taxi route management and conformance monitoring capability and support for surface separation. The end state will be a precise, unambiguous taxi clearance to be displayed in the cockpit, alerts to the flight crews to maintain conformance to the clearance, and overlay of surveillance information to assist in surface separation.

For FY 2011, \$1,300,000 is requested to perform high-fidelity simulation and refine and update the safety analysis.

### Benefits:

- Safety and efficiency improves with more automated visual information available in the cockpit and more information with increased precision available to air traffic control.
- 9. Separation Management Wake Turbulence Mitigation for Arrivals (WTMA) (\$3,400,000):

<u>Description of Solution:</u> This project will provide prototype evaluation and requirements definition for the Wake Turbulence Mitigation for Arrivals (WTMA) air traffic control decision support tool feasibility prototype. This work will lead to an FAA acquisition in FY 2013 to transform the capabilities of the prototype into functioning tools for use by the FAA air traffic controllers. The first operational benefit will be realized in FY 2015 when the WTMA decision support tool is first used in an operational setting. WTMA will allow controllers to reduce the required diagonal wake turbulence separation distance to a minimum of 1.5 NM when instrument arrival operations are being conducted on an airport's closely spaced parallel runways and there are favorable crosswinds. This solution would provide two-to-four more instrument arrival slots per hour (during favorable wind conditions) at an airport that uses its closely spaced parallel runways for arrival operations and has a significant percentage of Boeing 757 and heavier aircraft traffic.

For FY 2011, \$3,400,000 is requested to continue "shadow mode" evaluations of the WTMA concept feasibility prototype at the candidate airport, re-work the WTMA prototype based on initial site evaluation results, accomplish detail benefit and safety assessments for the implementation of WTMA procedures, and begins development of system level requirements and associated analysis products needed for FAA's investment decision process.

Benefits: Implementation of the Wake Mitigation for Arrivals (WTMA) air traffic control decision support tool at potentially 12-to-17 candidate airports that have a significant number of Boeing 757 and heavier aircraft operations and use closely-spaced parallel runways for arrival operations would yield \$20 million per year in aircraft operator cost savings. Savings come from maintaining a higher airport arrival rate than that is presently established when an airport is required by weather conditions to shift from capacity efficient visual landing operations to instrument landing system (ILS) operations. Under today's current closely-spaced parallel runway ILS operations, the aircraft spacings revert to those used for aircraft landing on a single runway, essentially cutting the landing capacity of the airport's closely spaced parallel runways in half. When crosswinds are present on the airport's approach corridor, WTMA would provide two-to-four additional arrival slots per hour for airports that are serving a significant number of 757 and heavier aircraft. WTMA will also provide Passenger Value of Time savings - estimated to be \$25 million per year if implemented at the 12-to-17 candidate airports. Better definition of benefits will be a product of the WTMA evaluations that are funded by this project. The initial benefit estimate was done jointly by the FAA Wake Turbulence Research Program and the associated NASA research organization as part of a process to develop potential solutions for reducing the required wake separations on instrument approaches to closely spaced parallel runways.

### 10. Separation and Trajectory Management - Enhancing Terminals and Airports Operation (\$22,000,000)

<u>Description of Solution:</u> Relative Position Indicator (RPI) provides flight specific spacing information to support merging multiple RNAV routings in the terminal. It directly supports the more efficient and high demand use of RNAV/RNP procedures by enhancing the existing Converging Runway Display Aid (CRDA) function of the terminal automation platforms (STARS and CARTS). RPI will display accurate indicators of aircrafts relative positions onto a merging traffic flow.

For FY 2011, \$22,000,000 is requested to perform analyses, systems engineering and support modifications and improvement to STARS and CARTS in order to support merging multiple RNAV routings in the terminal environment; and may begin LPV procedure development and acquisition of additional RVR sensors.

<u>Benefits:</u> More efficient utilization of RNAV/RNP routes via terminal automation platforms in order to support high demand. The advantage of RPI is its ability to accurately project a target image of an aircraft target on an RNAV arrival path with acceptably realistic flight dynamics over a wide range of operational conditions. Implementation of RPI will effectively allow RNAV arrival merging applications in the terminal environment, and aid the air traffic controller in merging traffic into the terminal environment.

### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$37,100.0
FY 2010 Appropriated		64,300.0
FY 2011 Request		80,700.0
FY 2012-2015		<u>109,500.0</u> <sup>1</sup>
Total	Various	\$291,600.0

### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

<u>Activi</u>	ty Tasks	Locations/ Quantity	Estimated Cost (\$000)
1. S	Separation Management – Wake Turbulence (Departures)		\$1,000.0
2. S	Separation Management – Closely Spaced Runway Operations	;	6,000.0
3. F	Flight and State Data Management – Surface/Tower/Terminal		22,500.0
	Systems Engineering		
4. T	Frajectory Management - Arrivals		7,000.0
5. S	Separation Management – Approaches, Ground Based		14,500.0
	Augmentation System		
6. S	Separation Management – Approaches, NextGen		1,500.0
	Navigation Initiatives		
7. S	Separation Management – Approaches, Optimize		1,500.0
	Navigation Technology		
	Flight and State Data Management - Avionics		1,300.0
	Separation Management – Wake Turbulence (Arrivals)		3, <del>4</del> 00.0
10. E	Enhancing Terminals and Airports Operation		<u>22,000.0</u>
Total		Various	\$80,700.0

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 $<sup>^{\</sup>rm 1}$  Future requirements are under review.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
1A14	Next Generation Air Transportation System (NextGen) – Safety, Security and Environment	\$8,000,000	Various	G-7A

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> The Security Integrated Tool Set (SITS) is part of the FAA's Operational Evolution Partnership (OEP) and efforts to develop the Next Generation Air Transportation System (NextGen). Functional and technical requirements, spiral development plans, and cross-platform interfaces (e.g., linkages between SITS and other air traffic management automation) need to be developed. These capabilities would be provided to select FAA users, as well in a customized form to interagency defense and homeland security partners (e.g., Department of Defense (DoD), Transportation Security Agency (TSA), Customs and Border Protection (CBP)) through a secure network, which enables shared access to an aviation security Common Operational Picture (COP) or, at least, a User Defined Operational Picture (UDOP) drawing on a common data set; real-time collaboration on monitoring, vetting, and operational response; and coordinated consequence management. This network will leverage enterprise grade database, processing, communications, and Information System Security (ISS) systems to support simultaneous, secure, and geographically distributed access by interagency users.

As the Air Traffic Organization (ATO) has taken on rapidly expanding national defense and homeland security mission areas, investment in the enhancement of the ATO's security specific automation systems and infrastructure are needed to enable the ATO role. The current technological tools used by the ATO are naturally focused on the organization's traditional safety and capacity activities. Since the 2001 attacks, the ATO has been forced to substantially adapt the use of existing systems (e.g., Traffic Situation Display (TSD) and Temporary Flight Restrictions (TFR) Builder) to support its security related missions. ATO has also leveraged very primitive tools such as the telephonic bridge used for the Domestic Events Network (DEN), which has become the primary mechanism used by over seventy agencies to maintain shared situational awareness of and coordinate operational responses to security incidents involving the National Airspace System.

While the ATO has been able to stretch the utility of these off-the-shelf systems, which were designed and deployed to enable safety and capacity functions, their inherent deficiencies as tools to effectively support security operations have become glaringly obvious. The lack of adequate aviation security focused tools, ranging from operational response systems to intelligence sharing and fusion mechanisms, has been highlighted by a number of Government Accountability Office (GAO) documents and other reports. Cited deficiencies include, but are not limited to: an inability to manage data on security incidents (e.g., violations of restricted airspace) to help "connect-the-dots"; the lack of automation to rapidly identify and track suspect flights using in-flight behavior, flight plan data, operator information, and flight trajectory in the context of security features (e.g., restricted airspace or proximity to sensitive ground locations); unavailability of a COP fusing data from multiple sources and agencies. Timely information can make a decisive difference in the outcome of an air security event. The safety and capacity centric systems currently available to the ATO security users and their interagency partners inadequately address this growing, critical gap.

SITS is bound by FAA's operational responsibilities inherent in the NAS mission and as specified in National Security Presidential Directive-47/Homeland Security Presidential Directive-16 (NSPD-47/HSPD-16). These initiatives mandate government-wide sharing of information among law enforcement and security organizations. SITS is currently the main effort underway to provide the link to and from the law enforcement and security organizations to share NAS information.

Since the terrorist attacks of September 11, 2001, national security concerns have heightened and airspace security efforts have become increasingly complex. FAA's primary mission is to ensure the safe and secure

operation of the NAS. In this role, FAA is responsible for advising its security partners on the best risk based actions to mitigate potential threats to the air domain, providing the best possible response to an air domain security incident, and coordinating the action across the NAS. To carry out this responsibility requires the FAA's Air Traffic Security Coordinators (ATSCs) access a number of displays and data sources, correlate data, determine the trajectory of the flight of interest, identify potential physical ground or critical infrastructure assets that may be affected, and identify the operational status and air traffic situation across multiple NAS sectors in order to have the best picture of the situation. The ATSCs must also coordinate communications and responses among multiple Air Traffic Control (ATC) facilities with the goal of ensuring the continued safe operation of the NAS while minimizing the impact, mitigation, or response action will have on the NAS. Although there exists a variety of communication and coordination tools, aircraft situation displays, and security related databases, there is limited integration among these systems. Analyses and data correlation are performed manually and information sharing is currently limited to voice communication. In many cases these operations are costly, time-consuming, inefficient, and labor-intensive. Specifically, SITS has identified the following performance gaps:

- Shared Situational Awareness (SSA) and collaboration are limited.
- Required decision support tools do not exist (inadequate support to make informed decisions).
- Required automated analysis tools do not exist (inadequate analysis for timely decisions).
- Inadequate alerting and update capabilities.
- No locally independent and remote/mobile access capabilities (restriction of required information flows),
- Inadequate capabilities to assess NAS impacts of security measures.
- Lack of metrics to analyze security operations effectiveness.

#### **Description of Solution:**

- The Security Integrated Tool Set (SITS) will streamline security information processes, improve shared
  operational security situational awareness, and enable the agency to effectively collaborate with their air
  domain security partners.
- SITS will support the performance of FAA's air domain security responsibilities to facilitate secure air domain operations based on FAA goals (SMP Pathways 1 and 4) as well as NSPD-47/HSPD-16 mandates.
- The SITS effort aligns to the Next Generation Air Transportation System (NextGen) Concept of Operations and will provide the security infrastructure to support evolution to layered, adaptive security. This includes information sharing through net-enabled operations, flight-specific risk assessment and mitigation strategies, and a unified communications, command and control environment.
- These capabilities would be provided to select FAA users, as well in a customized form to interagency defense and homeland security partners (e.g., Department of Defense (DoD), Transportation Security Agency (TSA), Customs and Border Protection (CBP)) through a secure network, which enables shared access to an aviation security Common Operational Picture (COP) or, at least, a User Defined Operational Picture (UDOP) drawing on a common data set; real-time collaboration on monitoring, vetting, and operational response; and coordinated consequence management.
- This network will leverage enterprise grade database, processing, communications, and Information System Security (ISS) systems to support simultaneous, secure, and geographically distributed access by interagency users.

For FY 2011, \$8,000,000 is requested to finalize business case, safety management document, NAS Enterprise Architecture (EA) artifacts, requirements documents, and others to support the final investment decision.

<u>Benefits:</u> The investment analysis is currently being planned; details will be added as they become available. It is anticipated that their will be a savings to the government (but not FAA) for the reduction in number of airborne intercepts by USAF aircraft and the number of false security alerts. In any event this program is needed to meet the requirements of NSPD-47/HSPD-16.

### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$8,000.0
FY 2010 Appropriated		8,200.0
FY 2011 Request		8,000.0
FY 2012-2015		<u>33,000.0</u> <sup>1</sup>
Total	Various	\$57,200.0

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
Security Integrated Tool Set		\$8,000.0

<sup>&</sup>lt;sup>1</sup> Future requirements are under review.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
1A15	Next Generation Air Transportation System (NextGen) – Systems Networked Facilities	\$35,000,000	Various	G-3F, G-3M

<u>FAA Strategic Goal:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> The Next Generation Air Transportation System (NextGen) transforms the national air transportation system by establishing enhanced and expanded services through new technologies, policies, procedures, and methods of operation to meet future demand and avoid gridlock in the sky and at the airports. It redesigns the air traffic control systems to make them flexible, scalable, and maintainable. It breaks down the geographical boundaries that characterize air traffic control and leads to a more seamless view of traffic, organized not by geographically oriented sectors, but by aircraft trajectories. Infrastructure, automation, equipage, procedures, and regulations are designed to support this seamless operational concept and must evolve from a geographical focus to a broader air traffic management concept. This includes facilities and the personnel who staff them.

Today's air traffic system was built around 1960's radar technology and is constrained by its limitations. This geo-dependent model (communication constraints, hardware/software limitations, and available data distribution capabilities) dictated how many facilities were needed and their location. As a result of these limitations, the number of terminal and en route air traffic control facilities has grown to over 500. Security concerns, including location-based risks, distributed infrastructure constrained by legacy architecture, and disparate automation platforms, further challenge the air traffic control infrastructure. This results in operational inefficiencies, including capacity limitations and less than optimal business continuity planning (BCP) strategies. In addition, many of these facilities have aged to the point where repair and remediation would be financially unsound.

NextGen facilities must handle increased traffic in the future while managing costs, improving and expanding services, and transforming FAA en route and terminal facilities to facilitate NextGen operational improvements. The current system has built-in limitations in flexibility, cost of service delivery, and continuity of operations. Some smaller airports have limited service due to cost of service; creating a need to increase service in these locations, while reducing costs.

NextGen redesigns the air traffic control systems to make them flexible, scalable, and maintainable. It breaks down the geographical boundaries that characterize air traffic control and leads to a more seamless view of traffic, organized not be geographically oriented sectors, but by aircraft trajectories. Infrastructure, automation, equipage, procedures, and regulations are designed to support this seamless operational concept and must evolve from a geographical focus to a broader air traffic management concept. This includes the allocation of staffing and facilities to provide expanded services; service continuity; best deployment, management, and training of the workforce; and the use of more cost-effective and flexible systems for information sharing and back-up. Air traffic facility optimization is essential.

Since requirements for facilities are no longer geo-dependent and do not require proximity of air navigation services being provided to the air traffic being managed, facilities are sited and occupied to provide for air traffic management facility optimization. This may include collocating several facilities (e.g., air route traffic control centers (ARTCCs) and terminal radar approach control (TRACONs) within a single facility).

The Networked Facilities solution set focuses on delivering an infrastructure that supports the transformation of air navigation service delivery unencumbered by legacy constraints. Networked facilities will provide for expanded services; service continuity; and optimal deployment and training of the workforce all supported by cost-effective and flexible systems for information sharing and back-up. Traffic is assigned to facilities on both a long-term and daily basis with service continuity a foremost requirement. Business continuity is built into

the system and provides for a more resilient infrastructure, better contingency operations, and a higher degree of service.

In addition, NextGen introduces evolutionary and revolutionary concepts of operation and new technologies into the air traffic system. As a result of this, implementation of NextGen requires extensive work in the area of early evaluations, concept development, and/or demonstration in a real-time environment without being encumbered by the fidelity of the NAS infrastructure.

#### 1. Integration, Development, and Operations Analysis Capability (\$3,000,000):

<u>Description of Solution:</u> This program continues the integration, development, and operations analysis capability to provide a real-time and flexible environment for the development and validation of the broad framework of concepts, technologies, and systems introduced by NextGen. It provides for the ongoing conduct of early evaluations, concept development, and/or demonstrations in a flexible, real-time NextGen integrated environment that is unencumbered by the NAS infrastructure. It also provides the capability for these activities to be developed and validated in parallel to ongoing NAS activities and research. The program enables the FAA to assess technologies and mature concepts in an integrated environment that supports low to high fidelity exercises. The integration, development, and operations analysis capability uses a rapid prototyping environment that interfaces with a high-fidelity capability in a controlled environment. The operations analysis capability emulates information flow and system performance characteristics, and is adaptable to illustrate and assess NextGen human-machine-interface concepts. An ongoing capability is required to conduct early concept validation and maturation, alternatives analyses, and requirements development.

In FY 2010, the program will continue the development of the integration, development, and operations analysis capability. It will integrate systems required to support human-machine studies. The operations analysis capability will provide an infrastructure required to evaluate concepts and alternatives. The capability will measure and validate human performance, usability, workload, and safety indications in a flexible integrated environment supporting the design and conduct of experiments. The program will include the development and validation of system prototypes and system analyses capabilities to define requirements while researching candidate solutions. The program will provide additional software development and system integration to enhance capabilities. As capabilities are integrated, processes will be developed for the operations and maintenance of the operations analysis capability.

For FY 2011, \$3,000,000 is requested to continue to enhance, operate, and maintain the operations analysis capability to support the development of iterative designs to evaluate concepts and alternatives. The capability will measure and validate human performance, usability, workload, and safety indications in a flexible integrated environment supporting the design and conduct of experiments. Products include the enhancement, integration, and validation of system prototypes and system analyses capabilities to define requirements while researching candidate solutions.

<u>Benefits:</u> This program provides for an integrated environment ranging from low to high fidelity capabilities to support NextGen concept validation and requirements necessary to facilitate the transition of NextGen technologies into the NAS.

### 2. Future Facilities Investment Planning (\$24,000,000):

<u>Description of Solution</u>: The NextGen Integrated Work Plan establishes a broad framework for the services, technologies, policies, procedures, and methods of operation that must be implemented by 2025 to achieve the national air transportation goals. This vision includes NextGen facilities as a key component of the strategy for supporting air transportation and enhanced operational decision making between now and 2025. The ATO maintains and operates thousands of staffed and unstaffed operational facilities that we must regularly upgrade and modernize. The largest facilities are the 21 En Route centers, which house hundreds of employees and equipment to control aircraft flying in the En Route airspace. The other operational facilities with significant staffing are the more than 500 towers and 167 TRACON facilities that control traffic departing and arriving at airports.

The FAA is evaluating the design and configuration of future NextGen facilities to support the planned NextGen improvements in service and the potential changes in airspace controlled by these facilities. It is

important that these new facilities are sized correctly so the full benefits of the NextGen Architecture can be realized. The potential benefits include accommodating NextGen capabilities such as Integrated Arrival and Departure Services, High Altitude Generic En Route Services, Flexible Airspace Management, Staffed NextGen Towers, and integrated business continuity services.

NextGen facilities are as much about change management as they are about reducing the number of facilities and cost. In order to facilitate the significant transformations and changes in roles and responsibilities of air traffic service providers, NextGen facilities are incorporated into the overall plan to achieve NextGen. Traffic is assigned to facilities on both a long term and daily basis with service continuity a foremost requirement. The facilities are sited and sized to provide for a stable workforce environment with opportunities for career progression.

Since the flexible ground and air-ground communications networks negate the requirement for proximity of air traffic facilities to the air traffic being managed, NextGen facilities will be sited and occupied to provide for infrastructure security, service continuity, and best deployment and management of the workforce. This includes collocating several operational domains (e.g., en route, terminal) within a facility.

Information systems facilitate the monitoring of infrastructure health, remote maintenance, and system resilience to maintain service availability and automatically alert the community about the status of NextGen assets. One key transformations resulting from NextGen is the ability to continue to operate the system with the loss of a limited number of key operational facilities. Network-enabled operations and infrastructure management services provide continuity of operations in the event of a major outage (such as a major hurricane or terrorist event).

A flexible infrastructure service delivery is how changing user needs are met and cost-effective services are scaled up and down as needs change. It is the way to ensure that the service providers and the information (e.g., flight data, surveillance, weather) are readily available when and where needed.

To address this, the NextGen facilities investment planning program of networked facilities focuses on optimization of air traffic service resources. This includes the allocation of staffing and facilities to provide expanded services; service continuity; best deployment, management, and training of the workforce; and the use of more cost-effective and flexible systems for information sharing and back-up.

In FY 2010, \$21,000,000 was appropriated to support activities that further advance the NextGen facilities planning activities. Funding will be used to prepare the business cases, develop a knowledge-based framework to support iterative decision-making for evaluating, approving, and implementing a strategic approach to modernizing the facilities of segment 1 of the NextGen Facilities Program.

This framework includes a compilation of products, tools and planning elements designed to provide an integrated approach for the collection, organization, and quantification of data and information, as well as the capability to define facility alternatives addressing the needs of multiple view points and decision makers.

Products will include engineering analysis and facilities-focused studies, cost-benefit and economic analyses, risk assessments, facilities staffing and maintenance studies, initial facility designs, NextGen business continuity requirements, informational material and facility-independent techniques and practices for decoupling service delivery from facility geographic locations.

Tools will include a facilities data organization and quantification system, a dynamic economic model, and a decisional support process which will collectively provide a comprehensive and rapidly configurable enterprise model to integrate the multifaceted engineering analysis needed to inform, substantiate, and justify iterative decision making.

In addition, key planning elements will be identified (e.g., development of systems and equipment, development of regulations, development and implementation of procedures, purchase of real property, etc,); requirements and plans for major risks that threaten achievement of performance, cost, schedule, and benefit objectives; strategies for procuring, executing, implementing, communicating and supporting the solution over its life-cycle will be developed; and external stakeholder input will be solicited to advise the accuracy and completeness of estimated costs, identified risks, and feasibility of schedules.

For FY 2011, \$24,000,000 is requested to begin final planning activities for segment 1 phase 2 of the program and begin solution development for segment 2-phase 1 of the program. Final planning elements will be identified including requirements and plans for major risks that threaten achievement of performance, cost, schedule, and benefit objectives. A strategy for procuring, implementing, and operating the segment 1 phase 2 solution over its life cycle will be developed; and industry input will be solicited and evaluated to ensure the costs, identified risks, and schedules contained in the baseline are accurate.

Based on the iterative decisions from segment 1 phase 1 of the program, a program office will be stood up to manage the solution development, execution, and implementation of the preliminary decisions for segment 1 phase 2.

The due diligence on real property, as necessary, will be developed and associated environmental studies will be initiated to ensure compliance with applicable regulations. Based on the program execution strategy a detailed integrated logistics and transition strategy plan will be finalized itemizing the step-by-step orderly transition of NextGen operations. Contingency and business continuity plans will be developed and further matured to ensure continuity of operations in the event of short- or long-term facility outages during and after the transition period.

Detailed facility layout designs will be finalized to accommodate equipment and systems in the operational areas, NAS equipment areas, operational support areas, and administrative areas. Planning for the procurement, implementation, and integration of systems and equipment will be coordinated within the FAA in order to populate the planned facility with the full complement of NAS equipment.

Staffing plans will be developed based on a comprehensive staffing strategy to maintain NAS operations during the transition to the new or refurbished facilities. Coordination with programs and specialties across the FAA will occur to ensure the availability of systems, equipment, capabilities and personnel during solution implementation, including communications, power services, automation, navigation, spectrum and surveillance.

Training coordination will occur to ensure the execution of the transition plans. An overarching risk program will continue to operate throughout phase 2 to identify and develop risk mitigation strategies and plans to ensure safety throughout the transition.

<u>Benefits:</u> NextGen facilities planning supports optimization of FAA's air traffic service provider resources. It considers infrastructure alternatives and associated benefits such as that of a geo-independent service delivery model to optimize air traffic service, improve workforce security, and ensure continuity of service. Future facilities will provide for increased cost effectiveness through better matching of assets to demand and reduce the need for local surge buffers in personnel and equipment. Additional benefits include the following:

- Environments which support NextGen operational changes.
- Seamless information exchange that increases flexibility and air navigation service provider agility to respond to demand.
- Improved work environment and increased opportunity for career progression.
- Reduced time and cost to train controllers and other personnel.
- Facilities that meet Department of Homeland Security guidelines.
- Reduced overall air traffic service provider costs while increasing the level of service.

#### 3. Test Bed/Demonstration Sites (\$8,000,000):

<u>Description of Solution:</u> Demonstration sites will be deployed along the East Coast for faster and more reliable tests using multiple systems to begin the integration of NextGen. We will emphasize the integration of individual-domain (intra-domain) which would allow for end-to-end (or multi-domain) demonstration and testing. These sites will provide immediate (near-term) integration of new emerging technologies, or applications into existing or planned demonstrations, while NAS customers see these sites as a visible, near-term step toward initiatives that support government / industry partnerships.

In FY 2010, the program establishes the initial NextGen test bed in Florida. The work being performed includes establishing the Florida NextGen Test Bed concept of operations, and the strategic plan to identify

near-term strategic objectives. In addition, the program establishes the Florida Test Bed Segment 1 System Requirements, Segment 1 System Architecture, and Segment 1 Implementation Plan. This effort is being followed by performing site engineering activities followed by system engineering and site equipment installation work to implement Segment 1 test bed capabilities, while coordinating with WJHTC on NextGen Test Bed efforts. In parallel with Segment 1 implementation work, the Florida Test Bed Segment 2 planning efforts will be initiated to establish demonstration capabilities within the Florida Test Bed utilizing live data feeds.

For FY 2011, \$8,000,000 is requested to continue to expand NextGen test bed capabilities in Florida and initiate planning activities in Texas. More specifically for Florida, the program will continue the planning and implementation of telecommunication infrastructure and associated policy structure to establish the initial live data feed capability at the Florida Test Bed. Furthermore, planning activities will be performed to initiate the Florida Test Bed Segment 3 phase that adds data sharing capabilities with other NextGen Test bed sites. The program will also address technology site refreshes and the maintenance of the Florida site. This includes supporting any arising technology integration and demonstration activities in Florida and the initiation of an initial NextGen interactivity between Florida and WJHTC. In addition to continued coordination with WJHTC to establish an initial integrated NextGen demonstration capability, the program will initiate planning activities to expand NextGen demonstration capabilities to NASA NTX at Texas. In summary, during FY 2011, the Test Bed program will continue integration activities between the NextGen Test beds, increase system capabilities; and improve operational fidelity of the environment. As the implementation of NextGen progresses, it is anticipated that the integration of the Test Beds will need to increase commensurate with the maturity of the concepts under evaluation. This will include but not be limited to - increased bandwidth between facilities, access to additional operational sites, development of data collection techniques and improved metrics to evaluate more advanced concepts. In addition, there will be requirements for additional operational equipment and sub-systems to increase the scale of the simulations as well as the fidelity of the environment.

<u>Benefits:</u> The NextGen integrated test bed is a multi-domain demonstration and testing facility that integrates individual airspace domains and allows for end-to-end demonstrations, evaluations and testing at one or more physical sites in line with the NextGen gate-to-gate concept. The integrated test bed supports the near-term integration of new / emerging technologies or applications into existing or planned NAS enhancements. In addition, the activity also supports NAS demonstration initiatives fostering government and industry partnerships and the sustainment of an FAA controlled end-to-end / multi-domain demonstration site.

The NextGen integrated test bed activity supports the demonstration of transforming the NAS to 4-D trajectory management and a performance-based system. The program provides integration and demonstration of alternate technologies and concepts, while supporting procedures and standards development, integration of near-term emerging technologies and airspace customers' initiatives with ongoing scheduled demonstrations. This program provides a vehicle to test concepts and leverage individual transformational program and project technology to create multi-domain cohesive demonstrations to capture the synergies needed to transform the NAS in an expedited manner. The evaluation of technology and the collaboration between public / private industry partners, Air Navigation Service Providers (ANSPs), customers, and owners will continue into perpetuity

### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$15,000.0
FY 2010 Appropriated		24,000.0
FY 2011 Request		35,000.0
FY 2012-2015		1,016,700.0 <sup>1</sup>
Total	Various	\$1,090,700.0

Activity Tasks	Locations/ Quantity	Estimated Cost (\$000)
1. Integration, Development and Operations Analysis Capability		\$3,000.0
2. NextGen Facilities Concepts and Requirements Definition		24,000.0
3. Test Bed/Demonstration Sites		<u>8,000.0</u>
Total	Various	\$35,000.0

<sup>&</sup>lt;sup>1</sup> Future requirements are under review.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2A01	En Route Automation Modernization (ERAM)	\$132,300,000	Various	A-01

<u>FAA Strategic Goals:</u> Greater Capacity - Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets project demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> En Route automation systems provide the foundation for FAA's air traffic control environment and are paramount to FAA's ability to implement new services and air traffic control tools necessary to improve efficiency and increase capacity. The current En Route automation domain comprises a mix of technologies that are the result of a piecemeal system evolution. The En Route Host Computer System represents the core of the National Airspace System (NAS). This mainframe computer provides the primary radar data processing and flight plan processing information necessary for air traffic controllers to separate aircraft and ensure the safe, expeditious movement of air traffic. The FAA can only maintain the Host Computer hardware through 2012, after which operational availability and maintainability will be at risk. En Route automation system outages during peak travel times can create a ripple effect that results in long delays and/or cancellations, and can paralyze the entire NAS.

Automation enhancements provide one of the few opportunities available to achieve productivity and efficiency gains that are necessary to deal with significant forecasted growth in operations without significant increases in controller staffing. While the Host and Oceanic Computer System Replacement program replaced the mainframe processors, the Host Computer software is still based on a dated, 30-year old architecture. Additionally, the current radar-position display processors deployed in 1998 are also reaching the end of their service life. Their processing power is less than a standard desktop computer and their resident graphics software language is proprietary and outdated. These hardware and software limitations progressively impede FAA's ability to accommodate increasing demand for air traffic services that provide increased efficiency and capacity.

The current backup system, the Direct Access Radar Channel (DARC), provides only limited capabilities for air traffic controllers and no safety alert functions. As such, FAA imposes airspace restrictions whenever the backup system is engaged.

Today's threats make it imperative to approach information security in the en route environment in a holistic and systematic manner. The system relies on a mix of technologies cobbled together through 40 years of piecemeal investment developed before the introduction of modern information security standards and technologies.

En Route system presents significant challenges in configuration management and documentation because of its multiple, disparate sub-systems and site-unique configurations. These challenges require complex testing and transition planning, increasing the effort required, and the risk to operations when fielding upgrades and managing airspace data. For example, in 2004, transition complexities that surfaced during relatively minor upgrades to the legacy Host computer system at three sites caused 300 flight delays.

<u>Description of Solution:</u> ERAM replaces today's En Route Host Computer System, its backup, and portions of the display system infrastructure, which include the technical refresh of the Radar Position processor, to enable improvements in airspace capacity, efficiency, and safety that cannot be realized with the current 30 year-old system. ERAM will be fully integrated into the future NAS, providing flight information processing to terminal and approach control facilities. It also provides flight information and route processing to the traffic management systems that control the efficient flow of air traffic. ERAM has a fully functional backup system that simplifies system maintenance and eliminates the need for restrictions in the case of primary system failure. The ERAM program redesigned the display interface to support an open, Commercial-off- the-Shelf (COTS) based architecture. Its architecture is based on the En Route Communications Gateway and the Data Position display processor technical refresh. Failure to update the current Radar Position processors would

leave a major bottleneck in ERAM's open system infrastructure. Attempting to deploy new ERAM infrastructure without new Radar Position processors presents unmanageable technical and operational risk during transition. For these reasons, the Radar Position technical refresh is included in the ERAM acquisition program baseline.

ERAM provides capabilities the current Host cannot because of its technological and structural limitations, including restrictions on the number of flight plans that can be stored, the number of air traffic control radars that can be used, and flexibility within airspace configuration. ERAM provides a state of the art foundation and will introduce new capabilities that will enable improvements in air traffic control services. New capabilities such as flexible routing around weather, congestion, and traffic restrictions and automated controller-to-controller coordination will reduce controller workload and increase productivity. Airspace users will be able to file their intent earlier in the flight planning process allowing air traffic control resources to be more efficiently allocated to handle anticipated workload, and end-to-end flight plan analysis will improve the predictability of proposed routing. National adaptation will reduce life-cycle costs of system maintenance and ensure a consistent level of service from facility to facility, and the use of international flight plans will allow airspace users to fly across national borders almost seamlessly.

ERAM also improves configuration management and adaptation, and reduces the complexity of system upgrades and maintenance. ERAM provides the technology and mechanisms to introduce real and effective information security to the critical air traffic control system.

The ERAM architecture and deployment plans assume the successful implementation of the projects comprising the En Route Automation Program. The En Route Communications Gateway (ECG) completed the replacement of the Peripheral Adapter Module Replacement Item (PAMRI) system, providing a modular and expandable system to support ERAM. Additionally, ECG supports state-of-the-art system architectures such as Internet Protocol and extensible data formats such as ASTERIX. The En Route System Modifications program replaces components and provides upgrades for operational display systems within the En Route environment. User Request Evaluation Tool (URET) is a set of decision support capabilities that assist the En Route sector team in the strategic detection and resolution of predicted problems with traffic and adapted airspace. URET provides four key capabilities to the Air Route Traffic Control Centers (ARTCC): (1) Aircraft-to-aircraft conflict detection; (2) Aircraft-to-airspace conflict detection; (3) Evaluation of user or controller request for flight plan amendments or route changes; and (4) Enhanced flight data management - URET deployed at all 20 ARTCCs in FY 2006. These efforts address component obsolescence, system maintainability, current system operational performance improvements, and technical solutions that provide continued improvements to the NAS. Additional efforts include: Console Reconfiguration and Main Display Monitor (MDM) Replacement (CRMR), Data Position display processors technical refresh (DPOS) and Console modifications (Console Mods) to accommodate equipment to support ERAM. The CRMR effort was completed on April 12, 2005. The Data Position display processors technical refresh effort was completed during FY 2006 and the Console Mods effort is ongoing with completion in FY 2008.

In coordination with other en route programs, ERAM will accomplish a complex transition from the current system to modern en route system architecture while not impacting critical services. This transition will provide improved en route ATC capabilities and establish a modern and supportable environment, facilitating future capabilities and enhancements.

ERAM development and deployment is being conducted incrementally in order to reduce risk, provide early benefits, address equipment sustainment issues, and ensure a stable system during the transition from the Host Computer system. The first step is the replacement of the DARC Host Back-up and the addition of safety alerts through the Enhanced Back-up Surveillance (EBUS) effort. EBUS was deployed to all 20 ARTCCs in FY 2006.

The second phase now the national deployment of the En Route Information Display System (ERIDS), an important tool for providing the early benefits of improved productivity and efficiency by distributing important information to air traffic controllers electronically to process print, manage and distribute paper. ERIDS national deployment was completed December 2007.

The third and by far, most complex step (ERAM Release 1) is the replacement of the Host Computer System with new software and hardware and the integration of these elements within evolving En Route system

architecture in coordination with the other elements of the En Route Automation Program. To mitigate risk, ERAM is leveraging existing FAA products and lessons learned to reduce cost, minimize deployment risk, and increase user acceptance. Specifically, Display System Replacement (DSR) forms the basis of ERAM radar controller display functionality; URET forms the basis of the flight data processing, data controller display functionality, and conflict probe; Standard Terminal Automation Replacement System (STARS) radar data tracker provides a standard tracker; and Microprocessor En Route Automated Radar Tracking System (MEARTS) forms the basis for ERAM separation assurance and safety functions. This step will complete the delivery of a new automation system at each En Route Air Route Traffic Control Center in the continental United States. ERAM Release 1 national deployment begins in FY 2009 and will be completed in FY 2011. Finally, ERAM Releases 2/3 will contain software maintenance updates and further functional enhancements.

For FY 2011, \$131,500,000 is requested to complete transition of all ARTCCs to ERAM, and continued maintenance support (On-site Support 1st Level Hardware Maintenance and 2nd Level Engineering Support and CDLS) for installed ERAM systems. An additional \$800,000 is requested for Independent Operational Test and Evaluation (IOT&E).

<u>Benefits:</u> The ERAM deployment will ensure the safety and continuity of NAS operations by replacing technically obsolescent and logistically unsupportable systems. ERAM provides a fully redundant backup channel to ensure system reliability and availability. ERAM is being developed with an open architecture that will facilitate meeting demands on the NAS for increased safety, capacity, and security as well as the inclusion of future enhancements.

Prior to budget year 2006, ERAM was captured as one of the projects under the En Route Automation Program budget line item. At the direction of the FY 2005 Conference Report, the following represents the funding request for ERAM only. The appropriation summary for prior years (FY 1982-2005) reflects the En Route Automation Program as a whole.

#### APPROPRIATION SUMMARY

<u>Locations</u>	<u>Amount (\$000)</u>
<del></del>	\$1,844,462.7 <sup>1</sup>
	171,750.0
	132,300.0
	0.0 2
Various	\$2,148,512.7

Activity Tasks	Locations/ Quantity	Estimated Cost (\$000)
1. ERAM Release 1		\$131,500.0
2. Independent Operation Test and Evaluation		800.0
Total	Various	\$132,300.0

Includes reduction for P.L.108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.

<sup>&</sup>lt;sup>2</sup> Future requirement for technology refresh will be requested in a future budget.

Budget I <u>tem</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2A02	En Route Communications Gateway (ECG)	\$6,000,000	Various	A-01

<u>FAA Strategic Goal:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> The En Route Automation Programs provide automation infrastructure improvements at the 20 high-altitude centers in the continental US. Five interdependent projects comprise the program: En Route Communications Gateway (ECG), Host and Oceanic Computer System Replacement, En Route System Modifications, En Route Enhancements, and En Route Automation Modernization (ERAM). These automation systems provide the foundation for FAA's air traffic control system.

While modern equipment is being procured and fielded to replace obsolete system elements, legacy operational automation systems must still be maintained and interim updates must be performed to continue air traffic services today. Minimizing disruption to high-altitude, or en route, automation services is critical because outages can create a ripple effect that results in long delays and cancellations throughout the NAS.

The ECG system, which replaced the aging Peripheral Adapter Module Replacement Item (PAMRI), is fully operational nationwide. ECG is the first step in FAA's plan to replace aging automation systems with modern technology. The ECG system was procured using commercial-off-the-shelf (COTS) products. The performance gap is the short life-cycle associated with COTS products, which require more frequent technology refreshes. Sometimes, technology upgrades improve capability. The ECG program allows the FAA to monitor, maintain, and evolve the ECG system to take advantage of technical advances.

The problem therefore, is to maintain the viability of the ECG system while the air traffic technology evolves, maintaining the service capability that ECG provides.

<u>Description of Solution</u>: The solution is twofold. First, the ECG acquisition team will remain a viable entity to continue managing the investment the government has made in providing a modern portal capability. Second, the team developed the ECG Sustainment and Technology Evolution Plan (STEP) to document the multi-year approach to maintaining the viability of the ECG system. This approach to sustainment and technical evolution combines purposeful, ongoing monitoring for obsolescence or evolution opportunities with proactive planning to identify the best alternatives and the best solutions to maintaining and evolving the ECG technical baseline.

In FY 2010, \$3,600,000 was appropriated for the ECG program to support program objectives in support of the FAA Flight Plan. This funding will provide for the following:

- \$1,300,000 for full replacement cost of hardware and software upgrades required to mitigate obsolescence issues. This includes testing of all viable alternatives identified via the STEP process as well as full system testing of the selected alternative. The ECG STEP process has been successful so far in coming up with more cost effective solutions that negate the need for full replacements of ECG components.
- \$800,000 for Program Support, that includes support activities for OMB Exhibit 300, Earned Value Management, STEP, Operational Analysis, contract administration, and engineering services. This also includes supporting interfaces with other En Route Automation systems such as NADIN, FDIO, and ERAM.
- \$400,000 for ECG Information System Security. This will include remediation activities associated with the completed Security Certification and Authorization Package dated August 2007, as well as conduct of a yearly Contingency Disaster Recovery Plan at an Air Route Traffic Control Center and FISMA Reporting requirements.

- \$400,000 to continue Operational Analysis (OA). The OA process ensures that the ECG system is monitored to verify that it is providing the benefits, performance, and level of service required. The OA results are also used to assist the monitoring for the ECG STEP.
- \$700,000 for in-service engineering.

For FY 2011, \$6,000,000 is requested for the ECG program to support program objectives in support of the FAA Flight Plan. This funding is requested for the following:

- \$3,200,000 for full replacement cost of hardware and software upgrades required to mitigate obsolescence issues. This includes research and testing of all viable alternatives identified via the STEP process as well as full system testing of the selected alternative. The ECG STEP process has been successful so far in coming up with more cost effective solutions that negate the need for full replacements of ECG components.
- \$1,300,000 for Program Support, that includes support activities for OMB Exhibit 300, Earned Value Management, STEP, Operational Analysis, contract administration, and engineering services. This also includes supporting interfaces with other En Route Automation systems such as NADIN, FDIO, and ERAM. Provide Reliability, Availability, Maintainability (RAM) Engineering and Analytical support services for domain and system performance.
- \$800,000 to continue Operational Analysis (OA). The OA process ensures that the ECG system is monitored to verify that it is providing the benefits, performance, and level of service required. The OA results are also used to assist the monitoring for the ECG Sustainment and Technology Evolution Plan.
- \$700,000 for in-service engineering.

<u>Benefits:</u> The most significant benefits are improved efficiency, capacity, and safety by providing controllers with newer, faster, and more capable technology to manage the significant increase in air traffic. By replacing hardware prior to reaching the end-of-maintenance dates, FAA can avoid significant increases in operation and maintenance costs and delays due to system outages. The future en route automation system will provide a cost-effective and fully integrated platform to support new automation functionality. Supplemental benefits include aviation fuel savings, fewer system delays, and the ability to support the demands of a robust economy. The en route automation system will also accommodate the deployment of functions contained in the initiatives that are expected to provide significant savings to the user community through more fuel efficient routes, reduced flight times and delays, and increases in controller productivity.

In-service engineering allows for immediate response to emerging technology solutions. Funding is requested for ongoing engineering support of all prototyping efforts.

### **APPROPRIATION SUMMARY**

	<u>Locations</u>	<u>Amount (\$000)</u>
Appropriated (FY 1982-2009)		\$249,901.2 <sup>1</sup>
FY 2010 Appropriated		3,600.0
FY 2011 Request		6,000.0
Baseline Requirement		61,700.0
Total	Various	\$321,201.2

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<sup>&</sup>lt;sup>1</sup> Includes reduction of FY 1998 funds pursuant to rescission contained in P.L. 106-69, October 9, 1999 and EAS. Includes reduction for P.L.108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004. Includes reprogramming reduction dated August 28, 2009.

Activity Tasks	Locations/ Quantity	Estimated Cost (\$000)
1. ECG Sustainment and Technology Evolution		\$3,200.0
2. Program Support		1,300.0
3. ECG Operational Analysis		800.0
4. In Service Engineering		<u>700.0</u>
Total	Various	\$6,000.0

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2A03	Next Generation Weather Radar (NEXRAD)	\$6,700,000	Various	W-02

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> NEXRAD, a tri-agency program between the Department of Transportation (DOT), the Department of Defense (DoD), and the Department of Commerce's (DOC) National Weather Service (NWS) share developmental costs in proportion to the number of systems fielded by each agency. The NWS is the lead agency responsible for the overall coordination of the development and implementation of the system upgrades. NEXRAD detects, processes, and distributes for display, hazardous and routine weather information. Technical upgrades are necessary to enhance NEXRAD and provide ATC with weather detection equipment to improve safety by detecting and characterizing hazardous weather phenomena.

In 1979, Congress directed DOT (FAA), DOC (NWS), and DoD to work together and develop a Doppler weather radar system to be shared by all agencies. The tri-agency Memorandum of Agreement (MOA) commits the participating agencies to support, maintain, and enhance the NEXRAD system over the NEXRAD's service life, currently projected to 2025.

The FAA's NEXRAD program provides the means to fund the FAA's share of the overall NEXRAD mission, and to ensure that FAA priorities are included in the planning for NEXRAD sustainment and improvement.

<u>Description of Solution:</u> On-going NEXRAD weather product improvements are critical for replacing the existing infrastructure, and introducing required new capabilities to multiple FAA system interdependent weather systems. The NEXRAD Product Improvement (NPI) updates NEXRAD technology providing two upgrades which include Super Resolution Products, an on-going infrastructure upgrade; and Dual Polarization (DUAL POL), a targeted technology upgrade boosting NEXRAD data quality for better precipitation data used by Integrated Terminal Weather System (ITWS), Corridor Integrated Weather System (CIWS), and Weather and Radar Processor (WARP). DUAL POL provides for improved flash flood warnings, severe thunderstorm warnings, biological target identification, and various types of winter storm warnings. Aviation applications include new warnings of hail and icing conditions, turbulence warnings, and bird strike warnings.

In FY 2010, \$6,900,000 was appropriated to continue weather product improvements including funding of software maintenance of tailored aviation algorithms and products as well as Tech Refresh activities. Funding is also provided to initiate Dual POL deployment and continue development of NEXRAD algorithms that use DUAL POL data to detect in-flight icing and hail.

For FY 2011, \$6,700,000 is requested to fund NEXRAD technical refresh of obsolete computer hardware components that will be required to sustain NEXRAD for its remaining lifetime (2025). NEXRAD algorithms that implement DUAL POL technology will be finalized, and the NEXRAD program will be supporting external program efforts to ingest and display these new NEXRAD products. Program office support will continue through the end of FY 2011. This support will assist FAA with the oversight of contracted NEXRAD activities.

<u>Benefits:</u> NEXRAD systems have increased aviation safety with the accurate and timely detection of hazardous aviation weather conditions. Weather related arrival and departure delays have been reduced, thus allowing aviation fuel consumption savings.

### APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)	130	\$348,053.7
FY 2010 Appropriated		6,900.0
FY 2011 Request		6,700.0
FY 2012-2015	_ <del></del>	8,600.0
Total	130	\$370,253.7

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
NEXRAD Legacy, Icing and Hail Algorithms		\$6,700.0

<sup>&</sup>lt;sup>1</sup> Includes \$8,700 reduction of FY 1998 funds pursuant to rescission contained in P.L. 106-69, October 9, 1999 and EAS. Includes reduction for P.L.108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2A04	Air Traffic Control System Command Center (ATCSCC) Relocation	\$2,100,000	1	F-28

<u>FAA Strategic Goal:</u> Organizational Excellence – Ensure the success of the FAA's mission through stronger leadership, a better trained and safer workforce, enhanced cost-control measures, and improved decision-making based on reliable data. Objective 2 – Improve financial management while delivering quality customer service.

<u>Description of Problem:</u> The FAA Air Traffic Control System Command Center (ATCSCC) is responsible for the tactical command and control of the National Airspace System (NAS) on a daily basis. The ATCSCC plays a key role in the safe and efficient operation of managing the NAS. The ATCSCC plays a key national security role and in the current leased facility, the security requirements do not continue to meet FAA security standards. Since 1994, the facility has been housed in commercially leased space with the current cost in excess of \$4,000,000 annually. The long term lease is set to expire in May 2011 (previously September 2013). The FAA must have a permanent location for this critical NAS function that continues to meet and stay ahead of evolving FAA security standards. In addition, there are many physical constraints in the existing leased ATCSCC facility operations room for reconfiguration and expansion for new Traffic Flow Management (TFM) equipment deployments. In the past, in order to meet new equipment deployments, the FAA has had to pay significantly for modifications to the existing leased space to accommodate these new TFM equipment deployments.

<u>Description of Solution</u>: The ATCSCC infrastructure project relocates and constructs a new ATCSCC facility on the FAA's owned property collocated with the FAA Potomac Consolidated Terminal Radar Approach Control (TRACON) Facility in Warrenton, Virginia. Since FAA owns the 33 acres of property where the Potomac TRACON is located, no new land acquisition will be required to build this new ATCSCC facility.

The existing ATCSCC is in a leased facility (located in Herndon, VA) that does not meet evolving FAA security standards. The new facility is moving to a secure FAA site that meets all existing FAA security requirements. In fact, the Potomac TRACON site is one of the few FAA sites that have received full Security Accreditation.

In addition to reducing FAA costs to operate the ATCSCC, the new facility is being designed to overcome the constraints of the existing building. Over the years the Traffic Flow Management equipment has been going through a relatively constant change with new equipment arriving nearly every year. The existing control room and the consoles were not designed with reconfigurations in mind. As a result, FAA continues to incur a significant cost for each minor reconfiguration or each new tool being deployed. The new facility is being designed from the ground up with the ability to reconfigure at little or no cost as a primary objective. This flexibility will not only allow low cost adaptability, it will also allow for faster deployment of equipment.

In FY 2010, \$10,300,000 was appropriated for equipment and installation costs, project management, construction modifications, site preparation and installation, and FAA Telecommunications Infrastructure (FTI) administrative circuits.

For FY 2011, \$2,100,000 is requested to perform program management, pay the initial telecommunication costs, address moving and disposal costs, and process change orders.

<u>Benefits:</u> The ATCSCC relocation will lower FAA's life cycle costs. The FAA will achieve cost avoidance benefits projected at \$121.4 million from fiscal year 2010 through fiscal year 2031. Collocation will also lower capital costs by eliminating the need for land acquisition, reducing site work costs, and significantly reducing backup power system and utility costs. Operations and Maintenance (O&M) costs will be reduced as well for the ATC system maintenance, facility security, telecommunication services, and grounds maintenance through collocation.

### APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$31,100.0
FY 2010 Appropriated		10,300.0
FY 2011 Request		2,100.0
FY 2012-2015		<u>2,100.0</u>
Total	Various	\$45,600.0

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. Program Management		\$500.0
2. Telecommunications Cost		500.0
3. Moving and Disposal		300.0
4. Change Orders		<u>800.0</u>
Total	1	\$2,100.0

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2A05	ARTCC Building Improvements/ Plant Improvements	\$36,892,000	Various	F-06

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

Description of Problem: En Route and Oceanic Services are responsible for sustaining and modernizing the FAA's 21 Air Route Traffic Control Centers (ARTCCs) as well as the Combined Center Radar Approach Control (CERAP) facilities at San Juan and Guam. The ARTCC Plan Modernization program is necessary to support Air Traffic Control (ATC) operational requirements, reduce the risk of ATC delays caused by infrastructure failures, and minimize future costs associated with infrastructure failures. These facilities and much of the mechanical and electrical equipment within them are over 40 years old. Many of the systems have exceeded their life expectancies and are at risk of failure. For example, in June 2001 smoke from a kitchen fire at the Cleveland ARTCC required an evacuation of the control room resulting in the loss of ATC capability for 16 minutes over 65,000 square miles. Fifty flights were delayed and all en route traffic was routed around the Cleveland airspace. In FY 2005 alone, there were eight catastrophic occurrences of pipe ruptures which could have similarly affected operations. At the Washington ARTCC, plastic sheeting had to be draped over air traffic control positions to continue operations.

The presence of asbestos fireproofing continues to pose a risk to maintenance personnel and significantly increases costs associated with maintenance or repair activities. Fire protection systems must be added in some areas of the buildings to meet building codes and structural upgrades are necessary at ARTCCs in seismic areas.

In FY 2008, a national condition assessment survey identified a \$122 million backlog of facility equipment that is past its life cycle. Obsolete equipment in this backlog increases the risk to facility operations in the event of failure. Additionally, when this equipment fails, the FAA often must expend additional funding to repair affected areas. For example when a roof or pipe leaks, repairs must be made to walls, ceilings, and carpets. The facility industry estimates that building owners incur \$4 of out year liability for each \$1 of backlog. The current backlog represents a potential out-year capital liability of \$488 million.

<u>Description of Solution:</u> For FY 2011, \$35,521,700 is requested to continue modernization and sustainment of existing ARTCC facility projects. These projects will include asbestos abatement, mechanical/electrical system replacements, fire detection and protection upgrades, as well as interior architectural construction. All facilities will also receive smaller sustainment projects targeted at eliminating infrastructure failure modes by replacing mission critical components. An additional \$1,370,300 is requested for in-service engineering.

<u>Benefits:</u> To support the FAA's Greater Capacity goal, the FAA must cost effectively renovate and manage its En Route facilities. This program is linked to a Flight Plan performance target for sustaining the operational availability of facilities that support the 35 OEP airports as well as the Air Traffic Operations organizational goals for optimizing service availability and reducing the unit costs of operations. These projects will reduce the risk of facility outages and will upgrade the facilities to meet current building code requirements.

In-service engineering allows for immediate response to emerging technology solutions. Funding is requested for ongoing engineering support of all prototyping efforts.

### APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009) FY 2010 Appropriated		\$1,042,100.0 <sup>1</sup> 50,000.0
FY 2011 Request	 	36,892.0
FY 2012-2015 Total	<del></del> Various	219,200.0 <sup>2</sup> \$1,348,192.0
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Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
ARTCC Facility Modernization		\$35,521.7
2. In Service Engineering		<u>1,370.3</u>
Total	Various	\$36,892.0

<sup>&</sup>lt;sup>1</sup> Includes \$19,600,000 in prior year funds for the San Juan CERAP – Sustain program. Includes \$23,800 reduction of FY 1998 funds pursuant to rescission contained in P.L. 106-69, October 9, 1999. Includes \$1,179,900 reduction of FY 2002 funds pursuant to supplemental P.L. 107-206, January 23, 2002. Includes reduction for EAS in FY 2002. Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004. Includes \$50,000,000 for the American Recovery and Reinvestment Act.

<sup>&</sup>lt;sup>2</sup> Future requirements will be based on activity levels and local situations that are validated on a year-to-year basis.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2A06	Air Traffic Management (ATM)	\$16,500,000	Various	A-05, A-21, M-08, M-39

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 2 - Increase reliability and on-time performance of scheduled carriers.

<u>Description of Problem:</u> Flight operations are approaching pre-9/11 levels, and aviation trends indicate that air traffic demand will continue to increase. Domestic, regional and commuter patterns and compositions are changing. Despite this growth, the economic viability of many commercial carrier airlines is uncertain. The Traffic Flow Management (TFM) portfolio of tools and capabilities is the only part of the National Airspace System (NAS) designed to help the aviation community reduce delays, improve operations, and succeed economically. However, the system cannot accommodate the anticipated growth in demand for services.

The existing TFM toolset will need to overcome the following challenges to meet FAA's mission and customer expectations:

- Continued timely development and integration of sophisticated decision support tools to minimize NAS delays and improve efficiency.
- Obsolescence of existing TFM system software architecture.
- Near-term sustainment limitations of existing TFM Infrastructure (TFM-I).
- Fiscal pressures forcing a reduction in the cost of ownership.
- 1. <u>Air Traffic Management (ATM) TFM Infrastructure Infrastructure Modernization (\$10,000,000):</u>

<u>Description of Solution:</u> The FAA must maintain mission essential operations at its 81 TFM-equipped Air Traffic Control (ATC) facilities for its customers and continue to provide enhanced TFM services. Air Traffic Management (ATM) includes: modernization of the Traffic Flow Management Infrastructure (TFM-I), development of Collaborative Air Traffic Management Technologies (CATMT), technology refreshment of the Departure Spacing Program (DSP), and development of the Route Availability Planning Tool (RAPT) prototype, and provides direct mission support to FAA by ensuring efficient flow of air traffic through the NAS.

TFM is the nation's primary source for disseminating flight information across the aviation community. The automation and communication mechanisms provided by the TFM system support the decision-making process used to adjust flight schedules and/or routes as necessary. When the NAS is impacted by severe weather, congestion, and/or outages, the TFM system has unique capabilities to predict chokepoints and facilitate the collaboration and execution of mitigation initiatives with stakeholders, using common information displays and tools, to minimize NAS delays.

Traffic Flow Management Infrastructure Modernization (TFM-M): The TFM-M program has recently replaced the obsolete hardware at FAA's field ATC facilities and in the process of modernizing the hub site facility hardware and software of the current infrastructure. When completed, TFM-M will provide a hardware and software infrastructure that will enable continued development of products and services to more effectively manage the flow of air traffic, while reducing the cost of ownership and ensuring the technological capacity to meet future user and customer needs.

In FY 2010, \$7,400,000 was appropriated to begin the technology refresh of the TFM remote sites.

For FY 2011, \$10,000,000 is requested to maintain contract oversight, update software/hardware licenses, provide system engineering activities and conduct a technology refresh of the TFM Processing Center hardware located at the William J. Hughes Technical Center in Atlantic City, NJ.

Benefits: TFM-M allows new tools and additional collaborative ATM functionality to be expanded and integrated into the existing infrastructure to improve system efficiency and decrease air traffic delays. Reduced delays produce substantial economic benefits to air carriers at a time when they are trying to recover financially. Independent economic analyses show that TFM programs currently deliver \$350 - \$550 million in benefits per year to FAA customers. TFM-M and CATMT are estimated to deliver at least \$155 million in annual benefits to FAA customers when the initial software functions are deployed, and will also reduce the FAA's cost of ownership for TFM-I by lowering sustainment costs. The Post Implementation Review (PIR) performed on the AFP deployment in Enhanced Traffic Management Service (ETMS) v8.2 showed that AFP saved the aviation community approximately \$38 million from June 2006 - December 2006. The PIR performed on ETMS v8.3 showed that Adaptive Compression was saving \$22 million per year. The PIRs performed on ETMS v8.4 and v8.5 documented a more usable system, but did not quantify cost savings.

### 2. <u>Collaborative Air Traffic Management Technologies Work Package 1 (\$5,700,000):</u>

<u>Description of Solution:</u> The FAA must maintain mission essential operations at all 81 TFM-equipped ATC facilities for its customers and continue to provide enhanced TFM services. Air Traffic Management (ATM) includes: modernization of the Traffic Flow Management Infrastructure (TFM-I), development of Collaborative Air Traffic Management Technologies (CATMT), technology refreshment of the Departure Spacing Program (DSP), and development of the Route Availability Planning Tool (RAPT) prototype, and provides direct mission support to the FAA by ensuring efficient flow of air traffic through the NAS.

Collaborative Air Traffic Management Technologies (CATMT): CATMT Work Package 1 focuses on four areas: Airspace Flow Management, Impact Assessment and Resolution, Domain Integration, and Performance Management. These capabilities will improve the usage of existing NAS capacity by improving automation tools and procedures to make air traffic more efficient during periods of adverse weather or excessive volume. Additionally, it will promote the use of automated systems that provide more accurate and timely information to all users and customers, and will implement tools and processes that promote collaborative decisions regarding best routing and scheduling alternatives.

In FY 2010, \$22,200,000 was appropriated to complete the CATMT Work Package 1 enhancements, specifically the reroute impact assessment capability which allows Traffic Management Unit (TMU) personnel to examine the impact of reroute requests on planned traffic management initiatives before actually activating them.

For FY 2011, \$5,700,000 is requested to complete and close all activities associated with the CATMT WP 1 effort.

<u>Benefits:</u> TFM-M allows new tools and additional collaborative ATM functionality to be expanded and integrated into the existing infrastructure to improve system efficiency and decrease air traffic delays. Reduced delays produce substantial economic benefits to air carriers at a time when they are trying to recover financially. Independent economic analyses show that TFM programs currently deliver \$350-\$550 million in benefits per year to FAA customers. TFM-M and CATMT are estimated to deliver at least \$155 million in annual benefits to FAA customers when the initial software functions are deployed, and will also reduce the FAA's cost of ownership for TFM-I by lowering sustainment costs. The PIR performed on the AFP deployment in ETMS v8.2 showed that AFP saved the aviation community approximately \$38 million from June 2006 - December 2006. The PIR performed on ETMS 8.3 showed that Adaptive Compression was saving \$22 million per year. The PIRs performed on ETMS v8.4 and v8.5 documented a more usable system, but did not quantify cost savings.

#### 3. <u>Air Traffic Management - In-Service Engineering (\$800,000):</u>

Also requested for FY 2011 is \$800,000 for in-service engineering to allow for immediate response to emerging technology solutions. Funding is requested for ongoing engineering support of all prototyping efforts.

### **APPROPRIATION SUMMARY**

	<u>Locations</u>	<u>Amount (\$000)</u>
Appropriated (FY 1982-2009)	Various	\$1,009,035.8 1
FY 2010 Appropriated FY 2011 Request		31,400.0 16,500.0
Baseline Requirement	 Various	37,900.0 ¢1.004.935.9
Total	various	\$1,094,835.8

### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. TFM-I Modernization		\$10,000.0
2. Collaborative Air Traffic Management Technologies WP1		5,700.0
3. In Service Engineering		800.0
Total	Various	\$16,500.0

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<sup>&</sup>lt;sup>1</sup> Includes a \$57,077 reduction of FY 2001 funds pursuant to rescission contained under P.L. 106-544. Includes a reduction for EAS in FY 2002. Includes a reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004. Includes \$17,700,000 for Free Flight Phase 2/CDM program to continue functionality development under new program, Collaborative Air Traffic Management Technologies.

<sup>&</sup>lt;sup>2</sup> Future requirement does not include Initial estimate of \$100.0M for CATMT Work Package 2 effort which will go to the FAA JRC at the end of FY 2008.

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2A07	Air/Ground Communications Infrastructure	\$7,600,000	Various	C-04, C-06, M-08

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> The current air/ground communication system must be improved to support FAA's goal to provide increased capacity in the U.S. airspace system that reduces congestion and meets projected demand. The growth in air traffic operational requirements has increased the need for air/ground communications coverage. The current system is aging, increasingly unreliable, and susceptible to radio interference. Disruptions of air/ground controllers to communicate with aircraft around affected areas may remove the ability of ground controllers to communicate with aircraft. Radio frequency interference at an Air/Ground (A/G) facility would severely disrupt air traffic services. Due to the deferment of the next generation air/ground communications (NEXCOM) system development program, FAA must continue to support the radio control equipment requirement to support expanded communications coverage.

<u>Description of Solution</u>: Air/Ground Communications Infrastructure will replace aging and increasingly unreliable equipment. In addition, Air/Ground Communications Infrastructure will establish new communications facilities. For FY 2011 \$7,600,000 is requested to fund the Air/Ground Communications Infrastructure as follows:

- The Communications Facilities Expansion (CFE) program provides new communications facilities and equipment. The program also improves and/or relocates current communication facilities to meet new demands. For FY 2011 \$4,000,000 is requested to provide funding for 10 expansion/relocation sites, procure replacement radios, equipment racks, antennas, towers, and site preparation/installation material.
- The Radio Control Equipment (RCE) program replaces radio signaling and tone control equipment. The equipment is located at all air route traffic control centers, remote center air/ground communications facilities, air traffic control facilities, remote transmitter receiver sites, flight service stations and remote control outlets. For FY 2011 \$3,000,000 is requested to perform an investment analysis and award a contract for new RCE equipment to sustain the NAS through a transition from existing RCE equipment and legacy interfaces to NextGen interfaces.

Also requested for FY 2011 is \$600,000 for in-service engineering. This allows for immediate response to emerging technology solution. Funding is needed for on-going engineering support of all prototyping efforts.

<u>Benefits:</u> The Air/Ground Communications Infrastructure program supports the FAA goal of Reduced Congestion. New and relocated communication facilities enable the establishment of new sectors to support capacity. In addition, new and relocated communication facilities will enable new and more efficient flight patterns. Efficient flight patterns reduce aircraft operations and maintenance costs for the airline industry. New communication equipment will lower periodic and correctional maintenance costs associated with the old and technically obsolete equipment in the field.

The RCE program provides significant benefits to the FAA. The current RCE equipment will be maintained until 2015. There exists some uncertainty as to what systems will be deployed between 2015-2025, however, by funding a new RCE acquisition effort in FY 2011 the FAA will help to quantify these uncertainties through an RCE investment analysis and acquisition. According to the February 2006 A/G Communications Roadmap, and its subsequent updates, the current RCE infrastructure is required until 2025 to support FAA's ongoing need for voice communications. The benefit of the new RCE product is to provide a tech-refresh to bridge the gap between 2015 - 2025 and beyond, leading to a more capable infrastructure.

#### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$456,621.5 <sup>1</sup>
FY 2010 Appropriated		8,600.0
FY 2011 Request		7,600.0
FY 2012-2015		8,800.0 <sup>2</sup>
Total	Various	\$481,621.5

#### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. Communications Facilites Enhancements		\$4,000.0
2. Radio Control Equipment		3,000.0
3. In Service Engineering		<u>600.0</u>
Total	Various	\$7,600.0

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<sup>&</sup>lt;sup>1</sup> UHF Radio Replacement Funding history transferred to BLI 2A17. Includes \$584,600 reduction of FY 1998 funds pursuant to rescission contained in P.L. 106-69, October 9, 1999. Also includes \$3,200,000 reduction for FY 1998 Congressional reprogramming. Includes \$5,453,300 reduction of the FY 2002 funds pursuant to supplemental P.L.107-206, January 23, 2002. Includes \$3,000,000 reduction for FY2003 Congressional reprogramming. Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.

<sup>&</sup>lt;sup>2</sup> Future requirements depend on NEXCOM Segments 2 and 3 Investment Analysis.

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2A08	Air Traffic Control En Route Radar Facilities Improvements	\$5,300,000	Various	S-04, M-08

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> The National Airspace System (NAS) currently has 142 En Route surveillance facilities. All of these facilities contain critical long-range secondary beacon radars. Many of these En Route (long range radar) sites were established in the early 1950's. Today, FAA air traffic control (ATC) requires seamless surveillance information provided within each air traffic controller's area of responsibility. In order to reliably provide seamless surveillance information in the En Route environment and due to the extreme age of these facilities, the need for facility infrastructure improvements are required at all of the operational En Route surveillance facilities. Failures and deficiencies in the existing infrastructure resulted in operational outages each year that have severe and immediate impacts on air traffic control En Route services.

The current air surveillance infrastructure has shortfalls that must be addressed to ensure that the air surveillance system can continue to meet the user needs into the future. The immediate need is to ensure that current air surveillance capabilities do not further degrade while planning and implementing longer-term solutions.

Most En Route surveillance facilities require improvements and/or modifications to correct existing deficiencies. Approximately 40 percent of the En Route surveillance service outages currently experienced can be directly linked to infrastructure failures and deficiencies.

Long Range Radar (LRR) Infrastructure Upgrades consist of two phases. Phase I consists of short term upgrades to facility infrastructure (i.e. refurbishment of lightning, grounding, bonding, and shielding systems) necessary to support the ATC Beacon Interrogator Replacement (ATCBI-6) deployment; and, Phase II consists of long term upgrades, replacement, and refurbishment of facility infrastructure subsystems. These upgrades will replace critical infrastructure systems if required for En Route secondary beacon operations.

Description of Solution: Prior to FY 2006, funds supported Phase I ATCBI-6 infrastructure upgrades; the removal of surplus radar equipment and towers; En Route radar facility improvements including random replacements; ATC radar beacon system relocations; Alaskan upgrades; and engineering solutions for urgent, site specific, operational, En Route radar facility issues. Congress also provided limited funding in FY 2003 to address some of the Air Route Surveillance Radar (ARSR-4) technical deficiencies. In FY 2004 and FY 2005 Congress provided a pilot program for ARSR-4 electronic technical manual. In FY 2006, FAA completed the Phase I infrastructure upgrades at 106 scheduled ATCBI-6 sites. Infrastructure upgrades include refurbishing power panels; improving lightning protection and grounding systems; replacing equipment shelters, and building improvements where necessary at beacon only sites. In FY 2007, FAA supported activities for the primary En Route radars funded by DoD and Department of Homeland Security (DHS) reimbursable agreement. Funding also supported the facility grounding upgrades at approximately 10 sites, the completion of 66 facilities assessments, continuation of system rotary joint/azimuth pulse generator, and critical infrastructure upgrades and refurbishments required to sustain En Route secondary beacon radar operations for an additional 20 years. In FY 2008, funds provided for continuation of facility improvement activities included: improving lightning protection and grounding systems, system rotary joint/azimuth pulse generator, critical infrastructure upgrades and refurbishments required in order to sustain En Route secondary beacon radar operations for an additional 20 years and in service engineering. In FY 2009, funds provided continued the facilities improvement activities initiated in FY 2008. DoD/DHS is responsible for maintaining and upgrading the primary surveillance radars.

In FY 2010, \$5,000,000 was appropriated to continue facility infrastructure upgrades at both ARSR-4 and LRR Service Life Extension Programs at 19 sites. In coordination with support activities for the primary En Route

radars funded by DoD and DHS reimbursable agreement, funding will support the repair and maintenance of the aging en route radar towers and facility grounding upgrades, and critical infrastructure upgrades and refurbishments required to sustain En Route secondary beacon radar operations for an additional 20 years. An additional \$300,000 was appropriated for in service engineering activities.

For FY 2011, \$5,000,000 is requested to continue facility improvement and infrastructure upgrades at FPS/ARSR and LRR Service Life Extension Program sites. In coordination with support activities for the primary En Route radars funded by DoD and DHS reimbursable agreement, funding will support the repair and maintenance of the aging En Route radar towers, facility grounding upgrades and critical infrastructure upgrades and refurbishments required to sustain En Route secondary beacon radar operations for an additional 20 years. An additional \$300,000 is requested for in service engineering activities.

<u>Benefits:</u> The planned infrastructure modifications will provide greater efficiency and reduce operating costs in En Route air traffic control and facility maintenance operations by refurbishing En Route equipment and facilities. Prior year accomplishments reduced the potential for reduced coverage. The lightning protection, grounding, bonding, and shielding has reduced failure occurrences in the beacon surveillance sites.

#### APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)	128	\$196,957.3 <sup>1</sup>
FY 2010 Appropriated	19	5,300.0
FY 2011 Request	19	5,300.0
FY 2012-2015	<u> </u>	<u>12,600.0</u> <sup>2</sup>
Total	176	\$220,157.3

#### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. Infrastructure Upgrades		\$5,000.0
2. In Service Engineering		300.0
Total	Various	\$5,300.0

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<sup>&</sup>lt;sup>1</sup> Includes \$314,500 reduction of FY 1998 funds pursuant to rescission contained in P.L. 106-69, October 9, 1999.

<sup>&</sup>lt;sup>2</sup> An investment analysis is currently underway aimed at defining a program to extend the life of the infrastructure at all LLR sites. The goal would be a consolidated plan to match the life of the site infrastructure with that of the surveillance systems at those sites. The FAA and DoD funding responsibilities will be addressed as part of the recommended solution.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2A09	Voice Switching and Control System (VSCS) Tech Refresh - Phase 2	\$15,600,000	Various	C-01, M-08

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> The VSCS system allows air traffic controllers to talk to pilots, providing air-to-ground and ground-to-ground voice switching and control systems at the 21 high-altitude centers, the Mike Monroney Aeronautical Center, and the William J. Hughes Technical Center. Without this system, controllers would be unable to speak with pilots and ground personnel to separate air traffic. VSCS is a critical piece of today's air traffic infrastructure. This system was fielded between 1994 and 1997. VSCS Training and Backup System (VTABS), which provides training circuits, separate from the operational communications, functions as the backup communications system.

This existing high-altitude voice switching and control system architecture is based on a 1970's design. Critical hardware and software are reaching the end of their useful service lives. Obsolete parts and programming languages have made maintenance cumbersome and costly. The FAA must replace the obsolete hardware and software now to avoid diminishing service reliability and increasing maintenance costs.

<u>Description of Solution:</u> This tech refresh replaces obsolete hardware and software for all the high-altitude voice switching and control systems, and those at the Mike Monroney Aeronautical Center and the William J. Hughes Technical Center. Phase 1 of the equipment upgrade began in 2000 and ended in 2006. Continued technical refreshment will allow the system to remain in use beyond 2014, which gives FAA plenty of time to develop the next generation voice switch.

In FY 2010, \$16,100,000 was appropriated to continue the retrofit of VSCS power supplies, the development of depot test equipment of repeater/LAN efforts, PLM to C++ code conversion activities, engineering analysis, and development of a replacement for the VTABS Test Controller. An additional \$600,000 was appropriated for in-service engineering.

For FY 2011, \$15,000,000 is requested to continue retrofit of VSCS power supplies, the development of repeater/LAN equipment, PLM to C++ code conversion activities, enhanced diagnostics efforts, engineering analysis and development of a replacement for the VTABS Test Controller.

<u>Benefits:</u> VSCS is an integral part of a functional En route air traffic control system; it provides the following qualitative benefits: Reliable access to many different ATC radios; Ability for ATC personnel to communicate with each other and coordinate work in the ARTCCs; and reliable and maintainable voice communication switching in En Route ATC facilities. The following benefits are non-quantified for Phase II tech refresh: VTABS Power Supply Replacement allows continued power supply backup to VTABS; Repeater/ LAN Modification allows future expansion of LAN; Depot Test Equipment allows continued and timely depot-level repair, and eliminates dependency on PL/M SW engineers; PL/M to C++ Software Conversion eliminates dependency of scarce PL/M SW engineers. In addition, VAX Compilers are obsolete; and Enhanced technician diagnostic software reduces technician fault assessment time and reduces depot test of non-faulted line replacement unit (LRUs). Since the benefits were determined to be equal among the alternatives, investment decisions were made based on cost.

Also requested for FY 2011 is \$600,000 for in-service engineering to allow for immediate response to emerging technology solutions.

#### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009) FY 2010 Appropriated FY 2011 Request	24  	\$1,563,550.7 <sup>1</sup> 16,700.0 15,600.0
Baseline Requirement Total	<del></del> 24	0.0 <sup>2</sup> \$1,596,850.7

#### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. VSCS Sustainment Activities		\$3,869.0
2. Program Management		1,108.0
3. Contractor Support		3,695.0
4. Tech Operations Engineering Support		6,328.0
5. In Service Engineering		600.0
Total	Various	\$15,600.0

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 $<sup>^1</sup>$  Includes \$5,940 reduction of FY 2001 funds pursuant to rescission contained in P.L. 106-544. Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.  $^2$  The JRC approved the VSCS baseline and has funded the program through FY 2011. The JRC requested the program

<sup>&</sup>lt;sup>2</sup> The JRC approved the VSCS baseline and has funded the program through FY 2011. The JRC requested the program return with results of the Ground to Ground Switch replacement study and a plan for Phase 3 with views on how to approach replacing G/G Switch VSCS.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2A10	Oceanic Automation System (OAS)	\$4,000,000	Various	A-10, M-25, M-39

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 2 - Increase reliability and on-time performance of scheduled carriers.

<u>Description of Problem:</u> The FAA is allocated 80 percent of the world's controlled oceanic airspace. This airspace stretches beyond domestic coverage with its land-based ATC infrastructure, including radar. FAA provides air traffic control services for oceanic flights, within an area of approximately three million square miles in the Atlantic; and 21 million square miles in the Pacific. This airspace is not sovereign – it is delegated to Civil Aviation Authorities, of which FAA is one, by International Civil Aviation Organization (ICAO) - and can be reassigned at any time. This airspace is presently managed by three ATC facilities: Oakland, New York and Anchorage Air Route Traffic Control Centers (ARTCCs). Oceanic air traffic is projected to continue to grow at a higher rate than domestic air traffic, primarily in the highest density areas. In addition, the market demands expanded capacity through improved operational and fuel efficiency. The FAA's current oceanic system is approaching maximum operating capacity.

Oceanic ATC differs from domestic ATC largely because there is no radar tracking of aircraft and no direct radio communication. Oceanic air traffic controllers must rely on other sources of aircraft position information. This data includes voice position reports from pilots derived from on-board navigation systems that include GPS and communications satellite information. This lack of reliable and timely position information, in turn, requires large aircraft separation standards that severely limit the useable system capacity. As a result, oceanic users are rarely able to obtain maximum fuel efficiency, minimize travel times, and access to preferred takeoff times and flight paths. An integrated, modernized oceanic air traffic control system is required to increase oceanic air traffic capacity and efficiency, without degrading safety, which would enable the introduction of free flight in oceanic air space.

<u>Description of Solution:</u> Prior to FY 2000, \$188,900,000 was appropriated under the Oceanic Automation program line item to deliver incremental improvements in oceanic air traffic control systems at the Oakland, New York and Anchorage ARTCCs. These included Telecommunications Processor, Interim Situation Display, Oceanic Display and Planning System, Air Traffic Services Inter-facility Data Communications Systems and Oceanic Data Link. This money also funded the Dynamic Ocean Track System (DOTS) Plus, which suggests optimum tracks for airlines and air traffic controllers, and Micro-En Route Automated Radar Tracking System (Micro-EARTS), the ATC platform for the FAA's offshore sites. These projects established the oceanic automation and communications infrastructure that currently exists in the three oceanic ARTCCs. The incremental system improvements enabled reduced wing tip to wing tip aircraft separation to 50 nautical miles in the Pacific and West Atlantic Route System (WATR) regions in 2000.

The new oceanic automation system sets the stage for reducing aircraft separation from 100 nautical miles to 30. The Advanced Technologies and Oceanic Procedures (ATOP) program enable the flexibility and predictability required for additional fuel savings and increased airline revenue.

ATOP has replaced existing oceanic ATC systems and procedures with a single integrated system and modernizes facilities responsible for managing over 24 million square miles of airspace over the Atlantic and Pacific Oceans. ATOP integrates flight data processing, detects conflicts between aircraft, and provides satellite data link and surveillance capabilities. The new oceanic system collects, manages, and displays oceanic air traffic data, including electronic flight-strip data, on computer displays used by air traffic controllers and integrate capabilities such as flight data processing, radar data processing, automatic dependent surveillance, controller pilot data link and conflict probe. ATOP provides a modernized oceanic air traffic control automation system including, installation, training, procedural development support and life-cycle system maintenance. The contract also allows for Pre-Planned Product Improvements (P3I) over the system life-cycle.

In FYs 2000 - 2009, \$505,088,381 was appropriated to acquire ATOP hardware, software development, information security, logistics support, training, facility modifications, IOT&E, system testing and maintenance, in-service management and software improvements for Micro-EARTS and DOTS Plus, technical refresh for Micro-EARTS, decommissioning of Oceanic Display and Planning System (ODAPS), and program support activities. In addition, as Micro-EARTS is a component of the ATOP architecture, and both Micro-EARTS and DOTS+ are part of the ATOP baseline funding is contained within this line item to improve platforms. The requested funding includes Oceanic NAS Plan Handoff, IOT&E and In-Service Management activities. Major accomplishments included awarding of the ATOP contract, delivery and installation of the ATOP system hardware at the three oceanic operational facilities (Oakland, New York and Anchorage) and William J. Hughes Technical Center. Oakland Center began early operational use in June 2004 and achieved full transition in October 2005. New York Center began initial live operations in March 2005 and achieved full transition in June 2005. Anchorage Center began initial live operation in March 2006 and achieved full transition in March 2007. Operational Readiness Date (ORD) was achieved for both Oakland and New York March 2006. Anchorage achieved ORD in April 2008. The FY 2007 and FY 2008 appropriations were utilized to continue implementation of Micro-EARTS technical hardware refresh, enhance the Micro-EARTS and DOTS Plus software baselines, continue facility modifications at Oakland ARTCC and initiate ATOP technical refresh at the William J. Hughes Technical Center (WJHTC) and Oakland ARTCC which replaces operating systems and all major system components (e.g., servers, workstations, communications switches, and interface gateways) with state-of-the-art components. FY 2008 also included enhancements to ATOP software to increase operational efficiency and controller productivity, complete facility modifications at Oakland ARTCC and the initiation of ATOP software pre-planned product improvement (P3I). In FY 2009 ATOP completed technical refresh at the William J. Hughes Technical Center (WJHTC) and the three oceanic sites, and continued ATOP P3I enhancements to ATOP software for procedural and radar operations.

In FY 2010, \$7,700,000 was appropriated to continue P3I for enhancements to ATOP software for procedural and radar operations, provide for information security and logistics support, provide for the required level of program and engineering support, and provide tech refresh for DOTS Plus.

For FY 2011, \$4,000,000 is requested to provide for system engineering support and P3I by the prime contractor for ATOP operational improvements, safety enhancements, and Agency commitments. The budget will also provide for program and engineering support, and support for the Oceanic I2F laboratory.

Benefits: Although oceanic flights comprise only four percent of total U. S. air carrier operations, they provide 49 percent of the international cargo revenue and 20 percent of the passenger revenue. The new automation system has reduced aircraft separation from 50 nautical miles lateral/10 minutes longitudinal to 30 nautical miles lateral/30 nautical miles longitudinal (equates to four minutes). Ninety percent more altitude change requests were granted at Oakland Center and New York Center in September 2005 versus September 2004. ATOP automation has allowed for the use of new routes from South America to New York, saving between 2,000-4,000 pounds of fuel per flight. ATOP increases oceanic capacity and efficiency, has mitigated potential cost of delays, and is expected to save airlines and aircraft operators more than \$5 billion in fuel costs. ATOP has enhanced communication and surveillance, which has increased sector capacity. Annual U.S. transoceanic revenues are projected to increase significantly by the year 2010.

#### APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)	Various	\$694,022.5 <sup>1</sup>
FY 2010 Appropriated		7,700.0
FY 2011 Request		4,000.0
Baseline Requirement		<u>38,800.0</u>
Total	Various	\$744,522.5

<sup>&</sup>lt;sup>1</sup> Includes \$8,747,000 reduction for the FY 1998 Host/Oceanic Computer System Replacement (HOCSR)/Security Equipment formal reprogramming. Includes \$81,900 reduction of FY 1998 funds pursuant to rescission contained in P.L. 106-69, October 9, 1999. Includes reduction pursuant to P.L. 108-7, February 20, 2003.

<u>Act</u>	ivity Tasks	Locations/ Quantity	Estimated Cost (\$000)
1.	Prime Contract, Program Management, Depot Support		\$2,360.0
2.	Facility Modification and Site Support		140.0
3.	Oceanic Integration and Interoperability Facility Lab		500.0
4.	OAS Program Management		<u> 1,000.0</u>
Tot	:al	Various	\$4,000.0

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2A11	Next Generation VHF Air/Ground Communications System (NEXCOM)	\$49,850,000	Various	C-06, C-21

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem</u>: The existing Very High Frequency (VHF) analog controller-to-pilot communications system lacks the capacity and flexibility to accommodate future growth in air traffic. The FAA goal of Reduced Congestion is at risk due to the lack of available air traffic control radio spectrum in high-density areas. The continuous growth in air traffic and the introduction of new services has driven a proportional demand (approximately four percent per year) for air/ground communication frequency assignments. The system is beyond its estimated life-cycle and is increasingly expensive to maintain. Air/Ground communication is the most fundamental and safety critical element of the ATC system supporting all phases of flight for en route, terminal, and flight service operational environments. There are approximately 60,000 analog radio units installed at over 4,650 sites.

#### Description of Solution:

#### 1. Next-Generation VHF A/G Communication System (NEXCOM) - Segment 1a - (\$20,000,000):

<u>Description of Solution:</u> NEXCOM will implement a new air/ground voice communication system using the limited available radio frequency spectrum more efficiently. NEXCOM will provide the operational flexibility required for NextGen. NEXCOM will be implemented in two segments (previously three). Segment 1 addresses the En Route environment, and is divided into two phases, Segments 1a and 1b. Installation of Segment 1a multimode digital radios (MDRs) began in 2004. The radios can function in analog or digital modes, though only one at a time. The MDRs, which will initially operate in the analog channel mode, will be a major improvement to our aging air-to-ground communications infrastructure. NEXCOM Segment 1b, system hardware and software has been cancelled because the agency believes that the spectrum problem can be addressed by the combination of the MDR and the Data Communications Program. NEXCOM Segment 2 (2010+) will implement MDRs that will service the high-density terminal areas and the flight service operations.

By the end of FY 2008, over 5,649 multimode digital radios were operational at approximately 479 sites across the United States. In FY 2010, \$33,700,000 was appropriated for program management, technical support, and to deploy multimode digital radios at approximately 160 sites across the United States.

For FY 2011, \$20,000,000 is requested for NEXCOM Segment 1a. Segment 1a multimode digital radios will be installed at approximately 160 sites across the United States, including Alabama, Alaska, Arizona, Arkansas, California, Florida, Indiana, Illinois, Iowa, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Mexico, New York, Nevada, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Vermont, Virginia, West Virginia, and Wisconsin.

<u>Benefits:</u> NEXCOM will meet the new and growing demands for air transportation services; accommodate the growing number of sectors and services; increase security by reducing circuit blockage and the risk associated from unauthorized access; and improve reliability by replacing aging air/ground communications equipment with new digital equipment.

#### 2. Next-Generation VHF A/G Communication System (NEXCOM) - Segment 2/3 (\$19,000,000):

<u>Description of Solution:</u> NEXCOM will implement a new air-to-ground voice communication system using the limited available radio frequency spectrum more efficiently. NEXCOM will provide the operational flexibility required for NextGen. NEXCOM will be implemented in two segments (previously three). The current NEXCOM Segment 2 was originally Segment 3.¹ The Data Communications Program will address the requirements of the original Segment 2. Segment 1 addresses the En Route environment, and is divided into two phases, Segments 1a and 1b. Under Segment 1a, installation of multimode digital radios (MDRs) began in 2004. These radios can function in analog or digital modes. The MDRs, which will initially operate in the analog channel mode, will be a major improvement to the existing aging air-to-ground communications infrastructure. NEXCOM Segment 1b, system hardware and software has been cancelled because the Agency believes that the spectrum problem can be addressed by the combination of MDR deployments and the Data Communications Program. NEXCOM Segment 2 (2010+) will procure and deploy VHF and UHF radios that serve high-density terminal areas and flight service operations.

In FY 2010, \$20,000,000 was appropriated for program management, technical support, and the procurement of 1,581 radios for Segment 2 terminal and flight service radio replacement.

For FY 2011, \$19,000,000 is requested for NEXCOM Segment 2. The funding will procure and begin installation of 2,459 radios in the terminal and flight service facilities.

<u>Benefits:</u> NEXCOM will meet the new and growing demands for air transportation services; accommodate the growing number of sectors and services; utilize VHF spectrum required for voice communications more efficiently and make the recovered spectrum available for data communications (a future NextGen initiative); and improve reliability and reduce the growth of maintenance costs by replacing aging air/ground communications equipment with new digital equipment.

#### 3. Communications Facilities Enhancement - UHF Replacement - (\$10,600,000):

<u>Description of Solution:</u> For FY 2011, \$10,600,000 is requested to procure 1,187 UHF radios, site preparation, training, and initial spares. The radios will be installed at multiple sites in Alabama, Alaska, Arizona, Arkansas, California, Florida, Indiana, Illinois, Iowa, Kansas, Kentucky, Louisiana, Michigan, Minneapolis, Mississippi, Missouri, Montana, Nebraska, New Mexico, New York, Nevada, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, South Dakota, Tennessee, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Virginia, West Virginia, and Wisconsin. The UHF Replacement program<sup>2</sup> replaces UHF radios at remote communications facilities. UHF radios are being deployed concurrently with the multi-mode digital very high frequency radios to minimize implementation costs.

For FY 2011 an additional \$250,000 is requested for Independent Operational Test and Evaluation (IOT&E).

<u>Benefits:</u> The Air/Ground Communications Infrastructure program supports the FAA goal of Reduced Congestion. New and relocated communication facilities enable the establishment of new sectors to support capacity. In addition, new and relocated communication facilities will enable new and more efficient flight patterns. Efficient flight patterns reduce aircraft operations and maintenance costs for the airline industry. New communication equipment will lower periodic and correctional maintenance costs associated with the old and technically obsolete equipment in the field.

The UHF radio replacement program will provide significant benefits to the FAA. The UHF radios will be deployed concurrently with the multi-mode digital radios and will achieve minimum cost avoidance. Another benefit is the cost reduction of using existing radios removed from the en route facilities to meet near term non-en route growth requirements from 2004 – 2007. The difference between the cost of purchasing new radios and the cost of refurbishing and repackaging radios to meet these requirements will result in savings of \$5,600,000 over four years. Deploying the radios concurrently also leaves the En Route air/ground remote sites with new, more reliable major components, which reduce maintenance expenses. The UHF radios also provide a vital part of the critical infrastructure supporting the nation's homeland defense efforts.

<sup>&</sup>lt;sup>1</sup> The current NEXCOM Segment 2 was originally Segment 3. The Data Communications Program will address the requirements of the original Segment 2.

<sup>&</sup>lt;sup>2</sup> The UHF Replacement Program has been transferred from BLI# 2A07 Air/Ground Communications Infrastructure.

#### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)	Various	\$415,334.3 <sup>1</sup>
FY 2010 Appropriated		<b>64,200.0</b> <sup>2</sup>
FY 2011 Request		49,850.0
Baseline Requirement		<b>28,100.0</b> <sup>3</sup>
Total	Various	\$557,484.3

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. Program Management		\$1,700.0
2. In-Service Management		300.0
3. Hardware/Software		16,500.0
4. Logistics		4,000.0
5. Implementation		16,500.0
6. UHF Radio Replacement Equipment		10,600.0
7. Independent Operational Test and Evaluatio	n <u></u>	<u>250.0</u>
Total	Various	\$49,850.0

<sup>&</sup>lt;sup>1</sup> UHF Radio Replacement funding history transferred from BLI# 2A07. Includes \$3,200,000 reduction for FY 1998 Congressional reprogramming and FY 2001 rescission reduction. Includes reduction for EAS in FY 2002. Includes reduction pursuant to P.L. 108-199, January 23, 2004.
<sup>2</sup> Includes UHF radio replacement program.

<sup>&</sup>lt;sup>3</sup> NEXCOM segment 1a and UHF radio replacement programs only. NEXCOM segment 1b has been cancelled and Segment 2 requires an executive investment decision.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2A12	System Wide Information Management (SWIM)	\$92,000,000	Various	G-5C, M-25

<u>FAA Strategic Goal:</u> Organizational Excellence – Ensure the success of the FAA's mission through stronger leadership, a better trained and safer workforce, enhanced cost-control measures, and improved decision-making based on reliable data. Objective 3 - Improve financial management while delivering quality customer service.

<u>Description of Problem:</u> Today's hard-wired infrastructure and systems cannot readily support the addition of new data, systems, data users, and/or decision makers as NextGen requires. In general, they are connected discretely to support yesterday's decision-making needs. Each of these interfaces is custom designed, developed, managed, and maintained individually at a significant cost to FAA. NextGen relies upon a new decision construct that brings more data, systems, customers, and service providers into the process. Data will be needed at more places, for more purposes, in a timely manner, and in common formats and structures to ensure consistent use. These new "data customers" need to be accommodated by providing the governance and policy that tell them how to connect to existing, open interfaces instead of designing, developing, testing, and implementing new ones. Network technology and data management software must use commercial equipment and current industry standards, reducing developmental and upgrade cost and simplifying maintenance. Specifically, needed modifications are extremely costly and time consuming. It does not provide the network-enabled operational capabilities needed to meet future capacity demands. Today's point-to-point architecture does not support these tenets. This situation represents a performance gap that must be bridged for NextGen to be successful.

<u>Description of Solution:</u> The SWIM program is an integral part of the National Airspace System (NAS) Enterprise Architecture roadmap and will promote the development of a secure NAS-wide information web to connect FAA systems. SWIM will provide policies and standards to support data management, along with the mechanisms (i.e., commercial software) for the core capabilities needed to publish data to the network, retrieve it, secure its integrity, and control its access and use. SWIM will leverage existing systems and networks to the extent practicable, and be based on technologies that have been proven in both operational and demonstration environments to reduce cost and risk. SWIM will be developed incrementally based upon the needs of various data communities, maturity of concepts of use, and segments that are sized to fit reasonable cost, schedule, and risk thresholds.

SWIM represents the steps that FAA is taking to reduce costs while providing better service to:

- Change system interfaces to support network messaging, reducing the cost of testing and maintaining each individual interface (currently a major cost driver and resource load for NAS systems).
- Provide the flexibility to provide information to new systems and locations without adding custom interfaces. This will significantly reduce the marginal cost of adding new system interfaces.
- Provide common interfaces that facilitate spontaneously adding new users and applications, for purposes
  of continuity of operations.

The FAA's Joint Resource Council (JRC) approved the Initial Investment Decision for SWIM on July 17, 2006. The Final Investment Decision for Segment 1 was approved by the JRC on June 20, 2007, and the JRC established the baseline for the first two years of Segment 1 (FY 2009 and FY 2010). The SWIM Program Office will return to the JRC in late FY 2009 to establish a baseline for the remaining five years of Segment 1 (FY 2011-2015) and in late FY 2010 for Segment 2.

During FY 2009 and FY 2010, the implementing programs will perform detailed requirements analysis and begin work on the detailed design for the Segment 1 capabilities. FY 2011 - FY 2015 will include the implementing programs' design, code, test, and deployment of these capabilities.

For FY 2011, \$80,300,000 is requested for the development of Segment 1. Efforts in FY 2011 include design, development, and test of initial Segment 1 capabilities. For FY 2011, SWIM funding will provide for the following:

- Traffic Flow Management initial flow object prototype.
- Integrated Terminal Weather System integration and test.
- Terminal Data Distribution System design.
- Continue SWIM Segment 1 Capabilities Deployment Corridor Integrated Weather System (CIWS).

For FY 2011, \$11,500,000 is requested for Segment 2 to:

- Initiate requirements analysis.
- Start hardware and software design and development.

An additional \$200,000 is requested for Independent Operational Testing and Evaluation (IOT&E).

<u>Benefits:</u> SWIM is vital to the achievement of National, DOT, and FAA strategic plans and the future evolution of air transportation management in the nation. The current FAA systems and operations cannot support this vision as they are not network-enabled, and are characterized by rigidly configured systems (communications lines, computers, and software applications). SWIM contributes to meet the following NextGen objectives:

- Increase Predictability SWIM will improve coordination to allow transition from tactical conflict
  management to strategic trajectory-based operations. SWIM will also provide the potential to increase
  machine to machine interchange supporting and disseminating decisions rather than the current man to
  man interactions. SWIM increases the likelihood that similar decisions will be consistent by enabling them
  to be based on the same data.
- Reduce Costs for Aviation SWIM will help to reduce infrastructure costs by reducing the number and types of interfaces, systems, and potentially, facilities. Initially, SWIM will provide a common network capability, reducing operation and maintenance costs of the hundreds of current interfaces. New systems will interface with SWIM, saving future development costs. Ultimately, redundant sources of data will no longer be needed and can be decommissioned.
- Shared Situational Awareness SWIM will help to provide shared situational awareness so that all
  appropriate parties are privy to the same complete set of information.
- Collaborative Decision Making SWIM will help to enable collaborative decision-making which means that
  once all parties have access to the same information, they can efficiently make real-time decisions and
  quickly reach agreements.

SWIM will also provide benefit to FAA resulting from new SWIM AIM functionality resulting in a reduction of staff time through automated processes.

NAS users will realize the benefits from the Weather Community of Interest's new capabilities, in which weather data are published to Airline Operating Centers (AOCs) as well as to the National Weather Service. Data will also be provided to airlines to improve efficiency in planning airport departures and arrivals, based on changes in runway visibility.

### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$90,400.5
FY 2010 Appropriated		56,548.0
FY 2011 Request		92,000.0
Baseline Requirement		93,100.0
Total	Various	\$332,048.5

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<sup>&</sup>lt;sup>1</sup> SWIM Segment 1 only. Future requirements under review for Segment 2.

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. Segment 1 Automated Data Exchange		\$200.0
2. Segment 1 Data Publications		68,700.0
3. Segment 1 SWIM Core Services		11,400.0
4. Segment 2 Initial Requirements		11,500.0
5. Independent Operational Test and Evaluation		200.0
Total	Various	\$92,000.0

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2A13	Automatic Dependent Surveillance Broadcast (ADS-B) National Airspace (NAS) Wide Implementation	\$176,100,000	Various	G-2S, M-25

<u>FAA Strategic Goals:</u> Greater Capacity — Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 2 - Increase reliability and on-time performance of scheduled carriers.

<u>Description of Problem:</u> While current surveillance is generally adequate for today's environment, it will not support the anticipated growth in aviation without loss of efficiency within the National Airspace System (NAS). As the request for additional services – including traffic demand – increases, system inefficiencies will increase in the form of delays and restrictions across the NAS. Surveillance methods used in today's environment will not support continued aviation growth. Additionally, the current surveillance systems do not take advantage of new technologies in navigation, communication, and flight management. Expansion of surveillance coverage is essential to support air traffic control modernization efforts. Any improvements FAA makes to surveillance capabilities must sustain or enhance the current levels of safety, capacity, and efficiency.

According to the Joint Government and Industry Roadmap for Surveillance Modernization, the Air Traffic environment of the future will be increasingly dependent on more accurate and timely information being available to Air Traffic Service providers and aircraft operators. Information pertaining to a variety of airspace conditions and accurate position data, including aircraft intent, will be necessary.

<u>Description of Solution:</u> ADS-B is an advanced surveillance technology that provides highly accurate and more comprehensive surveillance information via a broadcast communication link. ADS-B is a surveillance technique in which aircraft provide, via a data link, flight data derived form on-board position-fixing and navigational systems. Aircraft determine their position (longitude, latitude, altitude, and time) using GPS, internal navigational reference system, or otherwise. The aircraft's ADS-B equipment function processes this position information, along with other aircraft-derived flight parameters, into a periodic broadcast transmission, typically once a second, of the aircraft's position. Any airborne or ground-based ADS-B capable receiver, within range of broadcast, may receive and process the surveillance information for a variety of functions or uses.

The greater positional accuracy and ability to provide aircraft-derived, additional flight parameters (flight objects or flight data message elements), in addition to position data, defines ADS-B as "enhanced surveillance." The aircraft provides unique flight parameter information with the broadcast of its surveillance position. These other parameters, such as identification, directional vector, velocity, next waypoint, and other data are limited only by the equipment's capability, the communication link capacity, and the receiving system's capability. Additionally, ADS-B equipment may be placed on ground vehicles or obstacles to allow locating and identifying these items. The FAA's ADS-B system is based primarily on providing three fundamental broadcast services to support the ADS-B enabled applications:

<u>ADS-B</u>: This service provides highly accurate, aircraft-derived ADS-B reports that contain identification, state vector, and status/intent information about the aircraft. The information will be used for surveillance applications. ADS-B information is broadcast by the ADS-B equipped aircraft, received and processed by the ADS-B on-board avionics, and displayed on the aircraft's multi-function display.

<u>TIS-B:</u> Traffic Information Services provide ADS-B equipped aircraft with a more complete "picture" in situations where not all aircraft are equipped with ADS-B. TIS-B is a service that provides ADS-B equipped aircraft with surveillance data about non-ADS-B equipped aircraft. TIS-B comprises surveillance information provided by one or more surveillance sources, such as secondary or primary surveillance radar. The surveillance information is processed and converted for use by ADS-B equipped aircraft. TIS-B can also be

used in ADS-B implementations involving multiple ADS-B data links to provide a cross-link or gateway between ADS-B equipped aircraft using the different data links. This TIS-B sub-function is identified as Automatic Dependent Surveillance – Rebroadcast (ADS-R). Two communication link protocols have been approved for ADS-R use; Universal Access Transceiver (UAT), used mostly by general aviation aircraft, and the 1090 extended squitter, which broadcasts but does not receive signals, normally used in commercial transport aircraft.

<u>FIS-B</u>: Flight Information Services provide ground-to-air broadcast of non-control, advisory information which provides users valuable, near real-time information to operate safety and efficiently. FIS-B products include graphical and textual weather reports and forecasts, Special Use Airspace Information, Notices to Airmen, and other aeronautical information.

Prior Year funding focused on competing and awarding the service contract for the National program, to include turning on options for implementation of limited areas of ADS-B in the Gulf of Mexico (GOMEX), Juneau, Louisville/Philadelphia/Ontario, and an expansion of the TIS-B and FIS-B services in the East Coast, Great Lakes, and Southern California areas. Also included were activities focused on design reviews, testing and validation of the vendor designated architecture and acceleration of Future Applications development. FY 2009 activities include continuation of efforts started in FY 2007 and FY 2008 for ADS-B NAS-Wide implementation as well as 3 nautical mile separation studies. For FY 2010, activities will focus on attaining an in-service decision for ADS-B on July 9, 2010. To support this effort there is a need to obtain Initial Operating Capability (IOC) at each of the automation platform sites.

For FY 2011, activities will focus on continuing the NAS wide deployment of ASD-B, the continuance of future application development and the monitoring of ADS-B equipage for compliance with the rule, scheduled to be published in the federal register in 2010.

<u>Benefits</u>: The ADS-B, TIS-B, and FIS-B services provide new and improved operational capabilities. Service providers will use the new surveillance capability to provide ATC services. Users will use the surveillance and broadcast services capability to support flight operations.

<u>Capacity and Efficiency:</u> Airspace can be better utilized by providing the capability for reduced separation and allowing for greater predictability in departure and arrival times. ADS-B improves capacity and efficiency by:

- Providing radar-like separation procedures in remote or non-radar areas, possibly decreasing travel time;
- Supporting common separation standards (horizontal and vertical) in all classes of airspace;
- Improving the ability to manage traffic and aircraft fleets;
- Improving air traffic controllers ability to plan the arrivals and departures or aircraft in advance; and
- Providing the infrastructure necessary to operate the NAS at reduced cost.

<u>Safety</u>: ADS-B, TIS-B, and FIS-B helps to prevent accidents by providing increased situational awareness to air traffic controllers and pilots. ADS-B improves safety by:

- Provides air-to-air surveillance capability;
- Provides surveillance to areas that do not currently have surveillance coverage; and
- Provides real-time, in-the-cockpit, traffic, and aeronautical information. (Weather, temporary flight restrictions, and special use airspace).

The SBS benefits were estimated relative to the existing ATC system, with established procedures currently in effect. Historical data were combined with traffic projections to describe the baseline from which benefits could be measured. This reference point was modified, prior to estimating benefits, to reflect any approved future improvements to the baseline that are scheduled during the analysis time period. System effectiveness measures, the percent reduction in either accident rates or typical delay times, were applied to the estimated baseline level in order to derive expected benefits. The system effectiveness, the percent of the population equipped, and the percent of infrastructure installed are key drivers in all the benefit estimates. These factors combine to represent the level of benefits that are expected in the future.

The benefits are primarily associated with FAA cost avoidance, enhancements to safety, capacity and efficiency. The FAA cost avoidance is based on the ability to decommission a subset of Secondary Surveillance

Radar and the Surface Movement Radar across the CONUS and a reduction in vendor subscription charges due to value added services. The safety benefits include reductions in accidents such as Midair Collisions, Weather Related Accidents, Runway Collisions, and Controlled Flights Into Terrain in the CONUS, HI, the Caribbean and Alaska, and improved Search and Rescue and improved Medical Evacuation for remote villages in Alaska. The safety enhancements are associated with air to air capabilities and TIS-B/FIS-B services. The efficiency benefits include reductions in weather deviations, reduced cancellations resulting from increased access to some Alaskan villages during reduced weather conditions, and reduced flight delay from increased approach capacity and efficiency at airports because of increased surveillance accuracy, additional controller automation, and additional aircraft to aircraft applications. The efficiency benefits translate to savings in both, aircraft direct operating costs and passenger value of time.

The historical baselines for the safety benefits were based on a careful review of National Transportation Safety Board (NTSB) aviation accident report; a 16-year period 1989 through 2004 was used. Appropriate database search methodologies were developed for each accident type for which reductions are expected. The set of accidents identified for each category were compared to ensure that specific incidents were not counted more than once towards the potential benefits. The total historical number of accidents for each accident type was tabulated by category of operations or accident composition and compared with traffic counts over the same time period to estimate accident rates. Existing mandates for certain aircraft classes (such as the Terrain Awareness Warning System) were accounted for prior to estimating the effectiveness of ADS-B capabilities.

The efficiency baseline is primarily defined in terms of flight hours, delay hours, and fuel burn. Flight and delay times were estimated for each user group and by location in order to reflect the baselines associated with each benefit element. Flight and schedule data from the Enhanced Traffic Management System (ETMS), Airline Service Quality Performance (ASQP), and the Official Airline Guide (OAG) were combined with weather observations from the National Climatic Data Center (NCDC) to generate baselines under differing operating conditions. The FAA Aviation System Performance Metrics (ASPM) database integrates this information and was accessed to generate the baseline metrics needed to accurately portray the potential efficiency benefits.

Both the safety and efficiency historical baselines are a function of traffic density. The baselines are combined with traffic projections from the FAA Terminal Area Forecasts (TAF) to develop forecasts of potential benefits each year. In addition, the timeframe for which each benefit starts to accrue is based on when the specific application is to be operationally certified to provide the desired outcomes as well as on user equipage and the commissioning of the necessary ground equipment.

The effectiveness percentages attributed to ADS-B equipment/services and the percent of the population anticipated to equip are multiplied with the potential benefits each year to develop annual benefit estimates. The effectiveness assumptions are based on a combination of subject matter expert assessments and the results from previous studies. The equipage percentages by user group and location were combined to reflect the likelihood of the benefits being realized depending on whether one or two aircraft are involved in the scenario, and whether or not ADS-B equipped aircraft can view transponder equipped aircraft through the availability of TIS-B functionality. To adequately represent the impact of TIS-B, the interaction of the two aircraft must be defined to determine which of the paired aircraft is equipped with ADS-B avionics. These relationships are considered in the estimates.

ADS-B is uniquely suited to support a full range of aircraft to aircraft based applications, due to the high data rate of the broadcast (once per second). These applications include those that require a high degree of "Shared Situational Awareness", where both the pilot and ATC are viewing a common picture simultaneously while interacting with the data. Prime examples include: 1) Airport Surface Situational Awareness and Final Approach and Runway Occupancy Awareness, where pilots can not only determine their position on the airport surface, but can view the movement of other aircraft relative to them on a surface moving map; and 2) Enhanced Visual Approach (EVA) applications (including Initial EVA in visual conditions, CDTI Assisted Visual Separation in reduced weather conditions, and Merging and Spacing), which will enable pilots to improve flight efficiency and regain lost capacity in a variety of weather conditions. Also, NextGen will require core technologies that are flexible and have additional growth capability to adapt to an ever-changing NAS. ADS-B is positioned to support these requirements.

The SBS program benefits analysis included the quantification of benefits for the time period 2008 to 2035.

The SBS benefits estimate is \$18.5 billion in constant 2007 dollars and \$5.04 billion in risk-adjusted present value dollars.

### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$472,415.0
FY 2010 Appropriated		201,350.0
FY 2011 Request		176,100.0
FY 2012-2015		969,100.0 <sup>1</sup>
Total	Various	\$1,818,965.0

Act	ivity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1.	Solution Development		\$75,200.0
2.	Implementation		30,600.0
3.	In-Service Management		69,400.0
4.	Independent Operation Test and Evaluation		900.0
Tot	al	Various	\$176,100.0

<sup>&</sup>lt;sup>1</sup> Future requirements under review.

Budget I <u>tem</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2A14	Windshear Detection Services	\$1,000,000	Various	W-05

<u>FAA Strategic Goals:</u> Increased Safety – To achieve the lowest possible accident rate and constantly improve safety. Objective 1 - Reduce commercial air carrier fatalities.

Description of Problem: Windshear Detection Services (WSDS) consist of windshear technologies currently present within the National Airspace System (NAS); Weather Systems Processor (WSP), Terminal Doppler Weather Radar (TDWR), Low Level Windshear Alerting System (LLWAS) and Light Detection and Ranging (LIDAR). It is necessary to maintain existing LLWAS service to 2025, along with the TDWR Service Life Extension Plan (SLEP) and WSP Technology Refresh, until NextGen replacement technology is deployed and commissioned nationwide. LLWAS currently has multiple configurations. These configurations are comprised of a substaintal number of proprietary software and hardware components, many of which, have become obsolete. A Diminishing Manufacturing Sources (DMS) study determined that based on the remaining spares, failure rates, replenishment rates, and replenishment sources, LLWAS could potentially be negatively impacted by a loss of service. Multiple configuration and obsolesence issues make supportability difficult and costly. As identified in the NextGen Integrated Work Plan, a technology refresh will be necessary to maintain existing LLWAS service to 2025. A market survey released to industry in January of 2009, determined that there is market interest, capability, and experience currently available to address many of the LLWAS supportability, and obsolescence issues.

A performance gap also exists in wind shear detection at dry climates. Since windshear is not always accompanied by sufficient precipitation, which is how TDWR is designed to perform, it is difficult for TDWR to meet its specified 90 percent detection rate in dry climate locations, and therefore does not meet system specifications.

<u>Description of Solution:</u> An FY 2008 Windshear Study revalidated service at 110 of the 158 airports. The study also identified other airports that may meet the need for windshear detection services considering traffic growth and other determining circumstances in the NAS today. The FY 2008 study also recommended continued service in conjunction with new technology such as LIDAR. LIDAR, which improves how controllers identify dangerous windshear conditions on approach or departure from runways, uses a laser in the infrared wavelength to detect aerosol particles and their associated motion. Windshear and turbulence algorithms are applied to LIDAR data to provide Air Traffic Control with windshear warnings. The technology minimizes clutter that TDWR is susceptible to, and as a result, the LIDAR is a viable windshear detection alternative in dry climate areas, where clutter is problematic and dry windshear is often not associated with rain. Four major U.S. airports with TDWR are located in such an environment – Denver International, Phoenix Sky Harbor, Salt Lake City International, and Las Vegas McCarran. At these airports, LIDAR may work alongside TDWR to give controllers better detection of microbursts in both dry and wet climate conditions. A LIDAR is currently being tested at Las Vegas McCarran airport to evaluate its benefits to TDWR.

An FY 2010 Business Case for Windshear Detection Services is also planned to propose a technology refresh of LLWAS at sites where it is cost beneficial to do so, and to allow for new technology that may in some circumstances better satisfy the performance gap.

The FY 2008 WindShear Study, the market survey, in conjunction with the FY 2010 Windshear Detection Business Case will identify, in detail, the technology refresh alternatives, activities, benefits, costs, and program options. The LLWAS technology refresh will likely include or require: Master Station upgrade (one per site), upgrade multiple remote stations (6 to 12) per airport with one pole per Remote Station to be refurbished (Denver has 32 remote stations), display replenishment (1 to 3) Air Traffic Control Towers (ATCT) per site including Ribbon Displays, TRACON Displays, Display Selection Devices, solar power option redesign (10 percent of sites), software operating system rehost, firmware technology refresh, infrastructure assessment of poles, and NAS obsolescence issues.

In FY 2010, \$1,000,000 was appropriated to fund the Business Case, testing of the LIDAR system at McCarren airport, and purchase spare components.

For FY 2011, \$1,000,000 is requested to fund the periodic replacement of failed WSDS components such as LLWAS Master Stations, Remote Sensors, and Displays.

Benefits: Benefits were defined in the LLWAS Technology Refresh business case in FY 2009.

#### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$0.0
FY 2010 Appropriated		1,000.0
FY 2011 Request		1,000.0
FY 2012-2015	<del></del>	0.0
Total	Various	\$2,000.0

Activity Tasks	Locations/ Ouantity	Estimated Cost (\$000)
Windshear Detection	Various	\$1,000.0

Budget I <u>tem</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2A15	Weather and Radar Processor (WARP)	\$2,100,000	Various	W-04

<u>FAA Strategic Goal</u>: Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 – Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem</u>: There is a critical need to provide accurate, reliable, tactical and forecast weather conditions to air route traffic control center (ARTCC) controllers, traffic management specialists, and center weather service unit meteorologists. This weather data will allow the FAA to provide timely weather advisories and accomplish its mission of safe and efficient air traffic control within the National Airspace System (NAS). The WARP Program provides accurate weather data to critical NAS programs such as En Route Automation Modernization (ERAM), Advanced Technologies and Oceanic Procedures (ATOP), and User Request Evaluation Tool (URET). The current WARP system addresses the following performance gaps:

- Integrates weather radar data on air-traffic controllers' displays.
- Provides access to radar mosaics and other key weather information to area Supervisors and Traffic Management Personnel.
- Interfaces with advanced weather sensors.
- Plots and processes forecasted upper air wind and temperature gridded data.
- Provides weather data to other NAS systems.

Due to the WARP program's aging hardware and software infrastructure (unsupported operating system and HW equipment obsolescence), the existing architecture must be sustained and maintained until it is replaced. This will ensure that the weather processing and distribution capabilities continue to provide data which supports en-route controllers, traffic management specialists, and center weather service unit meteorologists who support air traffic.

<u>Description of Solution</u>: The WARP system is operational at the 21 ARTCCs and at the Air Traffic Control System Command Center (ATCSCC). Each operational WARP system consists of a Radar Acquisition and Mosaic Processor (RAMP) subsystem, a Weather Server, a Communications Subsystem, a Meteorologist's Workstation, Briefing Terminals, an ARTCC Monitor and Control Center (AMCC) workstation, and a Weather Information Network Server (WINS) subsystem. The ATCSCC WARP also includes the FAA Bulk Weather Telecommunications Gateway (FBWTG) server. The primary WARP functions are:

- Integrate timely and accurate weather onto air traffic controller displays.
- Support to the Traffic Management Unit and to air traffic control specialists at the ARTCCs and the ATCSCC.
- Disseminate weather data to critical NAS subsystems.
- Provide current and forecast data to Center Weather Service Unit Meteorologists, who support air traffic personnel.
- Provide processing tools to consolidate weather data from several sources into a single, integrated display that supports air traffic operations.

The WARP program enhances safety, reduces weather-related delays, and improves collaborative decision-making. The WARP weather functions furnish timely, accurate and integrated weather products to other NAS systems.

All operational WARP systems must stay current with the NAS while continuing to meet DOT/FAA strategic goals by implementing incremental WARP technical refresh activities addressing critical hardware and software obsolescence. These goals include communications upgrades, mandatory security system test and evaluation (ST&E), implementation of mandatory security certification and authorization package (SCAP) mitigation

activities, and the design and development of interfaces to critical NAS systems requiring weather data such as ERAM and Traffic Flow Management System (TFMS). In addition, the WARP system must continue building on its initial limited tech refresh activities focusing on the RAMP and WINS to be fully System Wide Information Management (SWIM) compliant. In FY 2009 the services of the operational WARP systems continued with completion of RAMP and WINS development.

In FY 2010, \$17,600,000 was appropriated to address the aging infrastructure of the existing WARP hardware and software systems. Specific activities include the deployment of initial limited tech refresh, stratification of weather information to controller displays, data format adaptation changes, interface and communications implementation changes, removal and reengineering of Harris Weather Data Service, as well as Automatic Product Generation (APG) processing and decoding server refresh activities.

For FY 2011, \$2,100,000 is requested to complete the incorporation of WINS Message Oriented Middleware (MOM) capability into the SWIM Service Container, OMB required benefits assessment, as well as on-going required information systems security activities.

<u>Benefits</u>: WARP will continue to provide timely weather data acquisition and dissemination capability to ensure safe air traffic control. WARP provides for full FAA usage of NEXRAD Doppler weather radar information. WARP will also provide the most timely and accurate forecast weather products to other NAS systems, significantly improving NAS capacity.

#### APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$182,013.0 <sup>1</sup>
FY 2010 Appropriated		17,600.0
FY 2011 Request		2,100.0
FY 2012-2015	<del></del>	3,700.0
Total	Various	\$205,413.0

#### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
WARP Technology Refresh	Various	\$2,100.0

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<sup>&</sup>lt;sup>1</sup> .Includes reprogramming increase dated August 28, 2009.

Budget I <u>tem</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2A16	Collaborative Air Traffic Management Technologies	\$35,900,000	Various	G-5A

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 2 - Increase reliability and on-time performance of scheduled carriers.

<u>Description of Problem</u>: Flight operations are approaching pre-9/11 levels, and aviation trends indicate that air traffic demand will continue to increase. Domestic, regional and commuter patterns, and compositions are changing. Despite this growth, the economic viability of many commercial carrier airlines is uncertain. The Traffic Flow Management (TFM) portfolio of tools and capabilities is the only part of the national airspace system designed to help the aviation community reduce delays, improve operations, and succeed economically. However, the system cannot accommodate the anticipated growth in demand for services.

The existing TFM toolset will need to overcome the following challenges to meet the FAA's mission and customer expectations:

- Continued timely development and integration of sophisticated decision support tools to minimize NAS delays and improve efficiency.
- Fiscal pressures forcing a reduction in the cost of ownership.

<u>Description of Solution</u>: The FAA must maintain mission essential operations at all 81 TFM-equipped ATC facilities for its customers and continue to upgrade enhanced TFM services. Development of new, additional Collaborative Air Traffic Management Technologies (CATMT) provides direct mission support to the FAA by helping to ensure efficient flow of air traffic through the NAS.

In FY 2010, \$18,100,000 was appropriated for the development of CATMT Work Package 2 (WP-2) enhancements: Arrival Uncertainty Management (AUM) for better delivery projection modeling; Weather Integration to include 2-hour advance forecast information on the TFM display; Airborne Reroute Execution (ABRR) to allow for automated in-flight reroute processing; and Collaborative Airspace Constraint Resolution (CACR) to allow for an automated combination of multiple flow strategy routines.

For FY 2011, \$25,400,000 is requested to continue the development of the CATMT WP-2 CACR, ABRR, and Weather Integration Phase 2 enhancements, and deploy the AUM initial capability and Phase 1 of the Weather Integration effort.

Also requested for FY 2011, is \$10,500,000 for CATMT Work Package 3 (WP-3) to develop a business case, to include engineering studies, in order to recommend the set of key areas to pursue in the FY 2011 – 2014 time frame. Currently the options include Remote Sight Re-engineering and Collaborative Information Exchange, both of which were deferred from the CATMT WP-2 Final Investment Decision Package, by the JRC on September 26, 2008, for further study. CATMT WP-3 will complete all planning activities and initiate design/development of the above listed capabilities, in accordance with the planned JRC 2B decision in July 2009.

<u>Benefits</u>: The initial benefit estimate shows that over the period 2011 – 2025 WP-2 will generate approximately \$780 million in ADOC benefits. Benefits for Work Package 3 will be developed as part of the business case.

### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$0.0
FY 2010 Appropriated		18,100.0
FY 2011 Request		35,900.0
FY 2012-2015	<del></del>	<u>108,400.0</u>
Total	Various	\$162,400.0

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. CATMT WP2		\$25,400.0
2, CATMT WP3		10,500.0
Total	Various	\$35,900.0

Budget I <u>tem</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2A17	En Route Automation Modernization (ERAM) – Post Release 3	\$5,000,000	Various	A-01

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets project demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> The existing ERAM contract development effort ends with ERAM R3 in 2011, and the NextGen mid-term development contract is not expected to be in place until 2015. This leaves a gap between 2011 and 2015 when no en route automation development contract is active. There is, however, a need to continue to enhance the air traffic control automation system. This program establishes a baseline which will support the award of a contract to fill the void.

<u>Description of Solution:</u> The ERAM architecture supports the managed evolution from today's Air Traffic Control operational environment to that of the future. ERAM provides a state of the art foundation and introduces new capabilities that enable improvements in air traffic control services. ERAM is the platform for all en route air traffic control automation. It is the base upon which new functionality must be built.

The baseline ERAM program replaces the En Route Host Computer System, its backup, and portions of the display system infrastructure, to enable improvements in airspace capacity, efficiency, and safety that could not be realized with the current 30 year-old system. ERAM will provide enhanced Surveillance Data Processing, enhanced Flight Data Processing, and a supporting infrastructure, which will include training, simulation, information display, enhanced support software and integrated Monitor and Control.

For FY 2011, \$5,000,000 is requested for ERAM Post Release 3. By 2011, ERAM will be fully operational in the NAS, providing flight information to terminal and approach control facilities. ERAM also provides flight information and route processing to the traffic management systems that control the efficient flow of traffic.

The ERAM Post Release 3 baseline builds on this ERAM core architecture. It contains efforts required for:

- Implementation of ERAM "extensible" requirements not completed in Release 2 or Release 3. ERAM
  extensible requirements are a necessary set of functional capabilities and performance required to
  harness ERAM's full potential for operational effectiveness. These requirements may complement
  NextGen initiatives, but are also uniquely critical to ERAM and are not contingent on the maturing of
  external NextGen concepts. Examples include:
  - Controller to controller coordination including conditional handoffs, point outs, approval requests, and airspace coordination that are sent via automation or as a result of operator commands.
  - Airspace management efficiency such as conflict improvements for holding aircraft, dynamically defining Special Activity Areas (SAAs) and Local Activity Areas (LAAs), and airspace configuration change coordination.
  - Improved reroute collaboration with Traffic Flow Management (TFM).
  - Reduce Beacon code duplication through beacon code allocation improvements and/or transition to ICAO 24 bit address which will greatly increase safety by reducing probability of miss-association.
- 2. The implementation of mature NextGen requirements into ERAM, and/or building the specific ERAM application(s) from NextGen infrastructure. These are mature NextGen requirements whose pre-implementation efforts (such as generating concept of operations, concepts of use, requirements analyses, business case development, prototyping, human-in-the-loop simulations, infrastructure implementation etc.) are complete and whose pre-implementation efforts were provided by NextGen capital funding. Examples include:

- Using ADS-B aircraft downlink information such as intent data and TCAS information to improve trajectory modeling, improve safety, and reduced missed and false alerts.
- SWIM data exchange with terminal, TFM, and AIM.
- Processing aircraft intent information from the Data Communications datalink.
- Improved separation based on aircraft equipage such as Performance Base Navigation conformance monitoring.

#### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$0.0
FY 2010 Appropriated		0.0
FY 2011 Request		5,000.0
FY 2012-2015		40,000.0
Total	Various	\$45,000.0

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
ERAM Post Release 3	Various	\$5,000.0

Budget I <u>tem</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2B01	Airport Surface Detection Equipment – Model X (ASDE-X)	\$4,200,000	Various	S-09, M-25

<u>FAA Strategic Goals:</u> Increased Safety – To achieve the lowest possible accident rate and constantly improve safety. Objective 3 - Reduce the risk of runway incursions.

<u>Description of Problem</u>: During FYs 2001 – 2004, there were approximately 257 million aircraft operations and 1,395 runway incursions.<sup>1</sup> This represents an average of one runway incursion per day during the four-year period. Based on historical data, if the FAA and the aviation industry took no intervening action, 15 fatal runway collisions at towered airports would have occurred between 2003 and 2022.<sup>2</sup> These collisions could result in 200 serious injuries and 700-800 deaths. Airport Surface Detection Equipment, Model X (ASDE-X) meets a recommendation for the implementation of new surveillance equipment aimed at preventing collisions and runway incursions at a large number of airports.

<u>Description of Solution:</u> ASDE-X is a surface surveillance system that provides seamless multi-sensor airport surveillance with identification and conflict alerting to air traffic controllers. The ASDE-X system integrates five technologies: transponder multilateration, surface movement radar, Automatic Dependent Surveillance – Broadcast (ADS-B) data, multi-sensor data fusion, and control tower display equipment. The integration of these sensors provides data with the accuracy, update rate, and reliability suitable for improving airport safety and efficiency in all weather conditions. The ASDE-X is particularly useful as a traffic control aid during hours of darkness and other conditions of poor visibility.

ASDE-X was developed to aid in preventing surface collisions and reducing critical Category A and B runway incursions by enabling air traffic controllers to track the surface movement of aircraft and vehicles. ASDE-X provides air traffic controllers with a visual representation of the traffic situation on the airport movement area and arrival corridors. This improves their ability to maintain awareness of the operational environment and to anticipate contingencies.

ASDE-X Safety Logic (AXSL) enhances the situational awareness provided by ASDE-X. AXSL uses surveillance information from ASDE-X to determine if the current and projected positions and movement characteristics of tracked aircraft and vehicles present a potential collision situation. Visual and audible alerts are provided to air traffic controllers when safety logic predicts a collision.

The FAA plans to install 35 operational systems and three support systems. The systems will be installed at airports with no surface surveillance systems and airports with existing ASDE-3/Airport Movement Area Safety System (AMASS). The FAA plans to deploy ASDE-X to 10 new establishment airports (no current surface surveillance capability), four replacement airports (existing ASDE-3/AMASS systems will be replaced with ASDE-X), 21 ASDE-X Upgrade airports (ASDE-3/AMASS systems will be upgraded with ASDE-X capabilities such as multilateration, new color displays, fusion tracking, and AXSL).

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<sup>&</sup>lt;sup>1</sup> Source: "FAA Runway Safety Report: Runway Incursion Trends and Initiatives at Towered Airports in the United States, FY 2001 – FY 2004", August 2005.

<sup>&</sup>lt;sup>2</sup> Source: "Fatal US Runway Collisions over the Next Two Decades", Air Traffic Control Quarterly, December 2000

ASDE-X program status as of January 2010:

#### 22 commissioned airports

•	General Mitchell International Airport, Milwaukee, WI	•	Orlando International Airport, Orlando, FL
•	Theodore Francis Green State Airport, Providence, RI	•	William P. Hobby Airport, Houston, TX
•	Seattle -Tacoma International Airport, Seattle, WA	•	Lambert - St Louis International Airport, St. Louis, MO
•	Hartsfield - Jackson Atlanta Int'l Airport, Atlanta, GA	•	Bradley International Airport, Hartford, CT
	Louisville International Airport, Louisville, KY		Chicago O'Hare International Airport, Chicago, IL
	Charlotte - Douglas International Airport, Charlotte, NC		Washington Dulles International Airport, Chantilly, VA
-	Detroit Metro Wayne County Airport, Detroit, MI	•	Phoenix Sky Harbor International Airport, Phoenix, AZ
•	John F. Kennedy International Airport, New York, NY	•	Los Angeles International Airport, Los Angeles, CA
•	Ft. Lauderdale / Hollywood Airport, Ft. Lauderdale, FL	•	Philadelphia International Airport, Philadelphia, PA
	George Bush Intercontinental Airport, Houston, TX	•	Miami International Airport, Miami, FL
•	Boston Logan International Airport, Boston, MA	•	Newark International Airport, Newark, NJ

Remaining 13 airports are in various stages of the ASDE-X implementation process.

In FY 2010, \$25,302,000 was appropriated for implementation activities, including construction and site preparation, equipment installation, and system optimization at 14 airports. Three systems will be delivered and 11 airports plan to achieve Initial Operational Capability (IOC). Remaining funds will be used for systems engineering, ICDLS, second level engineering support, initial telecommunication services, and contractor support for the program office and all of the above activities.

For FY 2011, \$4,200,000 is requested for completion of implementation activities, including construction and site preparation, equipment installation and system optimization at three airports. These three airports (LaGuardia (LGA), Memphis (MEM), and Las Vegas (LAS)) plan to achieve IOC. Remaining funds will be used for systems engineering, second level engineering support, and contractor support for the program office and all of the above activities.

<u>Benefits:</u> ASDE-X provides both safety and efficiency benefits. The primary benefit, increased safety, is achieved by providing air traffic controllers with improved situational awareness. ASDE-X functionality provides data tags for all transponder-equipped vehicles. The system also provides enhanced safety performance by supporting target projections and intersecting runway alerts. Moreover, through data fusion of multiple sensors (surface movement radar and multilateration inputs), more accurate positions with flight call signs and aircraft intentions are displayed on the controller's screen. This significantly improves controller common situational awareness, particularly during heavy periods of degraded weather or poor visibility. ASDE-X provides improved surface surveillance during heavy precipitation because rain has no impact on multilateration performance as it does on radar performance. Improved situational awareness will result in a reduction of surface deviations attributed to operational errors, reduce the number of runway incursions, and reduce the number and rate of general aviation and commercial accidents.

In addition to safety benefits, ASDE-X enables efficiency improvements by providing flight call signs for all transponder-equipped targets. As a result, controllers are able to view the ASDE-X display to determine the correct order of aircraft within queue, monitor whether aircraft are following their prescribed taxi routes, and, validate that the proper beacon code is associated with the radar target for each aircraft. Through the implementation of data tags, ASDE-X provides the ability to accurately identify each aircraft within a queue preventing unnecessary coordination and communications to determine the order of aircraft. This improved capability will reduce the time spent between clearance deliveries and in turn, lead to less taxi time and delays.

### APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)	38	\$469,175.0 <sup>1</sup>
FY 2010 Appropriated	0	25,302.0 <sup>2</sup>
FY 2011 Request	0	4,200.0
Baseline Requirement	0	36,700.0
Total	38	\$535,377.0

Activity	<u>Tasks</u>	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. Sit	e Preparation/Related Activities		\$1,200.0
2. Op	timization/Enhancements/Engineering Services		2,500.0
3. Pro	ogram Management		300.0
4. Se	cond Level Engineering		<u>200.0</u>
Total		Various	\$4,200.0

<sup>&</sup>lt;sup>1</sup> Excludes \$7.6M appropriated for ASDE-X under Airport Surface Detection Equipment (ASDE) in FY 2000. Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.
<sup>2</sup> Includes \$4.9M appropriated to relocate and upgrade ASDE-X system at Seattle-Tacoma.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2B02	Terminal Doppler Weather Radar (TDWR)	\$8,600,000	Various	W-03

<u>FAA Strategic Goals:</u> Increased Safety – To achieve the lowest possible accident rate and constantly improve safety. Objective 1 - Reduce commercial air carrier fatalities.

<u>Description of Problem:</u> The TDWR system is now 18 years old. It is comprised of a substantial number of proprietary software and hardware components, many of which have become obsolete and present significant supportability problems that worsen with time. In addition, the system's radome and air conditioners have reached the end of their service lives and need to be replaced.

<u>Description of Solutions</u>: Solutions to current supportability issues have been identified in the following nine service life extension program (SLEP) projects; enhancing the antenna's elevation gear system; replacing the Radar Product Generator (RPG) computer and rehosting its software; retrofitting the Radar Data Acquisition (RDA) hardware and software; replacing the current antenna drive motors with more reliable brushless motors; replacing the obsolete uninterruptible power supply for the RPG computer; replacing the obsolete transmitter control cards, and the obsolete radio frequency (RF) filter amplifier with modern equipment; and replacing the worn-out radomes and air conditioners with new equivalent units.

From FY 2002 through FY 2009, \$56,440,070 was appropriated under both the TDWR Product Improvement and TDWR SLEP to complete installation of the backup communications upgrade, procure spares and obsolete parts replacements, and complete the acquisition and installation of modification kits for the Direct Digital Controller (DDC) hardware and software rehost. Funding was also provided for the acquisition, testing, and installation of the new elevation bearings, to develop improved software and hardware for the RDA retrofit modification, and to procure its field modification kits. Funding was also provided to procure and test four prototype antenna drive systems, and to continue procurement of spares and replacements for obsolete parts and assemblies. Additionally, \$397,400 was appropriated for in-service management activities. Funding was also appropriated to procure 20 production antenna drive motor systems; develop and test a replacement for the obsolete RPG computer, develop and test a replacement RF filter amplifier, and acquire, and install production kits to replace three obsolete circuit cards with a new transmitter control circuit card. Funding was also provided to complete the acquisition of a the retrofit modification to the RDA subsystem; to buy production antenna drive motor systems and begin their installation; to acquire and install a replacement RPG computer and its uninterruptible power system; and to replace the air conditioners at about half of the TDWR sites.

In FY 2010, \$9,900,000 was appropriated to fund the installation of the RDA retrofit modification and continue improving its software; continue the acquisition and installation of the production antenna drive motor modification; continue the acquisition and installation of the replacement air conditioners, procure new RF Filter Amplifiers, complete the acquisition of the uninterruptible power systems for the RPG computers, conduct continuing logistics supportability studies; and begin replacing the radomes; and replace the air conditioners at the remaining TDWR sites.

For FY 2011, \$8,600,000 is requested to complete installation of the Elevation Drive modification; install the RDA Retrofit modification at 12 more sites; install the Antenna Drive Motor Modification at 15 more sites; and complete installation of the production Transmitter Sustainment modification kits. Funding will also be used for completing the installation of the production modification kits for the Radar Product Generator (RPG) computer, installing replacement air conditioners at 15 more sites, completing the installation of the production radio frequency (RF) Filter Amplifier modification kits as well as installing replacement radomes on 12 TDWR towers. Funding will also be used to support approval for Segment 2 of the TDWR service life extension program (SLEP 2). This is necessary to maintain our current operations until NexGen technology becomes operational.

<u>Benefits:</u> The TDWRs deployed at commercial airports have increased aviation safety through the accurate and timely detection of hazardous aviation weather conditions. Weather related delays have been reduced, allowing savings in aviation fuel consumption.

Operational benefits of the system include the real-time detection of microbursts, gust fronts, wind shifts, and precipitation, as well as prediction of wind changes that allow improved airfield efficiency when making runway changes. The program will continue to deploy improvements that will lower TDWR operations costs and improve its reliability.

#### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)	47	\$455,117.5 <sup>1</sup>
FY 2010 Appropriated		9,900.0
FY 2011 Request		8,600.0
Baseline Requirement		10,300.0 <sup>2</sup>
Total	47	\$483,917.5

#### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
Engineering Development/Implementation of SLEP Projects	Various	\$8,600.0

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<sup>&</sup>lt;sup>1</sup> Includes \$130,400 reduction of FY 1998 funds pursuant to rescission contained in P.L. 106-69, October 9, 1999 and EAS. Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.

<sup>&</sup>lt;sup>2</sup> The future requirements for TDWR SLEP are under review and final estimated costs have not yet been determined.

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2B03	Standard Terminal Automation Replacement System (STARS) (TAMR Phase 1)	\$22,000,000	Various	A-04

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion

<u>Description of Problem:</u> STARS automation systems have been operational at terminal facilities, both terminal radar approach control facilities (TRACONs) and air traffic control towers (ATCT) across the National Airspace System (NAS) since FY 2002. The STARS system consists almost entirely of Commercial-Off-the-Shelf (COTS) hardware and Commercially Available Software (CAS). Because COTS/CAS system are based on what is available in the commercial marketplace, there is a need to continually replace systems software and components when they have been identified as either End of Life (EOL) and/or End of Maintenance (EOM) items. Therefore, it is necessary that the STARS system is maintained using Technical Refreshment of the COTS/CAS components which have been identified as EOL or EOM. In addition, engineering and path finding is required to update the current system network to meet anticipated future NextGen processing requirements.

#### 1. Standard Terminal Automation Modernization (STARS) Phase 1 Enhancements (\$10,000,000):

<u>Description of Solution:</u> With STARS firmly established in the operational phase of its life-cycle, software enhancements are required for the baseline software to improve system performance, efficiency and to incorporate safety and security modifications.

In FY 2010, \$10,000,000 was appropriated for STARS software enhancements which will include system performance, efficiency, safety, and security modifications to the software baseline. The funding will provide for program and system engineering, technical support, and operational/suitability testing of software and system enhancements.

For FY 2011, \$10,000,000 is requested for continuation of STARS software enhancements which will include system performance, efficiency, safety, and security modifications to the software baseline. The funding will continue to provide for program and system engineering, technical support, and operational/suitability testing of software and system enhancements.

<u>Benefits:</u> The STARS system is fully digital and capable of tracking all aircraft within the defined terminal airspace using available FAA and DoD surveillance or with system upgrades to global positioning satellite reports. It provides functions equivalent to or better than those accomplished by the existing terminal automation systems along with enhanced security. It is designed to incorporate new functionality more quickly and easily. The STARS infrastructure can be expanded and extended to meet increased traffic demands and accommodate the introduction of new automation functions necessary for improved safety, efficiency, and capacity.

#### 2. Standard Terminal Automation Modernization (STARS) - Technology Refresh (\$12,000,000):

<u>Description of Solution:</u> Qualify a new processor configuration to replace the current Sun Ultra 5 systems. Procure initial hardware to begin support of the site replacement configuration.

In FY 2010, \$18,000,000 was appropriated to qualify, test and integrate a Sony Main Display Monitor (MDM) replacement. In addition, this funding will procure Generation 2 Tower Display Monitors (TDMs).

For FY 2011, \$12,000,000 is requested to replace the Ultra-5 processors with the new qualified processors and operating systems for the first block of operational sites, Operational Support Facilities (OSFs), FAA Academy,

and the William J. Hughes Technical Center. Procure MDM replacement and deploy to William J. Hughes Technical Center, FAA Academy, OSFs, and operational sites. Procure Generation 2 and Generation 3 TDMs. Develop, qualify and upgrade System Architect, Continuous Data Recording (CDR), Local Area Network (LAN) and unexpected end of life components.

<u>Benefits:</u> Technical Refresh of the STARS system will provide continued terminal services by replacing the original system Ultra-5 processors that have reached their end of maintenance. Replacement of these processors must begin in the FY 2009 period and will complete in the FY 2014 period. This will remove the Ultra-5's from service as their battery life expires. Adequate batteries were procured as a one-time buy to insure utilization of the Ultra-5 processors until FY 2014. A further procurement will not be available.

To enable the replacement of the Ultra 5s qualification of a new processor, typically an 18 to 24 month period, must begin in FY 2009 and continue into FY 2010 - 2011 where procurement for the first block replacement/upgrade of sites in FY 2011 will begin. This will enable current availability to be kept and allow for expansion into proposed NextGen activities as they are fielded. The new generation of processor's will enable STARS to move into a more open architecture providing benefits in increased mean time between failure (MTBF) and potentially lower overall system operating costs.

Fielding of the new generation processor, will require a new Operating System (OS). New generation processors will not run on the current fielded OS. This activity is typically an 18-24 month activity and must run concurrently with qualification of new hardware. A new OS will potentially provide security and others benefits. Additionally, the new OS is open source and will enable STARS to take advantage of this in the future.

The SONY Main Display Monitor (MDM) will need to be replaced beginning in FY 2011. Engineering work for identify and integrate a replacement will begin in FY 2009 and continue into FY 2010 to ensure a display replacement is available in a timely manner. The new display will provide lower operating costs and increased MTBF.

#### APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$1,783,220.6 <sup>1</sup>
FY 2010 Appropriated		28,000.0
FY 2011 Request		22,000.0
Baseline Requirement		1,153,800.0 <sup>2</sup>
Total	Various	\$2,987,020.6

#### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
STARS Technology Refresh		\$12,000.0
2. STARS Software Enhancements		10,000.0
Total	Various	\$22,000.0

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<sup>&</sup>lt;sup>1</sup> Includes \$651,300 reduction of FY 1998 funds pursuant to rescission contained in P.L. 106-69, October 9, 1999. Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.

<sup>&</sup>lt;sup>2</sup> Future production/deployment requirements for remaining 106 systems are under review.

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2B04	Terminal Automation Modernization/Replacement Program (TAMR Phase 3)	\$20,000,000	Various	A-04

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> This program would address the Modernization and Replacement of the ARTS IIIEs and ARTS IIEs. A total of approximately 106 sites are covered by Phase 3. These automation systems that currently provide the National Airspace System (NAS) critical separation and capacity services must be sustained and upgraded to maintain evolving and increasing functionality. These older systems, especially ARTS IIEs, are limited in capacity, and many may be unable to support future growth projections and new functionality. Those sites and systems can present an operational risk to service. Because of this risk, systems at the Terminal Radar Approach Control (TRACON) and Air Traffic Control Towers (ATCTs) need to be upgraded or replaced in the near future.

<u>Description of Solution:</u> These systems integrate data from radar and weather sensors and flight plan information for each aircraft into a graphical and textual presentation used by several thousand air traffic controllers. The solution to modernization and replacement is not yet known. Funding is needed to perform analyses and performance assessments, analyze alternatives, develop and implement the selected alternative, implement acquisition strategies, and test appropriate Commercial Off-the-Shelf (COTS) hardware.

In FY 2010, \$18,000,000 was appropriated to continue the implementation of Terminal Automation solution for all 106 sites. Complete the JRC and OMB Exhibit 300 processes and obtain decision.

For FY 2011, \$20,000,000 is requested to begin implementing the preferred solution.

<u>Benefits:</u> The Terminal Automation Modernization and Replacement System will replace and/or upgrade the existing automation to a state-of-the-art digital, radar and flight data processing and display system, providing new air traffic control "workstations" and backroom automation equipment to enable safe control of airplanes and enable continued service at current and future projected levels.

Qualitative benefits (cost avoidance) are expected such as avoiding costs to maintain aging equipment, lifecycle benefits of common displays and processors, and common hardware for re-use and expansions. Qualitative benefits are expected to enhance controller's situational awareness, and discerning weather and reducing the risk through efficiency and commonality.

### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$3,000.0
FY 2010 Appropriated		18,000.0
FY 2011 Request		20,000.0
FY 2012-2015		<u>531,800.0</u> <sup>1</sup>
Total	Various	\$572,800.0

#### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

	Locations/	Estimated Cost
Activity Tasks	<u>Quantity</u>	<u>(\$000)</u>
TAMR Phase 3	<del></del>	\$20,000.0

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 $<sup>^{\</sup>rm 1}$  Future requirements are under review.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2B05	Terminal Automation Program	\$3,900,000	Various	A-01, A-03

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> The Flight Data Input and Output (FDIO) equipment operates on older 1980s technology which limits system capacity and increases the difficulty in maintaining the systems. The program has been replacing obsolete/end-of-life components in the system since 1998. However, by FY 2010, components procured and replaced between 1998 and 2007 will again reach the end-of-life or become obsolete, requiring another cycle of technical refresh. For example, the personal computers, keyboards, CRT monitors, and printers are key components of the system that will require replacement. FDIO capability and services are required in the NAS until they are replaced by future NextGen technologies such as Terminal Flight Data Management (TFDM) system and/or NextGen Virtual Towers, in the 2020 timeframe.

#### 1. Flight Data Input/Output (FDIO) Phase II COTS Replacement (\$2,400,000):

<u>Description of Solution:</u> In FY 2010, \$2,400,000 was appropriated to (1) complete an operational analysis of the existing FDIO systems at TRACONs, ATCTs, and ARTCCs in order to identify/validate hardware and software technical refresh requirements; (2) develop solutions for replacement/modernization of end-of-life/obsolete components; and, (3) begin the procurement of replacement equipment necessary for continued FDIO operation.

For FY 2011, \$2,400,000 is requested to (1) procure hardware and necessary software to replace equipment currently in the field and program management support to procure and field replacement FDIO system components, and (2) procure FDIO components and continue installation of replacement FDIO components at FAA, DoD, ATC facilities.

<u>Benefits:</u> These activities ensure the availability and reliability of system hardware and software to support current system capabilities and NAS modifications/enhancements. The modifications help improve airport arrival efficiency, and enhance safety and system utility. Modernization of system hardware also reduces operating costs associated with maintaining older COTS equipment that has reached the end of its useful life or is obsolete. Additionally, the FDIO will support NAS modernization efforts by providing a platform to enable SWIM capabilities.

#### 2. Terminal Flight Data Management System (\$1,500,000):

<u>Description of Solution:</u> In FY 2010 \$1,000,000 was appropriated to begin the development of the business case including refinement of requirements and identification of potential alternatives for providing an acceptable solution.

For FY 2011, \$1,500,000 is requested to conduct the Investment Analysis (IA), obtain an initial investment decision, and begin refining the IA in preparation for the Final Investment decision.

Benefits: Benefits will be identified and quantified during the investment analysis in 2011.

## **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$76,157.0
FY 2010 Appropriated		9,600.0
FY 2011 Request		3,900.0
FY 2012-2015		10,200.0
Total	Various	\$99,857.0

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. Flight Data Input/Output		\$2,400.0
2. TFDM Business Case Analysis		<u>1,500.0</u>
Total	Various	\$3,900.0

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2B06	Terminal Air Traffic Control Facilities – Replace	\$114,600,000	Various	F-01

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> The FAA provides air traffic control services from over 500 airport traffic control towers (ATCT) and terminal radar approach control (TRACON) facilities. The FAA must continually replace portions of this infrastructure to ensure an acceptable level of air traffic control service and to meet current and future operational requirements. The average age of an ATCT is 28 years and a TRACON is 25 years, with some as much as 50 years old. As the volume and complexity of terminal air traffic control increases, so does the need to have additional positions in the ATCT/TRACON (i.e., helicopter positions, VFR traffic advisory, runway monitors, etc.). In many cases, control towers and TRACONs built 20 years ago do not meet today's operational requirements. The terminal facilities must conform to current building codes and design standards.

<u>Description of Solution:</u> The ATCT/TRACONs that cannot meet current operational requirements are being identified for replacement. Additionally, the FAA will determine the cost and operational benefit of collocating TRACONs that have common boundaries. When building a new facility, future growth and current building codes and design standards will be accommodated.

Terminal facility replacement projects are funded in five phases to provide sound financial management of projects. Phase I includes site selection and advance engineering. Phase II provides facility design, and electronic equipment design and procurement. Phase III is facility construction. Phase IV is equipment and utilities installation. Phase V is disposition, which includes decommissioning, demolition, or refurbishing of the old facility.

The FAA is in the process of developing a long-term Facilities Master Plan for ATCT and TRACON infrastructure replacement and improvements. This plan will address facility condition, ability to meet current needs, future growth and improvements at the airport served, and potential cost savings initiatives. The proposed list of projects was developed in concurrence with the plan.

In FY 2010, \$179,000,000 was appropriated to fund five phases of facility deployment to continue replacing aging facilities. This includes: \$6,379,000 for Phase I/II for one site, New York, NY; \$109,735,105 for Phase III construction funding for four sites, Las Vegas, NV, Fort Lauderdale, FL, Champaign, IL, and San Francisco, CA; and \$51,431,364 for Phase IV/V funding for 16 sites, Dayton, OH, Houston, TX, Gulfport, MS, Kona, HI, Memphis, TN, Reno, NV, Broomfield, CO, LaGuardia, NY, Pensacola, FL, Missoula, MT, Cleveland, OH, Traverse City, MI, Kalamazoo, MI, Islip, NY, Las Cruces, NM, and West Palm Beach, FL. Also appropriated was \$8,454,531 for other direct program costs. Products and services delivered include: formal facility requirements documentation, siting evaluations for all ATCT planning locations under consideration, preliminary engineering, and program management. Also in FY 2010, \$3,000,000 was appropriated to fund Palm Springs, CA and Nantucket, MA.

For FY 2011, \$114,600,000 is requested to fund five phases of facility deployment to continue replacing aging facilities. This includes: \$4,700,000 is requested for Phase I/II funding for four sites, Tucson, AZ, Tampa, FL, Akron-Canton, OH, and Teterboro, NJ; \$39,766,027 is requested for Phase III construction for one site New York, NY; and \$59,673,973 is requested for Phase IV/V continuation for sixteen sites, Abilene, TX, Cleveland, OH, Houston, TX, Kalamazoo, MI, Gulfport, MS, Broomfield, CO, Oakland, CA, Wilkes Barre, PA, Fort Lauderdale Executive, FL, Las Vegas, NV, West Palm Beach, FL, LaGuardia, NY, Boise, ID, Kona, HI, Palm Springs, CA, and Traverse City, MI. Also included in the request is \$10,460,000 for other direct program costs. Products and services delivered include: formal facility requirements documentation, siting evaluations for all ATCT planning locations under consideration, preliminary engineering, and program management.

Benefits: The terminal air traffic control facilities replace program contributes to FAA's system efficiency goal. New and replacement facilities support the NAS modernization strategy achieve efficient aerospace systems and operations. Strategic location, adequate height, and cab size of an airport traffic control tower will provide an efficient working environment, enable controllers to achieve an aerial view of the airport and fulfill the requirement to be able to see aircraft at the outer aircraft movement areas. This will result in enhanced safety and increased capacity, which will benefit the users.

### **Replace Terminal Air Traffic Control Facilities:**

Phase I/II – Funding of \$4,700,000 for four design starts.

Tucson, AZ - \$1,200,000 Akron-Canton, OH - \$1,100,000 Tampa, FL - \$1,200,000 Teterboro, NJ - \$1,200,000

Phase III - Funding of \$39,766,027 for one construction start.

New York, NY - \$39,766,027

Phase IV/V – Continuation funding of \$59,673,973 for 16 facilities started in previous years.

Abilene, TX – \$2,940,000 Fort Lauderdale Executive, FL - \$3,000,000 Cleveland, OH - \$14,770,000 Wilkes-Barre, PA - \$5,892,400 Las Vegas, NV - \$5,532,642 Houston, TX - \$2,138,300 West Palm Beach, FL - \$2,181,102 Kalamazoo, MI - \$4,100,000 Gulfport, MS - \$1,199,960 LaGuardia, NY - \$1,918,764 Boise, ID - \$1,558,295 Broomfield, CO - \$1,859,920 Kona, HI - \$3,224,000 Oakland, CA - \$5,833,900 Traverse City, MI - \$1,000,000 Palm Springs, CA - \$2,524,690

Other - Funding of \$10,460,000 is required for other direct program costs.

Advance Requirements Definition \$1,360,000
 Engineering, Siting, and Program Management \$9,100,000

### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)	509	\$2,088,920.8
FY 2010 Appropriated	23	179,000.0
FY 2011 Request	21	114,600.0
FY 2012-2015	29	600,000.0
Total	582	\$2,982,520.8

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<sup>&</sup>lt;sup>1</sup> Includes \$9,300,900 reduction of FY 1998 funds pursuant to rescission contained in P.L. 106-69, October 9, 1999. Includes \$9,854,675 reduction of the FY 2001 funds pursuant to rescission contained in P.L. 107-87, December 18, 2001. Includes reduction for EAS in FY 2002. Includes reduction pursuant to P.L. 108-7, February 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004. Includes \$79,056,761 for the American Recovery and Reinvestment Act.

Activity Tasks	Locations/ Quantity	Estimated Cost (\$000)
1. Phase I–V Funding	21	\$104,140.0
2. Advance Requirements Definition		1,360.0
3. Engineering, Siting and Program Management	<u></u>	9,100.0
Total	21	\$114,600.0

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2B07	Airport Traffic Control Tower (ATCT)/Terminal Approach Control (TRACON) Facilities – Improve	\$45,600,000	Various	F-01, M-08

FAA Strategic Goal: Greater Capacity - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> The FAA must continually upgrade and improve aging terminal facilities and equipment to provide an acceptable level of service and to meet current and future operational requirements. Upgrades and improvements include replacing obsolete equipment, such as tower cab consoles, and rehabilitating administrative and equipment space due to facility expansion. Facility expansion includes adding operational positions, training space, base building construction, environmental equipment, accessibility, structural and electrical upgrades.

Facility improvements must incorporate new requirements and ensure an orderly transition to the new arrangement, for relocated or replaced equipment, with minimal impact to existing operations. The power and heating, ventilation and air conditioning (HVAC) systems at many terminal facilities must be upgraded to handle both the new and old equipment during the in-service change-out. A successful transition of improvement projects is critical. In many towers, there is no room for additional equipment; therefore, base buildings must be expanded.

Facility condition assessments are necessary to determine the overall needs for facility improvements and to prioritize locations for investing improvements. These assessments are an in-depth evaluation of all the components of a facility.

Description of Solution: For FY 2011, \$45,600,000 is requested as follows:

- \$36,800,000 to initiate modifications, improvements, and repair ATCT/TRACON facilities that are not candidates for replacement. This funding includes the relocation of approach control functions to other existing locations, reducing the number of approach control facilities, while providing the same service.
- \$4,500,000 to support system engineering, configuration management, risk management, facility planning, and other program support services.
- \$2,600,000 for facility condition assessments.
- \$1,700,000 for in-service engineering.

<u>Benefits:</u> The ATCT/TRACON Terminal Facilities Improvement Program (TFIP) contributes to FAA's goals. Upgrading and improving facilities supports the NAS modernization strategy to achieve efficient aerospace systems and operations. Improvement projects will enable facilities to maintain current operational, environmental, and safety needs in lieu of replacing or relocating the entire facility. This effort will result in a smooth and orderly transition of new equipment into the FAA's terminal facilities. This will also improve the operational efficiency and environment of equipment operating within ATCT/TRACON facilities.

#### **APPROPRIATION SUMMARY**

<u>Locations</u>	<u>Amount (\$000)</u>
	\$668,221.5
	38,900.0
	45,600.0
	210,900.0 <sup>2</sup>
Various	\$963,621.5
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<sup>&</sup>lt;sup>1</sup> Includes \$943,249 for the American Recovery and Reinvestment Act.

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<sup>&</sup>lt;sup>2</sup> Future requirements are based on activity levels and local situations that are validated on a year-to-year basis.

<u>Act</u>	civity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1.	Improve Terminal Facilities - Modernize		\$10,225.0
2.	Improve Terminal Facilities - Sustain		26,575.0
3.	System Engineering/Program Management		4,500.0
4.	Facility Condition Assessments		2,600.0
5.	In Service Engineering		<u>1,700.0</u>
Tot	tal	Various	\$45,600.0

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2B08	Terminal Voice Switch Replacement (TVSR)	\$11,500,000	Various	C-05, M-08

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> As of FY 1994, over 70 percent of the voice switches in operation in the terminal environment were either the obsolete electromechanical or the aging analog switch installed from the 1960s through the 1980s. These older systems are unsupportable and replacement switches are required to ensure the continuation of effective air traffic control services. This program will replace these older switches with modern digital equipment and will significantly improve the operational and maintenance aspects of terminal operations. The acquisitions under this program also serve as the contract vehicles to provide equipment to new or modernized terminal facilities.

<u>Description of Solution:</u> This modernization program will replace the obsolete electromechanical and non-supportable electronic voice switch systems in terminal facilities. The terminal voice switch program consists of six major procurements: Small Tower Voice Switch (STVS) for small switches, Enhanced Terminal Voice Switch (ETVS), Rapid Deployment Voice Switch (RDVS) for large switches, Interim Voice Switch Replacement (IVSR), Conference Control System (CCS) and the Voice Switch By-Pass (VSBP). The STVS procurement was completed in FY 2002 with its last delivery in March 2002. The replacement of the conference control system consists of a single procurement for a new system at the Air Traffic Control System Command Center (ATCSCC), which went operational in October 2004. The VSBP is installed at terminal facilities to provide back-up access to selected radios. This contract expired in June 2007; a follow on contract was established. The ETVS and RDVS-IIA contracts were indefinite delivery/indefinite quantity (IDIQ) commercial off-the-shelf procurements. The ETVS contract was extended through June of 2007. The RDVS-IIA acquisition contract expired in December 2003, but systems for new facilities are in storage and installations continue. The IVSR contract was awarded in November 2004 and received an in-service decision in March 2007.

In FY 2010, \$10,000,000 was appropriated to procure, test, deliver, and install 10 terminal voice switches. An additional \$500,000 was requested for in-service engineering.

For FY 2011, \$11,000,000 is requested to procure, test, deliver, and install 10 terminal voice switches. In addition, an extension to the existing Terminal Voice Switch will be negotiated to allow for and support the Air Traffic Organization (ATO) Terminal Services planned new tower replacement requirements. An additional \$500,000 is requested for in-service engineering.

<u>Benefits:</u> This program provides reliable voice communications in support of air traffic terminal operations. The reliability of communications from controller to controller and controllers and pilots is vital to a safe air traffic control system. By providing an essential element of FAA's communications network, this program will support the safety of our transportation system. Approximately \$7,300,000 per year will be saved in operational costs by reducing the current annual maintenance cost for electromechanical switches, reducing annual depot support costs, and reducing man-year costs associated with greater reliability and inherent.

In-service engineering allows for immediate response to emerging technology solutions. Funding is needed for ongoing engineering support of all prototyping efforts.

## **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)	457	\$253,217.3
FY 2010 Appropriated	10	10,500.0
FY 2011 Request	10	11,500.0
FY 2012-2015	_ <del></del>	0.0
Total	477	\$275,217.3

<u>Acti</u>	vity Tasks	Locations/ Quantity	Estimated Cost (\$000)
1.	Voice Switch Procurement		\$3,230.0
2.	Contract Renegotiation		3,200.0
3.	Technical Support		800.0
4.	Program Management Support		1,750.0
5.	Logistics and Testing Support		1,150.0
6.	Information Security		100.0
7.	Site Preparation		770.0
8.	In Service Engineering		500.0
Tota	al	Various	\$11,500.0

<sup>&</sup>lt;sup>1</sup> Includes \$620,900 reduction of FY 1998 funds pursuant to rescission contained in P.L. 106-69, October 9, 1999; and \$30,730 reduction of FY 2001 funds pursuant to rescission contained in P.L. 106-544. Includes reduction pursuant to P.L. 108-7, February 20, 2003.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Location</u> :	CIP <u>Item(s</u> ):
2B09	NAS Facilities OSHA and Environmental Standards Compliance	\$26,000,000	Various	F-13, M-39

<u>FAA Strategic Goals:</u> Organizational Excellence – Ensure the success of the FAA's mission through stronger leadership, a better trained and safer workforce, enhanced cost-control measures, and improved decision-making based on reliable data. Objective 1 – Implement human resource management practices to attract and retain a highly skilled, diverse workforce and provide employees a safe, positive work environment. Make the organization more effective with stronger leadership, increased commitment of individual workers to fulfill organization-wide goals, and a better prepared, better trained, safer, diverse workforce.

<u>Description of Problem:</u> Non-compliance with federal, state, and local environmental, safety and health legal and other requirements imposes significant liabilities on the FAA in the form of interruptions to NAS operations, violations of binding agreements, lost work time and productivity, regulatory fines and sanctions, civil and criminal lawsuits, post-incident response actions, such as costly cleanups, and a decrease in employee morale. Recent examples of non-compliance events include a criminal investigation by the EPA over the improper management of asbestos containing materials at an Air Route Traffic Control Center (ARTCC) and multiple complaints of illnesses filed by FAA staff potentially exposed to molds and other air contaminants. Monthly, approximately 20 environmental, occupational safety and health (EOSH) events result in disruptions to National Airspace System (NAS) operations. Effectively managing environmental and safety risks and maintaining compliance requires the implementation of EOSH compliance programs to continually identify and assess risks, integrate risk reduction into system designs, implement controls and best management practices into daily operations, and maintain a workforce with the knowledge to identify and mitigate EOSH risks at their source.

<u>Description of Solution:</u> The program will provide funding required to implement nationally directed technical compliance programs designed to fully address federal, state, and local environmental and safety regulations and binding commitments. Within the Air Traffic Organization (ATO), the Environmental, Occupational Safety and Health (EOSH) Services group directs these programs in close collaboration with the Service Areas and Service Center.

For FY 2011, \$26,000,000 is requested to continue the implementation of the following major EOSH programs:

The Fire Life Safety Program, which directly supports the FAA public safety mission and NAS capacity goals, through the integration of life safety systems requirements and the management and control of fire events and fire related incidents in FAA's critical NAS facilities, particularly Air Traffic Control Towers (ATCTs). Effective support and protection of a safe air traffic control environment is essential to limiting the impacts of fire, explosion, or related events to the flying public, FAA's employees, as well as NAS operations and facilities.

The Occupational Safety and Health (OSH) Compliance Program, which supports FAA's mission to promote and assure employee safety and health by ensuring FAA employees are properly prepared, equipped, protected, and/or trained. The OSH Compliance Program encompasses 27 unique technical program elements (such as asbestos, confined space, electrical safety, hazard communication, indoor air quality, radiation, and hearing conservation) to ensure the Agency meets all its occupational safety and health requirements.

The Environmental Compliance Program ensures operational readiness is not compromised by environmental compliance issues. It is designed to ensure compliance with federal, state, and local environmental regulations, and includes 20 individual technical programs elements such as air pollution control management, fuel storage tank compliance, National Environmental Policy Act (NEPA) compliance, and pesticides management.

The Incident Response Program, which supports FAA in assuring continued operation of the NAS and associated systems during emergency situations and supporting FAA response to such incidents.

The Requirements Integration Program (RIP), which ensures Energy, Environmental, Occupational Safety and Health requirements are integrated into new and existing NAS systems. Support FAA's mission to promote and assure workplace safety and health in the NAS by managing a compliant Job Hazard Analysis (JHA) or System Hazard Analysis for In-Service Equipment (SHAISE) program that assists the FAA in identifying potential/existing workplace hazards and recommended controls for hazards associated with maintaining systems in the NAS.

The Safety Integration Program provides communications between ATO and other FAA lines of business. These areas include the Occupational Safety and Health Administration (OSHA) Annual Report, ATO Safety Management Information System (SMIS) data management, reporting and trending, injury illness and assessment, Supervisor/Manager Training liaison, fire life safety unique to ATCTs, and coordination and dissemination of information across ATO.

The EOSH Training Program supports FAA's mission to promote and assure a safe and efficient NAS by managing a compliant EOSH Training program that uses training funds efficiently and reduces accident/Injury/Illness by providing for a properly EOSH-trained workforce.

**The Inspection Program** supports FAA's mission to promote and assure workplace safety and health in the NAS by managing an EOSH inspection program that effectively identifies workplace hazards, reduces and eliminates risk factors within the workplace, prevents injury/illness, efficiently use resources and complies with regulatory guidance.

<u>Benefits:</u> The primary benefit of the NAS Facilities OSHA and Environmental Standards Compliance Program is a safer and healthier workplace that is compliant with all environmental and safety requirements. This results in fewer disruptions to NAS operations, greater worker productivity and morale, and reduced likelihood for regulatory inspections, fines and citations. The most recent benefit-cost analysis conducted by EOSH Services demonstrated a Benefit to Cost Ratio of 2.2 to 1 and an internal rate of return (IRR) of 8.12 percent. ATO EOSH programs are expected to realize over \$600 million dollars in benefits for the FAA (through avoided costs, Airline Direct Operating Costs, and Passenger Value of Time) over 10 years.

### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$448,289.4 <sup>1</sup>
FY 2010 Appropriated		26,000.0
FY 2011 Request		26,000.0
FY 2012-2015		104,000.0
Total	Various	\$604,289.4

Activity Tasks	Locations/ Quantity	Estimated Cost (\$000)
1. Environmental and Occupational Safety and		
Health (EOSH) Compliance		\$16,000.0
2. Fire Life Safety for ATCTs		10,000.0
Total	Various	\$26,000.0

<sup>&</sup>lt;sup>1</sup> Includes reduction pursuant to P.L. 108-199, January 23, 2004.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2B10	Airport Surveillance Radar (ASR-9) Service Life Extension Program (SLEP)	\$3,000,000	Various	S-03, M-25, M-08

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> The Airport Surveillance Radar Model 9 (ASR-9) provides aircraft target and weather information to air traffic controllers, which help reduce delays and improve safety at high activity airports. The ASR-9 system was designed and deployed in the 1980s and 1990s, and was at risk of an increase in failures. As a result of these failures, reliability and performance levels have degraded, thus adversely impacting efficiency. Therefore a service life extension of the ASR-9 hardware is necessary to continue system operation, improve reliability and performance levels, and maintain the current level of safety.

In FY 2010, \$1,400,000 was appropriated to complete Phase 1B transmitter modification installations.

#### 1. ASR-9 SLEP Phase 2 (\$2,000,000):

<u>Description of Solution:</u> The FAA developed a two-phased strategy to provide the 135 highest traffic airports aircraft surveillance services. Phase 1 immediately addresses the highest risk physical equipment repair and replacement in order to sustain operations. Phase 2 is a long-term strategy that will reduce overall service risk through 2025. This two-phased approach is more affordable and lowers risk.

Phase 2 consists of implementing additional modifications to the aging primary ASR-9 radar systems to sustain primary surveillance in terminal airspace through 2025. The sustainment of the ASR-9 aligns with the Next Generation Surveillance Roadmap Decision, and the Automatic Dependent Surveillance — Broadcast (ADS-B) backup strategy.

Alternatives will be presented based upon the benefit to maintain current functionality balanced with the versatility to achieve future requirements. For example, assuring that the ASR-9 system continues to utilize the current CD-2 language format with the capability to achieve compliance with future NAS Enterprise Architecture requirement(s) for Internet Protocol (IP) and the ASTERIX language format. Diminishing Manufacturer Sources and parts obsolescence issues at the Line Replaceable Unit (LRU) level will be addressed through consideration for substitute or redesign, ensuring logistical support. Additionally, alternatives will meet or exceed the reliability and availability of existing ASR-9 system functionality and performance through the introduction of economical, convergent technologies.

In FY 2010, \$1,000,000 was appropriated to continue design and development testing.

For FY 2011, \$2,000,000 is requested to conduct market research; develop plans and initiate a solicitation for a working prototype.

<u>Benefits:</u> Terminal radar reduces delays and improves safety at congested airports. During instrument meteorological conditions the radar provides air traffic controller's information that allows closer aircraft operations and increases air traffic arrival and departure operations. Modifying these radar systems reduces the risk of outages and ensures the continuation of maximum service capabilities during poor visibility, night time, and adverse local weather conditions. In addition, it reduces the overall lifecycle operation and maintenance cost of the systems.

#### 2. ASR-9 – Independent Operational Testing and Evaluation (IOT&E) (\$100,000):

IOT&E provides the agency with independent assessments of operational readiness that are used to support in-service decisions. These in-service decisions allow nationwide deployment and operational use of the new systems and ensure that the associated operational/safety risk is minimized, and will reduce system lifecycle operations cost. For FY 2010, \$200,000 was requested for IOT&E. For FY 2011, \$100,000 is requested for IOT&E.

### 3. ASR-9 - In Service Engineering (\$900,000):

In-service engineering allows for immediate response to emerging technology solutions. Funding is requested for ongoing engineering support of all prototyping efforts. In FY 2010, \$900,000 was appropriated for in service engineering. For FY 2011, \$900,000 is requested for in service engineering.

### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)	Various	\$1,017,631.8 1
FY 2010 Appropriated		3,500.0
FY 2011 Request		3,000.0
FY 2012-2015	<del></del>	0.0
Total	Various	\$1,024,131.8

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. ASR-9 SLEP (Phase 2)		\$2,000.0
In Service Engineering		900.0
3. Independent Operation Test and Evaluation		100.0
Total	Various	\$3,000.0

 $<sup>^{\</sup>rm 1}$  This funding includes the St. Louis Relocation Project and the Palm Springs Installation Project.

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2B11	Terminal Digital Radar (ASR-11) Technology Refresh	\$4,100,000	Various	S-03

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> The ASR-11 Tech Refresh Program addresses known issues associated with data signal processor (SDP) and single board computer obsolescence and ASR-11 system end-of life supportability issues. The Technical Refresh addresses identified In-Service Decision (ISD) action items associated with processing throughput and memory capacity. Technology Refresh will reduce operational support costs due to the elimination of duplicative support costs associated with maintaining of the two baselines over the ASR-11 system lifecycle. Technical Refresh provides the benefits of significantly improved processing, memory capacity, and open architecture that will serve as a technology enabler to allow future hardware (HW) and software (SW) modifications.

### Terminal Digital Radar (ASR-11) - Technology Refresh (\$4,100,000):

<u>Description of Solution:</u> The ASR-11 program is currently in the In-Service Management phase of the system lifecycle. The ASR-11 program has completed contractor Developmental Test and Evaluation (DT&E), FAA Operational Test and Evaluation (OT&E), and Independent Operational Test and Evaluation (IOT&E). At the completion of the testing, the system was deemed ready for operational deployment and the program achieved an ISD in September 2003. All 66 ASR-11 systems have been procured. There are two additional ASR-11 systems in the NAS purchased outside the program.

The technical refresh effort was initiated in 2005 as a joint, FAA, Department of Defense (DoD) and Raytheon effort to address life cycle obsolescence risk as well as the known performance limitations associated with the existing Signal Data Process (SDP) portion of the ASR-11 system. The SDP resides in the primary surveillance radar (PSR) portion of the ASR-11 system and performs the post radio frequency primary radar target and weather signal data processing. This information is used by the air traffic controller as primary target and weather data for use in aircraft separation. As part of the completion of the DoD funded development, the Technical Refresh is scheduled to complete in-plant integration and testing and on-site design test and evaluation in 2008. Operational testing by the FAA Technical Center is scheduled for 2009. Following completion of testing, a National Change Proposal will be processed to incorporate the technical refresh into the ASR-11 product baseline. The ASR-11 technical refresh replaces obsolete COTS hardware cards within the signal data processing card rack and refresh reduces the number of processing cards from fourteen to three. In-Service Decision is scheduled for December 2009.

The technical refresh kits are planned to be retrofitted into all ASR-11 systems previously fielded with the SDP. The FAA has procured 24 retrofit kits in FY 2009 with the remaining balance of the 68 FAA retrofit kits being procured in FY 2010 through 2012, with installation completed in 2015.

In FY 2010, \$12,863,000 was appropriated at the target level to procure 18 technical refresh retrofit modification kits and install 12 kits.

For FY 2011, \$4,100,000 is requested at the target level to procure 15 technical refresh retrofit modification kits and install 12 kits.

<u>Benefits:</u> The ASR-11 technical refresh program addresses identified ISD issues and outstanding action items associated with processing throughput and memory capacity issues with the existing SDP, primary radar azimuth resolution, low doppler weather performance, and false track performance.

In addition, the ASR-11 technical refresh program avoids a \$32.2 million incremental increase to the O&M cost baseline by eliminating duplicative support costs associated with SDP life cycle depot and second level engineering support.

The ASR-11 technical refresh eliminates a high supportability risk for operational ASR-11 sites due to SDP processor throughput and memory limitations.

The ASR-11 technical refresh program provides a suitable platform to allow the ASR-11 system to mitigate operational impacts to existing ASR-11 facilities due to new wind turbine power generation facilities currently impacting operational ASR-11 sites.

### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)	24	\$6,400.0
FY 2010 Appropriated	17	12,863.0
FY 2011 Request	15	4,100.0 <sup>1</sup>
FY 2012-2015	<u>12</u>	<u>16,600.0</u> <sup>2</sup>
Total	68	\$39,963.0

<u>Act</u>	ivity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1.	System Engineering/Program Management		\$250.0
2.	Procurement and Production		1,950.0
3.	System Software		420.0
4.	Retrofit Installation		<u>1,480.0</u>
Tot	al	Various	\$4,100.0

<sup>&</sup>lt;sup>1</sup> Requirements for technical refresh are under review. FY 2009 Tech Refresh funding is included.

<sup>&</sup>lt;sup>2</sup> Business case for ASR-11 ASDP requirements is being prepared. FY 2010-2013 Tech Refresh funding is not included.

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2B12	Precision Runway Monitors (PRM)	\$950,000	Various	S-08

FAA Strategic Goal: Greater Capacity – Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem</u>: The Precision Runway Monitor (PRM) system allows simultaneous independent approaches on closely spaced parallel runways less than 4,300 feet apart, returning a portion of lost capacity during adverse weather conditions and thereby reducing delays.

The PRM system is a highly accurate, electronic scan (e-scan) radar that tracks and processes aircraft targets in a one second update rate (as opposed to 4.8 seconds with conventional radars). The PRM system provides the controller with automatic alerts and high resolution displays that, in conjunction with specific procedures, enable pilots to fly simultaneous independent approaches to parallel runways spaced less than 4,300 feet. Parallel runways can be used for independent/simultaneous approaches during visual meteorological conditions (VMC); however, in instrument meteorological conditions (IMC), closely spaced runways cannot be used for independent/simultaneous approaches without PRM technology. The inability to conduct simultaneous approaches during adverse weather reduces throughput and increases delays. PRM supports FAA initiatives of increasing operational efficiency while reducing delays and maintaining operational safety standards.

Description of Solution: In 1992, Congress mandated installation of production PRM systems at five candidate airports with closely spaced (i.e., 750 - 4,300 feet), parallel runways. Systems were installed at Minneapolis (MSP), St. Louis (STL), Philadelphia (PHL), New York (JFK) and Atlanta (ATL) airports. From FY 1998 through FY 2001, three systems were commissioned (MSP, STL and PHL). The FAA entered into a National Agreement with the City of San Francisco to provide a PRM system to the San Francisco International Airport. Under a Memorandum of Agreement (MOA), the City of San Francisco received the system originally designated for Atlanta, procured another PRM system, and agreed to reimburse the FAA for oversight and management of the installation activities. The ATL PRM installation contract award was delayed in FY 2002 due to additional runway construction. In FY 2003, the FAA Administrator directed that the system procured under the San Francisco (SFO) MOA be installed in Cleveland (CLE). There was a Congressional mandate to initiate the procurement of three additional PRM systems for ATL, Detroit (DTW) and a site to be determined. Due to agency priorities and funding limitations, only one PRM system would be procured, which would be for the ATL site. In FY 2004, due to operational issues, the JFK system would be removed and assets sent to the Aeronautical Center to resolve supportability issues with the other systems. In FY 2005, the SFO and CLE systems were commissioned (for a total of five). Evaluation of Multilateration technology as a possible replacement for the E-scan PRM at Detroit (DTW) was initiated, as required by Congressional language. The MLAT subsystem, known as PRM-A, will provide accurate position and identification information on transponder equipped aircraft and surface vehicles by "multilaterating" on signals transmitted by the transponder. In FY 2007, the ATL system was commissioned (for a total of six).

In FY 2008, \$9,000,000 was appropriated to support parallel runway operations at DTW using a multilateration sensor with precision runway monitoring capability. This funding is being utilized utilized: to complete the design, testing and commissioning of the DTW system; to complete the construction, infrastructure support and installation for the Multilateration system at DTW; to procure, install and commission ILS equipment; for procedures development, planning, administrative and engineering support services covering the development, installation, testing and commissioning of the DTW system and its support infrastructure; to perform Air Traffic and Airways Facility training. This will result in the qualification of the PRM-A as an effective, low-cost alternative to the legacy PRM E-Scan system.

In FY 2009, \$1,000,000 was appropriated. The funding is being utilized to conduct an investment and economic analysis of replacing legacy PRM E-Scan systems with the Multilateration PRM-A system, and determining other candidate sites with closely-spaced parallel runways that may benefit from this technology. The FY 2009 appropriated amount was sufficient to continue efforts in FY 2010.

In FY 2011, \$950,000 is requested. The Final Investment Decision is planned for FY 2010 to replace legacy PRM e-scan systems with the PRM-A Multilateration configuration. This funding will be utilized to complete Requirements Documentation to achieve contract award for procurement of additional multilateration hardware and development of the required Common Automated Radar Terminal System (CARTS) interface.

<u>Benefits</u>: The commissioning of PRM and implementation of simultaneous approach procedures at selected airports can restore diminished capacity during adverse weather for approach and landing during instrument meteorological conditions. PRM allows simultaneous approaches to be closer together while retaining equivalent or improved levels of safety.

### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)	8	\$196,711.5
FY 2010 Appropriated		0.0
FY 2011 Request		950.0
FY 2012-2015	<u></u>	0.0 1
Total	8	\$197,661.5

#### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
Program/Business Management		\$100.0
2. Tech Refresh		<u>850.0</u>
Total	Various	\$950.0

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<sup>&</sup>lt;sup>1</sup> Requirements are currently under review.

Budget <u>Item</u> :	<u>Title:</u>	Request:	Locations:	CIP <u>Item(s</u> ):
2B13	Runway Status Lights (RWSL)	\$55,000,000	Various	S-11, M-25

<u>FAA Strategic Goals:</u> Increased Safety – To achieve the lowest possible accident rate and constantly improve safety. Objective 3 - Reduce the risk of runway incursions

<u>Description of Problem:</u> A top priority of the Federal Aviation Administration is to enhance airport safety while ensuring airport capacity. Reducing runway incursions is a major component of this effort. Runway incursions develop quickly and without warning from safe and routine traffic situations on the airport surface. Such time-critical runway incursions usually leave very little time for corrective action. Runway Status Lights (RWSL) are designed to provide direct indication to flight crews and vehicle operators that it is unsafe to enter a runway or to begin a take off.

<u>Description of Solution</u>: Runway Status Lights act as stoplights on runways and taxiways, signaling when it is unsafe to enter, cross or begin takeoff on a runway. Located along the centerline of a runway or taxiway, Runway Entrance Lights (REL) and/or Takeoff Hold Lights (THL) will illuminate red when a runway is in use, notifying the pilot of a taxiing aircraft to either stop prior to crossing the runway, or yield to the aircraft landing or taking off. Most runway incursions are caused by pilot deviation. The RWSL system provides a vital layer of redundancy in runway safety and is a back up and reinforcement of controller guidance.

An Initial Investment Decision was approved at the Joint Resource Council in July 2007. A Final Investment Decision was completed in June 2008. A prime contract was awarded October 2008. A final cost and schedule baseline review is in progress with an expected FY 2010 second quarter review.

In FY 2010, \$116,900,000 was appropriated to complete installation of the key site. Funding will be used to begin site specific construction and equipment procurement for 12 airports. Remaining funds will be used for systems engineering, logistic support activities, initial utilities services, second level engineering support, establish support systems as well as contractor support to the program office for the above mention activities. Also appropriated was \$400,000 for Independent Operational Test and Evaluation.

For FY 2011 \$54,600,000 is requested to continue implementation, and construction activities. Continue funding 12 construction and two new construction starts and equipment installation at 11 airports. RWSL systems will be delivered to 11 airports and eight airports plan to achieve IOC. Remaining funds will be used for systems engineering, software maintenance, ICDLS, spare parts, second level engineering support, initial utility service, information systems security requirements, and contractor support for the program office and all of the above activities. Also requested is \$400,000 for Independent Operational Test and Evaluation.

<u>Benefits:</u> Implementation of RWSL will reduce the likelihood of runway incidents. Most accidents take place at takeoff or landing therefore, a reduction in runway incursions directly translates into avoided accidents. Current runway accident risk models indicate that even with ASDE-X and Airport Movement Area Safety System (AMASS), a residual risk remains. RWSL is expected to address a significant portion of the remaining risk. Preliminary cost-benefit data suggests a positive business case for deployment of RWSL to high-risk airports. Specifically, current runway accident risk models indicate a risk-based return on investment in RWSL deployment to 22 airports.

#### APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$41,673.8
FY 2010 Appropriated		117,300.0
FY 2011 Request		55,000.0
FY 2012-2015		132,600.0
Total	Various	\$346,573.8

Activity Tasks	Locations/	Estimated Cost (\$000)
ACTIVITY TASKS	<u>Quantity</u>	<u>(\$000)</u>
System Engineering		\$5,068.3
2. Program Management		5,252.4
3. Installation		4,053.6
4. System Optimization		3,171.2
5. Implementation		3,888.1
6. Logistics and Documentation		3,709.6
7. Support Systems		1,820.6
8. Second Level Engineering		1,514.5
9. Hardware and Software		6,871.8
10. Construction		19,249.9
11 Independent Operational, Test and Evaluation		400.0
Total	Various	\$55,000.0

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2B14	National Airspace System Voice Switch (NVS)	\$30,200,000	Various	C-05

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> The current switch infrastructure within the NAS consists of 17 different types of switches. Each type of switch has a different logistical support structure resulting in an extensive inventory of parts to support each system as well as an engineering workforce that is capable of maintaining each switch type. This infrastructure is aging with some switches being over 20 years old. These aging switches are experiencing obsolescence issues. This requires engineering analysis and modification of systems to continue to operate these systems. Also the systems, as they age, are experiencing increasing failures of parts and increasing site visits for repairs, resulting in higher maintenance costs.

Additionally, the current inventory of switches does not support the future Air Traffic Control (ATC) operations as outlined by NextGen. These switches cannot be networked to allow for the flexibility that will be needed for future NAS operations, to include dynamic re-sectorization, facility backup, and resource re-allocation.

<u>Description of Solution:</u> The NAS Voice Switch will support current and future Air Traffic Control (ATC) operations as envisioned by government and industry forecasters. Much of this focus has been on reducing the duplication of functions and costs currently existing among the many systems providing ATC communications. This is driven by the demand to reduce operating, maintenance, and technology refresh costs. In conjunction with current technologies, a common architecture platform is currently being analyzed to resolve these issues.

In FY 2010, \$26,500,000 was appropriated for completion of Initial Investment Analysis and commencement of acquisition activities for achieving Final Investment Decision. An additional \$100,000 was appropriated for Independent Operational Test and Evaluation (IOT&E).

For FY 2011, \$30,000,000 is requested to complete the activities leading to the Final Investment Decision and award a contract. This would include completing cost/benefit analysis and completing engineering analysis of risk areas. Also, in this phase of the program, modification and development of the network capabilities required in the switch will be developed, tested and prepared for deployment in the next phase to meet the NextGen vision.

The tasks to be completed in FY 2011 are:

- Complete vendor demonstrations.
- Complete Final Investment Analysis for Final Investment Decision.
- Conduct Source Selection and make final selection.
- Award contract.

An additional, \$200,000 is requested for Independent Operational Test and Evaluation (IOT&E).

<u>Benefits:</u> The NAS Voice Switch program will allow FAA to achieve voice switching modernization objectives such as a network-based infrastructure as well as evolve toward a flexible communications routing architecture that supports dynamic re-sectorization, resource reallocation, airspace redesign and the NextGen vision (e.g., improving flow capacity).

The NAS Voice Switch program maps to the FAA goal of increased airport capacity to meet reductions in the projected operating costs by: reducing the number of equipment components needing to be inventoried, by reducing the number of switch types; reducing acquisition, training, and maintenance costs by reducing the

number of voice-switch designs; improving equipment availability and related inventory issues by reducing obsolete equipment; and reducing potential costs to users from air traffic delays due to projected outages of the existing systems and increased user demand.

### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$13,500.0
FY 2010 Appropriated		26,600.0
FY 2011 Request		30,200.0
FY 2012-2015		<u>183,500.0</u> <sup>1</sup>
Total	Various	\$253,800.0

### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. Investment Analysis		\$2,000.0
2. Engineering Analysis		2,500.0
3. SIR Preparation		2,500.0
4. Documentation		2,000.0
5. Contract Award		21,000.0
6. Independent Operational Test and Evaluation		200.0
Total	Various	\$30,200.0

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<sup>&</sup>lt;sup>1</sup> Future requirement under review.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2B15	Next Generation Voice Recorder Replacement Program (VRRP)	\$9,400,000	Various	C-23, M-08

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> FAA Order 7210.3, "Facility Operation and Administration," requires that ATC facilities "record operational communications to the maximum extent practicable." FAA Order 8020.11 and FAA Order 7210.56 require retention of data extraction records for accident and incident investigations. Recordings may be used to monitor any air traffic position for evaluation, training or quality control purposes and are to be available under requests made under the Freedom of Information Act. Voice recorders also are needed to support search and rescue activities. As the voice recorder technology has continued to evolve, early digital voice recorders have experienced obsolescence and supportability issues. These digital voice recorders are reaching the end of their service life utilizing obsolete operating systems and parts that have reached their end of life and are no longer manufactured. The remaining air traffic control analog voice recorders are beyond their expected service life and increasingly unreliable and expensive to maintain. Reduced availability critically impacts the detailed investigation of air traffic incidents and accidents. This reduced system availability impacts controller evaluation and training.

<u>Description of Solution:</u> The Next Generation Voice Recorder Replacement Program provides new voice recorders for en route and terminal ATC facilities. The program will replace obsolete and unsupportable digital voice recorders that have reached their 10-year end of life. The program will also provide the capability for new FAA facilities to procure voice recorder equipment and replace obsolete Dictaphone 9800 recorders in mobile air traffic control towers (MATCT). In FY 2009 and prior, 223 systems were funded. System deliveries of the next generation voice recorder replacement are planned through FY 2014.

In FY 2010, \$11,400,000 was appropriated for procurement, delivery and installation of 108 systems. An additional \$500,000 was appropriated for in-service engineering.

For FY 2011, \$8,900,000 is requested for procurement, delivery and installation of 138 systems. All 469 systems have been procured, 51 systems will be delivered and installed in future years. An additional \$500,000 is requested for in-service engineering.

<u>Benefits:</u> The Next Generation Voice Recorder Replacement Program will support the safety goal, providing legal recording capability between air traffic controllers, pilots and ground-based air traffic facilities in all ATC domains. It will also be utilized in the investigation of accidents and incidents and routine evaluation of ATC operations to include operational errors and operational deviations. Additionally, the program will reduce Operations and Maintenance costs to sustain recorder systems.

In-service engineering allows for immediate response to emerging technology solutions. Funding is requested for ongoing engineering support of all prototyping efforts.

## APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)	223	\$26,000.0
FY 2010 Appropriated	108	11,900.0
FY 2011 Request	138	9,400.0
FY 2012-2015		0.0
Total	469	\$47,300.0

Activity Tasks	Locations/ Quantity	Estimated Cost (\$000)
1. Voice Recorder Procurement	138	\$7,700.0
2. Program, Configuration, and Quality Management		350.0
3. Technical and Logistics Support		300.0
4. Second Level Engineering Support		300.0
5. Site Preparation and Implementation		250.0
6. In Service Engineering		<u>500.0</u>
Total	138	\$9,400.0

<sup>&</sup>lt;sup>1</sup> First year Next Generation Voice Recorder Replacement Program (NGVRRP) (C23.01-00) funds in FY 2006 and beyond are shown. FY 2006 funds of \$4.7M were transferred to C23.01-00 from the original Voice Recorder Replacement Program (VRRP) (CIP C23.00-00) to separate the two baselines. This decision was finalized by Executive Council decision on 30 April 2007.

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2B16	Integrated Display Systems (IDS) Technology Refresh and Sustainment	\$8,700,000	Various	A-03

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> The Information Display System Version 4 (IDS-4) integrates several National Airspace System (NAS) weather sensors and operational data onto a single display platform. The information is used by several thousand air traffic controllers. The IDS-4 vendor recently notified the FAA of hardware and software obsolescence issues, making it unfeasible to continue long term sustainment of the IDS-4. The current IDS-4 system is one of the largest automation systems used by the air traffic control system and must be sustained in order to continue providing the same level of service to the flying community. These older systems are obsolete, becoming increasingly difficult to repair or maintain, and, cannot accept new functionality. Thus, the systems are unable to support future growth projections in capacity and demand for air traffic services. This is an operational risk to service. Because of this high risk, these systems need to be replaced and sustained in the very near future.

<u>Description of Solution:</u> Replace all aging IDS-4 systems through open competition within a six year period. During the first year, a replacement workstation solution will be designed and developed, produced in a limited quantity, and undergo factory, developmental, and operational testing. Following successful testing, production of workstations will begin and workstations will be installed at three support facilities. FAA inhouse maintenance support and 2<sup>nd</sup> level engineering support will also be established to support the new workstations. This will mitigate the immediate risk of a catastrophic failure as the older workstations are removed from the NAS and used to repair the legacy workstations. In subsequent years, IDS-4s will be replaced at a rate that supports the projected failure rate. This system will provide the stop gap necessary to provide the FAA time to develop and deploy the Terminal Flight Data Manager (TFDM) system as defined in the FAA Road Map. TFDM implementation is currently planned in the Road Map from 2015-2020.

In FY 2010, \$7,000,000 was appropriated to procure 225 replacement workstations and to install 341 workstations at three large TRACONs and their associated ATC Towers.

For FY 2011, \$8,700,000 is requested to procure 445 replacement workstations and install 374 workstations at 12 TRACONs and their associated ATC towers.

<u>Benefits:</u> The Integrated Display System will replace IDS-4 systems with current technology. Replacement of these systems will mitigate the risk to service at these sites. Ensuring the system remains in service will help to sustain controller situational awareness by maintaining departure and arrival rates and providing more timely emergency response actions. Also, usable IDS-4 workstations will be sent to the Logistics Center to support the remaining IDS-4 systems until replacement can be accomplished.

#### APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$7,000.0
FY 2010 Appropriated		7,000.0
FY 2011 Request		8,700.0
FY 2012-2015		28,100.0
Total	Various	\$50,800.0

Activity Tasks	Locations/ Ouantity	Estimated Cost (\$000)
Replace IDS-4 Workstations	374	\$8,700.0

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2B17	ASR-8 Service Life Extension Program (SLEP)	\$2,600,000	Various	S-03

FAA Strategic Goals: Greater Capacity - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> The Airport Surveillance Radar, Model-8 (ASR-8) was procured in the mid-1970s and fielded between 1975 and 1980 to provide primary surveillance radar data to air traffic controllers at low and medium activity airports. Forty-one ASR-8 systems (38 operational systems and 3 support systems) will remain in use in the National Airspace System (NAS) after the Airport Surveillance Radar Model-11 (ASR-11) program implementation is complete. The NAS Architecture Surveillance Roadmap retains the ASR-8 systems through the year 2025. The Automatic Dependent Surveillance-Broadcast (ADS-B) backup strategy retains primary radar services in all terminal areas covered by primary radar today in order to mitigate single-aircraft avionics failures in the event of loss of ADS-B positioning source.

The ASR-8 systems are well past their intended life span and need modifications to ensure the systems are able to operate within the NAS and contain operating costs through 2025. The ASR-8 was developed using technology that is now obsolete. Some parts are no longer available and the ASR-8 analog data output can not interface directly with newer digital technology. Currently 11 ASR-8 operational systems are converted to digital format to feed existing automation systems. By 2013 all automation systems will require digital radar input to support ADS-B implementation. Sustaining the ASR-8 systems and providing radar data in digital format also aligns with other potential FAA initiatives such as weather improvements, consolidated Terminal Radar Approach Control (TRACON) establishment, and Internet Protocol (IP) addressing implementation.

The FAA also provides ASR-8 data to support the DoD mission. Currently the DoD Air Defense Sector receives radar data from eight of the 38 operational ASR-8 systems.

<u>Description of Solution:</u> The program office is performing an investment analysis to determine the best solution to sustain ASR-8 service and provide radar data in digital format at low and medium activity airports until 2025. Addition of Internet Protocol (IP) addressing and weather capabilities are also being evaluated in the investment analysis.

In FY 2009, \$3,000,000 was appropriated to prepare for Initial Investment Decision (IID).

In FY 2010, the program expects to receive an IID and prepare for Final Investment Decision (FID).

For FY 2011, \$2,600,000 is requested to complete FID and prepare for contract award for the approved solution.

<u>Benefits:</u> The program office is preparing a Business Case Analysis Report (BCAR) to determine the most cost beneficial SLEP solution. The program office expects the solution to reduce terminal radar delays, by reducing the risk of outages and ensuring continuation of radar service. In addition, the program office expects the modification to maintain or reduce future overall operation and maintenance cost of the systems and provide digital radar and weather data output to support NAS Architecture requirements.

#### APPROPRIATION SUMMARY

<u>Locations</u>	<u>Amount (\$000)</u>
	\$3,000.0
	0.0
	2,600.0
	0.0
Various	\$5,600.0
	   <u></u>

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. Procure Hardware		\$1,100.0
2. TAC Support		500.0
3. System Engineering		400.0
4. Testing		400.0
5. Regional Support		<u>200.0</u>
Total	Various	\$2,600.0

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2B18	Integrated Terminal Weather System (ITWS)	\$5,500,000	Various	W-07, M- 25, M-31, M-39

<u>FAA Strategic Goals</u>: Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem</u>: Weather is the major contributor to air traffic delays, accounting for 65 percent of all delays, and 40 percent of accidents. Air traffic personnel in Air Traffic Control Tower (ATCT) cabs, Air Route Traffic Control Centers (ARTCCs), and Terminal Radar Approach Control (TRACON) facilities rely on a number of terminal area sensors that collectively provide large amounts of weather data. These data, which controllers manually interpret, may also be confusing. The main shortcoming of the present system is that it cannot anticipate short-term weather changes that affect capacity, safety, and efficiency in the terminal area, such as precipitation, ceiling, visibility, windshear, microbursts, gust fronts, winds aloft, tornado activity, and thunderstorms, nor the impact of these changes on terminal operations. There is a need to consolidate and provide value-added, timely, and accurate weather forecasts and special products to the aviation system users and operations community.

<u>Description of Solution</u>: The Integrated Terminal Weather System (ITWS) provides products to terminal aviation system users that characterize the current terminal weather situation and forecast anticipated weather conditions for the next 60 minutes. ITWS integrates data and products from various FAA and National Weather Service (NWS) sensors (i.e., Terminal Doppler Weather Radar (TDWR), Airport Surveillance Radar (ASR), Next Generation Weather Radar (NEXRAD), Low Level Windshear Alert System (LLWAS), Automated Surface Observing System (ASOS), aircraft (via the Meteorological Data Collection and Reporting System (MDCRS), and other NWS weather information systems. Products generated by ITWS include: windshear and microburst predictions, storm cell and lightning information, and terminal area winds aloft. The ITWS situation displays (SDs) at tower cabs, TRACONs, and their associated ARTCCs (Traffic Management Units and Center Weather Service Units) facilitates a common situational awareness of severe weather phenomena among air traffic control personnel. Data is also available to airlines and other airline industry users for their use in planning activities. In the future, ITWS will provide service remotely to 16 secondary/reliever airports.

In FY 2010, \$1,100,000 was appropriated to install the final two of the remaining 11 ITWS Product Generators (PGs) and commission the final six remaining ITWS PGs. This will complete the 33 operational systems acquisition program, providing advanced graphical weather information at 59 airports, 29 of which are OEP level. Installation of displays and communications to provide remote ITWS service to 16 additional secondary/reliever airports will continue in FY 2010, resulting in service to six secondary/reliever airports. Studies for emerging requirements to expand ITWS service to additional sites will be conducted, and studies supporting and concept demonstrations for NextGen integration of weather systems will continue. In addition \$800,000 was appropriated for in-service engineering activities.

For FY 2011, \$4,700,000 is requested for installation of displays and communications to provide remote ITWS service to the final ten additional secondary/reliever airports, and to support requirements for ITWS service at additional sites, such as Southern California TRACON, Seattle, Portland, and Buffalo, if validated. The requested funding will also provide for operational support of recently commissioned systems, and the addition of new systems sending weather information through the external user interface to Volpe, which provides ITWS products to authorized, external users such as the airlines. Studies, concept definition demonstrations, and acquisition preparations for NextGen weather system integration and transition of legacy systems into NextGen weather architectures will continue. In addition \$800,000 is requested for in-service engineering activities.

<u>Benefits:</u> National Transportation Safety Board (NTSB) statistics indicate weather-related delays cost the aviation industry and the traveling public approximately \$4.1 billion per year, of which \$1.7 billion per year is considered avoidable. Weather is a direct contributor to 40 percent of all aviation accidents, 50 percent of all aviation fatalities, and accounts for 65 percent of system delays. Through improved integration of weather data into timely, accurate aviation weather information, FAA can reduce delays and improve NAS capacity utilization while enhancing aviation safety. The ITWS will integrate terminal weather data to automatically provide current weather information and predictions in easily understood graphic and textual form.

In-service engineering allows for immediate response to emerging technology solutions. Funding is requested for ongoing engineering support of all prototyping efforts.

#### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)	33	\$357,670.6 <sup>1</sup>
FY 2010 Appropriated		1,900.0
FY 2011 Request		5,500.0
Baseline Requirement	_ <del></del>	<u> 11,000.0</u>
Total	33	\$376,070.6

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. Program Management		\$200.0
2. Engineering		2,800.0
3. Telecommunications		80.0
4. NAS Implementation		30.0
5. Test and Evaluation		250.0
6. Program Support		1,340.0
7. In Service Engineering		800.0
Total	Various	\$5,500.0

<sup>&</sup>lt;sup>1</sup> Of this amount, \$49,300,000 was appropriated for the aviation weather products generator (AWPG) program, which was canceled in FY 1995. Additionally, \$6,000,000 was appropriated for the aviation weather research program in FY 1996. Also, \$3,000,000 was appropriated for phased array radar in FY 2001. Total non-ITWS funds \$58,300,000. The appropriation amount also reflects a \$359,400 reduction of FY 1998 funds pursuant to rescission contained in P.L. 106-69, October 9, 1999. Also includes \$58,560 reduction of FY 2001 funds pursuant to rescission contained in P.L. 106 554. Includes reduction for EAS in FY 2002. Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2B19	Terminal Automation Modernization/Replacement Program (TAMR Phase 2)	\$3,100,000	Various	A-03

FAA Strategic Goal: Greater Capacity – Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem</u>: The automation systems that provide the foundation for the current air traffic control system must be upgraded or replaced in order to increase capacity and improve productivity. These aging systems become limited in capacity, unable to support future growth projections and new functionality, and may present an operational risk to service. Because of this risk, systems at nine TRACON facilities were deemed Critical Risk to Service due to limitations in system processor capacity and parts obsolescence. Two of the nine sites addressed by TAMR Phase 2 need to receive Technical Refresh that includes planning, acquisition and installation commencing in 2011.

<u>Description of Solution</u>: The FAA is implementing Terminal Automation Modernization and Replacement in a phased approach, starting with the TRACONs that have the oldest terminal automation systems. This approach reflects FAA's current philosophy in maintaining business continuity and effective program management. Phases mitigate government, vendor, and deployment costs and risks by breaking down large, complex Terminal modernization acquisitions. Phases allow FAA to select a "best value" system, meet budgetary constraints and fulfill critical NAS requirements. Each phase will be justified, priced and presented separately to the Joint Resource Council (JRC).

These automation systems integrate data from radar and weather sensors and flight plan information for each aircraft into a graphical and textual presentation used by several thousand air traffic controllers. The nine high-risk sites include five Automated Radar Terminal System (ARTS) IIE and four ARTS-IIIE Full Digital ARTS Display (FDAD) sites. The ARTS-IIE requires upgrades to both the communications infrastructure and the old displays. The ARTS-IIIE/FDADs require similar display and processor upgrades to meet the current and projected growth at the large OEP airports. Additionally NTSB recommendations cannot be implemented until the displays are replaced at the ARTS-IIIE sites.

For FY 2011, \$3,100,000 is requested to procure end-of-life and end-of-maintenance hardware for two of the nine sites addressed under TAMR Phase 2.

<u>Benefits</u>: Benefits will be realized by preserving airport capacity and avoiding maintenance and operations costs. Without implementation, existing capacity would degrade, because the existing terminal automation's target processing function would constrain the amount of terminal traffic that can be handled, and hence, increase the number of duration of delays. This constraint in the National Airspace System, both for the airlines and the traveling public, was simulated using a national system model, and the benefits of avoiding the resultant delays have been monetized. These benefits are termed capacity benefits. Capacity benefits for the airlines are aircraft direct operating costs (ADOC) and for the traveling public, passenger value of time (PVT).

### APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$56,600.0
FY 2010 Appropriated		0.0
FY 2011 Request		3,100.0
FY 2012-2015		11,100.0
Total	Various	\$70,800.0

Activity Tasks	Locations/ Quantity	Estimated Cost (\$000)
TAMR Phase 2 Tech Refresh	<del></del>	\$3,100.0

<sup>&</sup>lt;sup>1</sup> Future requirements are under review.

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2B20	Remote Maintenance and Logging System (RMLS)	\$6,500,000	Various	M-07

<u>FAA Strategic Goal</u>: Greater Capacity - Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner.

<u>Description of Problem:</u> The existing Remote Maintenance Monitoring System (RMMS) is the primary tool used by the FAA to maintain the operation of all National Airspace System (NAS) systems and facilities. RMMS consists of two main functions: (1) monitor and control of remote NAS systems and facilities; and (2) maintenance management of all NAS systems and facilities. The RMMS hardware platforms and software applications have been operating since the 1980's and are in need of Technology Refreshment (life cycle replacement). The Maintenance Processor Subsystem (MPS) (Tandem computers) provides the current platform in which the legacy RMM system operates. The Tandem hardware and operating system have exceeded their useful life and require replacement for the following reasons:

- The Tandem hardware and software is currently unsupported by the manufacturer.
- Future third party hardware and software maintenance cannot be guaranteed.

<u>Description of Solution:</u> The Remote Monitoring and Logging System (RMLS) is the design solution for RMMS Technology Refreshment. RMLS is planned to be implemented in two Phases, Phase 1 National Logging Network (NLN) and Phase 2 National RMM Network (NRN).

In FY 2010, \$1,000,000 was appropriated to provide funding to implement the RMLS NRN key site.

In FY 2011, \$6,500,000 is requested to provide funding to procure the RMLS NRN equipment and to install RMLS NRN in the Western Service Area (WSA).

Phase 1 RMLS NLN is scheduled to be deployed and fully operational in FY 2010. RMLS NLN will re-host Simplified Automated Logging (SAL) and Event Manager (EM) on the former NIMS EMS hardware platforms, located at each of the Operational Control Centers (OCC's). RMLS NLN will perform the same maintenance management functionality of the current RMMS.

Phase 2 National RMM Network (NRN) will provide MPS hardware technology refreshment and re-host Maintenance Automation System Software (MASS) on new hardware platforms. RMLS NRN performs the same monitor and control functionality of the current RMMS. The RMLS NRN will consist of the following:

- New RMLS NRN Server-Based Platforms. These server-based platforms will be installed in the existing infrastructure located at the Operations Control Centers (OCC).
- New RMLS NRN Protocol Converter Platforms. These platforms will be installed at the Air Route Traffic Control Centers (ARTCC) to replace the existing MPS Tandem computers.
- Data Connectivity. FTI will provide data connectivity from OCC to OCC, from OCC to ARTCC, and from ARTCC to OCC.

The MPS will be removed and disposed as the RMLS NRN is placed in service.

<u>Benefits:</u> The RMLS NRN lifecycle is 13 years starting in FY 2010 and ending in FY 2022. When compared to maintaining the existing MPS over the same lifecycle the RMLS NRN provides the FAA a total Operations and Maintenance cost saving benefit of \$20.5 million.

## **APPROPRIATION SUMMARY**

	<u>Locations</u>	<u>Amount (\$000)</u>
Appropriated (FY 1982-2009)		\$0.0
FY 2010 Appropriated		1,000.0
FY 2011 Request		6,500.0
FY 2012-2015	_ <del></del>	<u>9,100.0</u>
Total	Various	\$16,600.0

Activity Tasks	Locations/ Quantity	Estimated Cost (\$000)
<ol> <li>Purchase Protocol Converter equipment</li> <li>Site Survey for installation of Protocol Converter Rack equipment at ARTCCs in WSA</li> </ol>		\$3,590.0 760.0
3. Install Protocol Converter Racks at ARTCCs in WSA Total	Various	<u>2,150.0</u> \$6,500.0

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2B21	Mode S Service Life Extension Program (SLEP)	\$1,500,000	Various	A-03

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> The ASR-9 was procured in the mid-1980s and fielded between 1989 and 1994. The system was expected to remain operational until 2005. The Mode S was procured during the same period to provide secondary surveillance radar (SSR) service and was expected to remain operational until 2008. Both systems have proved to be extremely reliable components of the National Airspace System (NAS). However, due to their age, the radar systems are becoming difficult to maintain. Both systems were developed using now obsolete technology. Several critical components are no longer available because the original equipment manufacturers have stopped producing the equipment, and the components are not available elsewhere. As a result, maintenance downtime is increasing, and Tech Ops/FAA Logistics Center has resorted to cannibalization, software rewrites, and temporary re-engineering in order to maintain these critical systems.

<u>Description of Solution</u>: Mode S SLEP Phase 2 will consist of implementing modifications to the aging secondary Mode S radar systems to sustain secondary surveillance in terminal and enroute airspace through 2025. The sustainment of the Mode S aligns with the Next Generation Surveillance Roadmap Decision, and the SBS (Surveillance and Broadcast Services)/ADS-B backup strategy. Based on this strategy, at a minimum, the Mode S systems at the 23 long range radar facilities and the top 50 busiest terminal facilities will need to be maintained through 2025.

Alternatives will be presented based upon the benefit to maintain current functionality balanced with the versatility to achieve future requirements. That is, assuring that the Mode-S system continues to utilize the current CD-2 language format with the capability to achieve compliance with future NAS Enterprise Architecture requirement(s) for Internet Protocol (IP) and the ASTERIX language format. Diminishing Manufacturer Sources (DMS) and parts obsolescence issues at the Line Replaceable Unit (LRU) level will be addressed through consideration for substitute or redesign, ensuring logistical support. Additionally, alternatives will meet or exceed the reliability and availability of existing Mode-S system functionality and performance through the introduction of economical, convergent technologies.

For FY 2011, \$1,500,000 is requested to conduct market research, develop plans and initiate a solicitation for a working prototype.

<u>Benefits:</u> Terminal radar reduces delays and improves safety at congested airports. During instrument meteorological conditions the radar provides air traffic controllers, information that allows closer aircraft operations and increases air traffic arrival and departure operations. Modifying these radar systems reduces the risk of outages and ensures the continuation of maximum service capabilities during poor visibility, night time, and adverse local weather conditions. In addition, this program reduces the overall lifecycle operation and maintenance cost of the systems.

## **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$0.0
FY 2010 Appropriated		0.0
FY 2011 Request		1,500.0
FY 2012-2015		0.0
Total	Various	\$1,500.0

	Locations/	Estimated Cost
Activity Tasks	Quantity	<u>(\$000)</u>
Mode S SLEP (Phase 2)	<del></del>	\$1,500.0

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2C01	Automated Surface Observing System (ASOS)	\$6,700,000	Various	W-01

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> Accurate, reliable weather information is an integral element in the safe and efficient use of the Nation's airspace. Surface weather observations are required by pilots for flight planning, takeoffs, and landings, by the National Weather Service for aviation weather forecasts, and by airline dispatchers and air traffic control personnel for air traffic control and flow management. Automated weather observing equipment improves the quality, frequency, and timeliness of weather observations, reduces costs, and reduces the period of time expended by air traffic controllers on weather observation duties. There is a continuing need for automated weather observing capabilities at many airports.

The ASOS Pre-Planned Products Improvement (P3I) program contributes to extending the service life of the ASOS equipment to 2020. Several of the ASOS P3I efforts have addressed, or are addressing, obsolescence issues that would affect the ability of the ASOS equipment to produce weather observations in the near future. The ASOS P3I sensor efforts also will reduce system data outages and maintenance costs.

<u>Description of Solution:</u> The FAA has developed a long-range equipment strategy for improving automated surface weather observations. The eight weather systems that make up the Automated Surface Weather Observation Network (ASWON) program provide automated surface weather observations to meet the needs of pilots, operators, and air traffic personnel without incurring the high costs of labor-intensive manual surface weather observations.

Currently, the ASOS P3I program is the only ASWON program receiving Facilities and Equipment (F&E) funding. Three of the five ASOS P3I efforts have been completed (Processor Rehost and Dewpoint Sensor Replacement) or are near completion (551 of 571 Ice-Free Wind Sensors have been installed). The two remaining ASOS P3I efforts are currently underway. The Phase I sensor development and performance testing of the Enhanced Precipitation Identification (EPI) sensor has been completed, but the EPI sensor production has been delayed because the sensor did not meet all performance specifications. A follow-on Phase II development and testing plan is being formed at this time. 2011 is the target date for completion of EPI System Test. The Ceilometer Replacement development and operational testing has been completed and production started.

In FY 2010, \$5,500,000 was appropriated to continue the EPI sensor development and operational acceptance testing and to continue ceilometer installations as part of the ASOS P3I program.

For FY 2011, \$6,700,000 is requested to procure the first 350 EPI sensors upon successful completion of test and evaluation and to continue ceilometer installations as part of the ASOS P3I program.

<u>Benefits:</u> The principal benefits from implementing ASWON are the continued and expanded capability for Instrument Flight Rule (IFR) flight operations; improved continuous observation capability at a significantly reduced cost from manual observations; high quality, real-time weather data communication networks and one minute updates to weather parameters to provide for rapid observation of changing conditions and awareness of conditions impacting the efficient flow of air traffic.

More specifically, the ASOS provides departure/destination weather observations to maintain and increase capacity of Part 121 commercial aircraft and Part 135 Commuter/air taxi operations, as well as cloud ceiling information for towered and non-towered airports. Aircraft operations would be significantly affected by ASOS failures that cause missing weather observation data. The current ceilometer has been out of production since 1997 and the manufacturer only agreed to provide repair support through December 2007. The ASOS

P3I Ceilometer Replacement effort will allow the ASOS to continue producing cloud ceiling reports through at least 2020.

The ASOS P3I program will provide \$631.7 million estimated benefits from year 2007 through 2020 – Source: MCR Business Case Analysis (July 12, 2007) for ASWON JRC Review. The benefits identified in the analysis were the costs avoided by commercial aviation operations that would be caused by ASOS ceilometer failures or the lack of precipitation data if the ASOS EPI sensor was not available. The benefits are estimated to start in FY 2012. The ASOS equipment must continue to provide surface weather observations at least until 2020 when NextGen alternatives may begin to offer new services to a majority of the 571 FAA field sites.

### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)	881	\$384,337.1
FY 2010 Appropriated		5,500.0
FY 2011 Request		6,700.0
FY 2012-2015	_ <del></del>	<u>2,500.0</u>
Total	881	\$399,037.1

#### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
ASOS – Pre-Planned Product Improvements	All systems	\$6,700.0

**Facilities and Equipment** 

<sup>&</sup>lt;sup>1</sup> Includes \$4,808,600 reduction of FY 1998 funds pursuant to rescission contained in P.L. 106-69, October 9, 1999. Includes FY 2001 rescission. Includes reduction for EAS in FY 2002. Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2C02	Flight Service Station Modernization - Alaska Flight Service Modernization (AFSM)	\$21,400,000	Various	F-05

<u>FAA Strategic Goals:</u> Increased Safety – To achieve the lowest possible accident rate and constantly improve safety. Objective 2 - Reduce the number of fatal accidents in general aviation.

<u>Description of Problem:</u> The Alaska Flight Service Modernization (AFSM) Mission Needs were approved in September 2006. By satisfying the below needs, increased business continuity will result. There are three areas of identified and approved needs:

- 1. <u>Automation System</u>: When the mission need was approved (September 2006), there were three legacy systems in place. The NAS baselined system Model 1 Full Capacity (located only at the three Automated Flight Service Stations (AFSS) and two non-NAS baselined systems. The legacy systems had exceeded their useful lifecycle, were difficult to support and did not meet operational requirements of NAS-SR-1000, NAS System Requirements and FAA Order 7110.10, Flight Services. During the concepts and requirements definition (C&RD) Acquisition Management System (AMS) process, the non-NAS baselined automation systems experienced security issues and reports of lost data. To resolve the security issues and loss of data, the three legacy systems were replaced by the Operational and Supportability Implementation System (OASIS). The OASIS contract period of performance ends in February 2008. FAA General Counsel advised that the OASIS contract can only extend by a single source until February 2010. To accelerate implementation of the automation portion of the AFSM, the program has been segmented. Segment 1 is a one-for-one replacement of the automation system, the voice switch along with facilities and flight service delivery points will be included in Segment 2 of the AFSM program.
- 2. <u>Voice Switch:</u> The Voice Switches at the AFSSs do not provide capability to handle additional frequency capacity and flexibility. As a result, one AFSS cannot assume the frequencies of another AFSS in case of a catastrophic outage or for flexibility and operational efficiency of providing services. The voice switch will be included in Segment 2 of the AFSM program.
- 3. <u>Flight Service Facilities:</u> The Flight Service facilities in Alaska are old, suffer from structural and safety deficiencies and generally do not meet the American's with Disabilities Act (ADA) accessibility requirements as defined and imposed by HF-STD-001, HFDS, and addressed by FAA Order 9550.8, FAA Human Factors Policy. Facilities will be addressed in Segment 2 of the AFSM program. Until AFSM Segment 2 is approved for implementation, the facilities will be sustained and updated to meet EEOSH and ADA requirements.

Until the Facilities and Flight Service Delivery phase can be completed, FAA must provide a comfortable and safe working environment for employees. Funds are being requested as part of the Alaska Flight Service Modernization (AFSM) program to sustain Alaska's flight service facilities (three Automated Flight Service Stations and 14 Flight Service Stations). Alaskan facilities have infrastructure deficiencies and require updating to meet ADA, OSHA and other local city and government codes and requirements. Existing heating, ventilation, and air conditioning (HVAC) systems fail to provide the proper environmental controls in operations, equipment, and administrative areas. In some cases, the existing HVAC systems re-circulate exhaust fumes from outside. Leaking roofs create water soaked areas – radically increasing the building mold spore count. Fire alarm systems require updating and evacuation routes/exits need to be modified to ensure safe egress. These conditions endanger personnel health and safety. Electrical upgrades and lightning protection are necessary to minimize the damage and frequency of power failures. Power failures directly affect flight service's ability to handle search and rescue efforts, provide pilot weather briefings, conduct inflight communications, and receive and distribute weather and NAS information.

<u>Description of Solution:</u> The AFSM program addresses the following shortfalls: 1) automation system, 2) voice switches at the three AFSSs, and 3) facilities and flight service delivery points resulting in increased business continuity. The AFSM program has been segmented. Segment 1 – Automation received the Investment Analysis Readiness Decision in November 2007 for a one-for-one replacement of the current

legacy (OASIS) automation system. AFSM automation received approval (January 2008) to combine initial Investment Analysis with final Investment Analysis and proceed to Final Investment Decision.

The AFSM Automation system will integrate weather graphics with text based weather and aeronautical information to provide pilot briefings. Automated weather, aeronautical and flight planning updates will be integrated with NOTAM and flight planning databases. A web portal will make data available to both FAA personnel and pilots, and will increase access to flight service information in most remote locations. Additionally, flight service buildings will be updated to meet OSHA and ADA requirements; building power, electrical and safety systems will be updated to meet current standards.

For FY 2010, \$20,000,000 was appropriated to continue procurement and implementation activities of the AFSM automation system. Implementation activities include: site preparation, installation, testing and checkout, training, joint acceptance/inspection, and commissioning. The automation system will be installed at all 17 facilities. Ongoing system activities include: maintenance and infrastructure support, funding the new system and providing corrective software fixes and 56-day updates. Additionally funding is requested to comply with OSHA, and ADA, at the following locations Deadhorse, Northway and Homer, and ensure the power, electrical and safety systems meet current standards. Also appropriated was \$100,000 for in-service engineering activities in support of the modernization program.

For FY 2011, \$21,200,000 is requested for the following:

- AFSM Automation System \$20,000,000 is requested to fund the AFSM automation system contract and includes the activities of program support, maintenance and logistics of the system, implementing corrective modifications to in-service hardware and software, second level engineering to include 56-day updates, quality assurance, information system security, configuration management, and software licenses. The AFSM automation system will be fully implemented and operational at 17 facilities.
- **Facility Sustainment** \$1,200,000 is requested for maintenance and upgrades to facilities. In FY 2011 the majority of these funds will be used for the upgrade/renovation of the Dillingham flight service station. Remaining funds will be used to complete unfinished projects from the previous year.

An additional \$200,000 is requested for Independent Operational Testing and Evaluation (IOT&E) and in service engineering.

<u>Benefits:</u> The Alaska Flight Service Modernization program maps to the FAA Flight Plan goal of Increased Safety – Reduce accidents in Alaska. With greater service availability, the result will be increased safety to the general aviation community in Alaska and reduction in accidents.

Segment 1-Automation provides life-cycle support efficiencies of NAS-baselined programs and integrated/enhanced capabilities and functions.

#### Other benefits include:

- Modernization of the Automation system.
- Expansion of situational awareness to improve efficiency.
- Increased access for General Aviation users.
- Reduced single points of failure.
- Reduced operational costs.

## **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$439,489.8
FY 2010 Appropriated		20,100.0
FY 2011 Request		21,400.0
FY 2012-2015	<u></u>	<u>30,000.0</u>
Total	1	\$510,989.8

Activity Tasks	Locations/ Quantity	Estimated Cost (\$000)
<ol> <li>AFSM Automation System</li> <li>Facility Sustainment</li> <li>Independent Operational Test and Evaluatio</li> <li>In Service Engineering</li> <li>Total</li> </ol>	n (IOT&E)  1	\$20,000.0 1,200.0 100.0 <u>100.0</u> \$21,400.0

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2C03	Weather Camera Program	\$3,200,000	1	M-08

<u>FAA Strategic Goals:</u> Increased Safety – To achieve the lowest possible accident rate and constantly improve safety. Objective 2 - Reduce the number of fatal accidents in general aviation

<u>Description of Problem:</u> In the state of Alaska, flying is equivalent to driving in the continental US (CONUS). Alaska's skyways are equivalent to the road infrastructure found throughout the CONUS making the use of small aircraft essential to everyday life. Many times flying is the only means to get children to and from school activities; to transport service providers such as clergy, doctors, dentists, and nurses; to deliver patients to medical facilities; and to supply the communities with groceries, fuel, and mail.

The combination of many pilots and extreme flying conditions has resulted in a much higher accident rate in Alaska. According to the National Institute for Occupational Safety and Health, a disproportionate number of all U.S. aircraft crashes occur in Alaska. Between 1990 and 2006, there were 1,497 commuter and air taxi crashes in the United States of which 520 occurred in Alaska – 35 percent of all commuter and air taxi crashes.

Deficient weather information in Alaska contributes to a higher risk of accidents and flight inefficiencies. Without weather information about their destination airport and route of flight, pilots cannot make informed decisions on whether it is safe to fly or continue their flight. This leads to accidents and unnecessary fuel costs. The effective use of automated weather systems is limited and costly. In November 1995, the National Transportation Safety Board (NTSB's) Safety Study on Aviation Safety in Alaska recommended that FAA assist the National Weather Service (NWS) with an evaluation of the technical feasibility and aviation safety benefits of remote color video weather observing systems in Alaska. A need for pictorial views of current weather conditions accessible to the aviation community was established.

<u>Description of Solution:</u> For FY 2011, \$3,200,000 is requested to improve safety and efficiency by providing weather visibility information in the form of near real-time camera images to aviation users. Low cost, commercially available, off-the-shelf cameras are installed at airports and en route locations. Camera images, updated every 10 minutes, are provided to the pilot and flight service station specialist for enhanced situational awareness, preflight planning and en route weather information about their destination airport and route of flight. Pilots are able to make more informed decisions on whether it is safe to fly before they are airborne and whether to continue their flight. This prevents accidents and avoids unnecessary fuel costs.

<u>Benefits:</u> Weather cameras are extremely beneficial in areas with rapidly changing terrain, weather phenomena, and as information about the safety Alaska airports and mountain passes. Weather cameras allow pilots to have weather information about their destination airport and route of flight. Pilots are able to make more informed decisions on whether it is safe to fly before they are airborne and whether to continue flight. This prevents accidents and avoids unnecessary fuel costs. Preliminary benefit data indicates weather cameras reduce 25 percent of weather related accidents within 25 miles of a weather camera sites. The continued expansion of weather cameras across the state of Alaska will help ensure FAA's safety goals are successful. Weather cameras have been identified as a specific initiative in the FAA's Flight Plan Increased Safety Goal for decreasing the number of general aviation aircraft accidents in Alaska.

The Weather Camera Program will contribute to this performance target by reducing a subset of Alaska accidents from a 2007 baseline of .28 accidents per 100,000 operations to:

FY 2009 - .22 accidents per 100,000 operations FY 2010 - .20 accidents per 100,000 operations FY 2011 - .18 accidents per 100,000 operations FY 2012 - .17 accidents per 100,000 operations FY 2013 - .16 accidents per 100,000 operations FY 2014 - .15 accidents per 100,000 operations

### **APPROPRIATION SUMMARY**

	<u>Locations</u> <sup>1</sup>	Amount (\$000)
Appropriated (FY 1982-2009) FY 2010 Appropriated FY 2011 Request FY 2012-2015 Total	119 23 24 <u>55</u> 221	\$25,300.0 <sup>2</sup> 3,800.0 3,200.0 <u>15,600.0</u> \$47,900.0

### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
Alaska Weather Cameras	24	\$3,200.0

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<sup>&</sup>lt;sup>1</sup> The number of locations has increased significantly from the FY 2010 submission. The increase is due to a December 2007 Final Investment Decision and new program baseline that reflects a lower cost implementation philosophy. As a result, additional sites are being installed at the same budget level.

<sup>&</sup>lt;sup>2</sup> Includes reduction pursuant to P.L. 108-199, January 23, 2004. Only prior year funds that were appropriated under Safe Flight 21, item 1A02 for Weather Cameras are reflected here. Prior year funds under 1A01 for the expansion of ADS-B are shown under item 1A10.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2D01	Very High Frequency Omnidirectional Range (VOR) with Distance Measuring Equipment (DME)	\$5,000,000	Various	N-06

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> The Very High Frequency Omnidirectional Range (VOR) with Distance Measuring Equipment (VOR/DME) is a ground-based electronic system that provides azimuth information to aircraft. When VOR/DME signal transmission deterioration occurs due to site encroachment, such as tree growth, construction of bridges, buildings, etc., it is necessary to restore these facilities to their full service volume. Tactical Air Navigation (TACAN) Antennas provide azimuth and distance information for military aircraft and distance information for commercial aircraft. The TACAN system sustainment is needed to allow continued access to En Route and Terminal approaches. The equipment at most of these sites is over 35 years old, which is beyond the originally estimated service life.

<u>Description of Solution:</u> This program replaces, relocates, converts and modifies Very High Frequency Omnidirectional Range (VOR) facilities (including Very High Frequency Omnidirectional Range (VOR) with Distance Measuring Equipment (VOR/DME) to improve the VOR performance. This program also provides for the continued field installation of approximately 100 remaining low-power Tactical Air Navigation (TACAN) antenna retrofit kits that were procured with prior year funds.

In FY 2010, \$5,000,000 was appropriated to fund engineering and technical services support; begin new acquisition activities, convert approximately three VOR/DME facilities; relocate one VOR/DME; and continue necessary sustainment implementation efforts for those systems that are no longer operational or supportable due to life-cycle issues. This funding will help to mitigate the risk of isolated capability gaps throughout the National Airspace System.

For FY 2011, \$5,000,000 is requested to fund engineering and technical services support; continue new acquisition activities, convert approximately three VOR/DME facilities; relocate one VOR/DME; and continue necessary sustainment implementation efforts for those systems that are no longer operational or supportable due to life-cycle issues. This funding will help to mitigate the risk of isolated capability gaps throughout the National Airspace System.

<u>Benefits:</u> The Very High Frequency Omnidirectional Range (VOR) with Distance Measuring Equipment (VOR/DME) program maps to the Federal Aviation Administration (FAA) goal of Reduced Congestion by making air traffic flow more efficient over land and sea. The replacement, relocation, conversion, or modification of VOR facilities will enable FAA to maintain a highly reliable, safe, and efficient ground based VOR, VOR/DME, and Tactical Air Navigation (TACAN) systems until the use of Global Positioning System is widespread. The improved availability of this program provides enhanced aircraft routing and increased airport capacity.

## **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$252,414.4 <sup>1</sup>
FY 2010 Appropriated		5,000.0
FY 2011 Request		5,000.0
FY 2012-2015	<del></del>	<u>12,500.0</u>
Total	Various	\$274,914.4

### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
New Acquisition Activities		\$800.0
2. Relocate VOR Facilities		2,000.0
<ol><li>Convert VOR/DME Facilities</li></ol>		1,200.0
4. Logistics/Engineering Support		400.0
5. In Service Engineering		<u>600.0</u>
Total	Various	\$5,000.0

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<sup>&</sup>lt;sup>1</sup> Includes \$970,100 reduction of the FY 1998 funds pursuant to rescission contained in P.L. 106-69, October 9, 1999. The FY 2001 appropriation has been adjusted to reflect the rescission pursuant to P.L. 106-554. Includes reduction pursuant to P.L.108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2D02	Instrument Landing System (ILS) – Establish/Sustain	\$7,800,000	Various	N-03

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> An ILS provides electronic guidance to pilots for safe aircraft landing during inclement weather and reduced visibility. The system includes a localizer, which gives lateral guidance to the runway centerline, a glide slope or landing beam to give vertical guidance, and marker beacons to show the aircraft progress as it approaches the landing field. The ILS sends information to instruments in the cockpit so that the pilot can maintain a perfect flight path to the runway even in low visibility. Some planes are equipped with an autopilot, which can directly receive ILS signals to automatically guide the plane to a landing.

Approach lighting and other equipment such as distance measuring equipment (DME), approach lighting systems (ALS), runway visual range (RVR) indicators, and non directional beacons (NDB) are part of the ILS approach and also aid the pilot in landing.

There are three categories of ILS. The lowest altitude at which a pilot is able to decide whether to land or abort (decision height) and how far the pilot can see the runway (runway visual range) defines each category.

- Category I: Decision Height (DH) 200 feet and Runway Visual Range (RVR) 2,400 feet (with touchdown zone and centerline lighting, RVR 1,800 feet).
- Category II: DH 100 feet and RVR 1,200 feet.
- Category IIIa: No DH or DH below 100 feet and RVR not less than 700 feet.
- Category IIIb: No DH or DH below 50 feet and RVR less than 700 feet but not less than 150 feet.
- Category IIIc: No DH and no RVR limitation, requires an autopilot.

Approximately 1,200 runway ends are equipped with an ILS in the U.S. Of these, approximately 125 are more than 25 years old and must be replaced because they have exceeded their expected service life and their original manufacturer no longer provides support. Furthermore, FAA receives funding to purchase additional systems but until recently, received little money for site preparation and installation. Site conditions can affect ILS component performance so FAA must select ILS sites carefully. Large buildings or hangars can affect localizer signals and uneven terrain distorts glide slope signals. Once a site is selected, FAA must rectify any environmental impacts. Installers must also dig trenches to install electrical cable and communication lines. All of this construction work adds considerably to the cost of providing ILS service.

The FAA is aggressively pursuing implementation of satellite navigation but until that transition is complete, ILS remains the world standard for providing approach and landing services. In the next decade, more than 700 currently deployed ILS will exceed their service life. Many of these will have to be replaced.

<u>Description of Solution:</u> This program procures, installs, and replaces ILS's with a grouping of electronic devices (i.e., localizers, glides slopes, Approach Lighting Systems (ALS), and other ancillary aids). It provides a precision approach capability for landing aircraft with precise electronic guidance and visual aid information. This precision approach capability allows aircraft to land in weather conditions that would otherwise be prohibited, and enable airports to meet increasing traffic demands.

In FY 2010, \$12,575,000 was appropriated to fund engineering and technical services support; provide incremental implementation funding for on-going ILS projects; and continue acquisition and implementation activities to increase operational availability for Category I/II/III ILS approaches". This includes procuring 11 ILS systems, attaining service availability (establish) for three ILS locations and attaining service availability (upgrade) for four ILS locations".

For FY 2011, \$7,800,000 is requested to fund engineering and technical services support; provide incremental implementation funding for on-going ILS projects; and continue acquisition and implementation activities to increase operational availability for Category I/II/III ILS approaches. This includes procuring four ILS systems, attaining service availability (establish) for two ILS locations and attaining service availability (upgrade) for four ILS locations".

Full implementation of satellite navigation and large-scale equipment decommissioning is decades away. In the meantime, the NAS continues to expand and users demand increased capacity, particularly in low visibility conditions. FAA must replace aging equipment and ensure that new equipment is installed correctly.

<u>Benefits:</u> The ILS program maps to the FAA goal of Greater Capacity by increasing airport capacity to meet projected demand and reduce congestion. The ILS provides both vertical and horizontal guidance information to the pilot to allow safe landings to touchdown and rollout.

The approach lighting provides the necessary visual cues for the pilot to safely land an aircraft when conducting an instrument approach. The ILS along with required approach lighting systems directly impact both system safety and capacity. This program provides the aircraft the ability to land in Instrument Meteorological Conditions, which increases the capacity to runways with ILS precision approach equipment. Weather-caused flight disruptions delays, diversions, over-flights, and cancellations impose economic penalties on both aircraft operators and users. A precision approach capability allows an airport to remain open to traffic when it would otherwise have closed thereby avoiding weather caused flight delays.

Establishment of new ILS's and replacement of aging ILS equipment will improve reliability and availability, therefore reducing the outage rate and the maintenance man-hours. Moreover, the ability to land aircraft in Instrument Meteorological Conditions (IMC) allows increased capacity to runways equipment with ILS precision approach and greatly improves Air Traffic Controller's workload.

#### APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$553,738.0 <sup>1</sup>
FY 2010 Appropriated		12,575.0
FY 2011 Request		7,800.0
FY 2012-2015		<u>26,000.0</u> <sup>2</sup>
Total	Various	\$600,113.0

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. Procure/Install/Sustain CAT I/II/III ILS's		\$6,200.0
Logistics/Engineering Support		<u>1,600.0</u>
Total	Various	\$7,800.0

<sup>&</sup>lt;sup>1</sup> Includes \$24,000,000 appropriated in FY 1999 and \$18,000,000 appropriated in FY 2000 under "Next Generation Landing Systems". Includes \$340,400 reduction of FY 1998 funds pursuant to rescission contained in P.L. 106-69, October 9, 1999. The FY 2001 appropriation has been adjusted to reflect the rescission amount pursuant to P.L. 106-554. Includes \$2,727,087 reduction of the FY 2001 funds pursuant to rescission P.L. 107-87, December 18, 2001. Includes reduction for EAS in FY 2002. Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004. Includes \$11,994,000 for the American Recovery and Reinvestment Act.

<sup>&</sup>lt;sup>2</sup> Future requirements will be based on activity levels and local situations that are validated on a year-to-year basis.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2D03	Wide Area Augmentation System (WAAS) for GPS	\$95,000,000	Various	N-12

<u>FAA Strategic Goals:</u> Increased Safety – To achieve the lowest possible accident rate and constantly improve safety. Objective 2 - Reduce the number of fatal accidents in general aviation.

<u>Description of Problem:</u> Many of the aircraft flying in the NAS lack seamless navigation capability and many runways in the NAS lack navigation aids that deliver stable vertical guidance in all weather conditions. The FAA provides vertically guided navigation to less than 18 percent of all public use runway ends in the NAS. FAA cannot afford to provide horizontal and vertical navigation for precision approach operations for all runway ends using ground-based navigation equipment such as the Instrument Landing System (ILS).

Similarly, proposed expansion of the NextGen airspace system requires precise Position Navigation and Timing (PNT) satellite navigation capabilities to facilitate access to more airports and runways.

### 1. Wide Area Augmentation System (WAAS) for GPS (\$85,000,000):

<u>Description of Solution:</u> WAAS, a satellite based navigation technology allows any qualifying airport in the NAS to have vertical and horizontal guidance without expensive legacy navigation hardware installed at each runway. WAAS increases safety and enhances capacity in the NAS at a reduced lower cost than all other alternatives. WAAS continuously broadcasts a GPS-like signal in space for horizontal and vertical navigation across the NAS. WAAS consists of a network of 38 precisely surveyed ground reference stations that monitor the global positioning system (GPS) satellite signals. The ground reference stations are distributed across the continental United States and Alaska at FAA facilities. Three master stations collect the reference station data and calculate corrections and integrity messages for each GPS satellite. The WAAS messages are broadcast to user receivers via leased navigation transponders on two commercial geostationary (GEO) satellites. The user receiver on the aircraft applies the corrections and integrity information from the WAAS message to obtain the precise navigation service. Today, WAAS users can conduct en route operations over 100 percent of the NAS. In addition, they can conduct precision approach operations to qualifying airports throughout 95 percent of the 48 contiguous states without the requirement of conventional ground based navigation hardware.

WAAS is also currently supporting early opportunities for many of the NextGen capabilities. Early operational opportunities identify those users and applications of WAAS enabled navigation services that support proposed NextGen operational capabilities and concepts of operations to be used within the near term period of 2011 to 2015. Early operational opportunities represent a goal for expediting NextGen applications. The primary opportunities are in the RNAV and RNP areas of developing satellite-based navigation routes and terminal operations to improve safety, enhance efficiencies, and minimize environmental impacts.

For FY 2011, \$85,000,000 is requested to address ground system sustainment, satellite costs, and avionics standards for dual frequency modernized GPS. FAA is continuing to sustain and enhance WAAS precise horizontal and vertical positioning service for localizer performance vertical (LPV) in the contiguous states and Alaska. FY 2011 includes funds for technology refresh consisting of subsystem replacement and communication upgrades of Commercial Off-the-Shelf (COTS) components and custom application software. The baseline architecture requires an ongoing evaluation of hardware and software reliability and obsolescence to select hardware items for replacement and custom software development, test and integration into the overall system. The total cost of technology refresh activities is \$18,830,000 in FY 2011. This activity goes beyond normal refresh activities since it must address a transition away from the use of L2P GPS signal as mandated by the DoD. This transition will be costly for WAAS since it relies very heavily the use of the L2P signal to generate safety-critical messages to users.

This request includes \$26,760,000 for satellite and ground uplink lease services. NAS implementation activities, totaling \$21,000,000, is comprised of flight standards support, aeronautical surveys, WAAS procedure development, flight inspection, international coordination, avionics standards for dual frequency

modernized GPS, and new air traffic implementation projects for WAAS. This activity represents a major initiative of WAAS development, addressing the widespread deployment of WAAS procedures throughout the NAS, as well as improving the utility to users.

Technology evolution, \$4,480,000, is requested for Stanford University, Boston College, Ohio University, and Jet Propulsion Laboratory. These institutions will perform threat model assessments, conduct ionospheric analysis in support of WAAS and conduct safety analyses to support WAAS integrity. Technical Engineering and Program support, \$13,920,000, is requested to support the WAAS program hardware and software refresh and review engineering documentation.

<u>Benefits:</u> The WAAS program maps to the FAA goals of Increased Safety and Increased Capacity. WAAS is the first navigation aid capable of providing vertical guidance, or three dimensional guided instrument approaches, to pilots during all phases of flight, in all weather conditions at all locations throughout the NAS. WAAS increases the availability of vertical guidance to all aviation operations. WAAS reduces accidents and saves lives. A Flight Safety Foundation Report shows that reliable, accurate vertical guidance can reduce landing accidents by seven-fold. WAAS increases airport capacity. A highly accurate and reliable navigation signal available throughout the NAS to all aircraft is a capacity multiplier. The WAAS investment increases the availability of highly accurate and reliable horizontal and vertical navigation to all users.

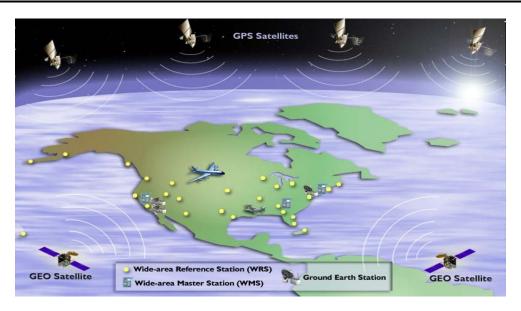
By increasing procedures and expanding WAAS coverage, customers equipped with WAAS receivers and increase the total benefit realized by WAAS. It is estimated that several tens of million WAAS enabled receivers have been sold for non-aviation purposes with no encouragement from the FAA to non-aviation industries such as maritime, surveying, recreation, and agriculture.

WAAS will reach over \$980 million in safety benefits and \$4.7 billion in efficiency benefits over the program life-cycle. Benefits of \$177 million for VOR reduction are realized by implementing WAAS. These benefits are accrued over the life cycle and are in undiscounted constant year dollars for FY 2009.

Reductions in the number of ground based navigation aids and the associated cost savings are expected to begin in 2010. The FAA will retain a minimum operating network of ground based navigation aids. This permits feeder airports to establish scheduled transport operations and eases the load on major airports during bad weather. Airports can also exploit WAAS's inherent flexibility of providing vertical guidance at both runway ends for any runway to maintain or increase arrivals depending on changing traffic and weather conditions.

### 2. WAAS Aeronautical Surveys (\$10,000,000):

<u>Description of Solution:</u> For FY 2011, \$10,000,000 is requested for new aeronautical surveys to support FAA flight plan goals for WAAS procedural development for 500 additional runways per year. The aeronautical surveys are conducted for each runway end to identify obstructions that might penetrate the obstacle free zone for a vertically guided instrument approach. The FY 2011 \$10,000,000 request for surveys is in addition to procedure and survey costs identified in item 1 above to account for increased survey production costs resulting from new standards established by the Airports organization.



<u>Benefits</u>: The WAAS program maps to the FAA goals of Increased Safety and Increased Capacity. WAAS is the first navigation aid capable of providing vertical guidance, or three dimensional guided instrument approaches, to pilots during all phases of flight, in all weather conditions at all locations throughout the NAS. WAAS increases the availability of vertical guidance to all aviation operations. WAAS reduces accidents and saves lives. A Flight Safety Foundation Report shows that reliable, accurate vertical guidance can reduce landing accidents by seven-fold. WAAS increases airport capacity. A highly accurate and reliable navigation signal available throughout the NAS to all aircraft is a capacity multiplier. The WAAS investment increases the availability of highly accurate and reliable horizontal and vertical navigation to all users.

By increasing procedures and expanding WAAS coverage, customers will equip with WAAS receivers and increase the total benefit realized by WAAS. It is estimated that several million WAAS enabled receivers have been sold for non-aviation purposes with no encouragement from the FAA to non-aviation industries such as maritime, surveying, recreation and agriculture. WAAS will reach over \$980 million in safety benefits and \$4.7 billion in efficiency benefits over the program life-cycle. Benefits of \$177 million for VOR are realized by WAAS enabling reduction or avoidance of the expensive and high maintenance cost ground based navigation aids. Reductions in the number of ground based navigation aids and the associated cost savings are expected to begin in 2010. A minimum operating network of ground based navigation aids will be retained. These benefits are accrued over the life cycle and are in undiscounted constant year dollars for FY 2009.

WAAS enables feeder airports to have reliable landing capability in all weather conditions, permitting feeder airports to establish scheduled transport operations and unloading major hub airports during bad weather. Airports can also exploit WAAS's inherent flexibility of providing vertical guidance at both runway ends for any runway to maintain or increase arrivals depending on changing traffic and weather conditions.

## APPROPRIATION SUMMARY

	<u>Locations</u>	<u>Amount (\$000)</u>
Appropriated (FY 1982-2009)	Various	\$1,439,824.8 <sup>1</sup>
FY 2010 Appropriated		91,000.0
FY 2011 Request		95,000.0
Baseline Requirement		1,421,500.0 <sup>2</sup>
Total	Various	\$3,047,324.8

<sup>&</sup>lt;sup>1</sup> Includes reduction pursuant to P.L. 108-199, January 23, 2004. Also includes FY 2003/2004 approved reprogramming.

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<sup>&</sup>lt;sup>2</sup> LPV Segment Only

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. Technology Refresh and Equipment Replacement		\$18,840.0
2. GEO Satellite and Development		26,760.0
3. NAS Implementation		21,000.0
4. Technology Evolution		4,480.0
5. Technical Engineering and Program Support		13,920.0
6. New Surveys		10,000.0
Total	Various	\$95,000.0

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2D04	Runway Visual Range (RVR)	\$5,000,000	Various	N-08

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> The RVR provides air traffic controllers and pilots with critical meteorological visibility data that is used to allow take offs or landings during limited visibility conditions. Approximately 20 percent of all RVR systems in the NAS exceed their 20 years of Economic Service Life (ESL). Consequently, there is an increasing likelihood of loss of service due to life-cycle issues associated with the older RVR systems currently in the NAS. Furthermore, the older RVR equipment is mounted on rigid structures. If struck accidentally during departure or landing, severe damage to aircraft and possible loss of life could result.

<u>Description of Solution:</u> The older RVR systems are being replaced with new-generation RVR equipment that will eliminate the emerging life-cycle issues (i.e., Reliability, Availability, and Maintainability) associated with the older RVR systems currently in the NAS. Furthermore, the new-generation RVR equipment is mounted on frangible, low-impact-resistant structures that break away if struck by aircraft during takeoff or landing.

In FY 2010, \$5,000,000 was appropriated for engineering and technical services/support; procurement of seven RVR systems; final incremental funding for on-going RVR installation projects; and funding for nine new RVR installation projects.

For FY 2011, \$5,000,000 is requested for engineering and technical services/support; procurement of 10 RVR systems; final incremental funding for on-going RVR installation projects; and funding for 10 new RVR installation projects.

Benefits: The two main areas from which cost savings can be expected are:

- Reduced Flight Disruption: Weather caused flight disruptions delays, diversions, over-flights, and cancellations impose economic penalties on both aircraft operators and users. Favorable RVR information is required to land during category II, III and many category I precision approaches. This allows an airport to remain open to traffic when it would otherwise have closed, avoiding weather-caused flight disruptions. These benefits are calculated by estimating the number of flight disruptions avoided multiplied by the unit cost for a flight disruption. The unit cost for a flight disruption is based on assumed operating scenarios that describe the flow of events when a flight is disrupted.
- Improved Safety: The benefit realized is the reduction or elimination of facilities and costs associated with aircraft accidents involving low-impact resistant structures versus aircraft accidents involving rigid approach structures. Use of low-impact-resistant structures reduces fatalities and the severity of damage to aircraft that accidentally strike these structures during departure or landing.

### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$141,200.7 <sup>1</sup>
FY 2010 Appropriated		5,000.0
FY 2011 Request		5,000.0
FY 2012-2015		17,000.0 <sup>2</sup>
Total	Various	\$168,200.7

Activity Tasks	Locations/ Quantity	Estimated Cost (\$000)
<ol> <li>Equipment Procurement</li> <li>Final incremental funding for on-going RVR installation p and initial incremental funding for nine new projects</li> </ol>		\$1,815.0 2,000.0
3. Logistics/Engineering Support Total	Various	<u>1,185.0</u> \$5,000.0

<sup>&</sup>lt;sup>1</sup> Includes \$685,500 reduction of FY 1998 funds pursuant to rescission contained in P.L. 106-69, October 9, 1999. The FY 2001 appropriation has been adjusted to reflect the rescission amount pursuant to P.L. 106-554. Includes reduction for EAS in FY 2002. Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.

<sup>2</sup> Future requirements will be based on activity levels and local situations that are validated on a year-to-year basis.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2D05	Approach Lighting System Improvement Program (ALSIP)	\$5,000,000	Various	N-04

<u>FAA Strategic Goals:</u> Increased Safety – To achieve the lowest possible accident rate and constantly improve safety. Objective 1 - Reduce commercial air carrier fatalities.

<u>Description of Problem:</u> Many of the older approach lighting systems in the National Airspace System (NAS) have rigid approach lighting structures. Aircraft that accidentally strike these structures during departure or landing can incur substantial damage. The National Transportation Safety Board (NTSB) recommended replacing the rigid approach lighting structures with low-impact resistant structures that collapse or break apart upon impact.

<u>Description of Solution:</u> This program procures and installs frangible approach lighting equipment, including the High Intensity Approach Lighting System with Sequenced Flashing Lights (ALSF-2) and Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR). ALSF-2's are installed at runways requiring Category II/III precision approaches. MALSRs are installed at runways requiring Category I precision approaches. The entire ALSF-2 and MALSR systems are replaced when non-frangible structures are replaced.

In FY 2010, \$10,337,000 was appropriated for replacement of the Seattle-Tacoma International Airport runway 16C ALSF-2 support structure; initial funding for three MALSR replacement projects; procurement of MALSR systems and ancillary equipment; and engineering and technical services/support. Also included in the appropriated amount are funds to procure four additional sites.

For FY 2011, \$5,000,000 is requested for continued funding for replacement of the Mc Ghee Tyson Airport, Knoxville, TN RWY 23R ALSF-2; initial funding for three MALSR replacement projects; procurement of five MALSR systems and ancillary equipment; and engineering and technical services/support.

<u>Benefits:</u> This program reduces fatality incidents and costs associated with aircraft accidents involving rigid approach lighting structures through the use of low-impact-resistant structures.

- Improved Safety: Safety benefits are estimated by comparing incidents and costs of life and equipment
  for collision accidents with rigid structures and non-rigid structures to estimate a differential cost per
  incident.
- Reduce Flight Disruption: Weather-caused flight disruptions delays, diversions, over-flights, and cancellations impose economic penalties on both aircraft operators and users. An operational MALSR or ALSF-2 allows an airport to remain open to traffic, when it would otherwise have closed, avoiding weather-caused flight disruptions. These benefits are calculated by estimating the number of flight disruptions avoided multiplied by the unit cost for a flight disruption. The unit cost for a flight disruption is based on assumed operating scenarios that describe the flow of events when a flight is disrupted.

### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$380,624.2 <sup>1</sup>
FY 2010 Appropriated		10,337.0
FY 2011 Request		5,000.0
FY 2012-2015		<u> 14,000.0</u>
Total	Various	\$409,961.2

### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. Replace ALSF-2 at Mc Ghee Tyson Airport, Knoxville,	TN RWY 23R	\$3,000.0
2. Initial funding for three MALSR replacement projects		450.0
Ancillary Equipment Procurement		500.0
4. Procure MALSR Systems		285.0
5. Logistics/Engineering Support		<u>765.0</u>
Total	Various	\$5,000.0

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<sup>&</sup>lt;sup>1</sup> The FY 2001 appropriation has been adjusted to reflect the rescission amount pursuant to P.L. 106-554. Includes reduction for EAS in FY 2002. Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004. Includes \$806,000 for the American Recovery and Reinvestment Act.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2D06	Distance Measuring Equipment (DME)	\$4,100,000	Various	N-09

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> Obsolete tube-type DME equipment collocated with the instrument landing systems (ILS) and terminal non-directional beacons is decreasing system efficiency. Replacement parts are largely unavailable. By providing the procurement and installation of upgraded, state-of-the-art DME systems, efficiency will improve by reducing the downtime required for the maintenance and repair of the antiquated DMEs.

Low-power distance measuring equipment (LPDME) is a critical part of the ILS during the aircraft's final approach to landing. LPDME replaces the Marker Beacons. An increase of the number of aircraft utilizing the equipment contributes to DME saturation and a shutdown of the systems. In addition, older equipment does not meet present availability and maintainability requirements. The FAA requires navigation systems of 99.95 percent availability or greater. Previous LPDME are unreliable, maintenance intensive and lack required Remote Maintenance Monitoring (RMM) capability. The capacity of older systems is less than 50 aircraft simultaneously and the mean time to repair can be greater than one hour.

<u>Description of Solution:</u> This program will replace older LPDME with new solid state LPDMEs. The LPDMEs will replace older marker beacons at existing ILS locations and be implemented at new ILS locations. The availability of the new LPDME is greater than 99.95 percent, mean time to repair is less than one-half hour, mean time between failures is 14,231 hours, and mean time between outages is 15,193 hours.

There are 451 identified Commercial Aviation Safety Team (CAST) requirements. However, FAA recommends implementation of only 177. This number would cover 80 percent of all operations. For safety reasons, the industry wants to discontinue step-down non-precision approach procedures whenever possible. The use of LPDMEs supports this operational goal for older, less-equipped aircraft, until these older aircrafts are outfitted with more advanced equipment

For FY 2010, \$6,000,000 was appropriated to fund engineering and technical services support; provide incremental implementation funding for on-going LPDME projects; and continue acquisition and implementation activities to increase operational availability at approximately 25 existing and newly established runway ends.

For FY 2011, \$4,100,000 is requested to fund engineering and technical services support; provide incremental implementation funding for on-going LPDME projects; and continue acquisition and implementation activities to increase operational availability at approximately 15 existing and CAST/newly established runway ends.

<u>Benefits:</u> The LPDME program maps to the FAA goal of Reduced Congestion by increasing airport capacity to meet projected demand. The equipment can handle more than 100 aircraft simultaneously, thus increasing airport capacity by a factor of two. Cost savings can be expected at a location by discontinuing relevant stepdown non-precision approach procedures.

Additional savings are will accrue when the marker beacons are replaced, through leasing the cost of the land, and discontinued maintenance of the older equipment. In addition, new equipment has the required RMM that can be maintained and certified remotely.

## **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$32,015.8
FY 2010 Appropriated		6,000.0
FY 2011 Request		4,100.0
FY 2012-2015		<u> 10,000.0</u>
Total	Various	\$52,115.8

### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost (\$000)
1. Equipment Procurement and Installation		\$3,600.0
2. Logistics/Engineering Support		500.0
Total	Various	\$4,100.0

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<sup>&</sup>lt;sup>1</sup> The FY 2001 appropriation has been adjusted to reflect the rescission amount pursuant to P.L. 106-555. Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2D07	Visual Navaids - Establish/Expand	\$3,800,000	Various	N-04

<u>FAA Strategic Goals:</u> Increased Safety – To achieve the lowest possible accident rate and constantly improve safety. Objective 1 - Reduce commercial air carrier fatalities.

<u>Description of Problem:</u> The Commercial Aviation Safety Team (CAST), a group including FAA, airline and airport personnel, has identified 781 runway ends that require implementation of a visual precision-like vertical approach capability. This capability will reduce the possibility of a controlled flight into terrain accident during approach and landing. The FAA has agreed to implement this capability at the 170 highest priority runways by installing Precision Approach Path Indicator (PAPI) systems.

<u>Description of Solution:</u> The FAA will procure and install PAPI systems to satisfy the CAST requirements. In addition, the older Runway End Identifier Lights (REIL) systems are being replaced with new-generation REIL equipment that will eliminate the emerging life-cycle issues (i.e., Reliability, Availability, and Maintainability) associated with the older REIL systems currently in the NAS.

In FY 2010, \$3,200,000 was appropriated for engineering and technical services/initial support; nine PAPI systems; final incremental funding for ongoing PAPI installation projects; and initial funding for nine new PAPI installation projects. An additional \$500,000 was appropriated for in-service engineering.

For FY 2011, \$3,200,000 is requested for engineering and technical services/initial support; eight PAPI systems; final incremental funding for ongoing PAPI installation projects; and initial funding for eight new PAPI installation projects. An additional \$600,000 is requested for in-service engineering.

### Benefits:

Improved Safety - Safety benefits stem from the reduction of accidents. Safety benefits are estimated by comparing incidents and costs of non-precision approach accidents with the same for precision-like approach accidents to estimate a differential cost per approach. Use of a precision-like landing capability of a PAPI will reduce accidents during landing. The REILs increase safety and capacity during landing by providing a pilot with the location of the approach end of the runway.

Reduced Controlled Flight Into Terrain - Controlled flights into terrain causes fatalities and imposes economic costs on aircraft operators. The visual precision-like vertical landing capability of the PAPI reduces the number of controlled flights into terrain.

In-service engineering allows for immediate response to emerging technology solutions. Funding is requested for ongoing engineering support of all prototyping efforts.

### APPROPRIATION SUMMARY

	<u>Locations</u>	<u>Amount (\$000)</u>
Appropriated (FY 1982-2009)		\$197,418.4 <sup>1</sup>
FY 2010 Appropriated		3,700.0
FY 2011 Request		3,800.0
FY 2012-2015		<u>8,400.0</u>
Total	Various	\$213,318.4

<sup>&</sup>lt;sup>1</sup> The FY 2001 appropriation has been adjusted to reflect the rescission amount pursuant to P.L. 106-554. Includes reduction for EAS in FY 2002. Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.

**Facilities and Equipment** 

<u>Acti</u>	vity Tasks	Locations/ Quantity	Estimated Cost (\$000)
1.	Equipment Procurement (PAPI Systems)		\$410.0
2.	On-going Installation Projects and New Installations Projects		2,240.0
3.	Logistics/Engineering Support		550.0
4.	In Service Engineering		600.0
Tota	al	Various	\$3,800.0

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2D08	Instrument Flight Procedures Automation (IFPA)	\$600,000	Various	A-14

<u>FAA Strategic Goals:</u> Organizational Excellence – Ensure the success of the FAA's mission through stronger leadership, a better trained and safer workforce, enhanced cost-control measures, and improved decision-making based on reliable data. Objective 3 - Improve financial management while delivering quality customer service.

<u>Description of Problem:</u> The legacy system, Instrument Approach Procedures Automation (IAPA) creates new Instrument Flight Procedures (IFP's) and sustains the 15,000+ existing IFP's. Developed in the early 1970's, the system is technically obsolete and increasingly unable to support the required safety and efficiency initiatives in the FAA Flight Plan. The legacy has no centralized database support and cannot be integrated into the FAA Enterprise Architecture.

The cost to maintain this system has escalated drastically. Specifically, the maintenance workload for existing IFP's has escalated at a rate of 45 percent each year since the mid-1990's. In addition, the demand for obstacle evaluation studies has doubled since the late 1990's to approximately 50,000 requests per year. These requests are expected to increase an additional 60 percent in the next ten years due to high definition television, cellular telephone industries, and wind turbines, etc. The majority of this workload is accomplished through manual processes with very limited automation support.

The increasing maintenance workload drastically diminishes the organization's ability to support the agency's initiatives such as: Required Navigation Performance (RNP), Area Navigation (RNAV), Wide Area Augmentation System (WAAS), Distance Measuring Equipment (DME), and Standard Terminal Automation Replacement System (STARS).

<u>Description of Solution:</u> This request will provide funding to replace the current IAPA system with next generation automated tools that generate products using fully integrated solutions for all aspects of visual and instrument flight procedures. In addition, this new system must be able to calculate, retain, and share the intricate business rules needed to design IFP's while automatically assessing impact of obstacles. The automated process must have the ability to evaluate new obstructions as well as perform necessary activities associated with changes in magnetic variation. Collaboration with the U.S. Air Force will save resources by developing a common tool that can still support unique agency requirements. The following projects are part of a tool suite called Instrument Flight Procedure Automation (IFPA):

- Instrument Procedures Development System (IPDS): IPDS provides a complete U.S. Terminal Procedures (TERPS) and International (ICAO) PANS-OPS criteria evaluation tool for the development or amendment of instrument flight procedures. IPDS will replace the legacy IAPA system and provide full coverage of new requirements, including international criteria.
- Obstacle Evaluation System (OE-IFR): OE-IFR will provide automation of existing or proposed obstacles'
  impact on IFP's, saving many staff hours expended in the current manual process. This module will be
  developed as a component of IPDS.
- Instrument Flight Procedures (IFP): IFP provides a repository for all IFP's and the ability to generate all 8260 series forms, as well as Aeronautical Radio Incorporated (ARINC) encoded IFP's for loading to aircraft flight management systems.
- Airports and Navigation Aids (AIRNAV): AIRNAV is a critical database and maintenance application for Airports, Runways, NavAids, and Obstacles used to support IFP development and maintenance.
- Automated Procedures Tracking System (APTS): APTS provides the ability to forecast and schedule IFP development, inspection and publication workloads.

In FY 2010, \$7,900,000 was appropriated for development of the IPDS, OE, IFP, AIRNAV and APTS tools.

For FY 2011, \$500,000 is requested for continued development of the IPDS and OE tools, and \$100,000 is requested to begin technology refresh analysis activities.

The performance-based National Airspace System requires an investment in systems integration and the automation of aviation data for safety and reliability purposes, as well as an automated electronic means of information sharing. The FY 2010 appropriated amount will provide funds for the replacement of the current IAPA system with next generation automated tools that create products using fully integrated solutions for all aspects of visual and instrument flight procedures. This new system will be able to calculate, retain, and share the intricate business rules needed to design IFP's while automatically assessing the impact of obstacles. The automated process will have the ability to evaluate new obstructions as well as perform necessary activities associated with changes in magnetic variation. Collaboration with the U.S. Air Force (USAF) will save resources by developing a common tool that leverages USAF resources already expended on their Global Procedures Designer (GPD) tool.

Benefits: IFPA will provide greater capacity by increasing the airport arrival capacity for eight major metropolitan areas, and at the OEP airports when visibility is restricted. The new IFPA suite will replace, modernize, and update IAPA systems in support of both visual and instrument flight procedure development such as approaches, standard terminal automation replacement system, airways, and departures. IFPA will greatly increase automated capabilities for all types of precision and non-precision flight procedures, including conventional and area navigation (RNAV) for en-route, feeders, arrivals and departures. In addition, the new program will build an integrated obstacle evaluation application, replacing a manual process. Existing systems cannot generate and integrate the necessary physical, temporal and spatial information needed to develop, inspect and publish flight procedures as well as evaluate the impact of obstacles. New technology is now available to meet these requirements.

While supporting FAA flight plan goals, continued support of IFPA will specifically provide the following overall benefits:

- Capability for ongoing maintenance of over 15,000 instrument flight procedures in use at over 4,000 paved airports, accommodating requirements for precision approaches and departures using Global Positioning System/area navigation, wide area augmentation system and local area augmentation system
- Efficient response to Air Traffic Obstacle Evaluation (OE) requests, addressing effects to instrument flight
  procedures, alleviating manual effort currently required for 50,000+ OE requests annually. In addition,
  application of TERPS rules as part of automated obstacle evaluation will be an important benefit.
- Replacement of IAPA's old 1970 obsolete computer hardware and software.
- Conversion of current IAPA software to OMB, DOT and FAA recommended architecture, providing
  opportunities for improved integration as well as a foundation for anticipated flight procedure demand
  well beyond FY 2009.

### APPROPRIATION SUMMARY

	<u>Locations</u>	<u>Amount (\$000)</u>
Appropriated (FY 1982-2009)		\$73,892.6 <sup>1</sup>
FY 2010 Appropriated		7,900.0
FY 2011 Request		600.0
FY 2012-2015		8,000.0
Total	Various	\$90,392.6

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<sup>&</sup>lt;sup>1</sup> Includes reduction pursuant to P.L. 108-199, January 23, 2004.

Activity Tasks	<u>Locations</u>	Estimated Cost (\$000)
1. Instrument Procedures Development System (IPDS)		\$500.0
2. Technology Refresh Cost Analysis		100.0
Total	Various	\$600.0

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2D09	Navigation and Landing Aids – Service Life Extension Program (SLEP)	\$6,000,000	Various	N-04

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets project demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> On average, 60 percent of all visual and navigation aids in the NAS are greater than 23 years old and exceed their 20 years of Economic Service Life (ESL) by three or more years. Because many of these systems exceed their ESL, service disruptions are possible. The existing medium intensity approach light system with runway alignment indicator lights (MALSR) and approach lighting system with sequence flasher 2 (ALSF-2) in-pavement steady burning approach lights are maintenance intensive. As a result, excessive runway down time exists that negatively impacts airport capacity.

There are approximately 800 MALSR systems in the NAS. The following provide a distribution of the MALSR systems in the NAS.

<u>Manufacturer</u>	<u>Systems</u>	Years in Service
GTE-Sylvania	30	34
SEPCO-Crouse Hines	42	33
Godfrey	127	33
Multi Electric	347	32
ADB-ALNACO	19	20
AVW Electronic (Remote	98	18
Maintenance Monitoring Capability)		
DME Corp. (RMM Capability)	137	10 or less

There are approximately 150 ALSF systems in the NAS. The following provides a distribution of the ALSF systems in the NAS.

<u>Manufacturer</u>	<u>Systems</u>	Years in Service
General Electric	3	47
Westinghouse	2	45
Hollingsworth	1	41
Heavy Duty	5	33
Godfrey	41	25
Airflow	46	20
New Bedford Panoramex	52	8 or less
<u>Manufacturer</u>	<u>Systems</u>	Years in Service
MK-1D	37	25
MK-1E	72	22

<u>Description of Solution:</u> The older navigation aids are being replaced with new generation navigation aids that will eliminate the emerging life-cycle issues associated with the older navigation aids currently in the NAS. Additionally, the existing MALSR and ALSF-2 in-pavement steady burning approach lights will be replaced. Replacing aging, obsolete visual navigational aids and other ground-based navigation and landing aids maintains current en route, approach, and landing capabilities at various airports throughout the United States.

In FY 2010, \$9,000,000 was appropriated for procure semi-flush fixtures, continue new technology initiatives. Complete installations and engineering of three MALSR and one ALSF-2, extend the service life of seven

ALSF-2 systems at OEP airports, by replacing the constant current regulator and installing a monitor for Category II/III approaches, fund shortfalls in carryover projects, and provide engineering and technical services support.

For FY 2011 \$6,000,000 is requested to procure and install LDIN lights, semi-flush fixtures, the Replacement Lamp Monitoring System (RLMS) at five OEP airports, procure, engineer and install Medium Approach Light System with Runway Alignment Identifying Lights (MALSR) at two locations; leap-frog (install) five ILS's removed from OEP airports; replace electrical cables at two OEP locations in conjunction with the RLMS installations; commission ten Runway End Identifications Lights (REILs), fund shortfall in carryover projects, and provide engineering and technical services support.

Regional Projects: The FAA must upgrade and improve various area navigation and landing aids on a continuing basis to satisfy operational requirements. Some examples are replacing guide wires for light stations, replacing cable between light stations, replacing glideslope wooden towers, replacing aluminum light towers with fiberglass towers, replacing DME antenna pedestals, converting antenna arrays, recabling localizer antenna, relocating navigation equipment. This funding request allows for relocating approximately four navigation systems, replacing one glideslope wooden tower, replacing two light station guide wires, replacing four localizer antenna platforms, and repairing a pier with navigation equipment.

<u>Benefits:</u> The replaced and upgraded equipment will help to reduce runway downtime and technician time associated with maintenance and repair of the visual and navigation aids. Additionally, the new in-pavement steady burning approach lights will require less maintenance, thus reducing runway downtime. These benefits will increase safety and airport capacity. The installation of RLMS' will reduce the need for technicians to physically monitor the ALSF-2's during adverse weather conditions.

#### APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$23,826.0
FY 2010 Appropriated		9,000.0
FY 2011 Request		6,000.0
FY 2012-2015		20,000.0
Total	Various	\$58,826.0

### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

	Locations/	Estimated Cost
Activity Tasks	Quantity	<u>(\$000)</u>
Equipment Sustain/Replace/Install	Various	\$6,000.0

Facilities and Equipment

197

<sup>&</sup>lt;sup>1</sup> Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes \$2,900,000 for the American Recovery and Reinvestment Act.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2D10	VASI – Replacement – Replace with Precision Approach Path Indicator	\$4,000,000	Various	N-04

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 2 - Increase reliability and on-time performance of scheduled carriers.

<u>Description of Problem:</u> The Visual Approach Slope Indicator (VASI) system was initially deployed in the 1960's within the NAS and requires replacement with more modern systems. The VASI systems are no longer the visual slope indicator standard for the International Civil Aviation Organization (ICAO). The ICAO recommended that all airports serving international operations replace the VASI lights with Precision Approach Path Indicator (PAPI) lights to standardize on the visual vertical guidance information.

<u>Description of Solution:</u> Phase 1 of the replacement program procures and installs PAPI systems to replace the older VASI systems at International Runways. This first phase of the program addresses the approximately 329 runway ends serving international operations. To date, FAA has completed 143 replacements with approximately 64 still remaining. Once the ICAO requirement is met, Phase 2 of the program will replace the remaining 850 VASI systems serving non-international operations.

In FY 2010, \$4,500,000 was appropriated for engineering and technical services/support; procurement of 10 PAPI systems, final incremental funding for on-going VASI replace PAPI projects and initial funding for 11 new replacement projects.

For FY 2011, \$4,000,000 is requested for engineering and technical services/support; procurement of 12 PAPI systems, final incremental funding for on-going VASI replace PAPI projects and initial funding for 12 new replacement projects.

<u>Benefits:</u> This program contributes to the FAA Strategic Goal of International Leadership. The PAPI system complies with the ICAO standard.

This replacement program:

- Fulfills the ICAO standard to install PAPI systems at all international runways.
- Responds to Airline Pilot's Association and General Aviation requests for PAPI's at validated approaches within federally controlled airspace.
- Reduces maintenance person-hours.
- Eliminates the currently supply support deficiencies related to lack of uniformity between various VASI configurations.

#### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$55,370.0
FY 2010 Appropriated		4,500.0
FY 2011 Request		4,000.0
FY 2012-2015		22,000.0
Total	Various	\$85,870.0

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
PAPI Equipment Procurement		\$570.0
2. On-going and New Requirements Projects		2,940.0
3. Logistics/Engineering Services Support		490.0
Total	Various	\$4,000.0

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2D11	Global Positioning System (GPS) Civil Requirements	\$58,500,000	Various	N-12

<u>FAA Strategic Goal:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

Description of the Problem: The National Space-based PNT policy (NSPD-39) requires civil agencies to fund new and unique civil GPS capabilities beyond the second and third civil signals already contained in the current GPS, specifically, the L1C signal and civil signal monitoring with DOT serving as the lead civil agency. FAA will include the funding to implement L1C and civil signal monitoring in its budget request for FY2009-2013 and technical oversight and National Coordination Office (NCO) support costs to serve as DOT's implementing agency for the civil funded capabilities. The global positioning system (GPS) is a satellite-based system that provides position, navigation, and timing (PNT) service to the U.S. government (USG) and the world with no direct user charges. GPS provides two PNT services; the precise positioning service (PPS), using the dual L1-C/A and L2 signals, and the Standard Positioning Service (SPS), using the single L1-C/A signal. Only the SPS is available for worldwide use by the civil community. Currently, GPS consists of second generation satellites (GPS-II) and the operational control segment (OCS). The GPS program is entering into a period of transition from GPS-II to the third generation (GPS-III) and the modernized operational control segment (OCX).

<u>Description of Solution</u>: Implementation of the L1C signal will consist of system design and development activities performed by the GPS-III and OCX prime contractors, managed by the USAF GPS Wing. In FY 2011, the work required to implement L1C is expected to consist of system design and development activities and program management. The GPS Signal Monitoring system will consist of a worldwide network of 18-21 GPS monitor stations connected to two processing facilities. The monitor stations must be installed at worldwide geographically dispersed locations such that every GPS satellite can be continuously monitored from at least two monitor stations. The monitor stations will collect real-time measurements of the GPS signals (L1C, L1-C/A, L2C, and L5) and forward this information to the processing facilities where a suite of software algorithms will monitor the accuracy, integrity, continuity, and availability of performance to verify that modernized GPS is suitably safe for use.

For FY 2011, \$58,500,000 is requested to accomplish the following activities:

- Program Management \$5,010,000 to prepare specifications, establish a development contract, and the
  resources necessary to monitor cost, schedule, and technical performance. \$3,000,000 of which is
  allocated for GPS Wing Civil Applications (GPC) and NCO support.
- Systems Engineering \$8,700,000 to develop the satellite architecture and system design for the L1C signal and new GPS monitor station receivers to collect the L1C, L1-C/A, L2C, and L5 measurements, establish new user avionics receiver standards, and algorithm description documents for the signal monitoring algorithms located at the processing facilities. This effort will also include site surveys, design of the terrestrial communications system, and implementation planning required prior to fielding of the ground infrastructure.
- Hardware and Software Development \$33,290,000 to design, procure, integrate, test, and factory
  acceptance of GPS monitor station and the processing facility equipment. The design and prototyping of
  the signal monitoring software algorithms will also be started.
- Test and Evaluation and Logistics Support \$11,500,000 is requested for test and evaluation planning, data collection to support prototyping, and logistics support planning for the GPS monitor station and processing facility equipment. Documentation will be developed to establish the operation standards and training needs for the GPS Signal Monitoring system.

<u>Benefits</u>: The Civil Unique GPS Capabilities (L1C and civil signal monitoring), are expected to provide a common signal that all global navigation satellite systems (GNSS) can use to provide improved accuracy, availability, and reliability of positioning, navigation, and timing services worldwide..

## **APPROPRIATION SUMMARY**

	Locations	Amount (\$000)
Appropriated (FY 1982-2009) FY 2010 Appropriated FY 2011 Request FY 2012-2015 Total  COST ESTIMATE OF WC	    ORK TO BE FUNDED THIS YEAR	\$21,800.0 43,400.0 58,500.0 102,600.0 \$226,300.0
Activity Tasks	Locations/ Quantity	Estimated Cost (\$000)
<ol> <li>Program Management</li> <li>System Engineering</li> <li>Hardware/Software Development</li> <li>Test and Evaluation/Data Collection and Documentation/Logistics Support</li> </ol>	  	\$5,010.0 8,700.0 33,290.0 11,500.0
Total		\$58,500.0

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2D12	Runway Safety Areas – Navigational Mitigation	\$20,000,000	Various	Z-OW

<u>FAA Strategic Goals:</u> Increased Safety - To achieve the lowest possible accident rate and constantly improve safety. Objective 1 - Reduce commercial air carrier fatalities.

<u>Description of Problem</u>: The Federal Aviation Administration's (FAA) runway safety program includes numerous programmatic elements intended to improve the overall safety of the Runways and Runway Safety Areas (RSA). The Runway Safety Area must be free of all objects that are three inches above the grade and are not frangible. The program will focus on and accelerate efforts to complete RSA improvements. One key element of this program is RSA Sterilization. Current standards for Runway Safety Area (RSA) Sterilization include provisions for clear areas, surface drainage, and weight supportability. The FAA currently owns and operates numerous NAVAIDs that violate the RSA clear area provision of 14 CFR Part 139. Although measured incremental progress has been made to correct these FAA-owned NAVAID RSA violations, a concerted, focused initiative must now be launched to ensure compliance of FAA owned NAVAIDs with 14 CFR 139 pertaining to RSA. PL-109-115 requires the FAA to complete RSA compliance with 14 CFR 139 not later than December 31, 2015 which is inclusive of FAA owned NAVAIDs.

<u>Description of Solution</u>: The initiative to correct FAA-Owned NAVAID violations in RSA will take the corrective action on those Navigation systems that are not in compliance with the Runway Safety Area requirements. The scope of the work to be accomplished will range from the installation of frangible connections on identified structures to the relocation of facilities within RSA if no other solution is available. The objects are in two classifications: those fixed by function and those not fixed by function. Those objects that are fixed by function and will not be able to perform their intended function if relocated will, in all likelihood, become compliant with the addition of frangible mounting. Those objects that are not fixed by function will have to be moved outside of the RSA. Below is a listing of objects by classification.

#### Objects fixed by function:

Runway End Identifier Lights (REIL)
Precision Approach Path Indicator (PAPI)
Visual Approach Slope Indicator (VASI)
Inner Marker (IM)
Approach Light System (ALS)
Runway Visual Range (RVR)
Access Roads
Radar Reflectors
Power Panels (case by case)
Integrated Control Cabinets (ICC)
Engineered Materials Arresting System (EMAS)
Glide Slope Antennas
Antennas
Maintenance Stands (Frangible Connections)

#### Objects not fixed by function:

Localizer (most cases when not possible to relocate) NAVAID Buildings (power sheds) Transformers Power Panels (case by case)

The activities associated with this effort will be prioritized according to the major airport hubs, their supporting reliever airports and then other airports with reported NAVAID violations. The FAA has identified approximately 2,500 objects that need to be addressed at various airport locations. These activities are expected to be completed by the end of Calendar Year 2015.

<u>Benefits</u>: The primary benefit is the prevention of loss of life from aircraft striking non-compliant Navigational Aids located in designated Runway Safety Areas.

Although FAA reports having relocated or modified NAVAIDs in more than 60 RSAs over the last 3 years, approximately 38 percent (394 of 1,016) of all RSAs still contain one or more non-compliant NAVAIDs—including some that could pose considerable safety risks to aircraft and their passengers in the event an aircraft enters the RSA.

Large NAVAIDs that are not moved or made frangible can pose a considerable safety risk to aircraft and passengers when struck during an overrun. For example, in June 1975 a Boeing 727 crashed into several non-frangible approach lighting systems (ALS) towers while attempting to land at John F. Kennedy Airport in New York. Of the 124 persons aboard, 113 died of injuries received in the crash. Likewise, in November 1976, an aircraft taking off at Stapleton International Airport in Denver Colorado collided into two non-frangible ALS structures resulting in 14 injuries.

In response to the Stapleton incident, the NTSB recommended that FAA expedite retrofitting of ALS structures with frangible materials so that the improvements would be completed within 3 to 5 years. However, more than 30 years later, we found that non-frangible ALS remain in RSAs and continue to pose a safety risk to aircraft and passengers. For example, the ATO is aware of several non-frangible ALS structures located within the RSAs at Sacramento International Airport, but it has not funded efforts to remove them or make them frangible.

#### APPROPRIATION SUMMARY

	<u>Locations</u>	Total <u>Amount (\$000)</u>
Appropriated (FY 1982-2009)		\$0.0
FY 2010 Appropriated		0.0
FY 2011 Request		20,000.0
FY 2012-2015		80,000.0
Total	Various	\$100,000.0

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
Navigational Mitigation	Various	\$20,000.0

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2E01	Fuel Storage Tank Replacement and Monitoring	\$6,300,000	Various	F-13, M-39

<u>FAA Strategic Goals:</u> Environmental Stewardship – Reduce pollution and other adverse effects of transportation and transportation facilities. Objective 1 - Adopt transportation policies and promote technologies that reduce or eliminate environmental degradation.

<u>Description of Problem:</u> Fuel storage tanks (FST) support the critical operations of emergency power generators at FAA facilities across the NAS. The loss of integrity in the tank systems may result in critical facility outages during periods of emergency generator operations. A loss of integrity in the tank systems also poses a pollution threat to the surrounding built and natural environment.

FSTs have historically contained materials that could cause environmental harm or result in personal injury if released. In response to the risk of accidental release, the Federal government, the various State legislatures, local county and city jurisdictions have all passed laws specifying the minimum requirements for construction, installation, removal, and operation of fuel tank systems. Additional requirements affecting storage system operations have been established under the jurisdiction of state and local building codes, fire protection codes, airport authority requirements, and occupational safety and health acts. Failure to comply with all elements of the regulatory requirements exposes the FAA to risk of fines and other penalties including the right to use and refill the tank systems ("red tag" violations).

The FST systems installed prior to and including late-1980s have reached the end of their planned 20 year operations life cycle. The 3,005 NAS tank systems managed under the FST Program life cycle sustainment guidelines must be replaced or upgraded to assure continued integrity. For example:

- Due to loss of fuel source, emergency power generators were inoperable and resulted in facility outages.
   Examples include: Cleveland Air Route Traffic Control Center (ARTCC) (36 minutes) and Sacramento ATCT (1 hour, 34 minutes) Fuel system blockage; Nashville TDWR Failed fuel supply line (17 hours, 3 min).
- Approximately 220 gallons of fuel released from the FST system at the Teterboro NJ ATCT engine generator as a result of component failure. Remediation efforts continue with remediation estimates exceeding \$75,000.
- Approximately 275 gallons of fuel released from the FST system at the Juneau AK SSC facility heater tank as a result of impact by falling ice.
- Suffolk County NY environmental regulators issued Notices of Violation for failure to meet minimum construction and operations standards. The violations at two facilities on Islip, NY MacArthur airport subject the FAA to potential fines in excess of \$3,500 a day.
- Wisconsin Division of Environmental and Regulatory Services issued Administrative Orders requiring replacement of six tank systems not meeting minimum construction standards. Replacement costs exceeded \$700,000. There are 220 FST systems currently operating beyond lifecycle replacement guidelines.

<u>Description of Solution:</u> The FAA will continue life cycle sustainment of the active FST inventory to support mission-critical activities and to assure compliance with regulatory requirements. The FST systems have varying life cycles depending on the specific hardware. FST integrity failures will be abated immediately to minimize adverse impact to personal and environmental safety, restore availability of the systems for National Airspace System (NAS) operations, and preclude regulatory fines.

Implementation of the ARTCC and Prime Power (PX) fuel storage system upgrades are major program initiatives. These critical facility fuel systems have been redesigned to provide enhanced technician control and increase operational readiness capacity. Components of the fuel storage system are being upgrade to comply with changing Environmental Protection Agency (EPA) storage tank regulations.

For FY 2011, \$6,300,000 is requested to fund:

- Two ARTCC fuel storage system upgrades.
- One prime power fuel storage system upgrade.
- Emergency system repairs necessitated by unforeseen integrity losses.
- Modification efforts under environmental regulatory requirements.
- Backlogged tank replacements.

<u>Benefits</u>: The FST lifecycle sustainment programs maps to FAA goal of greater capacity by avoiding delays due to NAS equipment outages. Executing an FST life cycle sustainment program will achieve cost benefits by reducing the risk of leaking FST systems, minimizing adverse impacts to personal and environmental safety, restoring availability of the systems for NAS operations, and avoiding regulatory fines of up to \$32,500 per day.

#### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$247,774.0 <sup>1</sup>
FY 2010 Appropriated		6,200.0
FY 2011 Request		6,300.0
FY 2012-2015		<u>26,500.0</u>
Total	Various	\$286,774.0

#### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
<ol> <li>ARTCC/Prime Power Initiative</li> <li>FST systems sustainment</li> <li>Total</li> </ol>	3 <u>Various</u> 3	\$4,945.0 <u>1,355.0</u> \$6,300.0

1

<sup>&</sup>lt;sup>1</sup> Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2E02	Unstaffed Infrastructure Sustainment (UIS)	\$14,100,000	Various	F-12, M-08

<u>FAA Strategic Goals:</u> Greater Capacity - Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

#### Description of Problem:

<u>UIS</u>: The FAA owns thousands of buildings whose sole purpose is to house, support and protect the National Airspace System (NAS) Communications, Surveillance, and Navigation aids. These structures are failing. They suffer from leaking roofs, deteriorated foundations and walls, inadequate air conditioning systems and electrical systems, and severely eroded roads that hinder access by FAA technicians. A majority of these 23,000 structures were built during the 1940's and 1950's. There are currently over \$185,300,000 in maintenance projects that have been deferred. This backlog will continue to grow and continue to threaten the FAA's ability to add capacity, unless funding for maintenance is increased.

<u>Seismic:</u> The FAA is required by Public Law (42 USC 7701), Executive Order (12699 and 12941) and DOT Policy (SS-98-01) to fund and execute a cost effective, long term earthquake risk mitigation program. The Seismic Safety Risk Mitigation program is the FAA's effort to comply with these mandates, protect the safety of FAA employees, protect the buildings and equipment in earthquake prone regions, control the cost of mitigation and reduce the cost of avoidable repairs following an earthquake. Significant and unacceptable life safety risks have been identified at over 50 FAA facilities. These risks place the safety of FAA employees and the flying public in jeopardy. The potential for injury, loss of life, loss of buildings and equipment, and loss of hundreds of millions of dollars in Trust Fund revenue from NAS disruptions are entirely avoidable.

<u>Description of Solution:</u> In FY 2010, \$17,000,000 was appropriated to make repairs to the facilities that have the greatest impact to the NAS, with an emphasis toward OEP airports. Modifications and refurbishments are required to extend the service life of these structures. These maintenance actions include replacing antiquated heating, ventilation and air conditioning (HVAC); replacing old electrical wiring; repairing damaged roofs, foundations and walls; doors and windows, refurbishment of steel towers, clearing of vegetation and grading of rutted access roads. Also, \$1,200,000 was appropriated for in-service engineering.

For FY 2011, \$12,800,000 is requested. The Unstaffed Infrastructure Sustainment (UIS) Program proactively sustains infrastructure supporting the NAS to enable the delivery of NAS systems required availability. Proactive NAS sustainment includes major repairs to and replacement of real property and structures which are normally not staffed. Sustainment of the unstaffed infrastructure includes:

- Major repair and replacement of FAA property including: access roads, grounds, fencing, storm water controls, parking lots, security lighting, and walkways.
- Major repair and replacement of FAA facilities including: buildings, shelters, roofs, storage buildings, plumbing, heating, ventilating and air conditioning (HVAC) equipment, electrical panels and distribution wiring, alarms and lighting.
- Major repair, refurbishment and replacement of NAS antenna and equipment towers.

Also requested for FY 2011 is \$1,300,000 for in-service engineering.

<u>Benefits:</u> The UIS program will reduce the backlog of deferred maintenance by 10 percent. The majority of unstaffed facilities provide surveillance, communications, weather, and air traffic assistance to remote areas in a very efficient and cost saving manner. While no labor costs are necessary to operate these facilities, the facilities require periodic upgrades. The program extends the service-life of the buildings and equipment, preventing system outages and providing cost savings for FAA, the airline industry and the public.

In-service engineering allows for immediate response to emerging technology solutions. Funding is requested for on-going engineering support of all prototyping efforts.

### APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$299,485.3 <sup>1</sup>
FY 2010 Appropriated		18,200.0
FY 2011 Request		14,100.0
FY 2012-2015		64,300.0
Total	Various	\$396,085,3

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
Structural Improvements		\$12,800.0
2. In Service Engineering	<del></del>	_1,300.0
Total	Various	\$14,100.0

<sup>&</sup>lt;sup>1</sup> Includes reduction for EAS in FY 2002. Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004. Includes \$4,300,000 for the American Recovery and Reinvestment Act.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2E03	Aircraft Related Equipment Program	\$9,000,000	Various	M-12

<u>FAA Strategic Goals:</u> Increased Safety – To achieve the lowest possible accident rate and constantly improve safety. Objective 1 - Reduce commercial air carrier fatalities

<u>Description of Problem:</u> The Flight Inspection (FI) aircraft fleet must be continually updated to meet the requirements of the NAS and help the NAS evolve to a performance-based system. Currently, 68 percent of the flight inspection (FI) fleet is limited in its support capabilities. The aircraft avionics and flight inspection mission systems require regular updating to meet Next Generation requirements. A performance based NAS allows civil aircraft to navigate airspace more safely and with greater flexibility than the current ground based system. Performance based initiatives will be achieved through implementation of Required Navigation Performance (RNP) area navigation, in addition to local area augmentation system (LAAS) and wide area augmentation system (WAAS). To meet these safety and greater capacity objectives, the FI aircraft fleet must be updated to continue to certify an expanding number of RNAV RNP, RNP, LAAS, and WAAS approaches at the lowest possible cost. The Flight Inspection aircraft fleet is composed of 29 specially equipped aircraft.

<u>Description of Solution:</u> This program will provide technical equipment upgrades and/or replacement to existing aircraft and mission equipment to meet performance requirements and ensure NAS safety by extending the expected life-cycle of 20 years to more than 30 years. Implementation of these systems will contribute to NextGen.

For FY 2011, \$9,000,000 is requested to continue ongoing initiatives from prior years and to implement new starts for the critical safety and capacity initiatives in the FAA Flight Plan:

- Next Generation Automated Flight Inspection System (NAFIS): NAFIS is a system that provides Flight Inspection (FI) capabilities in areas inaccessible by current FI aircraft. Technology upgrades are required to meet FI system modernization and increase independent truth system accuracy requirements to support the Future Air Navigation System (FANS) activity of the International Civil Aviation Organization (ICAO) and the Agency's Free Flight 2000 Program. The Automated Flight Inspection System (AFIS) is continually refreshed to comply with evolving NAS and the new space based Air Traffic System mission performance technology. Continued development of a NAFIS will employ an independent truth system and avionics suite to certify specialized instrument approaches and enable Standard Instrument Approach Procedures to locations that have been unable to have instrument approach capabilities. NAFIS uses advances in technology to reduce system weight resulting in increased aircraft range and fuel savings and will be adaptable to future FI aircraft.
- BE-300 Navigational Flight Management System (FMS) and Avionics Systems; Service Life Extension Program: This will replace the current navigational system, interior and avionics suite in the BE-300 model FI aircraft with new spaced based Air Traffic System capable flight management system. This upgrade will also assist in a reduced weight resulting in increased endurance and fuel savings, thereby, providing lower RNAV/RNP and WAAS unit costs.
- <u>Challenger 601 Navigational FMS and Avionics Systems:</u> Replace current navigational system, interior and avionics suite. The existing Challenger 601 aircraft avionics are 16 years old.

<u>Benefits:</u> The improvements provided by this program will help the agency achieve FAA Flight Plan safety and increased capacity objectives.

• NAFIS Transition from AFIS: This will increase the safety composite index by providing a means to ensure the integrity of existing, new, and improved navigational aids introduced into the NAS. The FAA will keep pace with the increase in NAS facilities and will control costs while supporting FAA Flight Plan by providing the flying public greater safety and quality of service, and ensuring a safe air traffic system. NAFIS will provide for infrastructure integrity and accuracy required in the evolving NAS. This project also

- is a replacement for a system that can not be sustained with current equipment. The AFIS hardware is out of date and is not supportable.
- BE-300 Navigational Flight Management System (FMS) and Avionics Systems; FMS will replace two older existing systems and provide reduced weight and power usage and increase limited cockpit space. Standardizing the FI fleet will enable the agency to achieve FAA Flight Plan goals of safety and system efficiency by improving capabilities for the new space-based Air Traffic System and support Operational Evolution Plan (OEP) initiatives to expand system capacity (RNP, WAAS, LAAS, FI capability).
- <u>Challenger 601 Upgrade</u>: This will replace two older less capable systems and standardize the FI fleet.

### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$112,784.0 <sup>1</sup>
FY 2010 Appropriated		10,000.0
FY 2011 Request		9,000.0
FY 2012-2015		40,000.0
Total	Various	\$171,784.0

### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
Automated Flight Inspection System (AFIS)/		45.500.0
Next Generation Flight Inspection System (NAFIS)		\$6,600.0
2. BE-300 Navigation, Flight Management and Avionics		2,000.0
3. Challenger 601 Upgrade/SLEP		<u>_400.0</u>
Total	Various	\$9,000.0

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<sup>&</sup>lt;sup>1</sup> Includes reduction pursuant to P.L. 108-199, January 23, 2004.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
2E04	Airport Cable Loop Systems – Sustained Support	\$7,000,000	Various	F-10

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> On-airport FAA maintained telecommunications systems use direct burial copper cable to transport FAA information from airport traffic control towers (ATCT) to other FAA facilities. The majority of the cable installed at airports has exceeded its life expectancy, resulting in an increase in emergency repairs that reduce the safe and efficient flow of aircraft. The overall age of existing cable systems, along with a need for the system to provide increased capacity and availability, led to the development of the Airport Cable Loop Systems Sustain Support program.

All towers and on-airport surveillance, navigation, landing, and communication nodes send and receive information via this communications infrastructure, the communications backbone of the airport. Most of the communications within the NAS is comprised of aged copper cable (some are beyond their respective service life), first installed when the facilities were commissioned. The majority of the cable has been spliced numerous times, which has further reduced the cables service life and capacity, as well as increased the maintainability requirements to keep the services that are running over the cable operationally available for air traffic control.

Surveillance, landing, and air communications systems at many large airports are endangered because of the condition of the underground cables supporting these systems. Much of the control and signal cables serving critical airport facilities are 25 to 40 years old and badly deteriorated. This makes the NAS vulnerable to catastrophic failure. Existing airport control cable configurations do not allow for redundant communication paths between these systems and towers. Most of the NAS control and signal cable infrastructure is copper and is highly susceptible to damage from lightning strikes, electromagnetic pulses, electromagnetic interference, corrosion, and rodents. The cable infrastructure supporting the new NAS systems being brought on line must be upgraded.

<u>Description of Solution:</u> The Airport Cable Loop Program replaces deteriorating or antiquated cable systems at major airports with redundant/diverse fiber optic communication loops. On-going projects include fiber optic loops at Chicago O'Hare, Atlanta, LaGuardia, Chicago Midway, Portland, Las Vegas and Memphis.

In FY 2010, \$6,000,000 was appropriated to begin projects for John F. Kennedy, Baltimore, Cleveland, Ft. Lauderdale, Philadelphia, Oakland, Ontario, Los Angeles, and Van Nuys airports. In addition, this funding will cover continuing work at Newark, Cincinnati Northern Kentucky, Boston-Logan Phase 2, Charlotte Douglas, and Covington airports. The funding will provide for unsupportable, aged cable loop equipment upgrade, and reconfiguration projects, program support, project engineering, training, logistics support, testing, and configuration management.

For FY 2011, \$7,000,000 is requested to continue the projects for John F Kennedy, Baltimore, Cleveland, Ft. Lauderdale, Philadelphia, Oakland, Ontario, Los Angeles, Newark, and Van Nuys airports. In addition, this funding will cover new work at Tampa, San Diego, and Honolulu airports. The funding will also provide for unsupportable aged cable loop equipment upgrade and reconfiguration projects, program support, project engineering, training, logistics support, testing, and configuration management.

<u>Benefits:</u> The cable loop program maps to FAA's goal of increased capacity by reducing or eliminating communications cable related outages. The program also supports the goal of increased on-airport safety by reducing or eliminating A and B runway incursions. System reliability and safety will be enhanced due to increased system performance from multiple pathways provided by the cable loop system. Standardizing requirements will simplify logistics, configuration management, training, procurement, and depot support.

There will now be a standard building block approach for installation and service. The FAA will realize savings in costs, resources, and time. Using fiber optic cable instead of copper will reduce the possibilities of interference and impedance faced by copper wire currently in use. Fiber optic cable is impervious to extremes in weather, lightning strikes, electromagnetic pulses, and electromagnetic interference. By using fiber optics, the agency will be assured of bandwidth and capacity to serve future systems.

### APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)	40	\$59,815.1 <sup>1</sup>
FY 2010 Appropriated		6,000.0
FY 2011 Request		7,000.0
FY 2012-2015	<u></u>	20,000.0
Total	40	\$92,815.1

### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. Site Engineering and Fiber Optic Installation		\$6,245.0
2. Program Management Support		565.0
3. Engineering Support/Design/Documentation		<u> 190.0</u>
Total	Various	\$7,000.0

<sup>&</sup>lt;sup>1</sup> Includes \$1,300,000 reduction of the FY 2002 funds pursuant to supplemental P.L.107-206, January 23, 2002. Includes reduction for EAS in FY 2002. Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2E05	Alaskan NAS Interfacility Communications System (ANICS)	\$12,100,000	Various	C-17

<u>FAA Strategic Goals:</u> Increased Safety – To achieve the lowest possible accident rate and constantly improve safety. Objective 2 - Reduce the number of fatal accidents in general aviation

<u>Description of Problem:</u> The Federal Aviation Administration's (FAA) Alaskan Satellite Telecommunications Infrastructure (ASTI) is based on technology platforms that are obsolete. In many cases, system components are no longer available for needed replacement and repairs. Since the ASTI provides Alaska with 90 percent of inter-facility communications for critical, essential, and routine air traffic control services, a technical refresh is needed to ensure future system availability to meet critical air traffic requirements. Currently, the required availability of 0.9999 is not being met. Availability is below 0.999 and declining. In addition, ASTI lacks a systematic funding process that addresses equipment aging and climatic impacts.

As a result of system aging, equipment obsolescence, and extreme Alaskan weather, trend data indicates increased system degradation of sites installed in the mid-1990's. Equipment that is impacted includes cabling, antenna feed assemblies, power boxes, deicers, controllers, cards, radomes, and ancillaries. Some parts and software are no longer supported by the manufacturer and need to be replaced.

<u>Description of Solution:</u> The FAA has established a six-year schedule (FY 2007 – FY 2012) for the technical refresh of the ASTI system estimated to cost \$40,800,000.

For FY 2011, \$12,100,000 is requested to complete antenna radome replacements, install a network monitoring and control system, and upgrade multiplexers. FY 2011 activities also include the installation of satellite communications at 64 facilities.

<u>Benefits:</u> The ASTI technical refresh will improve and sustain the availability of the infrastructure and reduce future operations and maintenance costs by \$78.6 million from FY 2009 through FY 2030. In FY 2007, ASTI facility availability was 99.8 percent. The technical refresh of aging facilities in Alaska will improve facility availability and enable more efficient use of FAA assets.

### APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)	87	\$133,806.9 <sup>1</sup>
FY 2010 Appropriated		9,000.0
FY 2011 Request	27	12,100.0
FY 2012-2015	_ <del></del>	_10,700.0 <sup>2</sup>
Total	114	\$165,606.9

<sup>&</sup>lt;sup>1</sup> Includes \$2,000,000 reduction for the FY 1999 Essential Air Services reprogramming. Also includes \$786,900 reduction of FY 1998 funds pursuant to rescission contained in P.L. 106-69, October 9, 1999.

<sup>&</sup>lt;sup>2</sup> Future requirements are currently under review.

## COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. Antenna/Radome Replacement		\$1,850.0
Remote Monitoring Control System		2,550.0
3. Multiplexers/Upgrade Satellite Equipment		7,200.0
4. Program Support	_ <del></del>	500.0
Total	Various	\$12,100.0

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
2E06	Facilities Decommissioning	\$6,400,000	Various	F-26

<u>FAA Strategic Goals:</u> Organizational Excellence – Ensure the success of the FAA's mission through stronger leadership, a better trained and safer workforce, enhanced cost-control measures, and improved decision-making based on reliable data. Objective 3 - Improve financial management while delivering quality customer service. Initiative: Improve management of FAA's real property assets by optimizing maintenance costs and disposing of excess assets.

<u>Description of Problem:</u> The June 2005 GAO report "Air Traffic Operations, the Federal Aviation Administration Needs to Address Major Air Traffic Operating Cost Control Challenges" states that FAA needs to expand its efforts to cut operational costs to address an expected gap between budget forecasts and expenses. The report recommends accelerating ground-based navigational aids decommissioning.

In recent years FAA has decommissioned many redundant or underused facilities. Funding was identified in FY 2007 to begin the divestiture (including environmental testing, infrastructure demolition, and property restoration) of these facilities. In addition, under NextGen, FAA plans to decommission entire classes of facilities such as Non-Directional Beacons and Remote Communications facilities.

### This program funds:

- Final disposition of decommissioned infrastructures and property restorations, meeting all applicable laws, including, but not limited to: the appropriate removal and disposal of hazardous materials; appropriate disposal of debris, evaluation of impact upon cultural preservation, historic preservation, wetlands, natural resource protection issues.
- Conducting Phase I Environmental Due Diligence Audit (EDDA) reports for government owned properties, as required by the General Services Administration (GSA) and other applicable laws.
- Investigating and documenting the structures to be removed at each site and associated restoration.

<u>Description of Solution:</u> This program results in the final disposition of decommissioned buildings, access roads and other real property.

For FY 2011, \$6,400,000 is requested to fund the final disposition of decommissioned infrastructures and associated property restorations, conducting EDDAs, and investigate required work as listed in the bullets shown above.

<u>Benefits:</u> Funded work will results in the release of decommissioned real property from FAA inventory and associated cost avoidance of: property lease fees; property maintenance fees (grass cutting, snow removal, etc); utility fees, and communications frequency fees.

#### APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$10,900.0
FY 2010 Appropriated		5,000.0
FY 2011 Request		6,400.0
FY 2012-2015		<u>10,000.0</u> <sup>1</sup>
Total	Various	\$32,300.0

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<sup>&</sup>lt;sup>1</sup> Future requirements will be based on activity levels and local situations that are validated on a year-to-year basis.

## COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
<ol> <li>Facility Disposition</li> <li>Program Management Total</li> </ol>	Various  Various	\$5,000.0 <u>1,400.0</u> \$6,400.0

Budget <u>Item</u> :	<u>Title</u> :	Request:	Locations:	CIP <u>Item(s</u> ):
2E07	Electrical Power Systems - Sustain/Support	\$95,000,000	Various	F-11, M-39

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> The National Airspace System (NAS) power system infrastructure is critical to both maintaining existing capacity and increasing the capacity of the NAS in the future. Analysis of NAS outage data shows a significant link between delays and the reduced reliability and aging of the NAS power system infrastructure. Failure of the aging power infrastructure has led to significant delays and resulted in investigations by the National Transportation Safety Board and the Department of Transportation Inspector General. The Power Systems Group is proactively addressing this situation to mitigate future risk from NAS power outages.

Of the \$4.6 billion NAS power system infrastructure, \$2.2 billion represents the power cable at airports essential to the operation of all air traffic. Seventy-five percent of this cable is well beyond the condition and age that commercial power companies would continue to operate. This has led to major airport disruptions. A proactive program is planned to tackle this significant risk. The current infrastructure is failing to deliver the power reliably, resulting in outages and delays. The FAA must maintain the current Air Traffic Control (ATC) system capacity by replacing unreliable power system equipment to avoid increasing power outages and service interruptions in the future. The following components of the ATC power system require immediate attention:

- Power Cable: The top 300 airports require 18 million feet of power cable to sustain operations. Seventy percent of these power cables are at a high risk of failure, which could lead to extended delays and outages. Replacement of this cable costs \$120 per foot and would normally be expected to last 30 years. The FAA aims to extend the life of this cable to 60 years with precise identification of candidate cables for replacement. Even with a 60 year life the annual cost of the cable replacement is estimated to be \$35 million. Several Operational Evolution Plan airports are operating with cable between 50 and 60 years old and are experiencing significant failures and delays. Replacing unreliable terminal power cables will be given the highest priority in this request.
- <u>Uninterruptible Power Supply (UPS):</u> An uninterrupted power supply is a device that prevents power disruptions and surges from adversely affecting electronic system performance. A UPS is necessary within an Airport Traffic Control Tower to ensure the continued performance of the facility and eliminate power disruptions to critical infrastructure. The FAA currently maintains 1,783 UPS with an expected service lifetime of 20 years. A significant portion of the UPS inventory requires replacement due to reliability and supportability issues attributable to age. UPS batteries require refurbishment on a four year cycle.
- En Route Power Systems: The FAA maintains 23 En Route Center power systems. Because of the critical role of the En Route Centers in the NAS, 100 percent of the power systems require sustained funding to maintain service life. The Los Angeles Air Route Traffic Control Center outage highlighted a system flaw or single point of failure that can lead to the loss of all critical and essential power and significant delays to air traffic. Each ARTCC requires \$5,000,000 to correct this situation. The delivery of this correction will take several years to complete due to funding and disruption constraints.
- Radar Lightning Protection: ATCT radars face threats to operability from lightning. Lightning Protection
  systems are incorporated to ensure ATCT radars do not sustain damage from lightning. Lightning
  protection and grounding is applicable to over 16,000 FAA facilities. Lightning protection and grounding
  systems require systematic refurbishment after a service life of 25 years.
- <u>Direct Current (DC) Power Systems</u>: DC power systems are used to provide a low cost, shorter term
  alternative to an engine generator. Critical safety electronic system availability is increased and
  commercial power disturbances of up to several hours no longer disrupt air traffic operations. The FAA
  maintains 541 DC Power systems with a service life of up to 15 years.

- Engine Generators: Engine generators serve as a backup power source for essential NAS electronic systems when commercial power becomes unreliable due to a weather system, natural disaster or other electrical outage beyond FAA control. Without an engine generator, an FAA site may expect 10 or more hours per year of commercial power failure and hence significant NAS disruption. The FAA maintains 3,565 NAS engine generators with a useful service life of 24 years. Maintenance of the aged inventory has increased five fold in six years with a significant reduction in reliability and availability.
- NAS Batteries: Batteries serve as a backup power source for key NAS facilities including navigation aids and communications. These batteries provide limited power during major power system disruptions and maintain the function of key systems while the NAS transitions to a safe level of reduced operation. The FAA maintains in excess of 4,000 battery installations with periodic replacement.

<u>Prioritization</u>: Projects will be prioritized to provide the maximum reduction of risk of loss of NAS service. This will utilize the magnetized impact priority model developed by the Air Traffic Organization (ATO) for the Power Services Group. This model prioritizes sustainment projects to the locations in the NAS that would result in the most disruption.

<u>Description of Solution:</u> Reliable distribution, conditioning and standby power systems must be in place to operate the NAS as well as to maintain the capacity of the NAS during commercial power outages.

For FY 2011, \$95,000,000 is requested to accomplish the following:

- \$6,500,000 to replace batteries.
- \$3,000,000 to replace power conditioning systems.
- \$4,500,000 to replace DC systems.
- \$25,000,000 to sustain the En Route Centers' critical power distribution systems.
- \$3,000,000 to correct grounding and lightning protection systems.
- \$22,000,000 to proactively replace airport power cables.
- \$17,000,000 to replace aging engine generators.
- \$2,000,000 to sustain critical power distribution systems.
- \$12,000,000 to provide Power System Sustain Support (PS3) and project support system engineering.

<u>Benefits:</u> The Electrical Power Systems Sustain Program maps to the FAA goal of greater capacity by avoiding delays due to NAS equipment outages. Backup power systems provide an average of 40 hours of operation for each FAA facility per year during commercial power disruption. This operation would not be possible with commercial power alone and significant NAS disruption would result.

For an ARTCC one hour of disruption is very conservatively estimated to be worth \$1.5 million. Therefore, backup power provides a benefit of \$60 million per year per ARTCC or a total of \$1.26 billion per year for ARTCC alone.

All backup power systems return their cost within six months of initial installation and exceed OMB expectations for lifetime. ARTCC ACEPS backup power systems are delivered at one third of the cost of commercial equivalents.

### APPROPRIATION SUMMARY

	<u>Locations</u>	<u>Amount (\$000)</u>
Appropriated (FY 1982-2009)		\$526,615.0 <sup>1</sup>
FY 2010 Appropriated		87,750.1
FY 2011 Request		95,000.0
FY 2012-2015		672,800.0
Total	Various	\$1,382,165.1

**Facilities and Equipment** 

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<sup>&</sup>lt;sup>1</sup> Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004. Includes \$50,000,000 for the American Recovery and Reinvestment Act.

## COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
<ol> <li>Regional Site Work</li> <li>Washington Headquarters Procured</li> </ol>	Various	\$85,900.0
Equipment and Services		9,100.0
Total	Various	\$95,000.0

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
3A01	Hazardous Materials Management	\$20,000,000	Various	F-13

<u>FAA Strategic Goals:</u> Environmental Stewardship – Reduce pollution and other adverse effects of transportation facilities. Objective 1 - Adopt transportation policies and promote technologies that reduce or eliminate environmental degradation.

<u>Description of Problem:</u> The FAA has identified over 700 contaminated sites at 200 locations nationwide that require investigation, remediation, and closure.

The United States Environmental Protection Agency (EPA) lists federal facilities that require remediation actions on the Federal Hazardous Waste Compliance Docket (FHWCD). Currently, there are 73 DOT facilities listed on the Docket, of which 70 are FAA facilities, the most of any DOT organization. Of the 70 sites FAA is responsible for, 65 have achieved No Further Remedial Action Planned (NFRAP) closure documentation from EPA. The FAA is currently conducting investigation, remediation, and closure activities at the five FHWCD sites that have not achieved NFRAP. Those sites are:

- Kirksville ARSR, AFS P-64.
- Mike Monroney Aeronautical Center.
- Omaha EX Air Force Station Z-7.
- Ronald Reagan National Airport.
- William J. Hughes Technical Center.

Site investigations at the identified sites have revealed that toxic contamination resulted from a variety of hazardous substances, including cleaning solvents, degreasing agents, pesticides, asbestos, polychlorinated biphenyls (PCBs), and heavy metals. The FAA has mandatory cleanup schedules in place as part of enforcement agreements with regulatory agencies. These agreements require the FAA to remediate contaminated soil and groundwater. Extensive contamination at the William J. Hughes Technical Center prompted EPA to place the site on the EPA National Priorities List (NPL or Superfund) as one of the nation's most environmentally dangerous sites. Other contaminated sites (many of which are located in Alaska) and the requirements of the Hazardous Materials Management program account for a large portion of unfunded liabilities documented in FAA's financial statement.

<u>Description of Solution:</u> To manage and remediate these contaminated sites, FAA developed the Hazardous Materials Management program. To achieve compliance with all federal, state, and local environmental cleanup statutes, including the Resource Conservation and Recovery Act of 1976, the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 and the Superfund Amendments and Reauthorization Act of 1986, FAA must continue mandated program activities. The FAA's program activities include investigating sites; managing hazardous materials and hazardous waste accumulation, handling, and disposal; installing groundwater monitoring wells; remediating site contamination; and controlling air pollution.

For FY 2011, \$20,000,000 is requested to:

- Continue to attain 94 percent "No Further Remedial Action Planned" closure documentation for FAA listed on EPA's Federal Hazardous Waste Compliance Docket by conducting contaminant investigations, implementing site remedial projects, and completing regulatory closures at the four remaining Docket sites: William J. Hughes Technical Center; Ronald Reagan Washington National Airport; Mike Monroney Aeronautical Center; and Kirksville ARSR Air Force Station.
- Continue to perform investigations and remediation projects at all other identified contaminated sites in accordance with state mandates and enforcement agreements to limit future liability to the Agency and foster environmental stewardship.

<u>Benefits:</u> The Hazardous Materials Management program maps to the DOT goal of Environmental Stewardship by reducing pollution and other adverse effects of transportation and transportation facilities.

The program significantly decreases financial and operational risks to FAA through assessing and remediating contaminated sites. The Hazardous Materials Management program also ensures that FAA complies with the Department of Transportation's performance goal of placing 93 percent of all sites listed on the EPA Federal Hazardous Waste Compliance Docket into the status of "No Further Remedial Actions Planned."

A 2002 cost benefit analysis performed by Booz Allen Hamilton determined a benefit ratio of 3.7 and an internal rate of return of 12.6 percent.

### **APPROPRIATION SUMMARY**

	<u>Locations</u>	<u>Amount (\$000)</u>
Appropriated (FY 1982-2009)		\$350,419.7
FY 2010 Appropriated		20,000.0
FY 2011 Request		20,000.0
FY 2012-2015		80,000.0
Total	Various	\$470,419.7

### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
<ol> <li>Superfund Sites Remediation</li> <li>Investigation and Remediation</li> <li>Investigation and Remediation of Other Sites</li> </ol>	Tech. Center, Atlantic City, NJ Alaskan Region	\$9,000.0 5,800.0
in FAA Regions; and Program Management	<del></del>	<u>5,200.0</u>
Total	Various	\$20,000.0

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<sup>&</sup>lt;sup>1</sup> Includes \$3,400 reduction of FY 1998 funds pursuant to rescission contained in P.L. 106-69, October 9, 1999. Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
3A02	Aviation Safety Analysis System (ASAS)	\$14,600,000	Various	A-17, M-39

FAA Strategic Goal: Increased Safety - Reduce commercial air carrier fatalities

<u>Description of Problem:</u> Present automation hardware and software technology capabilities must be enhanced to adequately and effectively capture, disseminate, and analyze a wide range of safety related and security data. Many program managers, accident investigators, inspectors, security, support, and others who need the information must use inefficient or non-integrated procedures for planning, scheduling, capturing, and tracking work programs, investigation results, and safety and security information. The Regulation and Certification Infrastructure for System Safety (RCISS) improves inspection, surveillance, certification, investigation programs, and the safety and security missions by integrating safety data and information by using automation, information architectures, data management, and other technologies that are cost effective and in line with industry standards.

<u>Description of Solution:</u> This program consolidates all previous information technology (IT) infrastructure programs that support the Associate Administrator for Aviation Safety's (AVS's) safety workforce. It will also expand and enhance the current AVS infrastructure while leveraging components across the AVS services. RCISS provides all IT infrastructure components to AVS's safety workforce, ensuring standard and reliable accessibility to safety data. The program will design and deploy the next generation infrastructure to meet AVS's business needs through addressing its mobile safety workforce needs and changes in the aviation industry. The program will focus on providing safety data to the AVS workforce while they are mobile (offsite) conducting safety inspections and investigations of airlines, manufacturers, pilots, accidents, etc. RCISS's enterprise infrastructure will provide access methods to all AVS national safety applications developed by Safety Approach for Safety Oversight (SASO), Aviation Safety Knowledge Management Environment (ASKME), Aerospace Safety Information Management (ASIM), and all other national safety programs developed or currently deployed within AVS.

Over the course of the next several years the RCISS program will design and implement a new enterprise infrastructure that encompasses the following six key components:

- 1. Devices for AVS's 5,000+ Safety Workforce (including new mobile devices) Activities will include lifecycle replacement and procurement of new devices.
  - Provides new equipment designed to meet operational demands.
  - Replaces outdated or malfunctioning devices.
- 2. Communications Local Area Networks (LAN), Wide area Networks (WAN) and (VPN) Activities will include lifecycle replacement and procurement of new equipment and services.
  - Improves accessibility and speed in utilizing national safety systems.
  - Provides new services for the transmission of safety data.
  - Replaces outdated or malfunctioning equipment.
- 3. Enterprise Services (Hardware and Software which allow components of the infrastructure to work together) Activities will include lifecycle replacement and procurement of new devices and software.
  - Improves management and operation of the infrastructure through enhanced monitoring, consolidation of equipment and data collection.
  - Improves infrastructure reliability.
- 4. Application Data Servers (Hosting of national AVS safety applications) Activities will include lifecycle replacement and procurement of new servers.
  - Begins the process of designing and planning the implementation of the application servers, which will support the future AVS safety systems.
  - Replaces or upgrades outdated or malfunctioning servers.

- 5. Commercial Off the Shelf (COTS) Software (Operating System Software, Database Software) Activities will include upgrade of software licenses.
  - Ensures continued vendor support for software.
  - Maintains ability to efficiently inter-operate with external infrastructures, e.g., other FAA organizations and the airline industry.
  - Evaluate future software to support safety workforce, enterprise management services and all other aspects of the infrastructure.
- 6. Contractor Support Activities will include assistance in designing the RCISS enterprise infrastructure.
  - Provides specialized technical expertise in the design and development of select component areas, e.g., wireless and enterprise architectural design.
  - Provides specialized training to support the implementation of new infrastructure components.

The RCISS infrastructure directly contributes to the success of AVS in meeting its mission goals when it is developed, implemented and administered as a single system. The infrastructure will become most effective in supporting the safety workforce when all of its components are optimized.

For FY 2011, \$14,600,000 is requested to provide technical refresh of equipment for the existing infrastructure as it continues to develop and implement IT services. The RCISS program will continue to deploy these IT new services in the following areas:

- Handheld Devices.
- Remote Connectivity Telecommunications.
- Consolidated Server/Storage Area Network (SAN) system.
- Enterprise Software.
- Disaster Recovery.

These services will ensure continuity of operations for critical and non-critical safety systems. Additionally, these services will ensure critical safety data is safeguarded against loss by providing a secure, reliable and timely backup of data. These new services will support the coming integration of AVS's safety data when data are no longer associated with a system. In this new environment, safety workers will assemble data as needed from various data sources to support new business processes. Data in these data stores will require critical recovery response.

<u>Benefits:</u> Enterprise-wide recovery strategies will mitigate the risk of an aviation accident occurring as result of disruptions to safety information. This benefit correlates to the Measurement Area "Processes and Activities," Measurement Grouping "Productivity (PRM).

Workforce Mobility benefits will support the FAA Flight Plan's Organizational Excellence goal. This benefit area will enhance the workforces' ability to operate in a mobile environment by deploying mobile handheld devices. RCISS will develop and implement an enterprise-wide mobile solution to mitigate the risk of an aviation accident occurring as a result of inefficient access to safety oversight capabilities. This benefit ties directly to PRM.

Data Warehouse Analysis and Reporting benefits will provide for an integrated data access across the AVS organization by providing access to centralized databases and systems. This benefit correlates to the PRM Measurement Area "Technology," Measurement Grouping "Interoperability.

E-Gov will expand communications between AVS and external users by allowing connectivity through proper devices and software. This benefit correlates to PRM Measurement Area "Technology," Measurement Grouping "Interoperability"

The SOA applications are designed to provide reusable data resources to FAA AVS Line of Business (LOB's). The goal of the project is to provide excellent customer service to further FAA objectives. Specifically, the project will initiate, develop, test, and deploy the SOA applications. This benefit correlates to PRM Measurement Area "Technology," Measurement Grouping "Interoperability"

Initiative enabler benefits will support the FAA Flight Plan goals of Increased Safety and Organizational Excellence. Specifically, RCISS will enable some of the benefits promised by the SASO and ASKME programs. The data developed, manipulated, analyzed, and reported on by the SASO and ASKME programs will reside on the RCISS IT infrastructure. Without that infrastructure, the full realization of SASO and ASKME capabilities could not occur. This benefit correlates to PRM Measurement Area "Technology," Measurement Grouping "Interoperability."

### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$286,811.4
FY 2010 Appropriated		10,500.0
FY 2011 Request		14,600.0
FY 2012-2015		53,500.0
Total	Various	\$365,411.4

### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
Hardware and Software Systems/Services	Various	\$14,600.0

<sup>&</sup>lt;sup>1</sup> Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 106-199, January 23, 2004.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
3A03	Logistics Support Systems and Facilities (LSSF)	\$11,500,000	Various	M-21

Flight Plan Goal #2 - Greater Capacity

<u>Objective #1</u> – Increase capacity to meet projected demand and reduce congestion. Improve NAS supply chain operations by modernizing the supply chain infrastructure.

<u>Description of Problem</u>: The Logistics Inventory System (LIS) is a legacy mainframe application that lacks the capability and flexibility to accommodate the current and future supply support needs to maintain the National Airspace System (NAS). If the FAA continues to operate with the current LIS system, the 2009-2013 flight plan goal of increasing capacity to meet projected demand and reduce congestion is at risk of not being met. The acquisition of new, complex NAS equipment, the requirement to support existing legacy systems, and the projected impact of implementing NextGen will increase the demand on the supply chain and maintenance operations for support services through the foreseeable future. The LIS system is currently operating far beyond its original estimated life-cycle and is becoming cost prohibitive to maintain as the FAA modernizes its systems and migrates from the legacy mainframe environment to more robust client/server based applications.

The FAA supply chain currently maintains records for the assets required to support the NAS in several independent systems: FAALC Warehouse Management System (WMS), Field Spares Inventory (FSI), and the Automated Inventory Tracking System (AITS). This decentralized management of assets within the agency continues to impede the ability of the FAA to provide optimal support to the NAS in a timely and cost effective manner. Asset tracking is the most fundamental and critical element of any supply chain system. The inefficiencies in current operations have resulted in the inaccurate computation of spares inventory required by the FAA supply chain. These inaccuracies have led to costly expense for new spare acquisitions that could otherwise be supported by existing repair capabilities, redistribution or fabrication. These issues can and will lead to critical outages resulting in delays for the aviation public, inefficient use of funds and manpower, and improper sparing levels in the field.

<u>Description of Solution</u>: For FY 2011, \$11,500,000 is requested for Commercial-Off-The-Shelf (COTS) software system integration and to build interfaces to other FAA systems and external systems.

The Logistics Center Support System (LCSS) will implement the latest in supply chain management philosophy and technology by COTS software packages. In addition to gaining the technological benefits associated with adopting object oriented software design, service oriented architecture (SOA), relational databases and a webbased user interface; this system will provide the robust operational business practices and industry standard business processes to the FAA needed to support the NAS and meet the objectives outlined in the flight plan. LCSS will be implemented in two segments; Segment 1 will be a prototype of the proposed software solution and Segment 2 will result in the full implementation of the COTS software solution and integration with existing support applications.

The LCSS program will be directly integrated with several other FAA initiatives to facilitate a comprehensive NAS supply support solution (i.e. 2D barcoding, Remote Monitoring and Logging System (RMLS), Integrated Logistics (iLOG), etc.). The 2D barcoding effort was implemented for the purpose of tracking assets as they move throughout the FAA supply chain. RMLS is the newly implemented field maintenance system solution intended to track all field activity associated with maintenance on NAS equipment at an operational facility. The data developed and maintained by the 2D barcoding effort, RMLS, and others will be integrated with LCSS to provide a comprehensive supply support solution. The iLOG board is implementing newly developed supply chain policy in order to transform the FAA supply support structure into a more proactive and efficient environment.

<u>Description of Benefits</u>: This program will work to control costs while delivering a greater capacity. Through LCSS, the FAA will save an estimated \$218 million, with a cost-benefit ration of 2:1 based upon initial

investment decision data. The benefits result from initial and inventory replenishment spares reductions, increased repairs under warranty, reductions expected in shipping/handing, space and utilities.

### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$82,542.4
FY 2010 Appropriated		9,300.0
FY 2011 Request		11,500.0
FY 2012-2015		800.0
Total	Various	\$104,142.4

### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. COTS System Engineering		\$4,828.0
2. Program Management		1,730.0
3. HD/SW COTS Acquisition		4,011.0
4. COTS Configuration and Evaluation		217.0
5. Documentation and Training		226.0
6. Implementation	<u></u>	<u>488.0</u>
Total	1	\$11,500.0

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
3A04	National Airspace System (NAS) Recovery Communications (RCOM)	\$15,000,000	Various	C-18

Flight Plan Goal #4: - Organizational Excellence

Objective #1: Support and implement U.S. security strategies and plans related to transportation.

<u>Description of Problem:</u> The Command and Control Communications (C3) program provides the FAA the minimum command and control communications capability necessary to direct the management, operation, and reconstruction of the National Airspace System (NAS) during local, regional, or national emergencies when normal common carrier communications are disrupted. The C3 program provides minimum capabilities for Continuity of Operations (COOP) for the FAA. Where applicable, C3 is an OMB SAFECOMM compatible program that encompasses multiple independent procurement projects, which are currently at various stages in the acquisition lifecycle.

In 1995, the National Telecommunication and Information Administration (NTIA) required a decrease in the frequency bandwidth used by the current VHF/FM network. As a result, the older VHF/FM radios that are configured to the outdated frequency separation requirements can no longer be utilized. In addition, the current system lacks coverage and integration with current VHF/FM equipment. This makes it difficult, and often impossible, to communicate over long distances. Network hardware has been fielded for approximately 20 years, long past its expected life cycle. For example, the cost to repair one module is more than the purchase of a new modern radio, yet for compatibility reasons, the repair of outdated equipment is continued.

The FAA, Emergency Operations, and C3 have a mission to develop web-based emergency operation information-sharing tools that create a common operational picture and support effective decision-making.

A secure, highly available, and flexible infrastructure has been created for effective collaborative communications, continuity of operations, and adaptive situational awareness for enhancing decision support.

This new infrastructure has been built upon existing FAA networks and technologies and the operations framework is built upon the lessons and best practices learned from previous and existing initiatives. It is called Emergency Operations Network (EON). EON requires a technical refresh.

The FAA's Washington Operations Center Complex (WOCC) operates on a continual basis, 24 hours a day seven days per week and provides the FAA with the ability for critical personnel to manage and exchange information during a disaster/crisis. Since the last re-design in 2002, the required personnel needed to staff the WOCC has changed, this changes the way critical personnel need to communicate.

The C3 program office has the responsibility to provide reliable communications support to the FAA, Department of Transportation, and other government agencies during national security events, disaster recovery efforts, accident investigations, government exercises, and special invitational events. The C3 program does not have the ability to support multiple deployments simultaneously in order to continue supporting the mission.

There is a continued requirement for high frequency radio, secure fax, automated notification, secure telephone and secure conferencing capabilities.

Other efforts within the C3 program also revolve around National Security and are classified. There are several operational command and control centers within the Washington area and other sites around the country that require modernization. Since September 11, 2001, the C3 program has had its responsibilities increased to meet the current national security demands.

<u>Description of Solution</u>: For FY 2011, \$15,000,000 is requested as follows:

- \$6,680,000 to continue procurement of VHF/FM radio equipment supporting the modernization of the current VHF/FM network. Existing regional networks will continue to operate in the 25 kHz mode until all antiquated infrastructure equipment has been replaced with 12.5 kHz equipment.
- \$1,780,000 to fund EON for a technological system refresh. The system refresh will consist of replacing or upgrading all components of the EON infrastructure including servers, switches, routers, power supply, memory and storage modules.
- \$2,060,000 to fund WOCC re-design activities include the following:
  - Architectural Demolition of hallway wall, flooring, and ceiling; wall construction; wall finish/painting; new furniture; break room renovation; and WOCC manager's office renovation.
  - Equipment New equipment including new racks and servers, new conference bridge, updated server
    and communications equipment, blade servers, new plasma TVs, printers, copiers, faxes, client
    server monitors, and new cabling and terminations.
- \$1,030,000 to purchase a new Crisis Support Team (CST) emergency response van and related communication equipment to be installed in the new van and to upgrade an existing older van. The communication equipment for the older van will upgrade the van with a similar configuration as the other vans.
- \$2,005,000 to fund other critical emergency communications, including HF radio equipment, secure communication equipment (such as secure conference bridge), automated notification system replacement/upgrade and satellite communication.
- \$1,445,000 to support other C3 efforts and supporting tasks to comply with National Communication Systems 3-10 requirements.

<u>Benefits:</u> The C3 program office provides critical communications for both daily NAS operations and disaster/crisis management by providing:

- Increased command and control by national leaders in the FAA and other agencies.
- Quicker response to natural and wartime disasters thereby helping avoid loss of life and property.
- Increased efficiency of flying time by FAA flight inspection aircraft and other public and private aircraft
- Ensure COOP will be maintained.
- OMB/DHS SAFECOM compatibility

The new C3 equipment will directly benefit the FAA in the form of lowered periodic and correctional maintenance costs of the old and technologically obsolete C3 equipment in the field. The C3 program also provides the FAA with OMB/DHS SAFECOM compatible emergency communication systems, ensuring interagency interoperability.

### Additional specific benefits include:

- The WOCC re-design will modernize the complex to be more functional and ergonomic, and to improve, expand, and streamline information, telecommunications, and associated utility infrastructures (e.g. power, security and heating, ventilation and air conditioning (HVAC)). The re-design will institute green initiatives to lower the power and cooling loads.
- Purchasing a new CST emergency response van provides the C3 program with the ability to support up to three simultaneous deployments. Additionally, upgrading the older van to same configuration standards as the two newer vans brings all three vans up the same configuration standard. One configuration standard benefits the CST by reducing maintenance and training required to maintain multiple configurations.

### APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$98,190.3
FY 2010 Appropriated		10,230.0
FY 2011 Request		15,000.0
FY 2012-2015		48,000.0
Total	Various	\$171,420.3

### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. VHF/FM Radio Equipment Implementation		\$6,680.0
2. EON System Refresh		1,780.0
3. WOCC Re Design		2,060.0
4. CST Van and Upgrade		1,030.0
5. Other C3 Tasks	<u></u>	<u>3,450.0</u>
Total	1	\$15,000.0

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<sup>&</sup>lt;sup>1</sup> Includes \$10,340 reduction of FY 2001 funds pursuant to rescission contained in P.L. 106-544. Includes reduction for EAS in FY 2002. Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L.108-199, January 23, 2004.

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
3A05	Facility Security Risk Management	\$17,000,000	Various	F-24, M-08

<u>FAA Strategic Goals:</u> Homeland and National Security – Balance homeland and national security transportation requirements with the mobility needs of the Nation for personal travel and commerce. Objective 1 - Support and implement US security strategies and plans related to transportation.

<u>Description of Problem:</u> The FAA staffed facilities are vulnerable to outside intruders, and existing security vulnerabilities jeopardize air traffic services critical to the National Airspace System. Employee and user security is critically dependent upon an operational and administrative environment that provides reasonable safeguards against these types of disruptions. Homeland Security Presidential Directives (HSPD) 7, Critical Infrastructure Identification, Prioritization and Protection mandates that agencies identify, prioritize, and coordinate the protection of critical infrastructure and key resources against terrorist acts.

<u>Description of Solution:</u> All FAA staffed facilities must be secured. FAA has assessed physical security risks and prioritized corrective actions based on the threat to the facility. The Facility Security Risk Management (FSRM) program has ongoing activities to reduce these risks. These activities include reducing the risk of intrusion and unauthorized entry by installing surveillance, intrusion detection, and access control systems. Other improvements include controlling parking, fencing, lighting, occupant emergency plans, intelligence sharing, physical barriers, shipping and receiving upgrades, and employee and visitor identification.

For FY 2011, \$17,000,000 is requested to support the continuing effort for the following upgrades:

- Construction/Equipment Installation at one Large TRACON.
- Equipment Installation at MMAC.
- Engineering design and equipment installation at WJHTC.
- Security upgrades at 29 Security Level 1 and Security Level 2 facilities.

<u>Benefits:</u> The FSRM program reduces the risk of unauthorized access to FAA staffed facilities. The FAA has completed upgrades and accredited 895 facilities, which protect employees, facilities, and assets of FAA's critical infrastructure. The FAA personnel security awareness has increased through the FSRM program, and the program also supports the FAA's response to Homeland Security Presidential Directives (HSPD) 7, 12 and 16.

### APPROPRIATION SUMMARY

	<u>Locations</u>	<u>Amount (\$000)</u>
Appropriated (FY 1982-2009)		\$232,500.0
FY 2010 Appropriated		18,000.0
FY 2011 Request		17,000.0
FY 2012-2015		67,400.0
Total	Various	\$334,900.0

**Facilities and Equipment** 

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<sup>&</sup>lt;sup>1</sup> Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.

### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. Construction/Equipment Installation		\$5,000.0
2. Equipment Installation at MMAC		4,000.0
3. Engineering Design/Equipment Installation (WJHTC)		3,000.0
4. Security upgrades at 29 SL-1 and SL-2 facilities		_5,000.0
Total	Various <sup>1</sup>	\$17,000.0

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 $<sup>^{1}</sup>$  Sites are subject to change. Facilities assessed and found to have "high" risk will receive security upgrades before facilities with lesser risk.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
3A06	Information Security	\$15,200,000	Various	M-31

FAA Flight Plan Goal 6 - Organizational Excellence

<u>FAA Objective 4</u> - Make decisions based on reliable date to improve our overall performance and customer satisfaction.

<u>FAA Performance Target 4</u> – Achieve zero cyber security events that disable or significantly degrade FAA services.

<u>Description of Problem:</u> The FAA must ensure the integrity and availability of all critical information systems, networks, and administrative systems due to the increased cyber terrorism and malicious activities by hackers and other unauthorized personnel. In the Homeland Security Presidential Directive/HSPD 7, FAA was directed to protect and ensure the integrity, confidentiality, and availability of all National Airspace Information Systems as well as federal information. Under the Federal Information Security Management Act (FISMA) of 2002, FAA must ensure all information systems identify and provide information security protection equal to the risk and magnitude of the harm resulting from unauthorized access, use, disclosure, disruption, modification, or destruction of information that support the agency, aviation safety and security, and the NAS.

The FAA Cyber Security program is a partnership between the FAA Chief Information Officer (CIO) organization and FAA lines of business and staff offices (LOBs/SOs) with a focus on protecting our information technology (IT) infrastructure. The program is comprised of the following areas: Cyber Security Management Center (CSMC); IT and ISS awareness and training; IT research and development (R&D); policy, standards, and requirements; program evaluations; and system certification and compliance. This comprehensive Cyber Security effort offers information security awareness training to the agency's key ISS personnel. This training will allow development and evaluation of policies and standards, formulation of system requirements, certification of systems and ensures their compliance with federal regulations, protection of FAA's computer enterprise, and response to computer security incidents.

Bravo events are targeted attacks on federal government systems, which pose a serious and imminent threat to those systems. These are events specific in nature, objective and patterned. They, by design, reflect hostile intent. Understanding all aspects of these events dictates that they be detected and prevented to the maximum extent to which the FAA is capable. The development of the term "Bravo" was initiated as an indirect route to allow the communication of these events and the identification and mitigation of systems that have been compromised or affected by these sophisticated attacks.

The Office of the Chief Information Officer (AIO's) work continues with a strategy, which is a comprehensive, proactive approach to preventing and isolating intrusions in the agency's computer networks. This cyber defense strategy involves hardening of the individual system and network elements, isolating those elements and backing up those elements to avoid services disruptions.

<u>Description of Solution:</u> Enhance the National Airspace System (NAS) architecture to include cyber security; harden individual NAS systems and network elements by completing remediation for the discovered vulnerabilities in each of the Nation Airspace Systems; enhance boundary protection to NAS facilities; improve recovery rate during times of cyber attacks through information sharing from the FAA Cyber Security Management Center (CSMC); conducting systemic monitoring at the CSMS, and addressing the challenge of providing cyber protection while maintaining reliability, availability and integrity through applied research and development initiatives. The safety-critical aspect of NAS operations leads to stringent requirements for reliability and availability, resulting in extensive use of system and equipment redundancy, path diversity, and software diversity. The mandate for high integrity increases the time and cost to design, develop, and verify NAS components during initial deployment, routine upgrades, and emergency patches. At the same time, FAA is under pressure to deploy cost efficient new systems that meet stringent safety and security targets. This

creates a challenge to reduce the time and cost to deploy high integrity systems to the U.S. national airspace, while at the same time enhancing confidence in the safety, security, and reliability of these systems.

#### MANDATES:

- Homeland Security Presidential Directive/HSPD-7
- Homeland Security Presidential Directive/HSPD-12
- Executive Order 13231, Critical Infrastructure Protection in the Information Age
- National Institute of Standards and Technology (NIST) 37
- Federal Information Security Management Act, OMB M-03-19
- OMB Circular A-130

For FY 2011, \$15,200,000 is requested to support the following:

#### REMEDIATION

Correct NAS system vulnerabilities discovered during prior year Security Certification and Authorization Packages (SCAP). Once an information system is accredited, it must undergo an independent risk assessment or an annual self assessment based on the guidelines provided by NIST SP 80026 to determine the current status of their information systems. Where necessary, the ISO must develop a plan of action and milestones (POA&M) describing the security measures that are planned or currently implemented to correct deficiencies noted during the assessment of the information system.

### **NAS ISS Security Transformation**

The FAA will complete concept of operation and implement strategy for automated recovery, which involves isolating those systems that have been affected by a virus, instituting the fix, and making sure that, affected systems get back online as soon as possible. Architecture and engineering efforts for alternative solutions to secure new NAS system will be developed (NSure concept). The NAS information technology systems will be monitored and all necessary actions will be taken to ensure the systems are not interrupted and are available at all times. Acquire and implement enhanced tools to be used by the Computer Security Incident Response Center to address complex and rapidly changing cyber threats and vulnerabilities. These would include analysis of NAS Netflow data, modeling and simulation of attack vectors into the NAS, data clustering and early indications and warning; as a result FAA will gain the capability to do predictive analysis of events that could cause a service outage to the NAS. Funds are also required to begin to examine the ISS requirements of a space based NAS.

Essentially, securing automated resources thru two factor authentication is an imperative for the FAA to reliably and securely provide Air Traffic Management (ATM) services to: (1) collect, process, store, and exchange sensitive and critical administrative, support, and operational data without unauthorized access, disclosure, or corruption and (2) protect, from service disruption, the information systems and technology that accomplish those tasks. If logical resources cannot be adequately and efficiently secured, the mission and objectives of the FAA are at risk.

### Logical Access and Authorization Control Service (LAACS)

LAACS will deploy a new enterprise-wide security service to securely manage access to government Information/IT resources. This service will protect the confidentiality, integrity, and availability of Department and Agency data, information systems (IS), and information technology (IT). In FY 2011 the LAACS Project Office will continue to support FAA capital investment necessary to complete FAA system/application interface and integration (I&I) within the LAACS COTS Software Solution Environment. The implementation of an LAACS solution is in alignment with DOT's implementation of the FIPS 201 Personal Identity Verification and NIST Special Publication 800-53, Security Policy Control Standards, for FAA employees and contractors.

### **IPv6 Transition**

The Office of Management and Budget (OMB) has directed all Federal Agencies to develop a strategy and plan using, "The Business Case and Roadmap for Completing IPv6 Adoption in the US Government. IPv6 integration must be prioritized at the agency level and executed in a well planned, phased approach with success criteria measurements and alignment with other key government initiatives like TIC, HSPD-12, FDCC, NETWORX, DNSSEC and the IT Infrastructure Line of Business (ITI LOB). Agency must have an IPv6 segment operational no later than FY 2012 and support both IPv4 and IPv6 segments during application and system

transition. Develop plans and provide management support to integrate the network connections from the Lines of Business/Staff Offices into the FAA IPv6 compliant backbone, applications and systems.

### **Trusted Internet Connections (TIC)**

The TIC initiative requires a reduction in external connections, including internet points of presence. Agencies must comply with critical TIC technical capabilities, continue reduction and consolidation of external connections to identified TIC access points, execute a MOA and SLA between DHS and agency CIO. The TIC load sharing strategy, plan and design must be developed and managed to meet OMB guidance. Einstein II deployment at each of the consolidated IAPs must be planned, coordinated and installed.

### Federal Desktop Core Configuration (FDCC)

Ensure government applications operate correctly on Windows XP and Windows Vista computer systems configured with FDCC. Conduct FDCC compliance testing and ensure the use of a SCAP-validated tool with FDCC Scanner capability to baseline the configuration, test common use cases (per normal processes), and to ensure the FDCC settings and patches are intact.

### **Enterprise Architecture and Interoperability**

The FAA is continuing to refine its enterprise architectures and wants to ensure that it is interoperable with the enterprise architectures being developed by other entities. The FAA is also integrating enterprise architecture into its investment processes to help FAA senior management make better informed decisions.

Enterprise Architecture: Continue to enhance the FAA's enterprise architecture and solutions architecture ensuring the Administrative, NAS-Support and the NAS architecture, defined by the Next Generation Transportation System (NextGen)) program, "to be" [future] states are compatible and meet the agency's future requirements. Opportunities to leverage architectural products to reduce costs and improve efficiency will be pursued including the development and enhancement of investment roadmaps.

Information Architecture: Develop and maintain the necessary information architecture to seamlessly share information between the agencies participating in the NextGen architecture, formalize agreements and develop policies to foster the transfer of necessary information between Government agencies and commercial entities. Support the SWIM program and other NAS program's data architecture efforts.

### **Technology Insertion**

Although commercial research and development can be leveraged to meet the IT and IT security needs of the FAA, certain capabilities associated with the FAA's mission must be acquired. These funds ensure the FAA's operational requirements are satisfied and that new capabilities are available in the correct timeframe, while maintaining required information security.

### Academia and NSF Technology

Continue to collaborate with the National Science Foundation (NSF), Universities and others Government Agencies to sponsor research on promising IT and IT Security technologies that meet FAA requirements and FAA can transition into operational networks to increase capabilities, mitigate risks, and/or reduce operating costs.

### **Tech Center**

Provide continuing support for a rapid prototyping laboratory established at the William J. Hughes Technical center (WJHTC) for the purpose of developing secure mobile solutions for aircraft and administrative uses. The lab supports rapid configuration changes for the purposes of vendor evaluation, system architecture development, security architecture development and general research.

### **Advanced Concept Technology Demonstrations**

Partner with DoD and participate in Advanced Concept Technology Demonstrations (ACTD). These demonstrations and experiments are designed to leverage existing technology and demonstrate its applicability to meet ongoing operational requirements. Artifacts from the demonstrations will be transitioned into FAA networks and facilities.

### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$118,712.4
FY 2010 Appropriated		12,276.0
FY 2011 Request		15,200.0
FY 2012-2015		48,000.0
Total	Various	\$194,188.4

### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

	Locations/	Estimated Cost
Activity Tasks	Quantity	<u>(\$000)</u>
Information Security		\$15,200.0

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<sup>&</sup>lt;sup>1</sup> Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
3A07	System Approach for Safety Oversight (SASO)	\$23,400,000	Various	A-25

Flight Plan Goal #1 - Safety

Objective #1: - Reduce the Commercial Airline Accident rate.

Objective #2: - Reduce the number of fatal accidents in general aviation.

<u>Description of Problem</u>: The White House Commission on Aviation Safety and the National Civil Aviation Review Commission determined FAA's regulatory and certification programs should be re-engineered to achieve a reduction in aviation accidents. These two aviation safety-related commissions recommended that the FAA conduct certification and oversight of all companies performing aviation safety functions, including repair stations located outside of the United States. They further recommended that the FAA be more vigorous in applying high standards for certification and in using emerging technology, safety reporting, and risk management concepts to help identify aviation safety problems before they result in accidents. Additionally, growth and enhancements to the National Airspace System will introduce a host of new tracking and communications systems, with satellite, ground, and aircraft components. These in turn will introduce new operational procedures and training requirements. The Flight Standards Service (AFS) will need to revise its surveillance and certification procedures to reflect these changes.

<u>Description of Solution</u>: Through the System Approach for Safety Oversight (SASO) Program, AFS will develop and implement a new proactive system safety approach based upon SMS principles to help identify, regulate, comply, and manage safety risks to eliminate accident causal factors in the aviation industry. FAA is currently resolving the reactive, compliance only nature of its oversight activities by building its own Safety Management System (SMS). The FAA SMS will go beyond compliance to identify system-wide safety hazards prior to their occurrence. It entails developing business models, collecting and sharing quality data, and developing new analytical methodologies to assist AVS inspectors in conducting their oversight job tasks. Within this framework, FAA must also integrate human factors considerations, promote information sharing with the aviation community, and allow for continuous improvements that keep pace with and utilize advances in technology.

For FY 2011, \$23,400,000 is requested to continue the re-engineering of AVS business processes and develop integrated, comprehensive SMS-based business applications. Specific efforts will continue to focus on conducting a complete analysis of current certification and surveillance processes. This will provide the basis for improved procedures, which will aid in the determination of the software tools and databases required to support the processes. Although Information Technology (IT) is only one component of the SASO solution, it represents a significant portion of the SASO investment. This request complements the SASO funding appropriated in the FY 2006 through FY 2010 timeframe. Existing AFS systems support a compliance-based approach to surveillance, certification, enforcement, and investigation. SASO is responsible for coordinating the realignment of those systems to an SMS. To address these problems, SASO has created an IT solution based upon e-Gov principles that integrates government and industry safety systems and data in a virtual extranet architecture. A core set of SMS applications will be developed that can be used by both Industry and the FAA to manage and oversee safety. This core set of applications will provide a common yardstick for measuring aviation safety.

<u>Benefits</u>: This program will produce safety business applications that identify and eliminate causal factors of commercial and general aviation accidents. Information sharing with the air transportation industry will improve the oversight process, which increases the FAA's effectiveness in mitigating or preventing aircraft accidents. The combination of business process re-engineering and the integration of better job performance aids will ensure a more efficient workforce performing certification and surveillance activities.

### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$52,000.0
FY 2010 Appropriated		20,000.0
FY 2011 Request		23,400.0
FY 2012-2015		<u>87,600.0</u> <sup>1</sup>
Total	Various	\$183,000.0

### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
Requirements Analysis	Various	\$23,400.0

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 $<sup>^{\</sup>rm 1}\,\text{Future}$  requirements are based on activity levels that are validated on a year-to-year basis.

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
3A08	Aviation Safety Knowledge Management Environment (ASKME)	\$14,800,000	Various	A-26

FAA Strategic Goal: Increased Safety - Reduce commercial air carrier fatalities

### Description of Problem:

Within the FAA's Regulation and Certification (AVS) organization, the Aircraft Certification Service (AIR) is responsible for developing, administering, and ensuring compliance to safety standards governing the design, production, airworthiness, and continued operational safety of civil aircraft and related components. Essentially, AIR is responsible for ensuring civil aircraft are designed and built to operate safely within the National Airspace System (NAS).

In carrying out their responsibilities, FAA personnel perform numerous business activities that generate massive amounts of data and information used in making strategic aviation safety decisions. The data is also used throughout AIR to ensure standardized regulatory compliance, workforce education, trend analysis, and program reporting. As the aviation industry has grown in size and complexity, so has the requirement for additional resources to perform these services. Between FY 1992 and FY 2000, the AIR workload increased 40 percent while the number of engineers, inspectors, and support staff grew by only 24 percent. Additionally, new security requirements related to terrorist countermeasures have surfaced as a result of the September 11, 2001 terrorist events. Many of those requirements are not yet fully realized.

The ability of AIR to remain responsive to industry growth will be impaired without maximizing the use of automation. The lack of a comprehensive system with new processes and automation would mean AIR would be unable to use information technology to modernize its business practices and maximize the productivity of its workforce. Delays to certification programs, release of new policies and guidance, designee approval or renewal, and response to inquiries will have a long-term detrimental effect on the vitality, safety, and efficiency of the aviation industry.

Without a comprehensive automated system to provide a corporate view of resource utilization, AIR and industry personnel will continue to be dependent on time-consuming, labor-intensive manual processes to store and retrieve required paper documents. Because current paper-based filing systems are local, it will remain difficult for AIR to have single-source information shared among geographically dispersed organizations to ensure consistency of policy application.

Without automated process assistance tools and the ability to provide current and accessible information, designee program effectiveness will be minimized, designees underutilized, and AIR designee oversight and evaluation will be deficient.

Without the ability to capture and manipulate its knowledge base, AIR will continue to lose the corporate history of past decisions, and be unable to provide reliable substantiation of previous decisions when requested to identify inconsistent or contradictory information.

Without integrated and automated tracking and work measure tools, AIR will not gain the ability to conduct long-term strategic analysis for better decision-making on resource allocation and direction.

Description of Solution: For FY 2011, \$14,800,000 is requested to fund the following ASKME requirements:

- Electronic Filing Service EFS Historical scanning activities Second year.
- Work Tracking Software-Risk Based Resource Targeting WTS-RBRT Evaluation of solution for the RBRT Sub-Function.
- Monitor Safety Related Data Oversee System Performance Internal and External MSRD-OSPi and OSPe - Deploy and evaluate detailed system requirements; Finish Design and Development activities for the OSPi Sub-Function.

- Assimilate Lessons Learned (ALL) Finish development activities and evaluate solution for the ALL Sub-Function based on requirements gathered.
- Designee Supervision / Past Performance Sub-Function (DS/PP) Complete development activities and deploy solution for the DS/PP Sub-Function.
- Work Tracking Software Work Activity Tracking (WTS-WAT) Start development of detailed system requirements.

The FAA will develop an Aviation Safety Knowledge Management Environment (ASKME) to provide a system for electronically storing FAA technical documentation and lessons learned identifying aircraft design and manufacturing safety issues so that they can be found, accessed, and shared more easily. This technical data includes the rationale for design and production certification decisions, interpretations of rules and policies, and audits of aircraft industry manufacturers. In addition, ASKME will provide tools to improve the ability to identify potential unsafe conditions by analyzing this documentation along with safety information such as Service Difficulty Reports, NTSB safety recommendations and reports, accident reports, and Maintenance Difficulty Reports. Finally, ASKME will provide electronic tools for capturing key safety related data resulting from during its standard business activities for rulemaking and policy development, airworthiness directives, design certification, production/manufacturing certification, airworthiness certification, designee management, evaluation and audit, external inquiries, enforcement, continued operational safety management, and international coordination.

ASKME is a suite of information technology (IT) tools designed to support and enable the Aircraft Certification Service (AIR) to meet specific FAA goals of Safety, Organizational Excellence, and International Leadership. AIR is an organization within the Agency's line of business known as Regulation and Certification (AVS).

The mission of AVS is to promote aviation safety in the interest of the America public by regulating and overseeing the civil aviation industry. AIR is specifically responsible for establishing safety standards governing the design, production quality, airworthiness of civil aircraft products, and the continuing airworthiness of aircraft. AIR issues and maintains certificates for design and manufacture of aircraft, aircraft engines and propeller, materials, parts, and appliances. AIR uses industry-paid staff called designees to assist industry companies to prepare for and maintain their certifications. AIR manages designee qualifications, appointment and monitoring. AIR monitors safety performance by conducting reviews of aviation products and reviewing safety data for trends; conducting safety inspections and surveillance; investigating possible violations and initiating enforcement actions; and participating in accident and incident investigations. Fundamentally, AIR's criticality to the airspace is the responsibility for ensuring that civil aircraft are designed and built to operate safely within the National Airspace System (NAS).

While AIR has approximately 1,100 staff and 5,000 designees (representatives that act on behalf of the FAA to perform certification-related activities), the business challenges associated with meeting the agency goals (Safety, Organizational Excellence, International Leadership) require AIR to adopt and implement innovations in IT, hence the requirement for ASKME.

### ASKME will:

- Implement a proactive safety management system. This system is designed to identify and address safety risks and accident precursors throughout the product lifecycle of design, manufacturing, operations, and maintenance, as well as build into the safety management process, automated lessons learned feedback mechanisms. The risk assessment performed on the safety data may be used for risk management analysis, root cause analysis, corrective action, and follow-on work in the areas of standards, certification, maintenance, and operations.
- Provide comprehensive, real-time, organization-wide access to current and historic digital and paperbased documentation aimed at supporting effective and timely decision-making in standards, certification, and continued operational safety.
- Enable real-time collaboration among AIR technical staff, industry, international aviation agencies, applicants, approval holders, and designees to facilitate effective and timely decision-making.
- Automate the integration of risk management processes into standards development, certification, and continued operational safety.
- Provide tools to assist with designee oversight and delegation in certification through the use of automated risk management tools.
- Provide tools to enhance resource utilization and performance management and monitoring.

When integrated into our safety management approach and practices, these combined capabilities will enhance aviation safety and promote a culture of system safety.

In order to accomplish the objectives, the ASKME suite of tools will provide the following:

- Web-based knowledge management portal designed to store AIR's valuable knowledge assets, making them accessible, facilitating management and workforce decision-making, providing a proactive systems safety approach, and improving overall productivity and customer- and citizen-based satisfaction.
- Collaboration tools to facilitate real-time communications, decision-making, and management between AIR, FAA Designees, and aviation industry Applicants, as well as its domestic and international partners. This collaboration capability will enhance identification, analysis, management, and resolution of safety issues; certification and production approvals; as well as oversight of designees. The tools will also support real-time collaboration between AIR and international civil aviation agencies to facilitate decision-making during accident response and regulatory development, allowing for real-time exchange of accident/incident information and aviation supplier audit information with other countries.
- Predictive safety data analysis tools designed to support the full range of continued airworthiness analytical activities from safety data identification/collection, risk assessment, and risk management, to prescription of corrective action, monitoring, and feedback. The tools will provide the capability to access and analyze accident/incident data to enable recognition of potential safety problems and development of solutions or intervention strategies. The tools will also provide the capability to integrate and analyze compliance, production, operations, oversight, and regulatory data and information to aid in identifying potential safety risks, develop new regulatory material, and approve design modifications. Finally, the tool will support the application of risk management tools to elements of the safety continuum, where applicable.
- Integrated data management and reporting tools to support a standard and integrated data management architecture that can facilitate agency and aviation industry-wide data collection and information sharing.

<u>Benefits:</u> ASKME is a key initiative in the FAA. ASKME maps to the FAA's strategic plan goals for FY 2008-2012 and the FY 2009-2013 Flight Plan.

ASKME is specifically linked to DOT and FAA goals as follows:

FAA 2008-2012 Goals/Strategies/Targets:

Goal 1: Increased Safety

S1: Reduce commercial airline fatal accident rate.

S.1.1: Cut the rate of fatalities per 100 million persons on board in half by FY 2025.

S2: Reduce the number of fatal accidents in general aviation.

S2.1: Reduce the fatal accident rate per 100,000 flight hours by 10 percent over a 10-year period (2009-2018).

S6: Implement a Safety Management System (SMS) for the FAA.

S6.1: By FY 2010, implement SMS in the Air Traffic Organization, Office of Aviation Safety, and Office of Airports. In FY 2012, implement SMS policy in all appropriate FAA organizations.

AIR is responsible for ensuring civil aircraft are designed and manufactured to operate safely within the National Airspace System (NAS). ASKME will provide the automated systems to conduct safety data analysis, data gathering, as well as the collection of lessons learned as it applies to AIR's safety-related responsibilities (e.g. aircraft certification and certificate management, regulatory development, designee supervision and oversight, and continuous operational safety). Jointly these systems will provide AIR with a comprehensive mechanism aimed at: 1) the early identification and resolution of accident precursors; 2) the promotion of systematic and structured risk assessment/risk management practices; and 3) the proactive management of safety issues throughout the lifecycle of an aircraft and its components. The projected savings over the life of the program is estimated at 174 avoided fatalities and a total savings of \$495 million (then year dollars at 80 percent high confidence level).

ASKME's automated safety data analysis tools will help realize the vision of the AVS Safety Management System and help close the gap left on reducing the U.S. commercial fatal accident rate.

Goal 3: International Leadership

I1: Promote improved safety and regulatory oversight in cooperation with bilateral, regional, and multilateral aviation partners.

Bilateral, regional, and multilateral aviation partner's access to lessons learned from accidents. Presently, lessons are learned by the few within FAA intimately involved in the accident. The learning drops off exponentially from there. The lessons learned component of ASKME will allow us to make this information available to all our regulatory partners, so that they can also make learning these lessons a requirement for overseas industries.

Through ASKME's state-of-the-art web portal and use of data feeds, the FAA will be able to push safety information (e.g. AIR-40 communications, regulations, orders, policy, guidance, airworthiness directives (ADs), etc.) to our bilateral, regional, and multilateral aviation partners by allowing them to automatically receive specific safety information that AIR produces and is of interest to them.

Provide bilateral, regional, and multilateral aviation partner's access to selected tools for Part 21, 23, 25 data, Equivalent Level of Safety memos, Special Conditions, Type Certificate Data Sheets (TCDS), etc.

I2: Promote seamless operations around the globe in cooperation with bilateral, regional, and multilateral aviation partners.

AVS is planning for the sharing of international safety standards, safety and certification data in real-time, thereby enabling AVS to keep pace with the challenges associated with the ever-increasing globalization of aircraft design and manufacturing and the need for real-time partnership, collaboration, and decision-making. ASKME, through its knowledge management environment, will provide the capability to implement automation tools that will enable the FAA and its international partners including ICAO to conduct business, collaborate, and make decisions effectively and in real-time. Its offering as a "critical new technology" will help to attain the performance target of ensuring key operational procedures are in place for these stakeholders/partners in a consistent and timely manner.

A core concept of ASKME is the critical integration of people, process, and technology. Together, these three components can offer, a culture of knowledge and system safety. ASKME's true value will be derived from the integration of the tools into the business process whereby the people will be able to provide the highest degree of service to its customers.

Goal 4: Organizational Excellence

OE4: Make decisions based on reliable data to improve our overall performance and customer satisfaction.

OE4.1: In FY 2009, 90 percent of Major System Investments are on schedule and within 10 percent variance of current baseline total budget estimate at completion (BAC).

OE4.2: In FY 2009. 90 percent of Major System Investments selected annual milestones are achieved.

The ASKME program office will leverage an Earned Value Management (EVM) System as the primary mechanism for planning, controlling, and integrating of project scope, schedule, and resources. The ASKME EVM system will deliver program schedule and cost performance metrics enabling the program to anticipate, forecast, and communicate program performance while ensuring the program performs on schedule and within cost. The EVM system will also measure progress towards milestones in an independently verifiable basis.

The current and projected/future AIR workload exceeds workforce capability. ASKME business process tools will help AIR to streamline work activity and oversight practices. This will enable AIR technical staff to transfer non-safety critical work activities to its pool of designees. The work transfer will result in a future cost savings by allowing staff growth to be maintained at minimal levels. Further, the work transfer will

enable AIR technical staff to focus more on safety identification, risk management, resolution, and improvement activities.

ASKME's analytical tools will provide the basis for AVS' technical staff to identify and pre-empt potential hazards and events through predictive analysis and subsequent decision-making and corrective action. Corrective actions will then be monitored to assess impacts to safety for further refinement of the risk management model. ASKME safety benefits are calculated at \$495 million (determined based on if ASKME automation was in place at the time of the accident could causal factors associated with AIR business processes have been eliminated).

### APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$18,678.0
FY 2010 Appropriated		8,100.0
FY 2011 Request		14,800.0
FY 2012-2015		<u>46,200.0</u> <sup>1</sup>
Total	Various	\$87,778.0

### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
Document Detailed System Requirements		\$14,800.0

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<sup>&</sup>lt;sup>1</sup> Future requirements are based on activity levels that are validated on a year-to-year basis.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
3A09	Data Center Optimization	\$1,956,000	Various	M-31

Flight Plan Goal #4 - Organizational Excellence

Objective #2 – Improve financial management while delivering quality customer service.

<u>Objective #3</u> – Make decisions based on reliable data to improve overall performance and customer satisfaction.

FAA's current IT infrastructure is highly distributed and reflects FAA's historical, federated approach to managing IT services. The hub of the infrastructure consists of buildings, rooms, and closets that house computer servers and other equipment for storing, managing, and disseminating electronic data. This includes four EDCs, three of which are located at the Mike Monroney Aeronautical Center (MMAC) and one of which is located at WJHTC. The EDCs currently host about 25 percent of FAA's total server footprint. Additional buildings and rooms are disbursed throughout the country and generally co-located with the regional offices and service centers. ATO, ARC, and AVS own the majority of servers and manage the associated physical space.

FAA has identified major factors that necessitate a change to the IT infrastructure:

- **Growing capacity demand**. FAA increasingly relies on IT automation and underlying IT infrastructure in support the FAA's mission support, business and administrative operations, and it requires more IT infrastructure capacity to meet that demand. However, LOBs face capacity shortages in floor space and in associated power and cooling capacity. This deficit impacts business agility and keeps new capabilities from being deployed in support of FAA operations.
- Growing need for coordinated capacity management. FAA manages capacity at the LOB-level. FAA's overall increase in IT workload requires a shift toward enterprise-level capacity management. Currently there is insufficient FAA-wide strategy around application hosting and data centers, causing each LOB to make "band-aid" type facility investments without Agency-wide strategic requirements. This strategy will not only enable individual LOBs to plan more effectively, but will provide cross LOB efficiencies and opportunities for collaboration that would otherwise be unavailable.
- Expanding IT footprint with network security risk. As FAA increases its IT infrastructure footprint in data center spaces around the country, individual LOBs have a greater challenge to protect the IT infrastructure from security threats.
- Expanding IT footprint without adequate business continuity. FAA continues to expand its IT infrastructure footprint, but without a coordinated strategy for business continuity and disaster recovery. Individual LOBs do not have the resources to implement adequate levels of redundancy and fault tolerance, leaving critical services at risk for downtime.
- Increased emphasis on environmental sustainability and energy efficient technologies. Data centers are heavy consumers of the US energy supply. FAA needs to ensure its IT infrastructure reflects use of best energy management practices and best available technology.

The Data Center Optimization Strategy (DCOS) program addresses these shortfalls by:

- Reducing IT costs. Data center consolidation will eliminate redundant data center assets; increase
  efficiency and workforce productivity; and recover space used by current data center facilities for other
  business functions, resulting in significant cost savings.
- Improving business agility. The consolidation effort will result in a scalable and flexible infrastructure
  to meet future business needs; reduce the time required to deploy new capabilities; increase IT funding
  visibility and financial discipline; and reduce management complexity.
- Improving IT service quality. Data center consolidation provides FAA an opportunity to design and operate enterprise-class services based on industry best practices.

Reducing risk. By consolidating its data center assets and locating them at a few strategic sites, FAA
will significantly improve its ability to secure information, provide business continuity, and manage assets
and service availability.

In support of this strategy, in March 2009 the DCOS program entered Concept and Requirements Definition (CRD) to begin the Joint Resources Council (JRC) investment decision process. The DCOS program is scheduling CRD briefings for February 2010 in support of Investment Analysis Readiness Decision (IARD).

A positive IARD would enable the DCOS program to begin initial investment analysis in March 2010 in preparation for an Initial Investment Decision (IID). This phase would require development of an alternatives analysis, with detailed cost estimates, and a business case in support of the recommended alternative. The business case would include a rationale for data center consolidation at a moderate to high level, relative to number of EDC sites, as well as geographic location of those sites. It is anticipated that the DCOS program would schedule briefings for December 2010 in support of IID.

A positive IID would enable the DCOS program to begin final investment analysis in January 2011 in preparation for a Final Investment Decision (IID). This phase would require development of a program baseline with detailed cost estimates, lifecycle schedule milestones, an earned value management system, an acquisition strategy and plan, and a program management plan. It is anticipated that the DCOS program would schedule briefings for August 2011 in support of FID. A positive FID would enable the DCOS program to initiate procurement activities in early FY 2012.

### APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$0.0
FY 2010 Appropriated		0.0
FY 2011 Request		1,956.0
FY 2012-2015		0.0
Total	Various	\$1,956.0

### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
IID and FID Preparation		\$1,956.0

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
3B01	Aeronautical Center Infrastructure Modernization	\$15,000,000	1	F-18

Flight Plan Goal #4 - Organizational Excellence

Objective #2 – Control costs while delivering quality customer service.

<u>Description of Problem</u>: The Aeronautical Center Infrastructure Modernization program funds renovation and the replacement of major building systems at the Mike Monroney Aeronautical Center (MMAC) in Oklahoma City not provided for by any other funding source or lease agreement. Funds are used for renovations that sustain and ensure facilities remain viable for present and future FAA employees, students, and contractors that support Air Operations, Engineering, Training (Radar/Navaids), National Airspace System (NAS) Logistics, and Business Services. Many of the facilities are 50 years old and in need of structural upgrade and/or renovation. Many NAS support functions are conducted in outdated structures, and in some cases, in buildings that do not meet current building codes. Deferring renovation and modernization of aging facilities has serious and costly consequences that include leaking roofs, deteriorating plumbing, malfunctioning heating, ventilation, air conditioning systems and non-compliance with life safety codes that can disrupt work, cause NAS automation and technology failures, risk occupants' health and safety, require emergency repairs, and cause loss of productivity.

The addition of new equipment to FAA's inventory, coupled with existing NAS support requirements, increases the need to maintain suitable space at the Aeronautical Center that house critical mission support personnel. Renovation permits space efficiencies for additional functionality, personnel, and systems. There is a corresponding need for related Center infrastructure, such as storm sewers, water lines, and telecommunications.

Description of Solution: There are three primary segments to this program in FY 2011:

- Systems Training Building (STB) Renovation (Phase III of IV): The STB was constructed in 1969 and has not had significant renovation. The basement houses NAS system training servers and has raised access flooring that has failed due to deterioration and fatigue. Using a phased approach, renovation will repair/replace the basement floor and interior walls, install fire suppression systems for fire egress and separation in open stairwells, provide funding for new boilers/chillers, upgrade electrical wiring, plumbing, insulation and new windows.
- Environmental System Support Building (ESS) renovation design and construction: The ESS is a 37 year
  old building that has not been renovated since initial construction. Funding will provide for design and
  construction documents for replacement of interior partition walls and ceilings, replacement of lighting
  and electrical systems, boilers/chillers, electrical wiring, plumbing and insulation, and installation of fire
  systems and proper egress.
- The MMAC telecommunications backbone data network upgrades: Funding this program will provide Cisco network updates to the Aeronautical Center backbone to provide redundancy, reliability, security and availability. Router backplanes will be replaced to support increased bandwidth needed by Data Centers and increasing user requirements. Hardware/software upgrades will support newer model telephones and replace old hardware. Single mode fiber will be provided to the north center campus for increased redundancy of core routers on the network, and increase bandwidth to Data Centers and individual Aeronautical Center users.

For FY 2011, \$15,000,000 is requested for the following:

- \$6,740,000 is requested for the Systems Training Building renovation. Funding will provide for relocating NAS systems, replacing interior building partition walls; replacing ceilings, lighting and electrical systems, boilers/chillers, electrical wiring, plumbing and insulation, and installing fire systems and proper egress.
- \$7,400,000 is requested for the Environmental System Support Building renovation design and construction. Funding will provide for design and construction documents for replacing interior partition

- walls and ceilings, replacing lighting and electrical systems, boilers/chillers, electrical wiring, plumbing and insulation, and installing fire systems and proper egress.
- \$860,000 is requested to upgrade the telecommunications infrastructure. Funding will support implementation of the Cisco network for Center redundancy, reliability, security and availability. Router backplanes will be replaced to support increased bandwidth required by FAA data centers and personnel. Funding will provide for hardware/software upgrades to support newer model telephone and replace old hardware with current and single mode fiber for increased redundancy of core routers on the network.

Benefits: This program sustains the Aeronautical Center as 'US critical infrastructure' identified in Presidential Decision Directive (PDD) 63, also allowing compliance with Executive Order 13327 for the efficient/economical use of Federal resources to maintain Government facilities. Aeronautical Center facilities are cost effective, and lower in cost than comparable GSA metropolitan Oklahoma City leased facilities, FAA Headquarters, and other FAA facility locations. Renovation of Center facilities extends the useful life of renovated buildings by 25 years, ensuring a viable future for FAA at these facilities. In FY 2011, renovation improves facility space and energy utilization, reduces maintenance costs of major systems within renovated buildings, provides for incremental upgrades of telecommunications infrastructure, and improves productivity of personnel using renovated facilities through space efficiencies and improved environmental controls.

#### APPROPRIATION SUMMARY

	<u>Locations</u>	<u>Amount (\$000)</u>
Appropriated (FY 1982-2009)		\$140,800.4
FY 2010 Appropriated		13,810.5
FY 2011 Request		15,000.0
FY 2012-2015		42,800.0
Total	1	\$212,410.9

#### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. Systems Training Building (STB) Renovation		\$6,740.0
2. Environmental System Support Bldg (ESS) Renovation		7,400.0
3. Telecommunications Upgrades to Infrastructure		<u>860.0</u>
Total	1	\$15,000.0

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<sup>&</sup>lt;sup>1</sup> Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
3B02	Distance Learning	\$2,000,000	Various	M-10

#### Flight Plan Goal #4 – Organizational Excellence

<u>Objective #1</u> – Make the organization more effective with stronger leadership, increased commitment of individual workers to fulfill organization-wide goals, and a better prepared, better trained, diverse workforce.

<u>Description of Problem</u>: Distance learning provides FAA with state-of-the-art quality course delivery to geographically dispersed students with a reduced dependency on travel to centralized facilities. Within this overall effort, this project focuses primarily on computer-based instruction (CBI), satellite delivery over the Aviation Training Network (ATN), and web delivery as critical distance learning solutions. The emphasis for FY 2011 is to replace unsupportable platforms and facilitating courseware compatibility for CBI and replace ATN uplink and downlink equipment that have reached the end of their useful life. With these replacements, the Distance Learning Program can continue to provide highly reliable systems for all of FAA to maximize training and operational efficiency. Resident-based training is costly in per diem and travel expenses. The FAA requires cost-effective distance learning alternatives to reduce the current resident-based training load, accommodate increases in training due to the introduction of new national airspace systems, continue personnel transition/refresher training, support succession training, and provide performance support.

<u>Description of Solution</u>: For FY 2011, \$2,000,000 is requested allowing distance learning to use the existing CBI, ATN and web delivery systems to provide a cost-effective distance learning delivery system and give the FAA a balanced and blended approach to delivering training to FAA employees. The requested funding will replace obsolete/ unsupportable CBI platforms and ATN uplink and downlink equipment that has reached the end of its useful life.

<u>Benefits</u>: The major benefit of distance learning is the substantial reduction in student travel and per diem costs associated with resident-based training. In addition, distance learning delivery methods increase training effectiveness as well as training opportunities for all FAA employees, provide flexibility in training schedules through local management control, and decrease the time employees spend away from their work site. The FAA CBI, ATN, and web delivery systems are required to deliver initial operator, transition, and maintenance training for many NAS Programs. The FAA CBI and ATN systems are used to deliver a large percentage of the FAA's annual technical training resulting in average cost avoidance in travel and per diem over the last eight years of \$16,800,000 per year.

#### **APPROPRIATION SUMMARY**

	<u>Locations</u>	<u>Amount (\$000)</u>
Appropriated (FY 1982-2009)		\$53,160.1 <sup>1</sup>
FY 2010 Appropriated		1,500.0
FY 2011 Request		2,000.0
FY 2012-2015		4,000.0
Total	Various	\$60,660.1

<sup>&</sup>lt;sup>1</sup> Includes reduction pursuant to P.L. 108-7, February 20, 2003.

# COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	<u>Locations</u>	Estimated Cost (\$000)
1. CBI Hardware Replacement		\$850.0
2. CBI Compatibility Testing and Design		100.0
<ol><li>Software Development/Network Upgrades</li></ol>		100.0
4. ATN Hardware Replacement		<u>950.0</u>
Total	Various	\$2,000.0

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
4A01	System Engineering and Development Support	\$32,300,000	Various	M-03, M- 08, M-45

<u>FAA Strategic Goals:</u> Organizational Excellence – Ensure the success of the FAA's mission through stronger leadership, a better trained and safer workforce, enhanced cost-control measures, and improved decision making based on reliable date. Objective 3 - Improve financial management while delivering quality customer service.

<u>Description of Problem:</u> System Engineering and Development Support provides the continuity workforce required to support the agency goals of improving aviation safety and security, improving the efficiency of the air traffic control system, increasing the capacity and improving the reliability of the National Airspace System (NAS), and increasing productivity while reducing operating costs.

The Capital Investment Plan (CIP) specifies the need for a total system approach to modernize the NAS. This effort will accommodate future demands and technology, improve vital safety services, and increase productivity, while reducing operating costs. The NAS architecture is the structure that reflects the changes in requirements and the evolution of technology in aviation. It is a road map for transition from one program to another, the replacement of existing infrastructure, the introduction of new capabilities, and the retirement of outdated systems. The key to the architecture's success and the future of NAS is maintenance of the interfaces between outgoing systems, current systems, and incoming systems. This is achieved through the discipline of system engineering and integration.

#### 1. CIP Systems Engineering and Technical Assistance - SETA and Other Contractors (\$29,300,000):

<u>Description of Solution:</u> For FY 2011, \$29,300,000 is requested to support 162 contractor staff years to procure the necessary critical technical expertise to provide for various contracts supporting SE2020, system architecture and other 8A support, and program evaluation support. The request will support air traffic control specialists, subject matter experts, computer science, electrical, and communications engineers, program analysts, cost analysts, financial analysts, operations research analysts, planners, and computer hardware and software technicians. This expertise meets the requirements of system engineering and integration for automation, communications, navigation and landing, surveillance, weather, software integration, and facilities for the NAS.

<u>Benefits:</u> SETA provides the continuity, innovation, and cost-effective workforce required to support agency goals of improving aviation safety and security, improving the efficiency of the air traffic control system, increasing the capacity and improving the reliability of the NAS, and increasing productivity while reducing operating costs. The creativity and innovation of the SETA workforce has resulted in significant cost savings and reductions of risk to FAA programs. SETA has also developed and enhanced software tools and programs to help improve the efficiency of the agency.

### 2. Continued General Support - Provide ANF/ATC Support (Quick Response) - (\$3,000,000):

<u>Description of Solution:</u> Air navigation facility air traffic control systems support is requesting \$3,000,000 which provides for engineering and related services to adjust to unforeseen circumstances affecting the safety and operations of the air traffic control system, as well as responding to specific emergency project deficiencies that would delay the realization of aviation user benefits.

<u>Benefits:</u> SETA provides the continuity, innovation, and cost-effective workforce required to support agency goals of improving aviation safety and security, improving the efficiency of the air traffic control system, increasing the capacity and improving the reliability of the NAS, and increasing productivity while reducing operating costs. The creativity and innovation of the SETA workforce has resulted in significant cost savings and reductions of risk to FAA programs. SETA has also developed and enhanced software tools and programs to help improve the efficiency of the agency.

## APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$1,264,974.5 <sup>1</sup>
FY 2010 Appropriated		31,700.0
FY 2011 Request		32,300.0
FY 2012-2015		<u>133,400.0</u>
Total	Various	\$1,462,374.5

#### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. System Engineering Technical Contract		\$25,000.0
2. System Architecture/Other 8A Support		1,900.0
3. Program Evaluation		500.0
4. Computer Services		1,900.0
5. ATC/ANF Systems Support		3,000.0
Total	Various	\$32,300.0

<sup>&</sup>lt;sup>1</sup> Includes \$248,000 reduction as part of the \$1,500,000 Support Contract general reduction enacted in FY 1999. Includes \$3,200 reduction of FY 1998 funds pursuant to rescission contained in P.L. 106-69, October 9, 1999. Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
4A02	Program Support Leases	\$38,600,000	Various	M-08

<u>FAA Strategic Goals:</u> Organizational Excellence - Ensure the success of the FAA's mission through stronger leadership, a better trained and safer workforce, enhanced cost-control measures, and improved decision-making based on reliable data. Objective 3 - Improve financial management while delivering quality customer service.

<u>Description of Problem:</u> To operate the National Airspace System (NAS), FAA requires real property rights for approximately 3,167 rentable real estate leases. Without property rights, FAA could not operate the NAS since the majority of its facilities reside either on leased land or in leased building space. Building space leases include those for planned, constructed, and newly finished Air Traffic Control Towers with high rent. The FAA must also obtain clear zones to prevent interference with electronic signals at certain facilities, such as very high frequency omnidirectional ranges, airport surveillance radars, and air route surveillance radars.

The real property leases are legally binding contracts that usually require rents to be paid each year. The total rent amount for the leases portfolio increases each year due to the addition of leases for new facilities and the renegotiation of expired leases.

<u>Description of Solution:</u> This program secures the required real property rights by providing the payments for approximately 2,408 land leases, 681 space leases, and 78 leases covering both land and space for operational facilities. It also funds the purchase of land when economically advantageous to FAA.

For FY 2011 \$38,600,000 is requested to fund 3,167 leases along with other real estate requirements and will include:

- Payment of rents for land and space leases that directly support navigation, communication, weather observation and reporting, air traffic control, and other functions that support the NAS.
- Costs associated with the rental and management of land and space for service/maintenance centers, deployment/development centers, laboratories, test beds, and other types of facilities that support the deployment and operation of technical facilities.
- Funds for conversion of existing leases to fee ownership or perpetual easements.
- Payments for condemnation (leasehold or fee) of real property interests;
- Costs for real estate appraisals, market surveys, title reports, and other costs associated with the
  acquisition and management of real property assets.
- Funds for costs to relocate offices, facilities, personnel, and equipment.
- Funds to combine or consolidate multiple offices when technically feasible and economically advantageous.
- Funds for developing business tools to enhance real estate acquisition and management activities and for implementing program efficiency practices.
- Funding for costs associated with real property lease terminations and equipment disposals.
- Funding for testing and studies (environmental, suitability, sustainability, cost-effectiveness, etc.) in connection with the leasing, purchasing, usage, management, and disposal of real property.
- Funding for real property costs associated with the transition to next generation facilities.

<u>Benefits:</u> This program improves management of the FAA's real property assets and supports the Agency Flight Plan Goal of Organizational Excellence through the improvement of financial management while delivering quality customer service. Real property costs are being effectively controlled through:

- The oversight and approval of all requests for additional real property rights.
- The oversight and approval of all major maintenance and enhancements to existing real estate.
- Where feasible the consolidation of space or co-location of sites that currently are leased separately;
   hence, eliminating duplicate rent, utility, and maintenance costs.

## **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$524,774.6
FY 2010 Appropriated		37,500.0
FY 2011 Request		38,600.0
FY 2012-2015		177,900.0 <sup>1</sup>
Total	Various	\$778,774.6

# COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

	Locations/	Estimated Cost
Activity Tasks	<u>Quantity</u>	<u>(\$000)</u>
Operational Leases	Various	\$38,600.0

 $<sup>^{1}</sup>$  Future requirements will be based on activity levels and local situations that are validated on a year-to-year basis.

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
4A03	Logistics Support Services (LSS)	\$11,000,000	Various	M-05

Flight Plan Goal #4 – Organizational Excellence

Objective #2 – Control cost while delivering quality customer service.

<u>Description of Problem</u>: The FAA has a serious shortage of government logistics personnel at regions and centers to manage real estate, acquisitions, and materiel for NAS modernization and capitalize agency assets as required by the agency's Flight Plan. Without adequate logistics services, real estate will not be acquired, contracts to buy or upgrade equipment and construct facilities will not be awarded, and modernized equipment and systems will not be efficiently installed and commissioned. Additionally, FAA will not be able to adequately document the capital cost of FAA facilities, or comply with mandatory accounting standards set by the Government Accountability Office (GAO) that could put the achievement of a clean audit opinion at risk.

<u>Description of Solution</u>: For FY 2011, \$11,000,000 is requested to fund contractor-supplied logistics services. Through the LSS program, the agency utilizes contractor-supplied services to perform real property acquisition, materiel management, contracting activities in support of FAA Capital Investment Plan (CIP) projects, and conduct capitalization and property control-related activities. These services currently provide a significant portion of the workforce for acquisition, real estate, and materiel management at regions and centers. The LSS program is instrumental in establishing new or upgraded facilities, including air traffic control towers and TRACONs, throughout NAS. The logistics personnel services will support the FAA Facility Security Risk Management (FSRM) program. The LSS resources will continue to be used for asset tracking and documentation efforts to obtain and maintain a clean audit opinion.

<u>Benefits</u>: The LSS program supports the FAA's performance goals of safety and system efficiency by fielding modernized equipment, systems, and facilities within the timeframes established by the programs included in the CIP. The logistics services are used to achieve a clean audit report in compliance with GAO standards. The performance goal of safety is addressed in FAA contracts in support of the FSRM program, which is designed to improve physical protection of employees and facilities in critical infrastructure as required by Presidential Decision Directive 63, "Protecting America's Critical Infrastructure."

#### APPROPRIATION SUMMARY

<u>Locations</u>	Amount (\$000)
	\$151,774.1
	11,000.0
	11,000.0
	<u>34,000.0</u>
Various	\$207,774.1

#### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
Real Estate Acquisition, Materiel  Management, Contract Administration	Various	\$11,000.0

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 $<sup>^{1}</sup>$  Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
4A04	Mike Monroney Aeronautical Center Leases (MMAC)	\$16,600,000	1	F-19

Flight Plan Goal #2 - Greater Capacity

Objective #1 – Increase capacity to meet projected demand and reduce congestion.

The Aeronautical Center lease provides critical facilities to support the missions of air traffic training, aviation research, engineering support of NAS equipment, NAS supply chain operations, aviation medical research, and other important aviation regulation, registration, certification, safety, and business services in Oklahoma City. The lease reduces FAA annual operating costs by providing facilities that are cost effective and lower in cost than Oklahoma City GSA lease prices and national averages, FAA Headquarters, and other FAA facility locations.

<u>Description of Problem</u>: The MMAC lease provides all the land and 80 percent of the facility space comprising the Aeronautical Center, including maintenance of leased building exteriors and replacement of leased building systems. The average age of leased buildings at the Center is 44 years. Delayed repair and replacement of building systems lead to structural and environmental system risk. The lease is for 1,100 acres of land, 2.8 million square feet of facility space comprised of:

- Master Lease Land, base rent, maintenance, and insurance.
- Airmen and Aircraft Registry Lease Land, base rent, maintenance, and insurance.
- Thomas Road warehouse lease.
- Tower space for Terminal Doppler Weather Radar (TDWR) target generators.
- Grounds Maintenance.

The Center requires large parcels of land as NAS test sites for surveillance radar, communications, weather, and navigation/landing systems, as well as warehouse, administrative office space, and training facilities that support the missions of approximately 5,500 employees, contractors, and 30,000 students annually.

The Aeronautical Center is a Level IV security site based on numbers of employees, facility square footage, sensitivity of records, volume of public contact, and mission-critical facilities whose loss, damage, or destruction may have serious or catastrophic impact on the NAS.

Funding for this program provides for the FY 2011 lease costs that are specified in the lease agreement and a contractual obligation through FY 2012, with automatic renewal without increase in base rent through 2028.

<u>Description of Solution</u>: For FY 2011, \$16,600,000 is requested for the continuation of Aeronautical Center leases.

Benefits: Leasing Aeronautical Center facilities provides for support of critical infrastructure that includes:

- Aviation training for over 30,000 FAA and international students per year in resident and distance learning, including approximately 1,000,000 hours of distance learning delivered annually.
- Logistics services and supply support to the operational NAS to all FAA Airway Facility locations, Air Traffic, and approximately 70 DoD and international organizations.
- Engineering services for NAS systems modification and repair.
- Aviation research: medical and human factors for aviation personnel.
- Standards and flight inspection services.
- Regulation certification of safety related positions and equipment, airmen and aircraft records and registration.
- Business services including cost accounting and payroll for the FAA and other DOT organizations.

## APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)	1	284,498.9
FY 2010 Appropriated		16,200.0
FY 2011 Request		16,600.0
FY 2012-2015	<del></del>	<u>70,700.0</u>
Total	1	\$387,998.9

## COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
Aeronautical Center Lease Payments	1	\$16,600.0

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 $<sup>^{1}</sup>$  Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
4A05	Transition Engineering Support	\$15,000,000	Various	M-22

<u>FAA Strategic Goals:</u> Organizational Excellence – Ensure the success of the FAA's mission through stronger leadership, a better trained and safer workforce, enhanced cost-control measures, and improved decision-making based on reliable data. Objective 2 – Control costs while delivering quality customer service; and Objective 3 - Improve financial management while delivering quality customer service.

<u>Description of Problem:</u> Due to staffing shortfalls, FAA's technical workforce cannot handle the surge in demand for short-term programs/projects that are critical to managing the volume of diverse systems and equipment associated with National Airspace System (NAS) modernization. As a result, FAA will experience significant NAS modernization scheduling delays if additional support services are not available to complete these projects.

Configuration Management (CM) is a vital component of NAS life cycle management. CM is a disciplined approach for establishing management processes, identifying and documenting the functional and physical characteristics of a material item, controlling changes to item characteristics, and reporting and recording of configuration information, including maintenance of the configuration record. FAA Order 1800.66, Change 1, NAS Configuration Management prescribes that CM shall apply to all systems, subsystems and components of the NAS, including the documentation describing the NAS. The efficient management of CM information is critical to the operation of CM functions and activities, as well as the management of FAA systems throughout their lifecycle. Until deployment of WebCM in December 2005, the NAS change control process was manual, labor intensive one that did not often provide accurate status accounting of FAA systems. WebCM now provides a means for up-to-date, accurate, status accounting of NAS systems and is being used to manage the FAA's NAS Change Control Board (CCB).

<u>Description of Solution:</u> The Transition Engineering Services (NISC) program provides FAA with the technical expertise necessary to ensure that NAS modernization stays on schedule.

For FY 2011, \$13,000,000 is requested for Transition Engineering Services to support the modernization schedules for NAS programs by providing a cost effective contractual vehicle for meeting critical Capital Investment Plan (CIP) projects and FAA organizational technical requirements. These resources will be used to:

- Meet the minimum contractual obligations as stipulated in the Transition Engineering Services (NISC) contract.
- Maintain program stability so that FAA modernization projects remain on schedule.
- Meet FAA and NISC program goals in accordance with the FAA Flight Plan and other internal agency plan.

In addition for FY 2011, \$2,000,000 is requested for WebCM; of which \$1,000,000 will provide for Requirements Definition and Investment Analysis and \$1,000,000 will provide for Prototyping and Solution Implementation Support.

WebCM provides an automated, integrated solution to the Agency's CM community for managing the National Airspace System (NAS) Configuration Management (CM) process.

<u>Benefits:</u> The Transition Engineering Services program maps to organizational excellence by providing a highly skilled and experienced workforce at cost effective rates. This support integrates equipment and systems into the NAS and ensures that the equipment functions properly once delivered. It improves facility reliability and availability to the NAS, which results in safe, efficient, and cost effective air traffic services.

The WebCM program reduces the risk associated with the implementation of new systems and technology in the NAS; reduces NAS equipment acquisition and maintenance costs through a coordinated systems approach; provides seamless enterprise-wide access to a repository of validated, real-time CM data; standardizes CM

processes and more effective management of NAS change process; and integrates CM requirements across the Agency.

## **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$570,499.9 <sup>1</sup>
FY 2010 Appropriated		14,300.0
FY 2011 Request		15,000.0
FY 2012-2015		60,000.0
Total	Various	\$659,799.9

#### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost (\$000)
Centrally Procured Services (NISC)		\$13,000.0
2. Web CM/CM Automation	<del></del>	<u>_2,000.0</u>
Total	Various	\$15,000.0

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<sup>&</sup>lt;sup>1</sup> Includes \$358,000 reduction as part of the \$1,500,000 Support Contract general reduction enacted in FY 1999. Includes \$5,000,000 reduction of FY 2002 funds pursuant to supplemental P.L. 107-206, January 23, 2002. Includes reduction for EAS in FY 2002. Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
4A06	Frequency and Spectrum Engineering – NAS Interference, Detection, Location, and Mitigation (IDLM)	\$2,600,000	Various	M-08, M-43

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 1 - Increase capacity to meet projected demand and reduce congestion.

<u>Description of Problem:</u> Radio Frequency Interference (RFI) detrimentally affects ground and satellite-based NAS communication, navigation, and surveillance (CNS) services. RFI causes degradation, corruption and in some cases loss of critical voice and/or data information required for the safe air traffic control of aircraft. Since 1995, the FAA has experienced an average of 1,700 RFI events per year. The FAA existing legacy systems used to resolve and restore RFI disrupted NAS services are beyond their service life. Technology and equipment refresh is required to continue mitigating and resolving disruptions to critical communication, navigation, and surveillance services throughout the NAS.

<u>Description of Solution:</u> The FAA will procure new mobile RFI detection and location equipment to replace existing legacy systems and will procure and install new fixed monitoring systems around critical OEP airports.

For FY 2011, \$2,000,000 is requested for the Interference, Detection, Location, and Mitigation (IDLM) program. The IDLM program will:

- Install fixed direction finding sites hardware and software around one OEP airports to increase accuracy and quick mitigation response including interference to the GPS signal-in-space.
- Replace 20 existing Navigational Aids Signal Evaluator Radio Frequency Interference (NASE/RFI) airborne
  analog direction-finding systems with the Airborne Interference Monitoring Detection Systems (AIMDS)
  new technology.

Also, \$600,000 is requested for in-service engineering activities to support all prototyping efforts.

Benefits: The Frequency and Spectrum Engineering Services Program maps to the FAA goals of Greater Capacity. Investing \$2,600,000 in FY 2011, FAA will improve the availability and reliability of existing CNS interference disrupted radio services by reducing the restoration time. By implementing the IDLM program, NAS RFI events will be quickly detected, located, and resolved around critical airports, maximize the use of personnel resources for maintaining the primary undisrupted CNS service delivery, and will prevent operational aircraft delays caused by RFI. IDLM is also critical for enabling the benefits of Satellite based navigation and Global Positioning System (GPS) approaches.

This technology refresh and expansion in capability will support the NextGen requirements. In-service engineering allows for immediate response to emerging technology solutions.

## APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$11,900.0 <sup>1</sup>
FY 2010 Appropriated		3,600.0
FY 2011 Request		2,600.0
FY 2012-2015		0.0
Total	Various	\$18,100.0

## COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1 Jency 20	\$1,000.0 1,000.0
<u></u>	600.0 \$2,600.0
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<sup>&</sup>lt;sup>1</sup> Prior year funding in the amount of \$48,581.2 was appropriated under CIP #M15.01/02 (NAS Spectrum Engineering Sustained Support/Frequency Interference Support-Resolution.

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
4A07	Technical Support Services Contract (TSSC)	\$22,000,000	Various	M-02

<u>FAA Strategic Goals:</u> Organizational Excellence – Ensure the success of the FAA's mission through stronger leadership, a better trained and safer workforce, enhanced cost-control measures, and improved decision-making based on reliable data. Objective 3 - Improve financial management while delivering quality customer service.

<u>Description of Problem:</u> The amount of skilled work necessary to modernize the National Airspace System (NAS) far exceeds available in-house resources.

<u>Description of Solution:</u> The Technical Support Services Contract (TSSC) is the agency's primary vehicle to provide a supplemental work force to install equipment and to support infrastructure modernization in a timely, cost-effective manner. Significant work is required to install, modify, and relocate equipment by personnel with electronic, mechanical, and civil engineering skills. Often, the engineering and technician support is of short duration and requires skills that FAA government employee work force does not have or exists in insufficient numbers for a specific type of installation need. TSSC allows FAA to avoid hiring added employees for a limited duration to handle surge demand such as when new equipment is installed at multiple locations.

For FY 2011, \$22,000,000 is requested to continue the TSSC vehicle infrastructure costs.

<u>Benefits:</u> The TSSC program maps to Organizational Excellence by providing a highly skilled and experienced workforce at cost effective rates. In a typical year, the TSSC vehicle is used to purchase more than \$60.5 million in labor and accomplish more than \$27.8 million in non-labor cost activities such as site preparation and other public works construction. TSSC directly supports modernization to the NAS that ensures operational availability by replacing old equipment and sustaining the infrastructure.

#### APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$901,431.8 <sup>1</sup>
FY 2010 Appropriated		22,000.0
FY 2011 Request		22,000.0
FY 2012-2015		<u>107,000.0</u> <sup>2</sup>
Total	Various	\$1,052,431.8

#### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
Contractor Labor and Travel (CL&T)	Various	\$22,000.0

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<sup>&</sup>lt;sup>1</sup> Includes \$407,000 reduction as part of the \$1,500,000 Support Contract general reduction enacted in FY 1999. Includes reduction for EAS in FY 2002. Includes reduction pursuant to P.L. 108-7, February 20, 2003. Includes reduction pursuant to P.L. 108-199, January 23, 2004.

<sup>&</sup>lt;sup>2</sup> Future requirements will be based on activity levels and local situations that are validated on a year-to-year basis.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
4A08	Resource Tracking Program (RTP)	\$4,000,000	Various	M-08

<u>FAA Strategic Goals:</u> Organizational Excellence – Ensure the success of the FAA's mission through stronger leadership, a better trained and safer workforce, enhanced cost-control measures, and improved decision-making based on reliable data. Objective 4 - Make decisions based on reliable data to improve our overall performance and customer satisfaction.

<u>Description of Problem:</u> The hardware and software for the Resource Tracking Program (RTP), which is the key tool that makes up the Corporate Work Plan (CWP) Toolset, must be constantly maintained and upgraded, to support FAA and the processes that will be impacted as it continues to evolve into the Air Traffic Organization (ATO). If this program is not funded at the requested level RTP will fall out of sync with other systems and processes and the agency will not be able to retrieve reliable data for ATO Capital projects. RTP is used to track all ATO Capital projects from cradle to grave. It is also used to develop the CWP and work releases for the Technical Support Services Contract (TSSC). It interfaces with DELPHI and the Budget Execution Module (BXM). RTP is a centralized system with load-balanced servers residing in Headquarters.

<u>Description of Solution:</u> RTP must be kept current, the software and hardware will continue to be modified to support the changing processes and the other systems such as the CWP Toolset with which RTP interfaces. To do this, the NAS Implementation Support Contract (NISC) and the Technical Support Services Contract (TSSC) will be maintained for contractor support, software development efforts, and technical support. Also, hardware and software licenses will be maintained to keep the cost of upgrades to a minimum. This maintenance will cover both the Headquarters and Boston sites. Documentation that is used to provide training to users and administrators of the system will also be maintained.

For FY 2011, \$4,000,000 is requested to keep hardware and software licenses current, support Earned Value Management (EVM) and cost accounting, maintain TSSC contract and NISC support, upgrade training documentation, and continue to provide training to users and data administrators.

<u>Benefits:</u> The RTP meets the FAA performance goal of Improving Efficiency of Mission Support. Three of the primary achievements will be:

- Providing reliable data with an automated tracking and reporting system for capital projects that will
  enable decision-makers to enhance the use of agency resources.
- Keeping major acquisition programs on schedule and within costs by maximizing limited resources linked to budget information and processes. These achievements will be reached by providing enhanced program and project management capabilities with cost accounting of capital expenses to FAA. Managers and engineers will have up-to-date reliable data on capital projects through RTP.
- Improving productivity by more than 20 percent when a standardized project management process is supported and emulates current operating procedures.
- Providing earned value management capability.

## APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$24,380.2 <sup>1</sup>
FY 2010 Appropriated		4,000.0
FY 2011 Request		4,000.0
FY 2012-2015		8,000.0
Total	Various	\$40,380.2

#### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. Programming Planning/Management		\$2,200.0
2. System Security		200.0
3. Hardware/Software Design and Development		1,500.0
4. Training		100.0
Total	Various	\$4,000.0

<sup>&</sup>lt;sup>1</sup> Prior to FY 1997, RTP was funded under the Technical Services Support Contract budget line item 4A10. Includes \$3,600 reduction of FY 1998 funds pursuant to rescission contained in P.L. 106-69, October 9, 1999. Includes reduction pursuant ton P.L. 108-7, February 20, 2003.

Budget <u>Item</u> :	<u>Title</u> :	Request:	<u>Locations</u> :	CIP <u>Item(s</u> ):
4A09	Center for Advanced Aviation System Development (CAASD)	\$80,700,000	Various	M-03

<u>FAA Strategic Goals:</u> Greater Capacity – Work with local governments and airspace users to provide increased capacity in the United States airspace system that reduces congestion and meets projected demand in an environmentally sound manner. Objective 2 - Increase reliability and on-time performance of scheduled carriers

<u>Description of Problem:</u> The FAA, along with its aviation partners, faces a broad range of technically complex challenges to achieve the Next Generation Air Transportation System (NextGen). Although FAA employees are highly knowledgeable about those technologies, it would be impossible to employ all of the research, science and engineering expertise needed to develop and improve them. The FAA requires highly specialized simulation and computer modeling capabilities that it does not have in-house and are only available through a Federally Funded Research and Development Center (FFRDC) that has unique knowledge, skills, and capabilities in aviation research, systems engineering and analysis. The establishment of a stable source of funding, along with a long-term contractual relationship, is in the best interest of the public and the FAA, because it permits economies that can only be supported with an established work force and provides continuity of services for an efficient and effective use of an experienced professional staff.

<u>Description of Solution:</u> The Center for Advanced Aviation System Development (CAASD) is a Federally Funded Research and Development Center (FFRDC), operating under a Memorandum of Agreement with the MITRE Corporation. CAASD has unique knowledge, skills, and capabilities in aviation research, systems engineering, and analysis. CAASD also conducts a continuing program of research, development, system architecture, and high-level system engineering to meet FAA's long-term NAS requirements. A long-term contractual relationship is in the best interest of the public and FAA, because it stabilizes funding and supports an established and experienced work force that provides continuity of services. In addition, CAASD's charter permits access to sensitive and confidential agency information and data that is not normally available to support contractors. CAASD's expertise is critical to FAA in transforming the nation's air transportation system in an effective and timely manner.

The FY 2011 funding will support approximately 268 MITRE Technical Staff years (MTS) of research and systems engineering as well as technical and operational analyses. This staffing level is well below the Congressional ceiling of 600 MTS. The FFRDC Executive Board has approved the fourth edition of the FAA CAASD Long Range Plan (FYs 2009 - 2013).

For FY 2011, \$80,700,000 is requested to continue research and development, advanced analysis, and engineering in the following areas.

NAS and NextGen Systems Integration and Evolution. Develop and integrate the NextGen enterprise architecture, operational concepts, capability action plans, and roadmaps to achieve an integrated evolution and align agencies' enterprise architectures; analyze NAS-wide strategic issues involving multiple outcomes for efficient investment and operational decisions; provide definition, structure, and content for the NAS enterprise architecture and ensure alignment with the evolving NextGen architecture; provide recommendations for U.S. and international flight data processing to improve NAS operations and global harmonization; assess and provide recommendations for NAS operational and infrastructure evolution paths to maximize the use of common capabilities and automation platforms supporting cross-ATO portfolio investment decision making; validate the productivity gains, operational feasibility and user benefits of selected NAS initiatives to effect the transition to NextGen; assess service and cost benefits and provide recommendations for implementing net-centric strategies that reduce NAS complexity and improve user access to information.

<u>Communications Modernization.</u> Conduct technical analyses on architecture alternatives at the program, service, and domain levels to ascertain which alternatives meet the required level of NAS communications service for least cost; conduct engineering analysis, communications network definition, and transition strategy studies for the FAA's Voice Communications and System-Wide Information Management (SWIM)

programs to provide robust network-enabled operations and to reduce the overall FAA communications costs; conduct spectrum analysis focusing on strategic issues related to the availability of adequate spectrum resources to support aeronautical communications for NextGen operational concepts and including airport surface applications; CAASD will work with the FAA's NextGen plan and other Civil Aviation Authorities (CAAs) around the world to develop the next generation system. This will enable the FAA to take a global leadership role in aviation communications; perform technical, architectural, operational, cost analyses and modeling to support the implementation of digital data communications services in the NAS. Conduct analysis of the operations enabled by data communications to ensure that FAA and the user community understand the operational benefits and business case.

Performance Based NAS. Provide new concepts for achieving a performance-based NAS, for example, the RNP Parallel Approach Transition (RPAT) concept, which utilized CAASD's operational knowledge, laboratories, and visual tools in its development; conduct technical analyses to identify airports and runways that will benefit from RNP and RNAV procedures; develop algorithms and prototype performance case analyses to validate Flight Standards procedure development tools; identify problems that emerge in the implementation of RNP and RNAV procedures and recommend resolutions and new criteria requirements using CAASD's air traffic, airline, automation, and avionics expertise; analyze and model all aspects of navigation assets, including Wide Area Augmentation System (WAAS), Local Area Augmentation System, (LAAS), divestiture of navigation aides (NAVAIDS), modernization of Global Positioning System (GPS), and interoperability with other Global Navigation Satellite System (GNSS) systems (e.g., Galileo); access the NAS-wide operational impacts of investment options and decisions; improve understanding of the future environment including anticipated demand at airports and for airspace; anticipate the impact of planned improvements on future airport and airspace capacity.

<u>En Route Evolution.</u> Perform system engineering analyses for new technologies, capabilities, and procedures for the en route system architecture and operational applications; develop integrated operational concepts and prototypes to demonstrate and evaluate new capabilities and procedures for the NextGen mid-term timeframe; develop and validate operational en route evolution plans that are integrated and aligned with the other domains including terminal and traffic flow management; conduct analyses to identify and mitigate the key technical and operational risks for specific NextGen mid-term capabilities; validate the operational feasibility and expected efficiency and expected mid-term capabilities; conduct benefit and cost analyses of key NextGen mid-term capabilities, and assess the prioritization of these capabilities; develop system-level requirements for NextGen mid-term capabilities that can be transferred to a development contractor.

Terminal Operations and Evolution. Provide FAA with technical analyses that inform decision making on which technical architecture alternatives provide the required level of service and minimize costs; provide technical and operational insight into systems that can be used to safely permit reduced separation standards and/or significantly increase overall system capacity and productivity, including factors such as system technical performance, weather measurement performance, human factors engineering, operational evaluation, safety assessment, and decision support system design; provide operational feasibility and implementation risk analyses that assist the FAA in identifying and prioritizing among the more promising operational changes, procedures and enabling technologies; provide technical and operational expertise to enhance the quality and efficiency TRACON controller training, to allow for reduced training time and cost, improve trainee success rates, and improved workforce capabilities (e.g., reduced operational errors, improved productivity).

Airspace Design and Analysis. Structure and execute technical analyses that will inform FAA and Industry decisions on airspace design and management; engineer the processes that govern airspace strategic planning and analysis efforts; investigate, innovate, and develop modeling, simulation, and analysis capabilities facilitating airspace design; explore issues that influence strategic airspace management and design policy, such as sectorization concepts; integrate all the above efforts to provide a national, system-wide optimization of airspace, leveraging CAASD experience, and perspective to coordinate multi-regional and multi-facility design efforts and other national airspace activities.

NAS System Operations. Assess NAS system-level performance; design, develop, and evaluate solutions to significant issues with FAA operational personnel and customers responsible for implementing the solutions; develop operational strategies to manage emerging and chronic congestion problems by modeling capacity, delay, predictability, ripple effects, and access issues; design and evaluate solutions with FAA operational personnel and customers responsible for implementing the solutions; develop improved measurement techniques for assessing operations; improve the FAA's responsiveness to customer issues and improve traffic

management strategies by modeling and assessing major operational problems with integrated analysis to verify alternate solutions; develop new modeling and analysis capabilities for analytic weaknesses; design, model, and assess new system operations procedures for new capabilities and airspace changes that will be implemented in the near future; develop analysis techniques and data to improve information on en route and terminal operations used in FAA operational and investment decision making; develop and evaluate new metrics to measure overall NAS operational performance.

<u>Traffic Flow Management (TFM) Operational Evolution.</u> Perform technical analyses of TFM requirements and system design in order to ensure that developed system enhancements will meet the current and future operational needs in a cost-effective manner; develop metrics that provide insight into the performance of the TFM domain; provide assessment of concept maturity, operational feasibility and implementation risks; advance the maturity of concepts to account for uncertainty (e.g. probabilistically) in predictions and decision making, by developing algorithms and prototype capabilities and conducting human-in-the loop (HITL) evaluation that will improve the FAA's ability to predict imbalances between traffic demand and real NAS capacity; translate concepts into requirements and assess the impact of enhancement capabilities on the TFM modernization system so that implementation cost and difficulty can be factored into the prioritization planning process for new capabilities and procedures.

<u>Aviation Safety.</u> Perform technical analyses of NAS-wide accident and runway incursion risk to identify airports or specific types of operations with the highest risk, and prioritize implementation of appropriate operational and technological mitigations, leading to a reduction in accidents and runway incursions; develop metrics and processes that allow FAA to proactively identify potential safety issues with both operations and architecture; identify risks before they lead to incidents or accidents; and identify and assess the feasibility of new or advanced capabilities and standards that mitigate safety issues in the NAS.

Mission Oriented Investigation and Experimentation (MOIE). Develop the tools and techniques for studying system capacity, throughput, performance, system dynamics and adaptation to technology- and policy-driven change; identify opportunities for innovative solutions to NAS problems and enhancements to NAS capabilities and procedures, and capitalize on them through applied research and technology transfer; research future concepts and technologies to understand their potential impact on the NAS and to develop and refine concepts for operational use and potential benefits; use prototyping and in-lab demonstration and experimentation to learn what works and what doesn't, and incorporate stakeholder feedback and building industry consensus on the way forward in key areas; strengthen FFRDC systems engineering skills and tools by exploring new regimens including complexity theory, agent-based modeling, and productivity modeling; leverage collaborations with industry, academia, and the broader aviation research community.

NAS-Wide Information System Security. Provide technical guidance on the most effective way to engineer security capabilities into the NAS, emphasizing a NAS-wide approach that reduces overall cost by leveraging shared services and building security into the underlying IT infrastructure; provide guidance on security threats, technology, standards, and practices being applied in other government and commercial enterprises in order to evolve Information Systems Security (ISS) to adapt to changing threats and technology advances; develop requirements and recommend solutions for effective cyber incident management program; advise the FAA on creating an IT infrastructure that will be resilient, flexible, and adaptable, and provide a defense-indepth strategy; apply MITRE experience with the DoD's successful transition to Network Centric Operations and CAASD's NAS domain knowledge to provide technical guidance on deploying network centric technologies within the NAS while maintaining ISS defense-in-depth.

Broadcast and Surveillance Services. Research ADS-B ground and cockpit-based solutions that will permit the FAA to deploy ADS-B throughout the entire NAS in a cost effective and timely manner, while reducing the cost of ownership for FAA surveillance infrastructure and ATC, and improving safety for all NAS users; prototype basic and advanced ADS-B applications that will result in improved efficiency and capacity for FAA and the airlines. This includes transforming applications that will leverage the aircraft as an active part of the NAS, as in the NextGen vision, and result in more efficient NAS operations; assess the impact of ADS-B on safety, capacity, and efficiency benefits for the FAA and users. This includes performing user coordination and lab simulations prior to deployment, and data collection and analysis after deployment; develop domestic and international requirements and engineering standards for future ADS-B applications, in close coordination with the users and manufacturers, as part of RTCA, the ICAO, FAA, RFG, and Eurocontrol standards development activities.

Special Studies, Laboratory and Data Enhancements. Manage the breadth of the CAASD FAA work program in a manner that ensures the activities contributing to each individual outcome benefit from the broader perspective of the entire work program; provide the CAASD work program with a research environment where prototypes and capabilities can be brought together with the appropriate mixture of fidelity and development flexibility to facilitate integration investigations, compressed spiraling of operational concepts and procedure development; exploration of new technologies, visualization of concepts, exploration of human factor issues, and transition of prototypes between the lab and the field; provide the CAASD work program with a an efficient aviation data repository system and associated tools to support data analysis that results in more useful products across the work program at a lower cost; provide the CAASD work program with a flexible model of the NAS capable of quickly and reliably estimating the high-level impacts of new technologies, procedures, or infrastructure improvements on key system performance metrics; conduct special studies of key subjects, as directed by FAA senior management.

<u>Benefits:</u> High quality research, systems engineering, and analytical capabilities help FAA meet the technically complex challenges in the NAS. CAASD provides independent advanced research and development required by the FAA to obtain technical analyses, prototypes and operational concepts needed to fulfill the vision for NAS architecture, FAA's Flight Plan, the NextGen Implementation Plan – FAA's plan to achieve NextGen. CAASD efforts support all Flight Plan goals across the board and the FFRDC continues to play a key role in defining NextGen. Its expertise is critical to FAA's efforts to transform the nation's air transportation system in an effective and timely manner.

#### APPROPRIATION SUMMARY

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)		\$1,164,866.1
FY 2010 Appropriated		82,000.0
FY 2011 Request		80,700.0
FY 2012-2015		334,600.0
Total	Various	\$1,662,166.1

#### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
1. CAASD (Air Traffic Organization)		\$65,850.0
2. CAASD (Non-Air Traffic Organization)		<u> 14,850.0</u>
Total	Various	\$80,700.0

<sup>&</sup>lt;sup>1</sup> Prior year funding for GCNSS was appropriated in FY 2004 under OEP BLI 5A30.

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
4A10	Aeronautical Information	\$18,300,000	Various	A-08
	Management Program			

<u>FAA Strategic Goals:</u> Increased Safety – To achieve the lowest possible accident rate and constantly improve safety. Objective 1 - Reduce commercial air carrier fatalities.

<u>Description of Problem:</u> The safety of the National Airspace System (NAS) is predicated on common and coherent situational awareness among the operators and users of the system. The lack of timely and/or accurate aeronautical information (AI) such as Notices to Airmen (NOTAM) and pertinent military operations data, as well as the lack of internal and external mechanisms for delivering this information to the appropriate end users, has been shown repeatedly to be contributing factors in operational errors and runway incursions.

The problems currently associated with providing aeronautical information services relate to safety, operational constraints, system issues, and institutional issues.

<u>Safety</u> – Since AI is provided for the most part as paper products, it is often incomplete, inconsistent and inaccurate; it involves manual manipulation during processing and publication; and it is not provided from a single source in a timely manner. This can increase the risk of misinformation being disseminated and lead to accidents.

Aeronautical information customers/users use non-standard, product driven data from multiple sources; this causes aeronautical information overload. Managing aeronautical information relies on manual and stove-piped operations to collect, integrate, and distribute information. The paper-based products, such as airport facility directories and charts which provide a static view of the airspace system, must be integrated manually with more dynamic information, like NOTAMs, causing pilots and other customers to expend considerable effort parsing and integrating these multi-source, multi-formatted, data. Frequently the different sources contain the same or similar data, but these data are often inconsistent or inaccurate. Furthermore, dissemination may not be performed in a timely enough manner. Since the aeronautical information is not digital, using the paper-generated information in simulations or digital displays requires manual entry, a time consuming and error-prone process.

<u>Operational Constraints</u> - Legacy AI services are not providing information to meet the needs of modern electronic systems/devices and are not ameliorating the constraints within which the aviation community must function.

Aircraft are equipped for the 21st century with Global Positioning Systems (GPS), Electronic Flight Bag (EFB) systems, Automatic Dependent Surveillance (ADS) and many other technologies; meanwhile, aeronautical information is being promulgated as paper charts, publications and NOTAMs.

In the globally competitive aviation business, airlines are operating on thin financial margins and need to achieve efficiencies in a constrained, dynamic environment. The dissemination of real-time information on changing aeronautical conditions will allow airlines to perform forecasting simulations and adjust their use of the airspace system to the changed conditions. To increase overall system efficiency, mitigate capacity restrictions, facilitate delivery of real-time facility status information, eliminate hazards to flight, and reduce system outages, aeronautical information needs to be digitally encoded so it can be interpreted by computers.

<u>System Issues</u> - There are technical system-to-system delivery issues and difficulties due to aging equipment in our current aeronautical information environment.

There are too many manual interfaces. Use of manual processes may result in errors, promulgates duplicate data, and produces inefficiencies that may compromise safety. In addition, timely availability of aeronautical information suffers from deficiencies in integration with the military systems. For example, the Central Altitude Reservation Function (CARF) military system is obsolete, resulting in increased workload on personnel due to slow, manual labor-intensive efforts to enter necessary military-related information. Exchanging data

between military systems such as CARF or Military Airspace Data Entry (MADE) and FAA systems can also entail a manual process.

Currently systems that create, process, store and, disseminate aeronautical information are out-of-date and reaching end-of-service life, thus leading to high operational and maintenance costs. Hardware technical refresh and new or improved alternatives for handling, processing and disseminating aeronautical information need to be developed.

<u>Institutional Issues</u> - Issues of regulations, procedures, global standards, and legal liability, cost recovery, intellectual property, and sovereignty could impede our ability to deliver the type of aeronautical information required for future systems. We need to address these issues so that they do not prevent our ability to change, once technical issues are dealt with.

<u>Description of Solution:</u> For FY 2011, \$18,300,000 is requested for Aeronautical Information Management (AIM) Modernization to improve the delivery of NAS status information including Notices to Airmen, Special Use Airspace status, weather information and flight planning services. The AIM Modernization will:

- Provide a modern information management system for NAS status information including NOTAM, SUA status, weather products and flight planning.
- Provide mission essential, secure support to the NAS operational environment.
- Improve the quality and consistency of aeronautical information by improving information integrity.
- Support current and future customer needs by providing information in computer readable formats.
- Ensure FAA aeronautical information systems are consistent with International Civil Aviation Organization (ICAO) standards and recommended practices.

To accomplish this mission, AIM Modernization has formulated a two segment solution development strategy:

- Segment 1a NOTAM Modernization: Provides the foundation for a modern AIM information management infrastructure, provide enhanced Notices to Airmen (NOTAM) services and make critical improvements to the FAA's Central Altitude Reservation Facility (CARF).
- Segment 1b Digital Integrated Briefing: Incrementally adds aeronautical status information capability in the areas of special use airspace management, performance metrics, flight planning support and weather product support.

#### Results obtained in FY 2009 include:

- Initiate development of NOTAM policy and systems to support International Civil Aeronautical Organization (ICAO) standards. Provide initial digital NOTAM capability to 5 airports
- Incorporate 100 percent of new NOTAM policy guidelines into NOTAM Entry Systems.
- Accomplish Initial Investment Decision and commence Final Investment Decision for AIM Modernization -Segment 1a.
- Integrate "AS IS" Aeronautical Information Management (AIM) enterprise architecture into the NAS enterprise architecture.
- Improve FAA / DOD compliance with Military Operations (MILOPS) systems.
- Ensure compliance of Special Use Airspace (SUA) notifications with NOTAM and Airspace policy.
- Continue to promote use of AIM data standards by development and delivery Aeronautical Information Exchange Model (AIXM) Release 5.1.
- Begin development of an automated Altitude Reservation (ALTRV) system to address critical system failures of the legacy CARF system.
- Complete results of Airport field user benefits study.

Based on the projected work plan, products that will be developed in FY 2010 include:

- Deploy new operational sites and deliver NOTAM system disaster recovery site
- Provide NOTAM origination access to all US airports
- Identify transition plans from legacy AIM systems to AIM Modernization Segment 1a
- Continue Solution Development for AIM Modernization Segment 1a
- Complete Final Investment Decision (FID) for AIM Modernization Segment 1a

- Integrate "TO BE" AIM enterprise architecture into NAS Enterprise Architecture
- Ensure 100 percent of new AIM projects are captured by Enterprise Architecture
- Deliver initial Altitude Reservation (ALTRV) automation capability

#### Based on the projected work plan, products that will be developed in FY 2011 include:

- Continue implementing AIM Modernization Segment 1a
- Continue transitioning from legacy AIM systems to AIM Modernization Segment 1a
- Begin phased AIM Modernization Segment 1a deployment
- Achieve final AMS decisions supporting AIM Modernization Segment 1b

<u>Benefits:</u> AIM Modernization benefits are being developed and quantified as part of the Initial Investment Decision. Major benefits for Segment 1 are anticipated to be:

- 1. <u>Legacy operations and maintenance cost savings</u>: The existing systems are at end of service life and using an out-modeled architecture. New architecture approaches using virtualization and consolidated servers will result in lower operation, maintenance and recovery costs.
- 2. <u>Savings through labor cost reductions to perform CARF functionality</u>: The CARF system is beyond end of life and additional command center staff is needed to manually compensate for legacy system deficiencies. The continued degradation of CARF automation utility will eventually result in three times the staff required to process altitude reservations manually.
- 3. <u>Airline and AIS provider labor cost savings</u>: Airlines and AIS providers have dedicated personal to process, interpret and investigate legacy text NOTAMS. Digital NOTAM will reduce confusion and increase the ability to directly integrate NOTAM information into pilot briefings. A survey of major airlines indicates a savings of 10 to 200 hours daily.
- 4. <u>NOTAM related safety benefits</u>: On average four accidents a year reference NOTAMs as a contributing factor. In addition, data from the pilot self-reporting database indicates that NOTAM issues contribute to many self-reported errors.
- 5. <u>NOTAM operational issues</u>: Better and more timely NOTAM information will enable pilots and airlines to improve flight scheduling and planning. We anticipate that these changes will reduce en route and taxiing time at airports. Discussions with major carriers like FedEx indicate that NOTAM confusion causes operational inefficiencies.

#### **APPROPRIATION SUMMARY**

	<u>Locations</u>	Amount (\$000)
Appropriated (FY 1982-2009)	391	\$89,841.0
FY 2010 Appropriated		10,000.0
FY 2011 Request		18,300.0
FY 2012-2015	<u></u>	<u>41,200.0</u> <sup>1</sup>
Total	391	\$159,341.0

#### COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ <u>Quantity</u>	Estimated Cost (\$000)
Aeronautical Information Management		\$18,300.0

<sup>&</sup>lt;sup>1</sup> Future requirements are pending a JRC Decision.

Budget <u>Item</u> :	<u>Title</u> :	<u>Request</u> :	<u>Locations</u> :	CIP <u>Item(s</u> ):
5A01	Personnel and Related Expenses	\$492,000,000	Various	M-08, X-01

#### (Dollars in Thousands)

	FY 2009 <u>Enacted</u>	FY 2010 Request	<u>Change</u>	FY 2011 Request
FTE, Direct	2,831	2,968	0	2,968
EOY Employment	3,181	3,181	0	3,181
Funding	\$460,500	\$470,000	+\$22,000	\$492,000

This activity funds the personnel, travel and related expenses of the FAA F&E workforce. The F&E workforce includes electronic, civil, and mechanical engineers; electronics technicians; quality control and contract specialists, and flight inspection personnel. The FY 2010 request for personnel related expenses is further justified as follows:

	FY 2009 Enacted	FY 2010 Enacted	<u>Change</u>	FY 2011 Request
Personnel Compensation and Benefits	\$415,718	\$425,013	+\$19,731	\$444,744
Travel	34,971	35,126	2,219	37,345
Other Objects	9,811	9,861	50	9,911
Total Funding	\$460,500	\$470,000	+\$22,000	\$492,000

#### Explanation of Changes: +\$22,000

- +\$4,144 Annualization of FY 2010 pay raise and locality pay
- +\$14,663 FY 2011 pay raise and locality pay
- +\$924 Annualization of performance pay increases
- +\$2,043 Additional travel requirements
- +226 Inflation

## PERSONNEL COMPENSATION and BENEFITS (PC&B)

For FY 2011 the agency is requesting an increase of \$19,731,000 to sustain the current Facilities and Equipment (F&E) workforce. This workforce is critical to the FAA's ability to modernize the NAS. Their work ensures that new systems enhancement, such as NextGen, contribute to the overall efficiency, safety, and reliability of the NAS. Civil, mechanical, and electrical engineers are required to provide technical support for design reviews, perform site preparation and installation, conduct technical evaluations, and provide systems integration and in-service management.

#### **TRAVEL**

An increase of \$176 is requested for inflation in travel costs. Also requested is \$2,043,000 required for NextGen program support and needed equipment installation at critical NAS facilities.

Travel requirements are driven by F&E engineering and technical work. Installation crews spend as much as 80 percent of their time working at sites distant from their assigned work place. The ability to use centrally located technicians and engineers ensures a consistent, highly proficient pool of personnel to accomplish these critical tasks. These engineers and technicians are involved in development and operational testing, factory acceptance testing, site evaluations, site preparation, critical design reviews, quality assurance activities, and support of field installation crews.

Similarly, Aviation Safety (AVS) specialists spend as much as 50 percent of their time at sites distant from their assigned workplace. Their support ensures that NAS modernization is accomplished consistent with worldwide aviation standards as well as work with other International Civil Aviation Organization member states.

#### **OTHER OBJECTS**

An increase of \$50 is requested to maintain funding for other objects. Spending in other objects includes contractual services in support of facilities and equipment as well as supplies and common use equipment.

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## RESEARCH, ENGINEERING, AND DEVELOPMENT APPROPRIATION

For necessary expenses, not otherwise provided for, for research, engineering, and development, as authorized under part A of subtitle VII of title 49, United States Code, including construction of experimental facilities and acquisition of necessary sites by lease or grant, \$190,000,000, to be derived from the Airport and Airway Trust Fund and to remain available until September 30, 2013: Provided, That there may be credited to this appropriation as offsetting collections, funds received from States, counties, municipalities, other public authorities, and private sources, which shall be available for expenses incurred for research, engineering, and development.

# PROGRAM AND FINANCING (\$ in Millions)

		FY 2009	FY 2010	FY 2011
Identific	ation code: 69-1334-0-7-402	Actual	Enacted	Estimate
Tacritine	Obligations by pro gram activity	Actual	Lilacted	Littilate
	Direct program			
00.01	Improve aviation safety	95	117	94
00.02	Improve efficiency of the air traffic control system	26	69	55
00.03	Reduce environmental impact of aviation	19	57	36
00.04	Improve the efficiency of mission support	4	9	5
09.01	Reimbursable program	5	16	16
10.00	Total new obligations	149	268	206
	Budgetary resources available for obligation			
22.00	New budget authority (gross)	177	207	206
23.95	Total new obligations	-149	-268	-206
24.40	Unobligated balance carried forward, end of year	61	0	0
	New budget authority (gross), detail			
	Discretionary:			
40.00	Appropriation	171	191	190
	Spending authority from offsetting collections			
58.00	Offsetting collections (cash)	1	16	16
70.00	Total new budget authority (gross)	177	207	206
	Change in unobligated balances			
73.10	Total new obligations	149	268	206
73.20	Total outlays (gross)	-144	-204	-225
74.40	Obligated balance, end of year	134	198	179
	Outlays (gross), detail			
86.90	Outlays from new discretionary authority	61	100	100
	Offsets			
	Against gross budget authority and outlays			
88.00	Offsetting collections (cash) from: Federal sources	1	16	16
	Net budget authority and outlays			
89.00	Budget authority	171	191	190
90.00	Outlays	143	188	209

This account provides funding to conduct research, engineering, and development to improve the national airspace system's capacity and safety, as well as the ability to meet environmental needs. For 2011, the proposed funding is allocated to the following performance goal areas of the FAA: improve safety, capacity, and environmental performance of the National Airspace System. The request includes funding for several research and development activities of the Next Generation Air Transportation System (NextGen), as well as the Joint Planning and Development Office which coordinates the interagency effort to develop NextGen.

# OBJECT CLASSIFICATION (\$ in Millions)

		FY 2009	FY 2010	FY 2011
Identific	ation code: 69-1334-0-7-402	Actual	Enacted	Estimate
	Direct obligations			
	Personnel compensation			
11.11	Full-time permanent	27	33	34
11.13	Other than full-time permanent	1	1	1
11.19	Total personnel compensation	28	34	35
11.21	Civilian personnel benefits	7	8	9
12.10	Travel and transportation of persons	2	4	3
12.55	Research and development contracts	88	168	116
12.60	Supplies and materials	1	3	2
13.10	Equipment	1	2	1
14.10	Grants, subsidies, and contributions	17	33	24
19.90	Subtotal, obligations, Direct obligations	144	252	190
	Reimbursable obligations:			
22.55	Research and development contracts	5	16	16
29.90	Subtotal, obligations, Reimbursable obligations	5	16	16
99.99	Total obligations	149	268	206

## **Employment Summary**

Identification code: 69-8108-0-7-402	FY 2009 Actual	FY 2010 Enacted	FY 2011 Estimate
Direct:			
10.01 Civilian full-time equivalent employment	260	308	311

## **EXHIBIT III-1**

# RESEARCH, ENGINEERING & DEVELOPMENT Summary by Program Activity Appropriations, Obligation Limitations, and Exempt Obligations (\$000)

	FY 2009 <u>ACTUAL</u>	FY 2010 ENACTED	FY 2011 REQUEST	CHANGE <u>FY 2010-2011</u>
Improve Aviation Safety	90,763	93,572	93,702	130
Improve Efficiency	43,226	48,543	54,874	6,331
Reduce Environmental Impacts	31,658	42,031	35,974	-6,057
Mission Support	<u>5,353</u>	<u>6,354</u>	<u>5,450</u>	<u>-904</u>
TOTAL	171,000	190,500	190,000	-500
FTEs				
Direct Funded	260	308	311	3
Reimbursable, allocated, other	0	0	0	0

## EXHIBIT III-2

# RESEARCH, ENGINEERING & DEVELOPMENT SUMMARY ANALYSIS OF CHANGE FROM FY 2010 TO FY 2011 Appropriations, Obligations, Limitations, and Exempt Obligations (\$000)

Item	Change from FY 2010 to FY 2011	FY 2011 PC&B by Program	FY 2011 FTEs by Program	FY 2011 Contract Expenses	Total
FY 2010 Base		Note Co	olumns are N		
Research, Engineering and Development Appropriations, Obligations, Limitations, and Example Obligations		\$42,284	308	\$117,317	\$ 190,500
Limitations, and Exempt Obligations					
Adjustments to Base					
Annualization of FY 2010 Pay Raise	260	260			
FY 2011 Pay Raise - OSI	708	708			
FY 2011 Pay Raise - SCI	573	573			
Non-pay Inflation	212	373		212	
Subtotal, Adjustments to Base	1.753	1,541		212	1,753
Subtotal, Adjustillerits to base	1,755	1,541		212	1,755
New or Expanded Programs					
Improve Aviation Safety	-1,184			397	
Improve Efficiency	6,114	22	1	5,425	
Reduce Environmental Impacts	-6,185	43	2	6,100	
Mission Support	-998			904	
Subtotal, New or Expanded					
Programs	-2,253	65	3	-1,182	-2,253
Total FY 2011 Request	-500	43,890	311	116,347	190,000

	DEPARTMENT OF TRANSPORTATION								
	BUDGET AUTHORITY								
	(in thousands of dollars)								
	FY 2009 FY 2010 FY 2011 Enacted Enacted Request								
FED	FEDERAL AVIATION ADMINISTRATION								
A. R	A. Research, Engineering and Development 171,000 190,500 190,000								
A11	Improve Aviation Safety	90,763	93,572	93,702					
a.	Fire Research and Safety	6,650	7,799	7,231					
b.	Propulsion and Fuel System	3,669	3,105	2,332					
C.	Advanced Structural/Structural Safety	2,920	4,935	2,566					
d.	Atmospheric Hazards-Aircraft Icing/Digital System Safety	4,838	4,482	6,635					
e.	Continued Airworthiness	14,589	10,944	10,801					
f.	Aircraft Catastrophic Failure Prevention Research	436	1,545	1,165					
g.	Flightdeck/Maintenance/System Integration Human Factors	7,465	7,128	7,174					
h.	System Safety Management	12,488	12,698	11,907					
I.	Air Traffic ControTechnical Operations Human Factors	10,469	10,302	10,475					
j.	Aeromedical Research	8,395	10,378	11,217					
k.	Weather Program	16,968	16,789	16,505					
I.	Unmanned Aircraft System	1,876	3,467	3,694					
m.	NextGen Alternative Fuels for General Aviation	-	-	2,000					
A12	Improve Efficiency	43,226	48,543	54,874					
a.	JPDO	14,466	14,407	14,292					
b.	NextGen Wake Turbulence	10,132	10,631	10,685					
C.	NextGen: Air Ground Integration	2,554	5,688	10,614					
d.	NextGen: Self-Separation	8,025	8,247	9,971					
e.	NextGen Weather in the Cockpit	8,049	9,570	9,312					
A13	Reduce Environmental Impact	31,658	42,031	35,974					
a.	Environment and Energy	15,608	15,522	15,374					
b.	NextGen Environmental Research Aircraft Technologies Fuels and	16,050	26,509	20,600					
A14	Mission Support	5,353	6,354	5,450					
a.	System Planning and Resource Management	1,817	1,766	1,733					
b.	William J. Hughes Technical Center Laboratory Facility	3,536	4,588	3,717					

Budget Item	Program Title	Budget Request
A11.a.	Fire Research and Safety	\$7,231,000

#### GOALS:

This program supports the following Flight Plan goal: Increased Safety.

**Intended Outcomes:** The Fire Research and Safety Program helps achieve FAA's strategic goal of increasing aviation safety by reducing the number of accidents associated with aircraft fires and by mitigating the effects of a post-crash ground fire. The program develops technologies, procedures, test methods, and fire performance criteria that can prevent accidents caused by hidden in-flight fires and fuel tank explosions and improve survivability during a post-crash fire. Fire safety research focuses on nearterm improvements in fire test methods and materials performance criteria, fire detection and suppression systems, aircraft fuel tank explosion protection, and long-range development of ultra-fire resistant cabin materials.

**Agency Outputs:** The FAA issues aircraft fire safety rules that govern material selection, design criteria, and operational procedures. The new test methods, reports, and journal publications produced by the Fire Research and Safety Program describe the technical basis for these regulations and offer guidance for regulatory compliance. FAA provides industry with state-of-the-art safety products and information as a result of its research. FAA research also produces new materials and government-owned patents.

Research Goals: The FAA will work to reduce the number of accidents and incidents caused by in-flight fire in both passenger-carrying and all-cargo (freighter) aircraft, to prevent fuel tank explosions, and to improve survivability during a post-crash fire. Near term research will focus on improved fire test standards for interior and structural materials, improved fuel tank inerting systems and extended inerting applications, and new or improved fire detection and extinguishment systems. Additionally, long-term research will be conducted to develop the enabling technology for a fireproof aircraft cabin constructed of ultra-fire resistant materials. The following milestones directly support the ultimate strategic goals of in-flight fire prevention, fuel tank explosion prevention and improved post-crash fire survivability:

- By FY 2011, provide comprehensive guidance for fire safety of high energy density lithium batteries in passenger carry-on items and aircraft power systems.
- By FY 2012, define composite fuselage fire safety design criteria
- By FY 2013, demonstrate the improvements in post-crash fire survivability, provided by ultra-fire resistant materials using full-scale test simulations.

**Customer/Stakeholder Involvement:** The Fire Research and Safety Program works with the following industry and government groups:

- Aircraft Safety Subcommittee of the FAA Research, Engineering and Development Advisory Committee – These representatives from industry, academia, and other government agencies annually review the program's research activities.
- Technical Community Representative Groups The FAA representatives apply formal guidelines to
  ensure that the program's research projects support new rule making and development of
  alternate means of compliance for existing rules.
- Aircraft manufacturers (U.S. and foreign), airlines, foreign airworthiness authorities, chemical
  companies, material suppliers, and aircraft fire safety equipment manufacturers meet regularly to
  share information on interior material fire tests and improvement of fire detection and suppression
  systems.
- National Transportation Safety Board (NTSB) The FAA works with and supports NTSB on in-flight fire incidents, on-site accident investigations, and related testing.
- Pipeline and Hazardous Materials Safety Administration (PHMSA) The FAA works with PHMSA to cooperatively develop requirements/guidelines for the safe transport of hazardous materials (current focus on lithium batteries).

**R&D Partnerships**: Fire Research and Safety Program R&D partners include:

- FAA-sponsored International Systems Fire Protection Working Group R&D involves fuel tank protection, hidden fire safety, fire/smoke detectors, halon replacement, and lithium battery fire hazards.
- FAA-sponsored International Aircraft Materials Fire Test Working Group R&D involves development and standardization of improved material fire tests.
- Interagency working group on fire and materials promotes technology exchange among U.S.
   Government agencies and prevents unwarranted duplication of work.
- Interagency agreement with the National Institute of Standards and Technology develops fire retardant mechanisms and rapid screening tools for flammability.
- Memorandum of cooperation with the British Civil Aviation Administration R&D involves a variety
  of fire safety research efforts.
- Cabin safety research technical group cooperates in and coordinates cabin safety research conducted and/or sponsored by the international regulatory authorities.
- Arrangements with Fortune 100 companies to share development costs for new fire resistant materials.

**Accomplishments:** The FAA operates the world's most extensive aircraft fire test facilities. The FAA certification engineers receive training in these facilities each year and, at the request of the NTSB, program personnel participate in major fire accident and incident investigations. The Fire Research and Safety Program annually publishes over two-dozen reports and papers (available to the public on-line at http://www.fire.tc.faa.gov/reports.asp) highlighting research results that have led to major improvements in aircraft safety.

Outstanding program accomplishments include:

#### FY 2009:

- Developed guidance for the extinguishment of lithium battery fires in passenger carry-on items.
- Developed hazardous gas emission criteria for post-crash fire exposure of a burn-through resistant fuselage, including composite construction.
- Evaluated non-intrusive oxygen measurement technology in aircraft fuel tanks.
- Developed analytical model to predict wing fuel tank flammability.
- Developed an improved flammability test method and criteria for aircraft electrical wiring.
- Evaluated the behavior of lithium cells in aircraft battery systems subjected to fire threats.
- Evaluated the behavior of small prototype fuel cells under development for personal items when subjected to fire threats.
- Evaluated the effectiveness of graphite-oxide nanoparticles as an additive approach to non-halogen fire retardant materials.

#### FY 2008:

- Measured and compared the flammability of composite and aluminum wing fuel tanks under simulated flight conditions.
- Measured and compared the heat transfer from an in-flight fire in composite and aluminum fuselage constructions.
- Developed safe acute exposure limits for gaseous halocarbon extinguishing agents in ventilated aircraft
- Developed a one-dimensional thermo-kinetic burning model for combustible materials.

#### FY 2007:

- Developed a cabin crew training video for fighting in-flight fires.
- Characterized the flammability of epoxy-graphite structural composites.
- Developed and standardized a next generation burner for insulation burn-through resistance.
- Evaluated the flammability of non-halogen, ultra-fire resistant plastics.

#### FY 2006:

- Evaluated the cabin hazards caused by outgassing from a composite fuselage material subjected to a simulated post-crash fuel fire.
- Determined the fire hazards of lithium ion batteries shipped as air cargo.
- Conducted engine nacelle fire extinguishment tests to determine the suitability of a promising new environmentally friendly agent, NOVEC 1230, as a replacement for the currently used halon.

#### Previous Years:

- Developed and demonstrated a simple and cost effective fuel tank inerting system.
- Determined the limiting concentration of oxygen to prevent fuel tank explosions.
- Developed improved and new flammability tests for thermal acoustic insulation, measuring in-flight fire resistance and post-crash burn-through resistance, respectively.
- Developed minimum performance test standards for halon replacement agents.
- Developed and demonstrated an onboard cabin water spray system for significantly improving post-crash fire survivability.

#### FY 2010 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:

Fire Safety Improvements

- Determine the cost/benefit of freighter on-board fire detection and suppression systems.
- Evaluate adequacy of certification tests used to demonstrate freighter smoke/fire detection compliance with regulatory requirements.
- Examine the effectiveness of depressurization to control in-flight fires in freighter aircraft.
- Develop a small-scale test that measures the in-flight fire resistance of composite fuselage materials.
- Evaluate the hazards of magnesium alloy seat structure during full-scale post-crash fire tests.
- Evaluate the relative fire hazards of state-of-the-art fuel cell technology.

#### Fire Resistant Materials

Develop and validate burning model for charring and laminated/composite materials.

## **FY 2011 PROGRAM REQUEST:**

## Ongoing Activities

- Research on in-flight fire safety will continue to address all-cargo (freighter) aircraft, responding to improved freighter fire safety recommendations issued by NTSB, related to fire detection and suppression.
- Research will address the fire hazards of lithium batteries in passenger items, aircraft systems, and transported as cargo. The safe transport of lithium batteries will be emphasized, supporting a joint PHMSA/FAA plan which outlines needed research and planned rulemaking.
- FAA's unique fire test facilities will support the mandated replacement of halon extinguishing
  agents in aviation proposed by ICAO. Specific dates will be required for the use of halon
  replacement agents in handheld extinguishers, engines, and cargo compartments.
- Research related to the fire behavior of structural composites is driven by the new Boeing 787, the first large transport aircraft with a composite fuselage and wings. New test methods (e.g., in-flight fire resistance) will be standardized.
- Research will continue on the improvement of existing required flammability tests and the
  development of new tests for novel applications of materials that may impact future aircraft fire
  safety; namely, new magnesium alloy seat structure and other applications which may offer
  potential large weight savings.
- Research will be undertaken to examine the impact of alternative aviation fuels (e.g., biofuels) on fire safety. The initial emphasis will be on fuel tank flammability.
- Long-term, applied research will continue to develop the enabling technology for ultra-fire resistant interior materials and facilitate the transfer of that technology to the private sector through patents, reports, publications, and international standards. In addition, work will continue on the

development of a numerical computer model to simulate full-scale aircraft fire tests to determine the improvement in post-crash fire survivability provided by ultra-fire resistant interior materials.

#### **New Initiatives**

No new initiatives are planned in FY 2011.

## **KEY FY 2011 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:**

### Fire Safety Improvements

- Determine the feasibility of cost effective fire suppression systems in freighter aircraft.
- Evaluate the effectiveness of current and advanced fire extinguishing agents against lithium battery fires.
- Provide comprehensive guidance on lithium battery fire safety in passenger items and aircraft systems.
- Determine the effectiveness and safety of approved and developmental halon replacement agents for the extinguishment of cabin fires with hand-held extinguishers.
- Standardize the new composite flammability test method for in-flight fire resistance.
- Develop a flammability test method for seat structure (e.g., magnesium alloy), if warranted.
- Determine and compare the fuel tank flammability envelope for candidate alternative fuels and Jet A fuel.

#### Fire Resistant Materials

- Fabricate cabin components and assemblies of ultra-fire resistant materials (seat sets, wall/ceiling panels, carpeting) and measure component fire behavior.
- Extend the FAA thermal-kinetic burning model (ThermaKin) to two-dimensional to simulate flame spread in aircraft cabins for current and ultra-fire resistant materials.

## **APPROPRIATION SUMMARY**

	Amount (\$000)
Appropriated (FY 1982-2009)	154,998
FY 2010 Enacted	7,799
FY 2011 Request	7,231
Out-Year Planning Levels (FY 2012-2015)	30,094
Total	200,122

Budget Authority (\$000)		FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Contracts: Fire Research and Safety Personnel Costs Other In-house Costs		2,816 3,588 234	3,355 3,650 345	2,961 3,443 246	3,495 3,940 364	2,750 4,118 363
	Total	6,638	7,350	6,650	7,799	7,231

OMB Circular A-11, Conduct of Research and Development (\$000)	FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Basic	0	0	0	0	0
Applied	6,182	6,638	7,350	6,650	7,231
Development (includes prototypes)	0	0	0	0	0
Total	6,638	7,350	6,650	7,799	7,231

A11.a Fire Research and Safety	FY 2011			Program	Schedule		· · · · · · · · · · · · · · · · · · ·
Product and Activities	Request (\$000)	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
061-110 Fire Research & Safety	, ,						
Fire Resistant Materials  Demonstrate numerical burning model for composites used in AC Extend ThermoKin burning model to 2-D for flame spread in cabins	300	•	<b>♦</b>				
Measure fire behavior of current and fire resistant components and assemblies Demonstrate 3-D ThermaKin model for AC cabins using component fire data Evaluate improvement in post-crash fire survivability provided by ultra-fire resistant materials using full-scale fire test simulations			♦	<b>♦</b>	<b>◊</b>		
Fire Safety Improvement	2,450						
Examine prototype fuel cell technology for fire safety risks		•					
Evaluate freighter fire detection certification tests		•					
Determine cost/benefit of freighter detection/suppression systems Examine effectiveness of depressurization for cargo fire control		* •					
Develop in-flight fire resistance test for composite materials		•					
Full-scale tests on magnesium seat structure		•					
Determine the feasibility of cost/effective freighter fire suppression systems			<b>♦</b>				
Evaluate the effectiveness of current/advanced agents against lithium batteries			<b>♦</b>				
Provide comprehensive guidance on lithium battery fire safety			<b>♦</b>				
Determine effectiveness of halon replacement agents in hand-held			<b>♦</b>				
extinguishers Standardize composite in-flight fire test method			<b>♦</b>				
Develop a small-scale test for seat structure, if warranted  Determine fuel tank flammability envelope			<b>♦</b>				
for alternative fuels  Define composite fuselage fire-safety design			<b>♦</b>				
criteria				<b>\Q</b>			
Develop a prototype fire hardened cargo container for the shipment of lithium batteries				<b>♦</b>			
Determine an optimal halon replacement agent for cargo compartments based on full- scale fire tests				<b>♦</b>			
Determine the effect of alternative fuels on postcrash cabin fire safety					<b>◊</b>		
Develop detection/extinguishing system to suppress hidden in-flight fires						<b>◊</b>	
Examine fire safety aspects of aircraft oxygen systems							<b>◊</b>
Personnel and Other In-House Costs	4,481						
Total Budget Authority	7,231	7,799	7,231	7,350	7,475	7,580	7,689

Note: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual budget process.

Budget Item	Program Title	Budget Request
A11.b.	Propulsion and Fuel Systems	\$2,332,000

#### GOALS:

This program supports the following Flight Plan goal: Increased Safety.

**Intended Outcomes:** The Propulsion and Fuel Systems Program helps achieve FAA's strategic goal of increasing aviation safety by reducing the number of accidents associated with the failure of aircraft engines, components, and fuel systems. The program develops technologies, procedures, test methods, and criteria to enhance the airworthiness, reliability, and performance of civil turbine and piston engines, propellers, fuels, and fuel management systems. To improve safety, the program conducts research needed to develop tools, guidelines, and data to support improvements in turbine engine certification requirements.

**Agency Outputs:** The FAA issues certification standards, Advisory Circulars, and reviews the specifications and practices recommended by recognized technical societies (ASTM International, SAE International) to maintain the airworthiness of aircraft engines, fuels, and airframe fuel management systems. The agency also publishes information and sponsors technology workshops, demonstrations, and other means of training and technology transfer. The Propulsion and Fuel Systems Program provides the technical information, R&D resources, and technical oversight necessary for the agency to enhance the airworthiness, reliability, and performance of propulsion and fuel systems.

**Research Goals:** The main research area within the Propulsion and Fuels Program is to ensure the structural integrity and durability of critical rotating engine parts in turbine engines throughout their service life. This research is providing analytical tools to meet the requirements of Advisory Circular AC33.14-1, "Damage Tolerance for High Energy Turbine Engine Rotors", allowing aircraft turbine engine manufacturers to assess the risk of fracture and manage the life of rotor disks. Research is also being conducted to establish an improved understanding of other material factors and manufacturing anomalies that can shorten the fatigue life of rotor disks.

- By FY 2012, develop a design methodology for use by industry to prevent cold dwell fatigue in turbine engine rotor disks and define a technique to assess the risk of the current aircraft fleet for cold dwell fatigue.
- By FY 2012, develop a certification tool that will predict the risk of failure of rotor disks containing material and manufacturing anomalies.

**Customer/Stakeholder Involvement:** The Propulsion and Fuel Systems Program works with the following industry and government groups:

- Subcommittee on Aircraft Safety of the Research, Engineering and Development Advisory Committee – representatives from industry, academia, and other government agencies annually review the program's activities.
- Technical Community Representative Groups FAA representatives apply formal guidelines to
  ensure that the program's research projects support new rule making and development of
  alternate means of compliance with existing rules.
- The Aerospace Industries Association (AIA) working subcommittees on rotor integrity and rotor manufacturing.
- The National Transportation Safety Board Recommendations A-90-89 and A-90-90, recommend
  that a damage tolerance philosophy be implemented in the design and maintenance of failure
  critical engine parts, and A-98-28 recommends that FAA in cooperation with industry address the
  uncontained engine failures caused by cold dwell fatigue.

**R&D Partnerships:** Propulsion and Fuel Systems Program R&D partners include:

- Turbine Rotor Material Design Program Southwest Research Institute (SwRI) has teamed with Pratt and Whitney, General Electric, Honeywell, and Rolls Royce to provide DARWIN™ (Design Assessment of Reliability With INspection), a probabilistic-based rotor life and risk management certification tool.
- The AIA working subcommittees on rotor integrity and rotor manufacturing.

**Accomplishments:** Outstanding program accomplishments include:

#### FY 2009:

- Released an enhanced version of the DARWIN™ probabilistic rotor design code with capabilities for automatic rotor modeling.
- Completed experiments to calibrate and verify analytical methods for time-dependent crack growth and thermo-mechanical fatique crack growth.
- Test results on Swift Enterprises high-octane, bio-renewable aviation gasoline were published showing that the fuel provided slightly better detonation performance than 100LL, and slightly lower power output than 100LL and resulted in higher engine operating temperatures. Overall the performance of the fuel showed promise and justifies further research.
- Continued laboratory characterization and engine ground testing of candidate unleaded fuels to replace 100LL avgas.

#### FY 2008:

- Released an enhanced version of the DARWIN™ probabilistic rotor design code with capabilities for surface damage of turned surfaces and blade slots.
- Published final report on full scale engine tests of 45 fuel formulations provided by the CRC. The
  results were used to develop a predictive model used for testing unleaded fuel components and
  determined that unleaded fuels require 3 more octane numbers than leaded fuels for comparable
  full-scale engine detonation performance.

#### FY 2007:

- Completed an enhanced version of the DARWIN™ code with the following new features: new analysis mode for titanium hard alpha anomalies, probabilistic treatment of multiple anomalies, and a crack formation module.
- Completed full scale engine tests of 45 fuel formulations provided by the CRC.

#### FY 2006:

- Continued the enhancement of the DARWIN™ probabilistic rotor design code.
- Completed research on an experimental GA fuel provided by Exxon-Mobil under a cooperative research and development agreement; results demonstrated that amine-based additives show some promise as a replacement for 100LL.
- Completed research investigating the feasibility of using ethyl tertiary butyl ether (ETBE), an ethanol fuel blend, as a GA fuel; results showed there are significant range penalties associated with this fuel that make it an undesirable replacement for 100LL.

## FY 2005:

• Completed an enhanced version of the DARWIN™ code that addresses multiple subsurface defects in turbine engine rotor disks.

#### Previous Years:

- Populated a rotor manufacturing induced anomaly database for use by the engine industry in sharing lessons learned in the manufacture of critical rotating engine parts to prevent future accidents caused by manufacturing defects.
- Completed an industrial demonstration of the pool power controller for the vacuum arc remelting
  process that will aid in producing defect-free titanium material for the manufacturer of turbine
  engine rotor disks.
- Completed research on the performance in a GA piston engine of 30 unleaded fuel formulations specified by the CRC Unleaded Aviation Gasoline Development Group. The research showed that none of the candidate formulations match the detonation suppression capability of 100LL.
- Demonstrated, verified, and industrialized the probabilistic rotor design and life management code known as DARWIN™ for titanium alloys that provides turbine engine manufacturers a tool to augment their safe life approach.
- Demonstrated and verified the DEFORM™ defect deformation code for analysis of titanium alloy defects during the rotor disk forging process.

- Proved that the fleet octane requirement is the single most critical parameter for development of high octane unleaded aviation gasoline and that the motor octane rating of any potential candidate must be 100 or greater.
- Defined detonation detection procedures that were adopted by the American Society for Testing and Materials as a test standard (ASTM D6424) for use on candidate unleaded replacement fuels.

#### FY 2010 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:

Turbine Engine Research

 Released an enhanced version of the DARWIN™ probabilistic rotor design code with second generation capabilities for automatic rotor modeling.

## **FY 2011 PROGRAM REQUEST:**

Ongoing Activities

- Continue to advance DARWIN™, the probabilistically based turbine engine rotor design and life
  management code to enhance its predictive capability. This code is an FAA approved means to
  support a damage tolerant based certification enhancement to the current safe life design
  approach.
- Continue to develop advanced damage tolerance methods for turbine rotor disks through
  experimentation and modeling to address the effects of complex time-temperature stress histories,
  small crack sizes, anomalies in nickel alloys, crack geometries, and surface residual stress on
  fatigue crack growth life.
- Continue to develop a design methodology for use by industry to prevent cold dwell fatigue in turbine engine rotor disks and define a technique to assess the risk of the current aircraft fleet for cold dwell fatigue.

#### KEY FY 2011 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:

Turbine Engine Research

 Release an enhanced version of the DARWIN™ probabilistic rotor design code with capabilities for high temperature crack growth and the ability to introduce anomalies at shop visits and during service.

## **APPROPRIATION SUMMARY**

	Amount (\$000)
Appropriated (FY 1982-2009)	101,585
FY 2010Enacted	3,105
FY 2011 Request	2,332
Out-Year Planning Levels (FY 2012-2015)	9,555
Total	116,577

Budget Authority (\$000)	FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Contracts:					
Propulsion And Fuel Systems	2,592	2,463	2,415	1,579	1,200
Personnel Costs	1,366	1,476	1,168	1,400	1,047
Other In-house Costs	90	147	86	126	85
Total	4,048	4,086	3,669	3,105	2,332

OMB Circular A-11, Conduct of Research and Development (\$000)	FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Basic	0	0	0	0	0
Applied	5,741	4,086	3,669	3,105	2,332
Development (includes prototypes)	0	0	0	0	0
Total	4,048	4,086	3,669	3,105	2,332

A11.b Propulsion and Fuel Systems	FY 2011			Program	Schedule		
Product and Activities	Request (\$000)	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
063-110 Propulsion and Fuel Systems							
Turbine Engine Research	1200						
Develop a certification tool that will predict the risk of failure of rotor disks containing material and manufacturing anomalies		•	<b>♦</b>	<b>♦</b>			
Release an enhanced version of the DARWIN™ probabilistic rotor design code with second generation capabilities for automatic rotor modeling		*					
Release an enhanced version of the DARWIN™ probabilistic rotor design code with capabilities for high temperature crack growth and the ability to introduce anomalies at shop visits and during service.			<b>♦</b>				
Develop design methodology for use by industry to prevent cold dwell fatigue in turbine engine rotor disks and define a technique to assess the risk of the current aircraft fleet for cold dwell fatigue.		•	<b>*</b>	<b>*</b>			
Personnel and Other In-House Costs	1,132						
Total Budget Authority	2,332	3,105	2,332	2,357	2,383	2,399	2,416

Note: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual budget process.

Budget Item	Program Title	Budget Request
A11.c.	Advanced Materials/Structural Safety	\$2,566,000

#### GOALS:

This program supports the following Flight Plan goal: Increased Safety.

**Intended Outcomes:** The Advanced Materials/Structural Safety Program helps FAA achieve its strategic goal of increasing aviation safety by preventing accidents that would occur as a result of structural failure. The Advanced Materials/Structural Safety Program assesses the safety implications of new and present day composites, alloys, and other materials, and associated structures and fabrication techniques that can help to reduce aviation fatalities. The program also develops advanced methodologies for assessing aircraft crashworthiness.

**Agency Outputs:** The Advanced Materials/Structural Safety Program provides technical support for rule making and develops guidance to help the aviation industry comply with agency regulations.

#### **Advanced Materials**

The FAA establishes rules for the certification of safe and durable materials for use in aircraft construction. While the rules are the same for composite or metal structures, different behavioral characteristics of structural materials call for different means of compliance. Although Advisory Circular AC 20-107B, "Composite Aircraft Structure" has been published, advances in technologies and materials require periodic updates and expansion of the Advisory Circular. The FAA Chief Scientist and Technical Advisor disseminates current technical information developed in this program to regulatory personnel through technical reports, handbooks, guidance, and policy. The goal of this data exchange is to allow regulatory processes to keep pace with industry advances and benefit from state-of-the-art technology and design. This provides the most efficient safety and certification information to the FAA certification service and industry.

#### Structural Safety

The FAA revises or updates crashworthiness-related Federal Aviation Regulations to accommodate new information for overhead stowage bins, auxiliary fuel tanks and fuel systems, aircraft configurations, seat and restraint systems, and human tolerance injury criteria. The FAA through this program is developing alternative methods to streamline the certification process (i.e. certification by analysis and component tests in lieu of full-scale tests).

Research Goals: To prevent accidents associated with the airframe use of advanced materials and to improve the crashworthiness of airframes in the event of accidents, the Advanced Materials/Structural Safety research focuses on developing analytical and testing methods for standardization; understanding how design, loading, and damage can affect the remaining life and strength of composite aircraft structures; developing maintenance and repair methods that are standardized and correlated with training and repair station capabilities; enhancing occupant survivability and reducing personal injury from accidents; improving crash characteristics of aircraft structures, cabin interiors, auxiliary fuel tanks, fuel systems, and occupant seat and restraint systems; and improving the efficiency of aircraft certification through the use of better analytical modeling of crash events.

- By FY 2011, develop preliminary full-scale test and analysis protocols for repeated loads and damage threats.
- By FY 2012, assess the risks and technical issues associated with severe blunt impact (e.g., ground service vehicle collisions).
- By 2011, develop side facing aircraft seat neck injury criteria for low tension/high lateral moment upper neck loading.
- By FY 2012, establish design criteria for restraint systems that protect occupants at the highest impact levels that the aircraft structure can sustain.
- By FY 2012, quantify critical sandwich panel degradation mechanisms (e.g., disbonding, fluid ingression, freeze/thaw).
- By FY 2013, develop criteria for damage tolerance assessments of laminated composite structures.
- By FY 2012, define criteria for use of embedded sensors in fault tolerant structures.

- By FY 2013, generate methodology for demonstrating aircraft structure crashworthiness certification by analysis.
- By FY 2014, evaluate field bonded and bolted repair practices to update related guidance and training for composite aircraft structures.
- By FY 2014, evaluate the ability of models to predict off-axis and multiple terrain impacts.
- By FY 2015, evaluate existing and emerging bonded airframe technology to update guidelines and standards.

**Customer/Stakeholder Involvement:** The Advanced Materials/Structural Safety Program complies with or cooperates with the following legislation and industrial and government groups:

- Public Law 100-591, the Aviation Safety Research Act of 1988, and House of Representatives Report 100-894 – sets priorities to develop technologies, conduct data analysis for current aircraft, and anticipate problems related to future aircraft.
- The Aviation Rulemaking Advisory Committee (ARAC) this FAA committee and its subcommittees
  help to ensure the effectiveness of the agency's rule making by identifying R&D requirements and
  priorities, providing guidance for the update of documents, such as the Advisory Circular (AC)
  AC20-107B and encouraging industry's full participation in implementing new rules.
- Aircraft Safety Subcommittee of the Research, Engineering and Development Advisory Committee representatives from industry, academia, and other government agencies annually review the program's activities.
- Technical Community Representative Groups FAA representatives apply formal guidelines to
  ensure that the program's research projects support new rule making and development of
  alternate means of compliance for existing rules.

**R&D Partnerships:** The Advanced Materials/Structural Safety Program benefits from a close working relationship with the Joint Center of Excellence (COE) for Advanced Materials and Structures (JAMS) lead by Wichita State University and the University of Washington. The research performed under this program is leveraged by the monetary and intellectual contributions of its partners including many major commercial aviation companies.

#### **Advanced Materials**

FAA sponsors with the cooperation of other government agencies and industry, a primary, authoritative handbook (Composite Materials Handbook 17) facilitating the statistical characterization data of current and emerging composite materials. This international reference tool is the best available data and technology source for testing and analysis, and also includes guidance on data development, design, inspection, manufacturing and product usage. On recommendations by regulatory guidance, material data contained in this handbook are acceptable for use in the certification process.

## Structural Safety

The program maintains cooperative interagency agreements in the structural safety area with the U.S. Army and Navy in the analytical modeling area.

Memoranda of cooperation and exchange of personnel have been established between the program and the French, Italian, and Japanese governments in the crash testing area. The program has worked closely with Drexel University to develop dynamic crash computer modeling codes for transport airplane structures.

**Accomplishments:** The Advanced Materials/Structural Safety Program provides technical reports (available on-line at http://actlibrary.tc.faa.gov), handbooks, ACs, and certification guidance to FAA organizations, aircraft manufacturers, maintainers, and operators. Outstanding program accomplishments include:

#### FY 2009:

- Documented the technical basis for draft AC 20-107B updates through cooperative efforts with industry on bonded structures, damage tolerance, and maintenance practices (e.g., workshops in 2004 through 2008).
- Assessed the scaling affects on dynamic properties of composite materials.

- Work with Commercial Aircraft Safety Team (CAST) to determine bounds of the threats from airport service vehicle collisions as related to research on high energy blunt impact.
- Determined typical strain rates of aircraft seats during dynamic loading.
- Compared the Hybrid II anthropomorphic test dummy response to the FAA Hybrid III response for use in future certification by analysis modeling.
- Demonstrated geometric dependence of composite materials for crash response (flat specimens and curved specimens)

#### FY 2008:

- Developed chemical characterization tests to ensure adequate surface preparation for bonded joints.
- Developed safety criteria for damage tolerance of fiber/metal laminates and friction stir welded joints.
- Assessed the severity of control surface stiffness degradation and its effect on dynamic characteristics.
- Developed analytical method to evaluate anthropomorphic test device (ATD) model results for crash testing
- Completed research of computer modeling of aircraft water impacts to help determine revised rotorcraft water impact and ditching standards.

#### FY 2007:

- Evaluated analytical methods to predict residual strength of composite sandwich structures following an impact event.
- Established feasibility of embedded sensors to track damage in composite structures.
- Evaluated aging composite aircraft by a destructive evaluation and testing.
- Developed an updated ATR 42-300 model to analyze critical fuselage frame failure observed in the vertical drop test.
- Developed occupant protection criteria for side facing seats commonly used in business jets. Currently, no criteria exist.
- Evaluated the use of reticulated foam to mitigate post-crash fires using full-scale sled tests.

### FY 2006:

- Developed software for analyzing bonded joints that can be used by the general aviation industry.
- Developed a web-based course on maintenance of composite airframe structures.
- Developed analytical models that predict durability of braided materials.
- Generated data on human neck injury criteria for side-facing aircraft seats that may be used to develop safety criteria for business jet with side-facing seats. Currently, no criteria exist for these seats.

### Previous years:

- Developed an aircraft seat cushion replacement methodology that may have the potential to replace future requirement for full-scale sled test currently required when replacing aircraft seat cushions.
- Established common practices for bonded joints in composites structures that served as a basis for a policy memo.
- Developed data on the procurement and processing of composites that resulted in a published Advisory Circular.
- Analyzed data from ATR42-300 drop test to help establish crashworthiness criteria for commuter aircraft.
- Developed an economical data reduction method, characterizing statistically composite materials through shared databases, that is now used worldwide by the general aviation industry.

## FY 2010 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:

#### **Advanced Materials**

- Continued work with industry to develop consensus for a damage tolerance and fatigue certification protocol.
- Initiate work to expand developments in composite training with the initial emphasis on levels of safety awareness.
- Initiate studies for the types of threats to composite aircraft structures while at the service gate and on the flight line.
- Generate composite material dynamic properties important to crashworthiness.
- Continue work with the FAA Office of Aviation Safety (AVS) in support of AC 20-107B by providing next level of protocols, data and guidance through research initiatives.
- Initiate work with new material forms (e.g., discontinuous fiber composites) that have found application in primary aircraft structures.

### Structural Safety

- Continue to develop analytical modeling techniques of aircraft crash conditions.
- Continue to review of the need for off axis analysis capabilities to assist in certification of structures for crashworthiness.
- Initiate discussions with EASA and other foreign regulators to evaluate modeling for rotorcraft impact on water, soft soil and hard surface.
- Develop guidelines (SAE 5765) to support the use of certification by analysis to streamline aircraft seat certification.
- Develop analytical modeling techniques to evaluate head injury criteria to support stream lining of aircraft seat certification.

## **FY 2011 PROGRAM REQUEST:**

#### Ongoing Activities

The program will continue to focus on damage tolerance and fatigue issues of composite airframes. This includes assessment of impact damage threats (e.g., in-flight hail, ground vehicle collisions). In addition it will focus on the aging of composite materials. Composite control surfaces degradation on transport airplanes will be explored and linked to aircraft safety issues. Quality control procedures will be studied for adhesive joints. Important field variables will be evaluated for bonded and bolted repairs. Researchers will also explore savings in maintenance costs, of using embedded sensors to monitor in-service damage and will investigate the long-term safety of friction stir-welded parts and fiber/metal laminates proposed for use in new aircraft. In addition, they will collect data for new materials and applications, such as ceramics and high temperatures.

Research will continue to develop analytical models of aircraft crash events. This will focus on the development of criteria and methodologies to validate analysis techniques and assess the effectiveness of the analysis to properly describe the crash event.

#### **New Initiatives**

No new initiatives are planned in FY 2011.

## **KEY FY 2011 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:**

## **Advanced Materials**

- Document accepted certification methodology for damage tolerance and fatigue. including full-scale test and analysis protocols for repeated loads and damage threats
- Develop training and conduct workshops to review progress in damage tolerance, adhesive joints and maintenance.

#### Structural Safety

 Develop analytical modeling protocols and methodologies of aircraft structures crash conditions for certification use

## **APPROPRIATION SUMMARY**

	Amount (\$000)
Appropriated (FY 1982-2009)	101,001
FY 2010 Enacted	4,935
FY 2011 Request	2,566
Out-Year Planning Levels (FY 2012-2015)	10,546
Total	119,048

Budget Authority (\$000)		FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Contracts:						
Advanced Materials		1,211	6,054	1,838	3,855	1,250
Structural Safety		165	0	0	0	0
Personnel Costs		1,394	945	1022	1004	1,218
Other In-house Costs		73	84	60	76	98
	Total	2,843	7,083	2,920	4,935	2,566

OMB Circular A-11, Conduct of Research and Development (\$000)	FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Basic	0	0	0	0	0
Applied Development (includes prototypes)	2,843	7,043	2,920	4,935	2,566
Total	2,843	7,083	2,920	2,448	2,566

Product and Activities	Request	Program Schedule							
2/0.444.4.1	(\$000)	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015		
D62-111 Advanced Materials Structures									
Advanced Materials	1,250								
Generate composite material dynamic properties important to crashworthiness.		•	<b>♦</b>						
Continue to provided data to the FAA Office of Aviation Safety (AVS) in support of AC 20-107B		•	<b>♦</b>						
Continued work with industry to develop consensus for a damage tolerance and fatique certification protocol.		•	<b>♦</b>						
Initiate work to expand developments in composite training with the initial emphasis on levels of safety awareness.		•	<b>♦</b>	<b>♦</b>					
Initiate studies for the types of threats to composite aircraft structures while at the service gate and on the flight line.  Document accepted certification		•	<b>♦</b>	<b>♦</b>	<b>♦</b>				
methodology for damage tolerance and fatigue. including full-scale test and analysis protocols for repeated loads and damage threats		•	<b>♦</b>	<b>♦</b>	<b>♦</b>				
Develop training and conduct workshops to review progress in damage tolerance, adhesive joints and maintenance.		•	<b>♦</b>	<b>*</b>	<b>*</b>		<b>♦</b>		
Initiate work with new material forms (e.g., discontinuous fiber composites) that have found application in primary aircraft structures.		•	<b>*</b>	<b>♦</b>	<b>♦</b>	<b>*</b>	<b>♦</b>		
062-110 Structural Safety									
Structural Safety	0								
Continue to develop analytical modeling techniques of aircraft crash conditions.  Continue to review of the need for off		•	<b>♦</b>						
axis analysis capabilities to assist in certification of structures for crashworthiness.		*	<b>♦</b>						
Develop analytical modeling techniques to evaluate head injury criteria to support stream lining of aircraft seat certification. Develop analytical modeling protocols		*	<b>♦</b>	<b>♦</b>					
and methodologies of aircraft structures crash conditions for certification use		•	<b>♦</b>	<b>♦</b>	<b>♦</b>				
Develop guidelines (SAE 5765) to support the use of certification by analysis to streamline aircraft seat certification.		•	<b>♦</b>	<b>♦</b>	<b>♦</b>				
Initiate discussions with EASA and other foreign regulators to evaluate modeling for rotorcraft impact on water, soft soil and hard surface.			<b>*</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>			
Personnel and Other In-House Costs	1,316								
Total Budget Authority	2,566	4,935	2,566	2,596	2,628	2,650	2,672		

Note: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual budget process.

Budget Item	Program Title	Budget Request
A11.d.	Atmospheric Hazards - Aircraft Icing/Digital System Safety	\$6,635,000

## GOALS:

This program supports the following Flight Plan goal: Increased Safety.

Intended Outcomes: The Atmospheric Hazards/Digital System Safety Research Program supports FAA's strategic goal of increased safety by reducing the number of accidents or potential accidents associated with aircraft icing and failures to software-based digital flight controls and avionics systems in preparation for the Next Generation Air Transportation System (NextGen). The program develops and tests technologies that detect frozen contamination, predict anti-icing fluid failure, and ensure safe operations both during and after flight in atmospheric icing conditions. To improve digital system safety, researchers are proactive in ensuring the safe operation of emerging, highly complex software-based digital flight controls and avionics systems.

A major goal of the program is to reduce aviation's vulnerability to all in-flight icing hazards through the application of its research to improve certification criteria. Commercial airplanes are not yet certified to fly in icing conditions to an icing envelope that includes supercooled large droplet (SLD) icing conditions. The program's researchers have contributed to the development of technical data and advisory materials to correct this omission. A study by the Engine Harmonization Working Group indicates that over 100 inservice engine events, many resulting in power loss and at least six in multiple engine flameouts, occurred in high ice water content environments over the period 1988 to 2003. A current collaborative research effort will address this issue.

The program will develop new guidelines for testing, evaluating, and qualifying digital flight controls and avionics systems for the certification of aircraft platforms. Additionally, the program supports development of policy, guidance, technology, and training needs of the Aircraft Certification Service and Flight Standards Service that will assist and educate FAA and industry specialists in understanding digital systems safety and assessing how it may be safely employed in systems such as fly-by-wire, augmented manual flight controls, navigation and communication equipment, and autopilots.

**Agency Outputs:** The FAA establishes rules for the certification and operation of aircraft that encounter icing conditions as well as rules for the use of software, digital flight controls, and onboard avionics systems. The agency uses the research results to generate ACs, and various other forms of technical information detailing acceptable means for meeting requirements, to guide government and industrial certification and airworthiness specialists and inspectors.

**Research Goals:** To reduce the number and severity of accidents, or potential accidents, associated with icing and failures to software-based digital flight controls and avionics systems, the program develops and assesses ways to ensure that airframes and engines can safely operate in atmospheric icing conditions, and ensure the proper operation of software, electronic hardware, and digital systems.

## Atmospheric Hazards

- By FY 2011, complete characterization of high ice water content atmospheric environments potentially hazardous to engines.
- By FY 2012, complete experimental work on the physics of engine icing in high ice water content environments.
- By FY 2013, develop methods for the airworthiness testing of engines in simulated high ice water content environments.
- By FY 2014, develop data and methods supporting the evaluation of aircraft engines for operation in high ice water content environments.

## Digital System Safety

 By FY 2011, determine potential safety, security, and certification issues of connecting aircraft systems to external systems, onboard network security and integrity.

- By FY 2011, develop new methods of evaluation for airborne electronic hardware to include semiconductor device wear out, system effects produced by microprocessors, reliability prediction, and lifecycle maintenance, while dealing with commercial off-the-shelf (COTS) technology in complex and safety-critical systems.
- By FY 2013, evaluate development and integration techniques that will produce software for complex highly integrated systems that must comply with airworthiness requirements.
- By FY 2013, evaluate airborne electronic hardware techniques and tools for qualification, verification, and assurance to develop additional evaluation methods that may improve the certification process for airborne electronic hardware.
- By FY 2013, evaluate alternatives to existing verification and validation techniques; improved techniques will provide a way to identify system requirement errors early in the development process before implementation into the system.
- By FY 2014, determine applicability of safety engineering and reliability engineering to software development assurance standards (i.e., Software Considerations in Airborne Systems and Equipment Certification (DO-178B).

**Customer/Stakeholder Involvement:** The Atmospheric Hazards/Digital System Safety Research Program collaborates with a broad segment of the aviation community to improve aircraft certification, inspection, and maintenance, including:

- Aircraft Safety Subcommittee of the Research, Engineering and Development Advisory Committee –
  representatives from industry, academia, and other government agencies annually review the
  activities of the Atmospheric Hazards/Digital System Safety Research Program.
- Technical Community Representatives Groups FAA representatives apply formal guidelines to
  ensure that the program's R&D projects support new rule making and the development of alternate
  means of compliance with existing rules.
- Ice Protection Harmonization Working Group and Engine Harmonization Working Group of the FAA
   Aviation Rulemaking Advisory Committee groups that ensure the effectiveness of the agency's
   rule making. Members of the working group and full committee identify research requirements and
   priorities.
- G-12 Aircraft Ground Deicing Committee of the Society of Automotive Engineers (SAE) this subcommittee assists in updating holdover time guidelines and establishing standards for de/antiicing methodologies, deicing fluids, and ground ice detection.
- SAE AC-9C Aircraft Icing (In-flight) Subcommittee this subcommittee assists in establishing guidance and standards for icing test and simulation methods.
- RTCA (formerly known as Radio Technical Commission for Aeronautics) members of this U.S.
  Federal Advisory Committee and its special committees (SC) help to ensure the effectiveness of the
  agency's rulemaking by identifying research requirements and priorities and providing guidance for
  Aircraft Certification Office engineers and the update of documents, such as avionics software, and
  electromagnetic hazards.
- Certification Authorities Software Team (CAST) a group of international certification software and AEH specialists who collaborate and make recommendations to regulatory authorities on the resolution of software and AEH aspects of safety.
- Research and Innovative Technology Administration (RITA) Volpe National Transportation Center –
  U.S. DOT organization that is leading information security research for U.S. transportation and is
  providing collaborative research inputs for the FAA research in aeronautical system security that
  supports the onboard network security goal.

**R&D Partnerships:** The program maintains a number of cooperative relationships:

- NASA Glenn Research Center includes various cooperative efforts on aircraft icing activities.
- Transport Canada based on an international agreement on research on aircraft ground deicing issues.
- Environment Canada based on an international memorandum of cooperation for research on inflight icing conditions.
- National Research Council of Canada based on an international memorandum of cooperation for research on engine and airframe icing.

- Australian Bureau of Meteorology (BOM) partner in field campaign in Darwin, Australia to obtain data in high ice water content (HIWC) environments
- Aerospace Vehicle Systems Institute (AVSI) cooperative industry, government, and academia
  venture for investigation and standardization of aerospace vehicle systems to reduce life-cycle cost
  and accelerate development of systems, architectures, tools, and processes.

**Accomplishments:** Significant program accomplishments include:

Aircraft Icing

#### FY 2009:

- Completed the development of methods for simulation of ice pellet and some mixed conditions for determination of fluid failure and allowance times.
- Completed investigation of runback ice formation and size and velocity effects on aerodynamic impact of runback ice for thermal ice protection for simulated flight conditions.
- Continued planning for collaborative flight research to acquire atmospheric data for high ice water content environments.
- Continued experimental work on the physics of engine icing in high ice water content environments.
- Completed the development of methods for simulation of ice pellet and some mixed conditions for determination of fluid failure and allowance times.
- Initiated development of methods to test engines in simulated high ice water content environments.

#### FY 2008:

- Completed analysis of data from propeller icing test at McKinley Climatic Laboratory to provide data for guidance to ensure safe flight of propeller aircraft in icing conditions.
- Continued research to characterize high ice water content environments for engines to ensure their safe operation in such conditions.
- · Continued experimental work on the physics of engine icing in high ice water content environments
- Developed improved methods for simulation of ice pellet, mixed, and other conditions for determination of fluid failure and holdover times.
- Continued study of aerodynamic effects of runback ice for thermal ice protection for simulated flight conditions.

## FY 2007:

- Conducted propeller icing test in McKinley Climatic Chamber and processed and published data.
- Conducted testing at flight Reynolds numbers on full-scale airfoil model of simulated runback ice for a thermal ice protection system.
- Developed technical data for the use of ground ice detectors.

## FY 2006:

- Developed snow generation system to test the time of effectiveness of modern de/anti-icing fluids in a controlled laboratory environment.
- Completed development of facility simulation capability for SLD icing testing to show safe operation in SLD environments in accordance with new proposed rules.
- Completed documentation and analysis of residual and inter-cycle ice for pneumatic boots at low airspeeds to provide data for guidance to ensure safe operation of pneumatic boots on low speed aircraft in icing conditions.

#### FY 2005:

- Investigated and documented characteristic features of runback ice for thermal ice protection systems to provide data for guidance to ensure safe operation of thermally protected aircraft in icing conditions.
- Enhanced in-flight icing simulation capability at the McKinley Climatic Laboratory suitable for testing
  of full scale engines and rotor blades for substantiation of safe operation of engines and helicopters
  in icing conditions.

Digital System Safety

#### FY 2009:

- Determined additional microprocessor evaluation issue that showed there is no consistent method
  to evaluate the safety of systems using these devices at the component or subsystem level and
  that a system-level analysis is required to mitigate this issue at the system level; results used to
  provide important inputs into a Microprocessor Selection and Evaluation Concepts Document.
- Completed the evaluation of Phase 3 onboard network security and integrity issues, which found
  wired and wireless access points to the networks of the aircraft control domain and airline
  information services domain of recently developed large transport aircraft and determined that
  operational maintenance security requirements will impact these two domains plus the in-flight
  entertainment domain. The results were fed into the Phase 4 research effort that includes work
  with RTCA SC-216.
- Determined that AEH tools can be qualified effectively through an electronic hardware validation all
  of the system requirements and an independent assessment of the tool's outputs. The results will
  be used for developing policy and guidance.

#### FY 2008:

- Determined additional microprocessor evaluation issues pertaining to risk and safety that included advancing past the stage of the use of a feature modeling approach to assure microprocessor system safety to a system-level behavioral approach; results used to provide important inputs into a Microprocessor Selection and Evaluation Concepts Document.
- Evaluated AEH tools to determine the major safety issues in the qualification process and AEH
  items for sufficiency of verification coverage analysis that includes development of criteria. The
  results will be used for developing policy and guidance.

#### FY 2007:

- Completed research of COTS component integration and verification for integrated modular
  avionics (IMA) systems on a generic aviation platform. The results are useful for FAA and industry
  practitioners of integrating IMA systems on aircraft, and will lead to more effective systems
  development and enhance the certification of digital flight controls and avionics systems. The
  results are published in a technical report and handbook.
- Developed and documented evaluation criteria for airworthiness of newly proposed databases that will define a suitable approach to develop and evaluate data networks for safety-critical avionics; results will provide guidance to FAA certification engineers.
- Defined and documented a safe, secure process for implementing LANs onboard aircraft; results will provide a network assurance process for FAA certification engineers.

#### FY 2006:

- Completed research on object-oriented technology (OOT) in aviation that will provide input for
  policy and guidance on the use of OOT systems and support harmonization with international
  certification authorities on the use of OOT.
- Evaluated the criteria and use of microprocessors in aviation and the identification of safety concerns for microprocessors; results will be used to develop test methods for modern, complex microprocessors that will improve the process of certifying aircraft avionics.

#### FY 2005:

- Studied deterministic operations of Ethernet equipment and provided evaluation criteria for the
  certification of Ethernet databases; results were incorporated into a handbook that provides
  network designers with guidelines for developing Ethernet databases that will be deployable in
  certifiable avionics systems.
- Completed research on software development tools that led to a handbook for developers and certifying authorities to use to evaluate the tools from the system and software safety perspective and provided a basis for future software development tool qualification guidelines.
- Completed research on software verification tools that identified specific evaluation criteria that could be used to determine whether the performance of the tool was acceptable and thereby improve the ability of the certification engineer to qualify software using these tools.

#### FY 2010 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:

#### Aircraft Icing

- Initiated collaborative flight research to acquire atmospheric data for high ice water content environments.
- Continued experimental work on the physics of engine icing in high ice water content environments.
- Completed the development of methods for simulation of ice pellet and some mixed conditions for determination of fluid failure and allowance times
- Initiated the evaluation of Remote Onboard Ground Ice Detection System (ROGIDS) for pretakeoff contamination check and other applications. Results will be used to develop data package for advisory material.
- Continued development of methods to test engines in simulated high ice water content environments.
- Initiated research on aerodynamic effects of ice on 3-D lifting surfaces

## Digital System Safety

- Evaluated Phase 5 onboard network security and integrity issues to insure security protection requirements are consistent with aircraft safety.
- Continued to evaluate of COTS technology in complex and safety-critical systems for obsolescence and life cycle maintenance of aviation electronics.
- Continued to evaluate verification and validation techniques for safety-critical digital systems.
- Completed investigation into the feasibility of using reverse engineering as a viable alternate means of compliance for achieving objectives of DO-178B.

## **FY 2011 PROGRAM REQUEST:**

## Ongoing Activities

Researchers will continue to refine laboratory methods to determine anti-icing fluid holdover times and allowance in a variety of environmental conditions, including new mixed conditions. Investigation of the enhancement and validation of icing simulation methods, with an emphasis on engine testing in high ice water content conditions, will continue. Researchers will also continue to evaluate onboard network security and integrity issues, software development techniques and tools (combined integration and development techniques for highly-integrated aircraft systems with verification and validation techniques), and, COTS technology in complex and safety-critical systems.

**New Initiatives** 

None.

## **KEY FY 2011 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:**

### Aircraft Icing

- Reduced Accidents During Flight In Glaciated, Mixed-phase and Supercooled Large Drop (SLD) Icing Conditions
  - Conduct analysis of data for characterization of high ice water content environments potentially hazardous to engines.
  - Continue experimental work on the physics of engine icing in high ice water content environments.
  - Develop data and methods supporting the evaluation of aircraft engines for operation in high ice water content environments.
  - Continue development of methods to test engines in simulated high ice water content environments.
- Reduced Accidents During Flight In 14 CFR Part 25, Appendix C Icing Conditions
  - Continue research on aerodynamic effects of ice on 3-D lifting surfaces.
- Reduced Accidents During Takeoffs In Icing Conditions
  - Continue the development of improved methods for simulation of ice pellet and mixed conditions for determination of fluid failure and holdover times and allowance times.
  - Continue evaluation of ROGIDS for pretakeoff contamination check and other Begin developing data and methods to support the evaluation of aircraft engines for operation in high ice water content environments

### Digital System Safety

- Software Development Techniques and Tools
  - Determine software development assurance level for highly integrated aircraft systems
  - Evaluate model-based development criteria considered by industry and address technical and certification issues.
  - Continue to evaluate verification and validation techniques for safety-critical digital systems.
  - Complete investigation into the feasibility of using reverse engineering as a viable alternate means of compliance for achieving objectives of DO-178B.
- Onboard Network Security and Integrity
  - Complete Phase 5 onboard network security and integrity issues to insure security protection requirements are consistent with aircraft safety and certification. Continues input to RTCA SC-216. This is a multi-phase activity.
- Airborne Electronic Hardware Design Techniques and Tools
  - Continue to evaluate AEH techniques and tools for qualification, verification, and assurance.
- COTS Technology in Complex & Safety-Critical Systems
  - Continue to evaluate COTS technology in complex and safety-critical systems for obsolescence and life cycle maintenance of aviation electronics.

## **APPROPRIATION SUMMARY**

	Amount (\$000)
Appropriated (FY 1982-2009)	91,657
FY 2010 Enacted	4,482
FY 2011 Request	6,635
Out-Year Planning Levels (FY 2012-2015)	26,842
Total	129,616

Budget Authority	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
(\$000)	Enacted	Enacted	Enacted	Enacted	Request
Contracts:					
Digital System Safety	842	737	1,080	1,158	2,200
Atmospheric Hazards – Aircraft Icing	1,316	1,052	1,811	1,526	1,919
Personnel Costs	1,614	1,653	1,832	1,660	2,308
Other In-house Costs	76	132	115	138	208
Total	3,848	3,574	4,838	4, 482	6,635

OMB Circular A-11, Conduct of Research and Development (\$000)	FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Basic	0	0	0	0	0
Applied	3,848	3,574	4,838	4,482	6,635
Development (includes prototypes)	0	0	0	0	0
Total	3,848	3,574	4,838	4,482	6,635

A11.d. – Atmospheric Hazards – Aircraft Icing/Digital System Safety	FY 2011 Request	Program Schedule						
Product and Activities	(\$000)	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	
064-110 Digital System Safety								
Digital System Safety	2,200							
Determine software development assurance level		•	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	
Evaluate model-based development criteria		•	<b>♦</b>	<b>♦</b>				
Evaluate verification and validation techniques		•	<b>♦</b>	<b>♦</b>	<b>♦</b>			
Investigate the feasibility of using reverse engineering.		•	<b>♦</b>					
Evaluate onboard network security and integrity		•	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	
Evaluate AEH techniques and tools for qualification, verification, and		•	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>		
Evaluate COTS technology in complex and safety-critical systems		•	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>		
Determine applicability of safety engineering and reliability engineering				<b>♦</b>	<b>♦</b>	<b>♦</b>		
064-111 Atmospheric Hazards-Aircraft Icing								
Aircraft Icing	1,919							
Characterize high ice water content atmospheric environments for engines and conduct analysis		•	<b>♦</b>					
Conduct experimental work on the physics of engine icing in high ice water content environments.		•	<b>♦</b>	<b>♦</b>				
Develop data and methods supporting the evaluation of aircraft engines for operation in high ice water content environments			<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>		
Develop methods to test engines in simulated high ice water content environments		•	<b>♦</b>	<b>♦</b>	<b>♦</b>			
Conduct research on aerodynamic effects of ice on 3-D lifting surfaces.		•	<b>♦</b>	<b>♦</b>				
Develop improved methods for simulation of ice pellet, mixed, and other conditions for determination of fluid failure and holdover times and allowance times		•	<b>♦</b>	<b>♦</b>	<b>♦</b>			
Evaluate ROGIDS for pre-takeoff contamination check and other applications; develop data package for SAE spec and advisory material		•	<b>♦</b>	<b>*</b>	<b>♦</b>			
Conduct research on aerodynamic effects of ice on 3-D lifting surfaces.		•	<b>♦</b>	<b>♦</b>				
Personnel and Other In-House Costs	2,516							
Total Budget Authority	6,635	4,482	6,635	6,675	6,715	6,722	6,730	

Note: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual budget process.

Budget Item	Program Title	Budget Request
A11.e.	Continued Airworthiness	10,801,000

#### GOALS:

This program supports the following Flight Plan goal: Increased Safety.

Intended Outcomes: The Continued Airworthiness (formerly known as the Continued Airworthiness/ Aging Aircraft Program) contributes to FAA's strategic goal of increasing aviation safety by reducing the number of accidents associated with failure of aircraft structure, engines, and systems. The program promotes the development of technologies, procedures, technical data, and performance models to prevent accidents and mitigate accident severity related to civil aircraft failures as a function of their continued operation and usage. The program is focused on long-term maintenance of the structural integrity of fixed wing aircraft and rotorcraft, continued safety of aircraft engines, development of inspection technologies, and safety of electrical wiring interconnect systems (EWIS), mechanical systems, and flight controls.

**Agency Outputs:** The FAA issues rules and advisory materials for regulating aircraft design, construction, operation, modification, inspection, maintenance, repair, and safety. Further understanding of the technologies, procedures, technical data, and analytical models produced by the Continued Airworthiness Program provide a major source of technical information used in developing these regulations and related advisories. Through this research, FAA also works with industry to provide the aviation community with critical new safety technologies and data.

**Research Goals:** The goal of the Continued Airworthiness Program is to understand and develop methods to counter the effects of age and usage on the airworthiness of an aircraft over its lifetime, including potential effects of modifications and repairs. The program conducts research in developing technologies and processes, and assesses current practices in order to eliminate or mitigate the potential failures related to aircraft aging processes, thereby reducing the number and severity of accidents.

To satisfy these goals the program conducts research to assess causes and consequences of airplane structural fatigue, corrosion, and other structural failures, and develop effective analytical tools to predict the behavior of these conditions. This includes research on nondestructive inspection (NDI) technologies being developed to detect these conditions. Similar research is conducted on aircraft engines and rotorcraft. Aircraft systems research to understand the causes and consequences of EWIS and mechanical systems failures, and the relationship of these failures to other aircraft systems and safety completes the program.

- BY FY 2011, complete a study of safe life and risk-based fleet management for small-airplane continued operational safety.
- By FY 2011, assess performance of in-situ damage detection technologies for inspection of remote and inaccessible areas in aircraft. In-situ monitoring provides the means to monitor structural behavior and identify damage not normally found between major maintenance checks.
- By FY 2011, complete study to assess need for new rudder design standards in transport category aircraft and need for new pilot training standards with regard to rudder usage.
- BY FY 2012, assess performance of traditional and advanced inspection systems necessary for
  evaluating the strength of bonded aircraft structures. The continued airworthiness of bonded
  aircraft structures, whose use is increasing, will require technologies to find hidden damage in
  these joints.
- By FY 2013, develop technical data on rotorcraft that provide guidance for certification of Health and Usage Monitoring Systems (HUMS) for usage credits.
- By FY 2013, develop a predictive methodology for damage tolerance risk assessment and risk management for continued operational safety of small airplanes.
- By FY 2013, assess performance of an advanced inspection system for identifying environmental damage of composite structures, such as by chemical, UV, and water ingress.
- By FY 2014, provide technical data to develop guidelines for implementing structural health monitoring (SHM) in commercial transport category airplanes.

**Customer/Stakeholder Involvement:** The Continued Airworthiness Program coordinates with an extensive network of government and industry groups, including:

- Subcommittee on Aircraft Safety of the Research, Engineering and Development Advisory
   Committee representatives from industry, academia, and other government agencies annually
   review program activity, progress, and plans.
- Technical Community Representative Groups FAA representatives apply formal guidelines to
  ensure that the program's research projects support new rule making and the development of
  alternate means of compliance with existing rules.
- Aviation Rulemaking Advisory Committees industry representatives propose cost-effective rulemaking and research to address aircraft safety issues.
- Aircraft manufacturers, operators, foreign airworthiness authorities, academia, and industry trade groups consult on a wide range of current and future aging aircraft and continued airworthiness issues.

**R&D Partnerships:** The Continued Airworthiness Program activities are closely coordinated with industry, NASA, and the Department of Defense (DoD). The FAA maintains interagency agreements with NASA, the U.S. Navy, the U.S. Air Force, and the Department of Energy. The FAA, DoD, and NASA have co-sponsored 12 joint Aging Aircraft Conferences.

The FAA collaborates closely with several private and public organizations, including:

- Metallic Materials Properties Development and Standardization (MMPDS) Government/Industry Steering Group – a joint government and industry working group that funds and develops the metallic materials properties handbook.
- Cooperative Research and Development Agreement with Boeing for joint research on structural integrity of bonded repair and emerging structural technologies.

**Accomplishments:** The Continued Airworthiness Program conducts a broad array of projects to meet the goals described above. Technical reports documenting the accomplishments of most projects are available on-line at http://actlibrary.tc.faa.gov.

Outstanding program accomplishments include:

#### FY 2009:

- Developed a comprehensive analysis tool for the risk assessment and risk management of small airplane continued operational safety with regard to fatigue crack initiation.
- Completed initial phase of joint research with Boeing on the structural integrity of bonded repair technology at FAA's full-scale structural test and evaluation (FASTER) facility
- Completed studies to quantitatively determine the impact of process variables on the performance of FPI and integrate results into industry inspection standards.
- Completed initial evaluation of thermal acoustic technology as a potential replacement for FPI in inspecting critical engine components.
- Completed testing of single-element, dual-load-path flight control linkages from transport category aircraft for corrosion and other anomalies that could affect safety.
- Completed upgrade of Arc Fault Evaluation Laboratory to accommodate more sophisticated separation and segregation testing of aircraft wiring (EWIS research).

#### FY 2008:

- Developed software for predictive methodology for the risk assessment and risk management of small airplane continued operational safety with regard to fatigue crack initiation.
- Completed assessment of reliability of various advanced inspection technologies in detecting second layer cracks in typical transport aircraft fuselage structure.
- Completed validation and demonstration of HUMS processes and methods for flight regime recognition on Bell 206 rotorcraft using the HUMS AC.
- Completed initial study on certification standards and design issues for rudder control systems.

 Completed an advanced risk assessment tool for conducting hazard analysis of EWIS systems. The tool used a probabilistic method to support compliance with FAR 25.1309 requirements.

#### FY 2007:

- Completed the airworthiness evaluation of an aged Raytheon Beech 1900D.
- Completed the destructive and extended fatigue testing of fuselage sections from a retired Boeing 727. Results support formulation of policy on use of teardown data for airworthiness certification.
- Conducted the field test of a magnetic carpet probe for rapid and wide-area inspection of aircraft engine critical rotating components.
- Completed assessment of ASTM and new fatigue crack growth test methods for use in addressing rotorcraft fatigue life.
- Developed methodology to evaluate mechanical systems on current transport category aircraft for safety and reliability.

#### FY 2006:

- Completed development of the MMPDS Handbook of FAA accepted material properties, which
  replaces MIL-HDBK-5 previously cancelled by the DoD. The MMPDS Handbook is an essential
  reference for aircraft manufacturer design engineers and is used by FAA for aircraft certification.
- Completed aircraft wire degradation research on common types of aircraft electrical wire as a function of laboratory controlled aging processes. Data generated are used to evaluate potential methods of monitoring wire performance in aircraft and wire reliability assessment methods.
- Completed research on the use of composite doublers as a safer, more cost-effective means for repair of damaged metallic aircraft structure.
- Completed development of a low cost, field prototype, generic scanning and imaging system that
  can be readily coupled to existing aircraft inspection devices, thereby improving flaw detection in
  metal and composite structure.
- Completed second-phase development of a magnetic carpet probe for rapid and wide-area inspection of aircraft engine critical rotating components. This technology is a potential replacement of fluorescent penetrant inspection (FPI).

#### Previous Years:

- Established the FAA Arc Fault Evaluation Laboratory and initiated the evaluation of advanced circuit protection technologies and experiments to quantify damage created by arc fault conditions.
- In cooperation with industry, developed, validated, and facilitated the adoption of improved inspection procedures for detecting cracks and corrosion in rotorcraft.
- Demonstrated phased array inspection technology for critical engine titanium forgings. Phased array technology reliably detects smaller material flaws in critical engine component forgings.
- Developed rotorcraft component damage part database that allows determination of the origin and causal factors of rotorcraft structure and component failures.
- Developed the fatigue crack growth database that is used in support of damage tolerance assessments of airframe structure.

#### FY 2010 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:

- Developed and validated a model-assisted probability of detection methodology to determine
  quantitative inspection reliability data, eliminating the need to conduct expensive and time
  consuming tests currently required to establish inspection reliability. Accurate probability of
  detection data is critical to determining the life of safety critical components.
- Continued development of probabilistic structural risk assessment and risk management methodologies for small airplanes.
- Continued damage tolerance and durability research for emerging structural technologies such as integral structure fabricated by friction stir welding to ensure safety, support maintenance, and support future certification policies and guidance.

- Developed technical data for certification process for rotorcraft HUMS systems using conditionbased maintenance approach for mechanical systems.
- Completed interim reliability assessments of conventional and advanced inspection devices to detect hidden flaws in thick, complex composite laminates.
- Completed study on usage, design, and training issues for rudder control systems in transport aircraft.
- Completed development of damage-tolerant design methods for aircraft propellers

#### FY 2011 PROGRAM REQUEST:

#### **Ongoing Activities**

The FY 2011 funding request will support Continued Airworthiness Program research requirements that contribute to FAA's aviation safety goal. The program will continue its focus on providing data on developing technologies, technical information, procedures, and practices that help ensure the safety of aircraft structures and systems in the civil aircraft fleet. Research will continue on the development of certification processes for HUMS systems for rotorcraft, and on monitoring the development of health monitoring systems for commercial airplanes. Research will continue on the development and evaluation of risk assessment and risk management methods for the continued operational safety of small airplanes. Research will continue on flight controls and mechanical systems, focusing on assisting pilots with advanced displays and systems to avoid problems in both transport category and general aviation airplanes. Researchers will also continue efforts on investigation of nondestructive inspection techniques for critical engine components. Research on nondestructive inspection of structures will continue its focus on the development of methods and technologies to assure the long term safety of metallic, composite, and bonded structures. Finally, research will begin on advanced electrical power systems for NextGen use.

#### **KEY FY 2011 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:**

- Developed EWIS separation and segregation advisory guidance. This research supports
  development of guidelines for the design and modification of aircraft EWIS and improves safety by
  ensuring that adequate clearances for EWIS separation and segregation are provided in EWIS
  installation.
- Complete a study of safe life and risk-based fleet management for small airplane continued operational safety.
- Continue damage tolerance and durability research for emerging structural technologies to ensure safety, support maintenance, and support future certification policies and guidance.
- Continue to lead the MMPDS steering group in updating metallic properties handbook.
- Continue research to develop rotorcraft data that provide guidance for the certification of HUMS systems for usage credits.
- Develop technical data on regulatory issues for ongoing fly-by-wire and fly-by-light working groups.
- Continue research to develop the potential of advanced or emerging NDI techniques for critical engine components.
- Assess advanced inspection systems to perform large area inspection of composite airplane components.
- Develop enhanced models of full stall departure characteristics for transport airplanes.
- Develop functional, safety, and certification information for advanced flight displays to meet NextGen trajectory management needs.
- Continue research on minimum performance criteria and certification requirements for automatic envelope protection and automation systems for general aviation.
- Conduct research to develop technical data to evaluate and assess commercial aircraft health monitoring systems for certification and continued airworthiness requirements.
- Develop technical data for standards on NextGen electrical power systems and components.

## **APPROPRIATION SUMMARY**

	Amount(\$000)
Appropriated (FY 1982-2009)	405,544
FY 2010 Enacted	10,944
FY 2011 Request	10,801
Out-Year Planning Levels (FY 2012-2015)	43,582
Total	470.871

Budget Authority	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
(\$000)	Enacted	Enacted	Enacted	Enacted	Request
Contracts:					
Continued Airworthiness Personnel Costs Other In-house Costs Total	14,211	11,679	9,839	6,847	6,949
	4,159	3,946	4,447	3,831	3,517
	251	320	303	266	<u>335</u>
	18,621	<b>15,945</b>	<b>14,589</b>	<b>10,944</b>	<b>10,801</b>

OMB Circular A-11, Conduct of Research and Development (\$000)	FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Basic	0	0	0	0	0
Applied	18,621	15,945	14,589	10,944	10,801
Development (includes prototypes)	0	0	0	0	0
Total	18,621	15,945	14,589	10,944	10,801

A11e -Continued Airworthiness	FY 2011			Program Schedule					
Product and Activities	Request (\$000)	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015		
065-110 Continued Airworthiness									
Structural Integrity and Inspection Systems Research	3718								
Develop risk-based fleet management methods for small-airplane continued operational safety		•	<b>♦</b>	<b>♦</b>	<b>♦</b>				
Conduct research on application of damage tolerance methods to emerging structural technologies		•	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>			
Continue to lead the MMPDS steering group in updating metallic properties handbook		•	<b>◊</b>	<b>♦</b>	<b>♦</b>				
Assess damage detection technologies for remote/inaccessible areas in aircraft		•	<b>◊</b>						
Investigate advanced NDI systems for composite and bonded structures.		•	<b>◊</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>		
Rotorcraft Structural Integrity and Safety	1150								
Establish guidance for certification of HUMS applications for usage credits		•	<b>◊</b>	<b>♦</b>	<b>♦</b>				
Investigate regulatory issues for ongoing fly- by-wire and fly-by-light working groups			<b>◊</b>	<b>♦</b>	<b>♦</b>				
Continued Airworthiness of Aircraft Engines	569								
Develop monitoring of machining process to prevent manufacturing-induced surface anomalies on critical engine components		•	<b>◊</b>						
Develop potential of advanced NDI techniques for critical engine components.		•	<b>◊</b>	<b>♦</b>	<b>♦</b>				
Continued Airworthiness of Aircraft Systems	1512								
Provide technical guidance on pilot rudder usage, design, and training issues		•	<b>♦</b>						
Develop enhanced models of full stall departure characteristics for transports			<b>◊</b>	<b>◊</b>	<b>◊</b>				
Develop data for advanced flight displays to meet NextGen trajectory management needs			<b>◊</b>	<b>♦</b>	<b>♦</b>				
Continue research on envelope protection and automation systems for general aviation		•	<b>◊</b>	<b>♦</b>					
Assess EWIS separation and segregation standards and develop advisory guidance		•							
Develop technical data to evaluate and assess aircraft health monitoring systems			<b>◊</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>		
Develop technical data for standards on NextGen electrical power systems and components			<b>◊</b>	<b>♦</b>	<b>♦</b>				
Personnel and Other In-House Costs	3,852								
Total Budget Authority	10,801	10,944	10,801	10,856	10,911	10,909	10,906		

Note: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual budget process.

Budget Item	Program Title	Budget Request
A11.f.	Aircraft Catastrophic Failure Prevention Research	\$1,165,000

#### GOALS:

This program supports the following Flight Plan goal: Increased Safety.

**Intended Outcomes:** The Aircraft Catastrophic Failure Prevention Program supports FAA's strategic goal of increasing aviation safety by reducing the number of fatal accidents from uncontained engine failures and engine malfunctions. The program develops technologies and methods to assess risk and prevent occurrence of potentially catastrophic defects, failures, and malfunctions in aircraft, aircraft components, and aircraft systems. Its researchers assess the use of advanced materials to protect aircraft critical systems and passengers in the event of catastrophic engine failures. The program also uses historical accident data and National Transportation Safety Board recommendations to examine and investigate:

- Turbine engine uncontainment events, including the mitigation and modeling of aircraft vulnerability to uncontainment parameters stated in AC 20-128, Phase II.
- Fan blade out analysis and other engine related impact events like bird strike and ice ingestion.
- Propulsion malfunction indications in response to Aerospace Industries Association (AIA) recommendations and proposed solutions.

**Agency Outputs:** With technical data from the Aircraft Catastrophic Failure Prevention Program, FAA establishes certification criteria for aircraft and revises regulations to certify new technologies. The agency also publishes ACs to outline acceptable means for meeting these rules. The program's objective is to ensure safe aircraft operation in the public domain.

**Research Goals:** To reduce the number of fatal accidents from uncontained engine failures, the program develops data and methods for evaluating aircraft vulnerability to uncontained engine failures and provides analytical tools for protecting identified critical systems that may need shielding from uncontained engine debris. Through the LSDYNA Aerospace Users Group, FAA is working with industry to establish standards for finite element analysis and guidance for use in support of certification.

- Continue through 2014, the FAA/NASA/Industry sponsored quality control program for modeling aircraft impact problems.
- By 2013 develop and verify a generalized damage and failure model with regularization (MAT 224) for aluminum and titanium materials impacted during engine failure events.

**Customer/Stakeholder Involvement**: The program collaborates with a broad cross section of the aviation community, including:

- Subcommittee on Aircraft Safety of the Research, Engineering and Development Advisory Committee representatives from industry, academia, and other government agencies annually review the program's activities.
- Technical Community Representative Groups FAA representatives apply formal guidelines to ensure that the program's research projects support new rule making and development of alternate means of compliance with existing rules.
- The Aviation Rulemaking Advisory Committee (ARAC) helps to ensure the effectiveness of the
  agency's rule making. Members of the subcommittee and full committee identify research
  requirements, priorities, and provide guidance for the update of documents such as AC20-128, and
  encourage industry's full participation in implementing new rules.

**R&D Partnerships:** The Aircraft Catastrophic Failure Prevention Program partners with industry and other government agencies including:

NASA and industry in support of the development and validation of explicit finite element analysis. The industry participates in the LSDYNA Aerospace Users Group to support quality control reviews of the code and also critique research objectives in material testing, model development and verification. NASA and FAA are teamed to develop high quality test data and analytical models that support the Aerospace Users Group efforts. The end goal is to develop guidance for the use of LSDYNA in the certification process.

 The AIA Transport Committee – with participation of FAA and industry, has examined propulsion system malfunctions, identified inappropriate crew response, and recommended development of specific regulations and advisory materials to correct safety hazards.

**Accomplishments:** Results of Aircraft Catastrophic Failure Prevention Program research provide the technical basis for FAA rule changes and new or modified ACs. Researcher results are also provided to airframe and engine manufacturers and designers.

#### Engine Uncontainment Research

## FY 2009:

- Continued FAA/NASA/industry sponsored quality control program for modeling aircraft problems in the manufacturer's supported finite element code (LSDYNA).
- Completed testing of 2024 aluminum necessary to populate the new Material Model 224 failure map in LSDYNA.

## FY 2008:

- Continued FAA/NASA/Industry sponsored quality control program for modeling aircraft problems in the manufacturer's supported finite element code (LSDYNA)
- Continued to improve material models for incorporation into the LSDYNA code that are verified and accepted by the aerospace users group as standardized models.

#### FY 2007:

- Completed testing and modeling of fabrics used in gas turbine engine containment systems. Test
  results will be compared with analytical results from fabric model version 3.1
- Completed testing and material model development for aluminum using the Johnson-Cook formula.
- Developed an oversight process that ensures consistent results as computers and programs continue to evolve for generic aerospace problems run in LSDYNA

#### FY 2006:

- Delivered the UEDDAM, version 3.0 for evaluation of uncontained engine debris hazards to aircraft.
   UEDDAM uses a Monte Carlo approach to perform the vulnerability analysis in design cases where the released multiple fragments are analyzed.
- Conducted a workshop for the Department of Defense and ARAC on UEDDAM in November 2005.

#### FY 2005:

- Developed fabric attachment data and designs for fuselage shielding. Fabric material models were used to design full scale shields to be tested in an aircraft fuselage.
- Completed full-scale fabric shielding demonstration test of various fabric attachment designs in a retired commercial airplane at Naval Air Warfare Center (NAWC), China Lake.

### Previous Years:

- Conducted a workshop for engine certification engineers on non-linear finite element modeling of turbine engine containment systems at the Los Angeles Aircraft Certification Office (ACO).
- Completed a collaborative effort with NASA, the U.S. Navy, and the U.S. Air Force to perform the first full-scale engine disk crack detection demonstration.
- Developed test data and improved analytical modeling of fabric shielding with revision to the fabric material model.
- Conducted a workshop for engine certification engineers on non-linear finite element modeling of turbine engine containment systems at the Boston ACO.
- Developed a significant database of small and full-scale test data to understand the interaction of multiple ballistic fabric layers in engine fan blade out containment systems.

### **Propulsion Malfunction**

#### FY 2009:

 Propulsion malfunction research completed a demonstration of the information-based display for the engine lubrication system.

## FY 2008:

• Continued to develop an information-based oil display system.

## FY 2007:

• Completed detailed study of propulsion malfunctions classified as mechanical damage. Research developed a set of indications that can be added to the flight deck as indications and annunciations to inform the crew that a malfunction exists on a specific engine. This effort recommended a focused follow-on effort to study an information based oil system display.

#### FY 2005:

Completed detailed study of propulsion malfunctions classified as Sustained Thrust Anomalies.
 Research developed a set of indications that can be added to the flight deck as indications and annunciations to inform the crew that a malfunction exists on a specific engine.

#### Previous Years:

 Completed an in-depth analysis of 80 in-service propulsion system malfunctions and developed recommendations for potential propulsion indication improvement.

## FY 2010 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:

- Develop a modular Uncontained Engine Debris Damage Assessment Model (UEDDAM) (version 4) to be compatible with Department of Defense code upgrades for supportability and incorporate industry recommended improvements.
- Continue FAA/NASA/industry sponsored quality control program for modeling aircraft problems in the manufacturer's supported finite element code (LSDYNA).
- Complete development of Material Model 224 for fragments impacting 2024 aluminum structure.

#### **FY 2011 PROGRAM REQUEST:**

## Ongoing Activities

Research will continue on the NASA/FAA/industry program for modeling aircraft engine failures in LSDYNA. The FAA/NASA/academia will continue to evaluate improved material models and incorporate them into LSDYNA upon acceptance by the Aerospace Users Group. Users' guidelines and training will continue to be developed and made available through George Washington University.

#### **New Initiatives**

No new initiatives are planned in FY 2010.

## **KEY FY 2011 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:**

## **Engine Uncontainment Research**

- Continue FAA/NASA/industry sponsored quality control program for modeling aircraft problems in the manufacturer's supported finite element code (LSDYNA).
- Complete testing of titanium necessary to populate the material failure map of LSDYNA MAT224
- Continue collaboration with NAWC China Lake to maintain the UEDDAM code

## **APPROPRIATION SUMMARY**

	Amount (\$000)
Appropriated (FY 1982-2009)	36,510
FY 2010 Enacted	1,545
FY 2011 Request	1,165
Out-Year Planning Levels (FY 2012-2015)	4,701
Total	43,921

Budget Authority (\$000)		FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Contracts: Aircraft Catastrophic Failure Prevention Research		947	1,684	0	947	750
Personnel Costs		533	482	415	555	384
Other In-house Costs		32	36	21	43	31
	Total	1,512	2,202	436	1,545	1,165

OMB Circular A-11, Conduct of Research and Development (\$000)	FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Basic	0	0	0	0	0
Applied	1,512	2,202	436	1,545	1,165
Development (includes prototypes)	0	0	0	0	0
Total	1,512	2,202	436	1,545	1,165

A11.f Aircraft Catastrophic Failure Prevention Research	FY 2011 Program Schedule						
Product and Activities	Request (\$000)	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
066-110 Aircraft Catastrophic Failure Prevention Research							
Engine Uncontainment Research	750						
Continue FAA/NASA/industry sponsored quality control program for modeling aircraft problems in the manufacturer's supported finite element code (LSDYNA)  Complete development of Material Model 224 for fragments impacting 2024 aluminum structure		•	<b>*</b>	<b>*</b>	<b>*</b>	<b>◊</b>	<b>♦</b>
Develop modular UEDDAM Code (version 4)		•					
Continue collaboration with NAWC China Lake to maintain the UEDDAM code			<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>
Complete Testing of Titanium necessary to populate the material failure map in LSDYNA MAT224			<b>♦</b>				
Complete verification of MAT 224 for Aluminum and Titanium					<b>♦</b>		
Personnel and Other In-House Costs	415						
Total Budget Authority  Note: Out year numbers are for planning purpo	1,165	1,545			1,177	1,177	1,176

Note: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual budget process.

Budget Item	Program Title	Target-Level Request
A11.g.	Flightdeck/Maintenance/System Integration Human Factors	\$7,174,000

#### GOALS:

This program supports the following Flight Plan goals: Increased Safety and Greater Capacity.

**Intended Outcomes:** The Flightdeck/Maintenance/System Integration Human Factors Program helps achieve FAA's Flight Plan goals for increased safety and greater capacity by:

- Developing more effective methods for pilot, inspector, and maintenance technician training.
- Enhancing the understanding and application of risk and error management strategies in flight and maintenance operations.
- Increasing human factors considerations in certifying new aircraft and in equipment design and modification.
- Improving pilot, inspector, and maintenance technician task performance.
- Developing requirements, knowledge, guidance, and standards for design, certification, and use of automation-based technologies, tools, and support systems.
- Addressing human task/performance and human-system task/performance requirements associated with transitioning NextGen capabilities.

**Agency Outputs:** The Human Factors Research and Engineering Program provides the research foundation for FAA guidelines, handbooks, advisory circulars, rules, and regulations that help to ensure the safety and efficiency of aircraft operations. It also develops human performance information that the agency provides to the aviation industry for use in designing and operating aircraft, and training pilots and maintenance personnel.

#### Research Goals:

## By FY 2012:

- Develop flight path and energy state management guidance for air carrier flight deck training systems and procedure design.
- Provide human factors guidance for Automatic Dependent Surveillance-Broadcast (ADS-B) equipment design and operation.
- Provide human factors guidelines for advanced instrument procedure design and use.
- Provide guidance for fatigue mitigation in the maintenance environment.
- Define the work, task, education, and training requirements for the NextGen era aircraft maintenance technician.
- Address human automation integration issues regarding the certification of pilots, procedures, training, maintenance, and equipment associated with enhanced communication/navigation/surveillance (CNS)/Air Traffic Management (ATM) operations necessary to achieve NextGen capabilities.

**Customer/Stakeholder Involvement:** Program researchers work directly with colleagues in FAA, other government agencies, academia, and industry to support the following R&D programs and initiatives:

- NASA's Aviation Safety Program.
- The FAA's Voluntary Safety Program Office initiatives including Advanced Qualification Program (AQP), Flight Operations Quality Assurance (FOQA), and Aviation Safety Action Program (ASAP).
- The FAA/Industry Safer Skies initiative analyzes U.S. and global data to find the root causes of accidents and proposes the means to prevent their occurrence.
- The FAA Research, Engineering and Development Advisory Committee Representatives from industry, academia, and other government agencies annually review the activities of the program and provide advice on priorities and budget.

**R&D Partnerships:** The Flightdeck/Maintenance/System Integration Human Factors Program collaborates with industry and other government programs through:

- Joint Safety Analysis Teams and Joint Safety Implementation Teams within the Safer Skies Agenda

   coordinated with NASA and industry, these efforts stress human factors issues in developing intervention strategies for the reduction of air carrier and general aviation accidents.
- DoD Human Factors Engineering Technical Advisory Group FAA participates in this group to promote a joint vision for automation and related technical areas.
- Domestic and international aviation maintenance industry partners like Boeing, Continental Airlines, British Airways, and the International Association of Machinists

  – the emphasis is on achieving research results that can be applied to real-world problems.
- Society of Automotive Engineers G-10 subcommittees FAA participates on all of the Society's subcommittees involving human factors to adapt their findings to aviation standards, guidelines, etc.
- Fifteen FAA cooperative research agreements with universities supporting research on air carrier training, flight deck automation, aviation accident analysis, general aviation, and aviation maintenance technician and inspector training.

#### **Accomplishments:** The program's accomplishments include:

#### FY 2009:

- Completed study addressing non-alert symbology for Airborne Separation Assurance Systems to assist RTCA SC-186 Cockpit Display of Traffic Information (CDTI) Working Group in addressing non-concurrence in the preliminary Minimum Operational Performance Standards (MOPS) document.
- Developed countermeasures crew multi-tasking.
- Developed best practices for Line Operations Safety Audits (LOSA).
- Completed Aviation Maintenance Safety Action Program Maintenance Program Development Handbook.
- Developed small unmanned aerial systems (UAS) Maintenance Handbook.

#### FY 2008:

- Conducted research and provided results to SAE International Aerospace Behavioral Engineering Technology Committee to update an aerospace industry recommended practice on electronic symbols. Aerospace recommended practices are used by industry to demonstrate means of compliance with FAA regulations.
- Completed Human Factors Analysis and Classification System on-line database. This provides capability for FAA personnel to access key human factors information associated with NTSB accident investigations from 1990-2006.
- Completed research on electronic flight bag (EFB) related safety events. Results will be used to update an Advisory Circular and a new Flight Standards handbook on EFBs.

#### FY 2007:

- Completed development of human factors Certification Job Aid for FAR Parts 25 and 23 flight decks
- Completed development of the Human Factors Certification Job Aid and made it available to the aviation community through a web site application.
- Disseminated to the scientific community findings regarding simulator platform motion and its impact on pilot performance during specific maneuvers.
- Completed an international survey of human factors programs in maintenance organizations, providing information on training, error management, fatigue management, and other issues for FAA and industry.

#### FY 2006:

- Updated the Human Factors Certification Job Aid with Part 25 Advisory Circulars and information on design of flight deck equipment, tasks and procedures, and testing assumptions. The job aid helps government and industry to minimize the likelihood of design induced human performance errors.
- Developed practical customized assessment tools to help FAA certifiers and inspectors, system
  designers and operators standardize and streamline evaluations of electronic flight bags.

• Improved a LOSA methodology that has been adopted by the International Civil Aviation Authority (ICAO) to help air carriers identify human-centered safety vulnerabilities.

### FY 2010 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:

## Information Management and Display

- Developed research platform and initiated instrument procedures design research project addressing charting and depiction of performance based navigation procedures.
- Conducted usability assessment of surface moving maps that display township position in surface operations.
- Updated human factors guidance for electronic flight bag certification, operational approval and training, based on performance data.
- Developed guidance to address human factors issues associated with use of synthetic vision for primary and multifunction displays.
- Developed proactive methods for general aviation data collection to facilitate risk assessment and accident prevention.

#### **Human-Centered Automation**

- Developed research platform to support research that will provide guidance for use by FAA
  Certification and Flight Standards personnel to evaluate traffic displays and traffic
  applications/operations that use ADS-B technology.
- Investigated automation and new technology impacts on aviation maintenance process, safety, tasks, technician skills, and need for regulation.
- Developed advanced automation training tools for pilots reflecting results of an industry study and Performance-Based Operations Aviation Rule-Making Committee (PARC) team data.
- Developed human factors guidance for advanced autopilots and automation technologies in small airplanes.

## **Human Performance Assessment**

- Developed the Maintenance LOSA safety audit tools for maintenance and ramp operations that will evaluate a maintenance organization's effectiveness.
- Developed guidance materials, tools, and administrative process to manage and/or regulate aircraft maintainer fatigue.
- Provided human factors guidance for the operation of UAS within the NAS.
- Continued to develop improved methods to report, record and analyze flight safety data to reduce the likelihood of air carrier incidents and accidents.

### Selection and Training

- Continued development of international standards for simulator fidelity.
- Developed training for visual approaches for low-time pilots.
- Developed best practices for Voluntary Safety Data teams.
- Determined the appropriate training intervals to reduce pilot skill decay.

### **FY 2011 PROGRAM REQUEST:**

The program will continue to focus on providing technical information and advice to improve pilot, inspector, maintenance technician, and aviation system performance. The emphasis will remain on developing guidelines, tools, and training to enhance error capturing and mitigation capabilities in the flight deck and maintenance environments, and on developing human factors tools to ensure that human performance considerations are adequately addressed in the design, certification, and operational approval of flight decks, equipment, and procedures. Additional emphasis will be placed on encouraging maintenance shops and repair stations to have human factors maintenance programs and to offer maintenance human factors training.

## Ongoing Activities

### Information Management and Display

- Identify human factors issues in instrument procedures design.
- Develop guidance for moving map displays in surface operations.
- Develop guidance to address human factors issues associated with using synthetic vision for primary and multifunction displays.

### **Human-Centered Automation**

- Develop human factors guidance for ADS-B equipment certification and operational approval.
- Investigate and revise technician skill, knowledge, and work force needs for emerging aviation and ground-air integrated maintenance personnel and determine potential for new guidance materials and updated regulation.
- Develop advanced automation training tools for pilots reflecting results of an industry study and Performance-Based Operations Aviation Rule-Making Committee (PARC) team data.
- Develop human factors guidance for advanced autopilots and automation technologies in small airplanes.

### **Human Performance Assessment**

- Design a safety audit tool for maintenance and ramp operations to evaluate a maintenance organization's effectiveness.
- Identify effective methods for mitigating maintainer fatigue.
- Provide human factors guidance for the operation of UAS within the NAS.

#### Selection and Training

- Develop guidance and training material to improve consistency of safety team decisions.
- Identify training and checking approaches for jet upset recovery using advanced and existing simulators.
- Continue development of international standards for simulator fidelity.

## **New Initiatives**

## **Human-Centered Automation**

 Investigate safety and task impacts and process changes to maintenance caused by automation, new technologies, and air-ground integration.

## **KEY FY 2011 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:**

Information Management and Display

- Completed instrument procedures design research project addressing charting and depiction of performance based navigation procedures and produce draft report.
- Complete usability assessment of surface moving maps that display township position in surface operation report.
- Update human factors guidance for electronic flight bag certification, operational approval and training based on performance data.
- Develop guidance to address human factors issues associated with using synthetic and enhanced vision to support equivalent visual operations.

## **Human-Centered Automation**

- Develop human factors guidance for ADS-B equipment certification and operational approval.
- Investigate and revise technician skill, knowledge, and work force needs for emerging aviation and ground-air integrated maintenance personnel and determine potential for new guidance materials and updated regulation.
- Investigate safety and task impacts and process changes to maintenance caused by automation, new technologies, and air-ground integration.
- Develop human factors guidance for advanced autopilots and automation technologies in small airplanes.

• Develop advanced automation training tools for pilots reflecting results of an industry study and Performance-Based Operations Aviation Rule-Making Committee (PARC) team data.

#### **Human Performance Assessment**

- Test and field the Maintenance LOSA safety audit tool for maintenance and ramp operations that will evaluate a maintenance organization's effectiveness.
- Deliver and implement guidance materials, tools, and administrative process to manage and/or regulate aircraft maintainer fatigue.
- Provide human factors guidance for the operation of UAS within the NAS.
- Develop mitigation strategies for human factors issues that are contributing to very light jet incidents.

## Selection and Training

- Validate training for visual approaches for low-time pilots.
- Develop guidance and training material to improve consistency of safety team decisions.
- Identify training and checking approaches for jet upset recovery using advanced and existing simulators.
- Continue development of international standards for simulator fidelity.

## **APPROPRIATION SUMMARY**

	Amount (\$000)
Appropriated (FY 1982-2009)	220,528
FY 2010 Enacted	7,128
FY 2011 Request	7,174
Out-Year Planning Levels (FY 2012-2015)	29,425
Total	264,255

Budget Authority (\$000)	FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Contracts: Flightdeck/Maintenance/System Integration Human Factors	4,954	5,957	4,714	3,995	3,623
Personnel Costs	2,902	3,066	2,587	2,919	3,309
Other In-house Costs	143	177	164	214	242
Total	7,999	9,200	7,465	7,128	7,174

OMB Circular A-11, Conduct of Research and Development (\$000)	FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Basic	0	0	0	0	0
Applied	7,999	9,200	7,465	7,128	7,174
Development (includes prototypes)	0	0	0	0	0
Total	8,099	9,200	7,465	7,128	7,174

I1.g. – Flightdeck/Maintenance/System Integration Human Factors	FY 2011			Program S	Schedule	:hedule		
Product and Activities	Request (\$000)	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 201	
Information Management and Display	1,100							
Identify human factors issues in instrument procedures design		•	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>	
Develop guidance for moving map displays in surface operations		•	<b>◊</b>	<b>♦</b>				
Update human factors guidance for electronic flight bag certification, operational approval and training based on performance data		•	<b>♦</b>	<b>♦</b>				
Develop guidance to address human factors issues associated with using synthetic and enhanced vision to support equivalent visual operations		•	<b>♦</b>	<b>♦</b>	<b>♦</b>			
Human-Centered Automation	1,073							
Develop human factors guidance for ADS-B equipment certification and operational approval		•	<b>◊</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>		
Investigate automation and new technology impacts on aviation maintenance process, safety, tasks, technician skills, and need for regulation		•	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>	
Develop advanced automation training tools for pilots reflecting results of an industry study and Performance-Based Operations Aviation Rule-Making Committee (PARC) team data		•	<b>♦</b>	<b>♦</b>				
Develop human factors guidance for advanced autopilots and automation technologies in small airplanes		•	<b>♦</b>	<b>♦</b>	<b>♦</b>			
Human Performance Assessment	730							
Design a safety audit tool for maintenance and ramp operations to evaluate a maintenance organization's effectiveness.		•	<b>◊</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>	
Identify effective methods for mitigating maintainer fatigue		•	<b>♦</b>	<b>♦</b>	<b>♦</b>			
Provide human factors guidance for the operation of unmanned aerial vehicles within the NAS I		•	<b>♦</b>	<b>♦</b>	<b>♦</b>			
Develop mitigation strategies for human factors issues that are contributing to very light jet incidents		•	<b>♦</b>	<b>♦</b>	<b>♦</b>			
Selection and Training	720							
Develop guidance and training material to improve consistency of safety team decisions Identify training and checking approaches for		•	<b>◊</b>					
jet upset recovery using advanced and existing simulators Continue development of international		•	<b>♦</b>	♦				
standards for simulator fidelity		•	<b>◊</b>	<b>\</b>				
sonnel and Other In-House Costs	3,551							
Total Budget Authority	7,174	7,128	7,174	7,253	7,336	7,390	7,446	

Note: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual

Budget Item	Program Title	Budget Request
A11.h.	System Safety Management	\$11,907,000

#### Goals:

This program supports the following Flight Plan goal: Increased Safety.

Intended Outcomes: The System Safety Management Program (formerly known as the Aviation Safety Risk Analysis Program) helps achieve FAA's strategic goal of increasing aviation safety by promoting and expanding safety information sharing and safety risk management initiatives efforts. The program develops risk management methodologies, prototype tools, technical information, and safety management system procedures and practices that will improve aviation safety. In addition, the program aims to develop an infrastructure that enables the free sharing of de-identified, aggregate safety information that is derived from various government and industry sources in a protected, aggregated manner. It also conducts operational research to leverage proposed new technologies and procedures that may enhance pilot and aircraft safety during terminal operations.

Agency Outputs: The program will develop an infrastructure that enables the free sharing of deidentified, safety information that is derived from various government and industry sources in a protected, aggregated manner. In addition, the program is providing methodologies, research studies, and guidance material that provide aviation safety inspectors, aircraft certification engineers, analysts, and managers the capabilities of systematically assessing potential safety risks and applying proactive solutions to reduce aviation accidents and incidents. The program is also conducting operational research and analysis to maintain or improve safety and improving terminal area efficiency.

**Research Goals:** To reduce the number of aviation accidents and incidents by developing a secured safety information and analysis system that provides access to numerous databases, maintains their currency, enables interoperability across their different formats, provides the ability to identify future threats, conducts a causal analysis of those threats, and recommends solutions.

- By 2011, develop automated tools to monitor each database for potential safety issues and to analyze disparate data drawn from multiple sources, enhancing discovery, identification, and evaluation of safety risks.
- By 2012, demonstrate a working prototype of network based integration of information extracted from diverse, distributed sources.
- By 2013, develop advanced infrastructure and laboratory for conducting and sharing analysis tools
  and aggregated safety information that allows industry stakeholders to perform standardized data
  analysis and vulnerability discovery on a wide variety of diverse sets of data.
- By 2013, develop a collection of enterprise business objects that provides a system view of realtime NAS facility operations combined with available ASIAS baseline data.
- By 2014, develop a user interface that allows safety oversight personnel the capability to monitor National Airspace System (NAS) facility operations.
- By 2015, demonstrate a two-thirds reduction in the rate of fatalities and injuries<sup>\*</sup>

To reduce the risk for passengers and crews and enhance the traffic control process in the terminal area operations, human-in-the-loop (pilot/controller) simulation, evaluations and operational flight data analysis will be conducted.

- By 2011, complete an evaluation air traffic and flight procedures for terminal area operations using pilot-in-the-loop flight simulator
- By 2012, develop methods to model unusual attitude encounters outside the normal operating envelope, allowing FAA to approve advanced flight simulators that more realistically model the behavior of an actual aircraft.

-

<sup>\*</sup> The two-thirds reduction in the rate of aviation fatalities and injuries is based on a 2004 baseline.

- By 2012, identify new navigation technologies and data requirements for the development of new procedures to enhance the capacity and safety of the terminal area.
- By 2013, identify contributing factors and develop models for landing performance of selected make, model, and series aircraft using standard operating practices to improve the safety and capacity in terminal areas.

**Customer/Stakeholder Involvement:** The program encourages broad industry and government participation across all projects.

- Subcommittee on Aircraft Safety of the Research, Engineering and Development Advisory
  Committee representatives from industry, academia, and other government agencies annually
  review the program's activities.
- Technical Community Representative Groups FAA representatives apply formal guidelines to ensure that the program's research projects support new rule making and the development of alternate means of compliance with existing rules.
- The Joint Planning and Development Office (JPDO) Safety Working Group a national-level integrated safety management framework that addresses all facets of the air transportation system, building safety design assurance into operations and products.
- Commercial Aviation Safety Team a FAA/industry collaborative effort to develop and implement data-driven safety initiatives.
- Airline industry groups to ensure that research capabilities are properly focused and benefit stakeholders beyond commercial aviation industry including, but not limited to, manufacturers of very light jets and other advanced aircraft systems.

**R&D Partnerships:** The Program partners with industry, academia, and other governmental agencies, including:

- National Aeronautics and Space Administration via collaborative agreements to integrate advanced research text and digital analysis products into the Aviation Safety Information and Analysis Sharing (ASIAS) research efforts.
- The Civil Aviation Authority of the Netherlands to conduct joint research on aviation system safety initiatives via a Memorandum of Cooperation.
- Technical expertise from air carriers to provide industry reviews and recommendations regarding safety and efficiency of terminal area operations as well as air carriers' cooperation with data sharing agreements and governance models that allow for the free sharing of aviation data in accordance with approved voluntary safety information sharing agreements.
- Center of Excellence for General Aviation Research (CGAR) via Grants to increase data and tools available for cooperative GA safety analyses among industry stakeholders.

**Accomplishments:** Significant accomplishments from prior years include:

Risk Management Decision Support

FY 2009:

- Completed a model which identifies and incorporates the gap analysis between 14 CFR Parts 121, 135, 145; maps to the two top levels of ACOSM, and can be interfaced with International Aviation Transportation Association Operational Safety Audit (IOSA).
- Determined injury ratios for well-defined unsafe conditions (e.g., structure failure, electrical system failure, landing gear vibration, powerplant failure, and so forth) on aircraft systems or components.

#### FY 2008:

- Defined a modified air carrier operations systems model (ACOSM) model that incorporates the regulations and relationships between Title XIV of the Code of Federal Regulations (14 CFR) Parts 121, 145, 135, 91, 191, 61, 141 and is compatible with the top level architecture of IOSA).
- Completed a gap analysis of FAA Safety Management System standards, FAA and international regulatory standards.

- Released a prototype decision support system that provides the FAA with improved certificate
  management and oversight capabilities. The major products will be identification of databases
  within FAA purview, redesigned databases, and possible location of and access to existing
  databases needed to populate the described methodology.
- Developed a technology transfer plan for the updated prototype software tool that contains the
  integrated framework and methodology for the identification, classification, and assessment of
  aviation maintenance and flight operations hazards; Added a repair station node which links to the
  prototype.
- Continue risk management concept, model and analytical tool development in support of commercial and general aviation.

#### FY 2007:

- Produced technical descriptions of the various business relationships between 14 CFR 121 operators and 14 CFR 145 repair stations; the models will be used to identify the hazards and assess the risks involved these types of relationships.
- Completed a prototype software tool that contains an integrated framework and methodology for the identification, classification, and assessment of aviation maintenance and flight operations hazards.

## FY 2006:

- Released a working prototype of an integrated framework that describes the methodology for identification, classification, and assessment of aviation system hazards and risks.
- Developed a preliminary methodology which provides a baseline assessment of the current safety
  oversight for effectiveness, efficiency, and sustainability and identifies data inputs and could
  provide metrics such as the responsiveness of the air carriers to corrective and preventive actions,
  effects of oversight on safety precursors, inspection output and inspector workload and readiness.

## Aviation Safety Information and Analysis Sharing

### FY 2009:

- Completed the ASIAS CONOPS that is focused on the new data sharing concepts among commercial aviation stakeholders.
- Developed an ASIAS architecture for the implementation of emerging technologies and system to support the sharing of information between commercial aviation stakeholders.
- Developed automated tools to monitor databases for potential safety issues.
- Developed prototype ASIAS system and associated reports that show the benefit of using diverse textual and digital data sets for analyzing commercial aviation safety metrics and enhancements.
- Conducted analytical studies including Runway Safety Study, Terrain Area Warning System Study,
   Airline Benchmarks and Commercial Aviation Safety Team (CAST) Safety Enhancement Metrics

## FY 2008:

- Created Governance structure and mechanisms for utilizing airline data to look at safety issues across multiple commercial aviation carriers.
- Identified studies to be completed in FY-08 related to Runway Safety and Terrain Area Warning Systems
- Identified initial set of core metrics for monitoring known risks identified through Commercial Aviation Safety Team (CAST) safety enhancements
- Identified initial set of commercial airline industry benchmarks that allow airlines to understand how their operations are performing in comparison to other airlines participating in the ASIAS program
- Completed initial acquisition of new types of data for analyzing safety issues around the airport and runway.

## FY 2007:

 Released first draft of the ASIAS Concept of Operations (CONOPS) that is focused on the new data sharing concepts among commercial aviation stakeholders.

Aircraft Maintenance - Maintainability and Reliability

#### FY 2009:

 Developed technical data to be used for the development of standards for carbon monoxide detection devices and inspection methods to determine the integrity of exhaust systems.

### FY 2007:

 Proposed a new quality management system to perform and monitor tool calibration at maintenance facilities; the new system will improve safety by reducing aircraft maintenance errors due to the use of out-of-tolerance tools.

### FY 2005:

• Completed enhancements to the Maintenance Malfunction Information Reporting (MMIR) System with capability to collect usage and flight profile data – the helicopter industry and FAA are using the MMIR data to improve maintenance reliability and product design.

## Safety Analysis Methodology

#### FY 2007:

• Completed a methodology to provide a different level of certification credit for design features intended to reduce flight crew errors.

## FY 2005:

 Provided technical data on standard probabilities of certain environmental and operational conditions to support transport airplane certification for safety assessment purposes.

### Terminal Area Safety

## FY 2009:

- Developed testing procedures and requirements to identify required navigational performance (RNP) constraints with regard to operation on Radius-to-Fix (RF) legs.
- Evaluated air traffic and flight procedures for terminal area operations by using human-in-the-loop flight and air traffic simulators.
- Produced video on "Aircraft Laser Illumination awareness for the aviation community".
- Analyzed operational landing distance performance of a typical regional jet aircraft model.

### FY 2008:

- Completed the evaluation of stopping distances for two typical subsonic narrow body jet aircraft in commercial operations. The data will aid in understanding causes of aircraft overruns.
- Conducted a survey of area navigation (RNAV) and flight management systems to determine the current and projected capabilities with regard to radius-to-fix (RF) path terminators.
- Conducted bench test of currently RF-capable RNAV and flight management systems against a
  representative group of terminal and instrument approach procedures to evaluate capabilities and
  constraints for RF path terminators.

#### FY 2007:

- Completed flight evaluation of the critical terminal area situations under which red Land and Hold Short Operations lights must be illuminated and extinguished during high capacity operations at an airport by using pilot-in-the-loop flight simulation.
- Developed assessment tools and procedures to evaluate pilot workload during various flight conditions by using the LifeShirt® technology in simulated flight operations.

## FY 2006:

 Developed methods to identify commercial aircraft touchdown points during commercial operations by using instrument landing systems (ILS) or non-ILS information, these methods will aid in understanding causes of aircraft overruns and runway excursions.

### FY 2005:

 Provided measures of pilot reaction to laser illumination collected using FAA's B-737 flight simulator to support AC 70-1 "Outdoor Laser Operations" and AC 70-2 "Reporting of Laser Illumination of Aircraft".

## FY 2010 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:

## Risk Management Decision Support

- Demonstrated a one-third reduction in the rate of fatalities and injuries through the development of an analytical method and associated metrics.
- Completed a safety impact assessment of very light jets (VLJs) in the NAS.

## Aviation Safety Information and Analysis Sharing

- Expanded ASIAS architecture to include the sharing of air traffic information and air carrier information among industry stakeholders.
- Continued development of automated tools to monitor databases for potential safety issues.
- Expanded prototype system to include the concepts of sharing information and applications among industry stakeholders from an enterprise-level, allowing diverse industry stakeholders to analyze data on an industry-wide basis rather than individual organizational level. The prototype system will contain a technical process to query de-identified safety data from any participating airline Flight Operations Quality Assurance or Aviation Safety Action Program, aggregate it through a distributed database and make it accessible to appropriate industry stakeholders. The ASIAS prototype will be demonstrated in 2012.
- Conducted analytical studies, e.g., aircraft hazard analysis, determination of risk values for potential unsafe\ conditions, and flight crew intervention design credit, using ASIAS and other aviation safety data

## Terminal Area Safety

- Completed testing procedures and requirements to identify required navigational performance (RNP) constraints related to terminal area operations.
- Evaluated air traffic and flight procedures for terminal area operations by using the pilot-in-theloop flight simulators.
- Completed evaluating risks associated with undesired laser cockpit illumination.
- Analyzed the operational landing distance performance of selected aircraft make/model/series.
- Develop models of unusual attitude (wake, stall) encounters outside the normal operating envelope, allowing FAA to approve advanced flight simulators that more realistically model the behavior of an actual aircraft.

## **FY 2011 PROGRAM REQUEST:**

## Ongoing Activities

Government, industry, and academia aviation safety subject matter experts will be invited to demonstrate a working prototype of a network-based integration of information extracted from diverse, distributed sources. The research will continue to develop innovative, advanced tools and methodologies that will for the first time be able to convert and integrate aviation safety data that is currently distributed across multiple organizations and archives into information on the operational performance and safety of the aviation system. Using ASIAS and other aviation safety data, analytical studies to identify safety issues and verify mitigation and safety enhancements will continue. Research and analysis will continue to ensure that the FAA maintains a desired level of safety while accommodating the need for more efficient use of the terminal area.

New Initiatives None

## **KEY FY 2011 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:**

Aviation Safety information Analysis and Sharing (ASIAS)

- Continue to develop an advanced infrastructure and laboratory for conducting and sharing analysis tools and aggregated safety information that allows industry stakeholders to perform standardized data analysis and vulnerability discovery on a wide variety of diverse sets of data.
- Continue development of automated tools to monitor databases for potential safety issues.
- Expand prototype system to include the concepts of sharing information and applications among
  industry stakeholders from an enterprise-level, allowing diverse industry stakeholders to analyze
  data on an industry-wide basis rather than individual organizational level. The prototype system
  will contain a technical process to query de-identified safety data from any participating airline
  Flight Operations Quality Assurance or Aviation Safety Action Program, aggregate it through a
  distributed database and make it accessible to appropriate industry stakeholders. The ASIAS
  prototype will be demonstrated in 2012.
- Conduct analytical studies, e.g., aircraft hazard analysis, determination of risk values for potential
  unsafe conditions, and flight crew intervention design credit, using ASIAS and other aviation safety
  data.
- Develop methods and risk models to evaluate advanced aircraft systems and component integration.

### **NAS Facility Services Data**

- Develop a Facility Operations Module that includes enterprise-level business objects that store and make accessible data elements that are specific to NAS safety oversight.
- Develop a flexible user interface that provides safety oversight personnel the capability to monitor NAS facility operations as they occur with respect to failures, risk and other off-nominal occurrences.

## Terminal Area Safety

- Continue testing procedures and requirements to identify RNP constraints related to terminal area operations.
- Conduct multiple operational evaluations of new technologies and procedures using human in the loop flight and air traffic simulators to improve flight safety and terminal area efficiencies
- Analyze the operational landing distance performance of selected aircraft make/model/series.
- Develop models of unusual attitude encounters outside the normal operating envelope, allowing FAA to approve advanced flight simulators that more realistically model the behavior of an actual aircraft.
- Identify new cockpit centric navigation technologies and data for the development of new procedures to enhance the safety and capacity within the terminal area.

## **APPROPRIATION SUMMARY**

	Amount (\$000)
Appropriated (FY 1982-2009)	91,403
FY 2010 Enacted	12,698
FY 2011 Request	11,907
Out-Year Planning Levels (FY 2012-2015)	47,434
Total	163,442

Budget Authority (\$000)	FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Contracts:					
System Safety Management	3,232	6,402	9,608	9,879	8,926
Personnel Costs	1,947	2,892	2,669	2,531	2,652
Other In-house Costs	113	223	211	288	329
Tot	al 5,292	9,517	12,488	12,698	11,907

OMB Circular A-11, Conduct of Research and	FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Development (\$000)  Basic	0	0	0	0	0
Applied	5,292	9,517	12,488	12,698	11,907
Development (includes prototypes)	0	0	0	0	0
Total	5,292	9,517	12,488	12,698	11,907

A11.h System Safety Management	FY 2011			Program	Schedule		
Product and Activities	Request (\$000)	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
060-110 System Safety Management							
Risk Management Decision Support	0 ·						
Develop method and associated metrics to measure progress in reducing the rate of fatalities and injuries		•	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>
Conduct System Safety Assessment of VLJs		•					
Aviation Safety Information Analysis and Sharing	5,320						
Complete ASIAS CONOPS focused on the new data sharing concepts among commercial aviation stakeholders.		•					
Develop advanced infrastructure and laboratory for conducting and sharing analysis tools and aggregated safety information		•	<b>♦</b>	<b>♦</b>	<b>♦</b>		
Develop automated tools to monitor databases for potential safety issues		•	<b>◊</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>	<b>◊</b>
Develop prototype ASIAS system and associated reports		•	<b>♦</b>	<b>♦</b>			
Conduct analytical studies using ASIAS and other aviation safety data		•	<b>♦</b>	<b>◊</b>	<b>◊</b>	<b>♦</b>	<b>◊</b>
Develop methods and risk models to evaluate advanced aircraft systems and component integration.		•	<b>♦</b>	<b>♦</b>	<b>♦</b>		
NAS Facility Service Data	2,320						
Develop Facility Operations Module			<b>◊</b>	<b>◊</b>	<b>◊</b>		
Develop a flexible user interface that provides safety oversight personnel the capability to monitor NAS facility operations			<b>♦</b>	<b>♦</b>	<b>♦</b>		
Terminal Area Safety	1,286						
Develop testing procedures and requirements to identify RNP constraints		•	<b>♦</b>	<b>♦</b>			
Evaluate air traffic and flight procedures for terminal area operations by using human-in- the-loop flight and air traffic simulator		•	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>
Evaluate devices and risks associated with undesired laser cockpit illumination		•					
Identify contributing factors and develop models for landing performance of selected make/model/series aircraft using standard operating practices to improve the safety and capacity in terminal areas		•	<b>◊</b>	<b>◊</b>	<b>♦</b>		
Develop models of unusual attitude encounters outside the normal operating envelope		•	<b>♦</b>	<b>♦</b>			
Identify new cockpit centric navigation technologies and data for the development of new procedures to enhance the safety and capacity within the terminal area			<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>
Personnel and Other In-House Costs	2,981						
Total Budget Authority	11,907	12,698	11,907	11,913	11,915	11,841	11,765

Note: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual budget process.

Budget Item	Program Title	Request
A11.i.	Air Traffic Control/Technical Operations Human Factors	\$10,475,000

#### GOALS:

This program supports the following Flight Plan goals: Increased Safety, Greater Capacity, and Organizational Excellence.

Intended Outcomes: The Air Traffic Control/Technical Operations (ATC/TO) Human Factors Program supports FAA strategic goals for increased safety and greater capacity by developing research products and promoting the use of those products to meet the future demands of the aviation system. The human factors research program for FY 2011 will emphasize the concept of Human System Integration (HSI) and safety aspects of the functions performed by air traffic controllers and technical operations personnel. The HSI concept will address the interactions between workstation design, personnel selection, training, and human error/safety. The program will examine the roles of controllers and maintainers at increased capacity levels and how those roles are best supported by allocation of functions between human operators and automation to enhance safety and minimize the potential for human error. The ATC/TO program generates requirements for human interface characteristics of future air traffic and technical operations (maintainer) workstations and enhances our understanding of the role that system design plays in mitigating human error including operational errors, runway incursions, and errors that result in NAS equipment outages. Additionally, researchers are developing effective methods to present weather information to air traffic specialists for severe weather avoidance and accident prevention, developing methods to select new air traffic service providers and maintainers so that the applicant screening process is valid, reliable, and fair, and improving human-system integration in the maintenance arena to increase reliability and availability of the NAS.

The research program works to improve system safety by:

- Developing:
  - A technical operations Human-System Integration roadmap that complements the introduction of advanced technology and automated capabilities as the NAS increases dependence on automation and leased services for critical data sources in the NAS that were formerly controlled by the FAA.
  - Methods to identify new potential human error problems as the air traffic service providers' roles and responsibilities change as a result of increasing automation levels.
  - Organizational changes to transform the technical operations Air Traffic Organization (ATO) safety culture.
  - Effective methods to present air traffic specialists weather information for accident prevention through severe weather avoidance.
- Improving:
  - Effectiveness of safety analyses that concentrate on detecting the potential for human error during the concept and research phases of system development.
  - Methods to select and train new air traffic service providers and maintainers.

The program works to improve the ATC and technical operations contribution to system capacity by:

- Developing:
  - Integrated workstations that allow technical operations specialists to meet increased availability and service demand.
  - Methods to assess the value of proposed changes to workstations to determine if human-inthe-loop performance is enhanced.
  - Advanced workstation concepts for maintenance workstations that use automation and advanced technology to increase availability of the NAS, decrease the probability of system outages, and decrease the cost of air traffic services.

## • Improving:

- Human-system integration in a manner that allows air traffic service providers and pilots to cooperatively manage traffic loads as cockpit technology and air traffic workstations are more closely connected to efficiently move NAS air traffic.
- Allocation and sharing of roles and responsibilities between air traffic service providers and pilots as technology evolves to meet future demands.

**Agency Outputs:** The Air Traffic Control/Technical Operations Human Factors Research Program provides leadership and products to motivate NAS evolution to assure that the system's human component will reliably perform to meet the flying public's needs. Outputs include:

- Air traffic workstations and concepts that increase workforce productivity by identifying key
  workload factors that must be mitigated to enable the humans in the system to manage the future
  NAS traffic flow.
- Human reliability analytical tools and methods to assess and mitigate the potential for human error.
- Assessments of the effectiveness of fatigue risk management strategies.
- ATO safety culture transformation through research in the Technical Operations community to identify effective interventions to move the ATO toward a "Just Culture."
- Future air traffic service provider and maintainer personnel selection criteria to enhance screening process efficiency and effectiveness.
- Guidelines and standards for design of computer-human interfaces used in Technical Operations.

### Research Goals:

- By FY 2011, complete a study to determine the feasibility of performing a quantitative analysis of human reliability in the air traffic domain.
- By FY 2011, initiate a study to determine the effectiveness of fatigue management changes in air traffic control.
- By FY 2012, improve computer-human interface design to reduce information overload and resulting errors.
- By FY 2012, apply program-generated human factors knowledge to improve aviation system personnel selection and training.

**Customer/Stakeholder Involvement:** The ATC/ATO Human Factors research program receives requirements from its internal FAA sponsoring organizations, primarily the following FAA ATO Air Traffic/Technical Operations research groups:

- Advanced Air Traffic Systems Requirements Group En Route and Terminal Service units as well
  as System Engineering in Operations Planning, operational personnel and systems developers
  articulate human factors research requirements for measuring the proposed technology benefits to
  controllers and maintainers. FAA Flight Standards and Aircraft Certification organizations
  participate in the research requirements definition associated with pilot/controller interface with airground integration weather aspects as the FAA moves toward a vision of the future NAS.
- Individual and Team Performance Requirements Group ATO Safety, En Route, Terminal, Technical Operations and System Engineering service units participate to identify human performance research needs involving fatigue, safety culture, human error hazard identification, age, operational errors, runway incursion prevention, and supervisor practices.
- Advanced Technical Operations Systems Requirements Group The Technical Operations, En Route, and Terminal service units recommend NAS infrastructure operational and maintenance research including ATC systems maintenance displays, controls, and maintainability features specification.
- Personnel Selection and Training Requirements Group ATO Technical Training and Development, Human Resources, FAA Academy, Workforce Services, and the Financial Services groups address personnel selection and training including the ability to successfully screen applicants for controller positions and for reduced training cost and time.

## **R&D Partnerships:**

- Collaborative research with NASA includes fatigue risk management, training effectiveness, and innovative human error safety analytical techniques.
- Collaboration with EUROCONTROL includes joint development of a Human Reliability Assessment Tool, participation in semi-annual Air Traffic Management (ATM) Seminars, and leadership of an Action Plan 15 Safety workgroup to identify ATM human factors issues.
- Cooperation with the ICAO-endorsed NOSS Collaborative (Normal Operations Safety System/Threat & Error Management) to assess controller safety.
- Cooperative research agreements are in place with Massachusetts Institute of Technology, Georgia Institute of Technology, St. Louis University, Ohio State University, and American Institutes for Research.

## **Accomplishments:** Program highlights include:

### FY 2009:

- Developed a tool for human reliability analysis in collaboration with EUROCONTROL human factors
  experts to assess the impact of changes to air traffic management planned by both the US and
  European air traffic service providers.
- Delivered a human factors specification/standard for the design of TO workstations.
- Initiated a Human System Integration study of the impact future air traffic maintenance concepts on the Technical Operations workforce.
- Conducted simulations to determine the appropriate use of data communications in terminal airspace.
- Conducted preparations for an air-ground integration simulation regarding improved weather products at the controller workstation to enhance safety in the NAS.
- Calculated safety risks of an operational error (OE) occurring as a function of the amount of time spent on position.

## FY 2008:

- Completed tower simulation infrastructure to support NextGen human factors research for the airport domain.
- Application of en route workstation research concepts that are being transferred to the operational
  arena as the data communications program matures through the initial integration of this
  technology.
- Completion and dissemination of a tower supervisor best practices study to suppress the potential for runway incursions and operational errors.
- Validated the Human Error Safety Risk Assessment (HESRA) research tool on a wake turbulence system in the early stages of development to manage safety risk prior to system development and fielding. This research tool will be transferred to the operational domain via the Safety Management System (SMS) toolbox.
- Completed first stage of safety culture enhancement by transfer of the technical operations aviation safety action program (ASAP) to the operational domain.
- Completed data collection for the technical operations work force anthropometric measurement database.
- Developed a maintenance domain alerts and alarms human factors design standard.
- Conducted a NOSS trial in a FAA facility to demonstrate the utility of the concept and provide unique safety data for the participating facility.
- Initiated a maintainable and extensible job/task analysis information database providing the ability to access, update, and report requirements in parallel with NextGen development.
- Developed and validated a technically sound computer-based practical color vision test that relates to ATC tasks.

#### FY 2007:

Completed simulations that evaluate capacity enhancements when en route workstations are
provided with data communications and aircraft self-spacing and self-separation provisions.

- ATC safety alerts study completion in response to National Transportation Safety Board concerns
  that controllers are not responding properly to prevent mid-air collisions and controlled flight into
  terrain accidents.
- Tower situation display demonstration with integrated flight data to reduce display clutter and integrate tower controller tasks.
- Initiation of a tower controller external vision requirements study to support staffed virtual tower development with no direct airport surface view.
- Safety Culture improvement project expansion to more facilities enabling the technical operations community to improve safety
- Transfer of the National Air Traffic Professionalism Program (NATPRO) to the En Route service unit as a research product that is making the transition to the operational domain.
- Updated en route and terminal job task analyses and developed air traffic controller performance standards.

### FY 2010 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:

- Developed a human factors display standard that will be used as a system design requirements
  document to leverage past lessons learned and aid the move toward a common display platform
  for all air traffic domains where similar display requirements exist.
- Conducted simulations and analyses of controller time-on-position as it relates to operational
  errors. The analyses will seek to find the minimum time on position that provides an adequate
  level of situation awareness and the maximum time beyond which mental fatigue induces human
  error.
- Refined a tool for human reliability analysis in collaboration with EUROCONTROL human factors
  experts to assess the impact of changes to air traffic management planned by both the US and
  European air traffic service providers.
- Conducted a survey to determine the effectiveness of controller fatigue management changes introduced in FAA Orders during 2009
- Continued a Human System Integration Study of the impact future air traffic maintenance concepts on the Technical Operations workforce.

## **FY 2011 PROGRAM REQUEST**

The program will continue to provide research that will operate in concert with other human factors system development activities that are focused on the NextGen solutions being proposed for the future NAS. This research program addresses human performance issues in ATC systems acquisition, design, operation, and maintenance over the next several years with an emphasis on safety, training and personnel selection as part of the Human System Integration concept. The human factors research program will continue to emphasize the safety aspects of NAS enhancements as NextGen changes emerge and change the interactions between the actors and systems in the NAS. The proactive analysis of human error causal factors continues to be the focus of a portion of this research program.

## Advanced Air Traffic Systems

- To support the Agency goal to reduce General Aviation (GA) accidents the Flight Standards
  organization in collaboration with the ATO Safety service unit has requested that the Human
  Factors Research Program develop human factors display requirements for controller weather
  information. Weather is a major factor in GA fatalities and controllers are in a unique position to
  aid pilot decision-making.
- The ATO Terminal service unit has noted that there are a plethora of alerts and alarms in airport traffic control towers. Many new systems, including NextGen systems, are proposing to bring new displays and alerts to the tower on a piecemeal basis. The Terminal service unit has requested the development of a human factors display standard for tower air traffic control alerts.

## Individual and Team Performance

- In response to NTSB concerns regarding controller fatigue the Human Factors research program
  has worked with the ATO to institute changes to controller scheduling policy. The ATO Safety
  service unit has requested that we determine the effectiveness of controller fatigue mitigation
  strategies associated with changes to controller scheduling requirements.
- An important component of the ATO safety program concerns the enhancement of our safety culture. The Technical Operations Safety Culture Transformation project in this research program has been successful and the initial phase is making the transition to an operational program. The technical operations service unit has requested that we continue work in human error reduction and reporting by expanding the application to the management portion of the organization.

### Advanced Technical Operations Systems

- The Technical Operations service unit has indicated that maintenance technicians are confronted
  with as many as 40 different interfaces with non-standard characteristics that must be memorized
  and manipulated. This service unit has offered a research requirement to standardize the user
  interface by developing human factors requirements for a standard graphical user interface on
  maintenance work stations and system displays used by maintainers.
- The future concept of operations for maintenance of air traffic systems will involve an increase reliance on conducting maintenance from remote locations. The Technical Operations service unit has requested the continued development of human factors information requirements for remote maintenance monitoring.

## Personnel Selection and Training

- The ATO is making significant investments in the procurement of new training simulators for tower cab controllers. The Terminal service unit has requested that we complete a training effectiveness evaluation methodology and apply the methodology to a new tower simulator by 2011.
- Previous color vision tests for air traffic controllers were not job related and not tied to the use of
  color on air traffic displays. The aero medical representatives in the controller selection process
  have requested the continued testing and validation of a newly developed occupational test of ATC
  specialist color vision that is job related.
- Potential changes to the air traffic system purport to encompass a shift in the job of the controller due to the increased use of automation and new concepts in traffic management and aircraft navigation. If these changes take place there may be a need for new controller selection criteria. The identification of the new criteria requires a Strategic Job Analysis for air traffic controllers.
- The FAA is rapidly changing the types of technology and maintenance concepts used by air traffic systems. The technical operations community has identified the need to review the selection criteria for maintenance personnel by performing an update of the air traffic systems maintainer Job Task Analysis.

#### **New Initiatives**

New research will focus on human factors engineering design aspects of HSI. This will also require an updated maintenance concept including increased availability of NAS systems, a maintainer personnel roadmap and a concerted effort to reduce the effects of human error during the maintenance process:

Update the Human Factors Design Standard. This document was published in 2003 and is cited as
a design standard in every major FAA procurement that has a human interface. Planned
publication for the document is 2013 and will be coordinated with the Department of Defense MilStd-1472 update currently under way.

## **KEY FY 2011 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:**

## Advanced Air Traffic Systems

- Developing human factors display requirements for weather information as technology provides weather information to the cockpit as well as the controller work station.
- Developing a human factors display standard for tower air traffic control displays.

## Individual and Team Performance

- Determine the effectiveness of controller fatigue mitigation strategies associated with changes to scheduling requirements.
- Continue work in human error reduction and reporting by expanding the application of research in transformation of the ATO safety culture.

## Advanced Technical Operations (TO) Systems

- Develop human factors requirements for a standard graphical user interface on maintenance work stations and system displays used by maintainers.
- Continue development of human factors information requirements for remote maintenance monitoring

## Personnel Selection and Training

- Complete a training effectiveness evaluation methodology and apply to a new tower simulator.
- Complete the development and testing of a occupational test of ATC specialist color vision
- Complete the Strategic Job Analysis for air traffic controllers
- Complete an update of the air traffic systems maintainer Job Task Analysis

## **APPROPRIATION SUMMARY**

	Amount (\$000)
Appropriated (FY 1982-2009)	182,574
FY 2010 Enacted	10,302
FY 2011 Request	10,475
Out-Year Planning Levels (FY 2012-2015)	43,439
Total	246,790

Budget Authority (\$000)		FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted		FY 2011 Request
Contracts:						
Air Traffic Control/Technical Operations		4,130	4,333	4,142	4,389	4,302
Personnel Costs		5,285	5,443	6,128	5,617	5,800
Other In-house Costs		239	224	299	296	373
	Total	9,654	10,000	10,469	10,302	10,475

OMB Circular A-11, Conduct of Research and Development (\$000)	FY 2007 Enacted	FY 2007 Enacted	FY 2009 Enacted		FY 2011 Request
Basic	0	0	0	0	0
Applied Development (includes prototypes)	9,654 0	10,000 0	10,469 0	10,302 0	10,475 0
Total	9,654	10,000	10,469	10,302	10,475

A11.i. – Air Traffic Control/Technical Operations Human Factors	FY 2011	Program Schedule						
Product and Activities	Request (\$000)	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	
O82-110 Air Traffic Control/Technical Operations Human Factors Advanced Air Traffic Systems  Developing human factors display requirements for weather information Developing a human factors display standard for tower air traffic control displays Update to Human Factors Design Standard	850	*	<ul><li> </li><li> </li><li> </li></ul>	<ul><li> </li><li> </li><li> </li></ul>	<ul><li> </li><li> </li></ul>	<b>\lambda</b>	<b>*</b>	
Individual and Team Performance  Determine the effectiveness of controller fatigue mitigation strategies  Continue research in transformation of the ATO safety culture	1,200	•	<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>◊</b>		
Technical Operations (TO)  Develop human factors standard graphical user interface on maintenance work stations Development of human factors information for remote maintenance monitoring	1,202	*	<ul><li> </li><li> </li></ul>	<b>*</b>				
Personnel Selection and Training  Complete a training effectiveness evaluation methodology and apply to a new tower simulator  Complete the development and testing of a occupational test of ATC specialist color vision  Complete the Strategic Job Analysis for air traffic controllers  Complete an update of the air traffic systems maintainer Job Task Analysis	1,050	* * * *	<ul><li></li></ul>					
Personnel and Other In-House Costs	6,173							
Total Budget Authority	10,475	10,302	10,475	10,633	10,799	10,934	11,073	

Note: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual budget process.

Budget Item	Program Title	Budget Request
A11.j.	Aeromedical Research	\$11,217,000

## GOALS:

This program supports the following Flight Plan goal: Increased Safety.

#### **Intended Outcomes:**

Civil Aerospace Medical Institute (CAMI) Aeromedical Research Program

The Aeromedical Research Program supports FAA's Flight Plan Goal for Increased Safety by:

- Investigating and analyzing injury and death patterns in civilian flight accidents and incidents to determine their cause and develop preventive strategies.
- Supporting FAA regulatory and medical certification processes that develop safety and health regulations covering all aerospace craft occupants and their flight environments.
- · Recommending and developing equipment, technology, and procedures for optimal:
  - Evacuation and egress of humans from aerospace craft;
  - Dynamic protection and safety of humans on aerospace craft; and
  - Safety, security, and health of humans on aerospace craft.

Research program outcomes include improved safety, security, protection, survivability and health of aerospace craft passengers and aircrews. The Aeromedical Research Program supports FAA's Flight Plan goals to reduce air carrier fatalities, reduce the number of fatal accidents in general aviation and support FAA organizational excellence by:

- Exploiting new and evaluating existing bioaeronautical guidelines, standards, and models for aerospace craft cabin equipment, procedures, and environments.
- Providing research data to serve as the basis for new regulatory action in evaluation of existing
  regulations to continuously optimize human performance, health, and safety at a minimum cost to
  the aviation industry.
- Analyzing pilot medical and flight data, information from accidents and incidents, and advanced biomedical research results to propose standards and assess certification procedures that optimize performance capability.
- Evaluating the complex mix of pilot, flight attendant and passenger activities in a wide range of environmental, behavioral, and physiological situations to propose standards and guidelines that will enhance the health, safety, and security of all aerospace travelers.

Airliner Cabin Environment Research Program

The Airliner Cabin Environment Research Program supports FAA's Flight Plan Goal for Increased Safety by:

- Developing and testing adaptive environmental control techniques to enable a safe and healthy cabin air environment including during in-flight incidents.
- Validating software tools and methods to mitigate possible air contamination incidents during flight and ground operations.
- Developing advanced air chemistry models for interaction of atmospheric ozone and volatile organic compounds.
- Developing advanced methods to automatically analyze textual safety reports and extract system
  performance information for prognostic identification of safety risks for system operators and
  designers.
- Developing advanced scientific models and experimental data of airborne and surface transmission of existing and emerging infectious diseases within aircraft.

- Evidence-based development of appropriate hazard identification and risk management criteria
  guidelines to maximize safety and health in the air transportation system in response to infectious
  disease.
- Recommending and developing equipment, technology, and procedures for optimal:
- Evidence-based development of appropriate policy, regulations and guidelines to maximize safety and health from the cabin air quality environment;
- Identifying hazards and characterizing risks of the major infectious diseases likely to be carried onboard aircraft;
- Providing air quality incident identification to alert crew to potential problems and provide signals to the environmental control system for appropriate response; and
- Providing for safety, security and health of passengers and crewmembers on commercial aircraft.

**Agency Outputs:** Agency outputs proceed from the FAA Office of Aviation Medicine (AAM), specifically, 1) the Civil Aerospace Medical Institute (CAMI) and 2) the FAA National Air Transportation Center of Excellence (CoE) for Research in the Intermodal Transportation Environment (RITE).

## CAMI Aeromedical Research Program

CAMI's Aeromedical Research Program provides research data to assess new technology, and evaluate existing bioaeronautical guidelines, standards, and models for aerospace craft cabin equipment, procedures, and environments. Aeromedical research serves as the basis for new regulatory action and evaluation of existing regulations to continuously optimize human performance and safety at a minimum cost to the aviation industry. This research program analyzes pilot medical and flight data, information from accidents and incidents, and advanced biomedical research results to propose standards and assess certification procedures that optimize performance capability. This research program is conducted by in-house resources, specifically the CAMI Aerospace Medical Research Division and supports Airliner Cabin Environment Research efforts.

## Airliner Cabin Environment Research Program

The FAA National Air Transportation Center of Excellence (CoE) for Research in the Intermodal Transportation Environment (RITE) was formulated in response to issues raised in a 2002 National Research Council Report regarding Airliner Cabin Environment and the Health of Passengers and Crew during normal and events outside the normal operational envelope. RITE addresses public, aircrew, and congressional concerns regarding these issues including: disease transmission, contaminant transport, ozone (including chemical reactivity of aircraft cabin interiors), pesticides (residual and sprayed), and contaminants that may be carcinogenic used as additives in hydraulic and lubricating fluids in aircraft engines and Auxiliary Power Units (APUs) and identified as possible neurological toxins in crew members. RITE also conducts R&D on cabin air quality sensors, advanced environmental control systems, and on chemical and biological agents, disinfection techniques and aircraft materials compatibility with disinfection processes. The research is primarily conducted by universities and the industry. Established in 2004 by the FAA Administrator, RITE is led by Auburn University, with Harvard and Purdue Universities as Technical Co-Leads. Other member universities include Boise State University, Kansas State University, the University of California at Berkeley, and the University of Medicine and Dentistry of New Jersey.

The FAA and RITE are uniquely positioned to provide evidence based research data to assess new technologies, provide hazard identification and risk assessment for aircraft cabin environmental events and provide appropriate guidelines, propose standards, and models for aircraft cabin equipment, procedures, and environments. The airliner cabin environment research program serves as the basis for new regulatory action and evaluation of existing regulations to continuously optimize the safety and health of passengers and crewmembers at a minimum cost to the aviation industry.

## **Research Goals:**

## CAMI Aeromedical Research Program

- By 2012, validate mathematical models to evaluate whether aircraft designs meet requirements for evacuation and emergency response capability.
- By 2012, establish design criteria for restraint systems that protect occupants at the highest impact levels that the aircraft structure can sustain.
- By 2015, apply and develop advances in gene expression, toxicology, and bioinformatics technology and methods to define human response to aerospace stressors.
- By 2015, incorporate aerospace medical issues in the development of safety strategies concerning
  pilot impairment, incapacitation, spatial disorientation, and other aeromedical-related factors that
  contribute to loss of aircraft control.
- By 2015, develop advanced methods to extract aeromedical information for prognostic identification of human safety risks.
- By 2015, develop a methodology to compile, classify, and assess aviation-related injuries, the
  mechanisms that resulted in these injuries, and their relationship to: autopsy findings, medical
  certification data, aircraft cabin configurations, and biodynamic testing: Aerospace Accident Injury
  and Autopsy Data System (AAIADS)

## Airliner Cabin Environment Research Program

- By 2011, apply and validate advanced air sensing technology for volatile organic compounds in the aircraft cabin environment.
- By 2011, develop bleed air contamination models of engine compressors and high temperature air system for effects on health and safety of passengers and crew.
- By 2012, complete experimental projects in support of regulatory, certification, and operations for
  existing Aviation Rulemaking Committees by providing data and guidance for new or revised
  regulation of airliner cabin environment standards.
- By 2012, develop and validate chemical kinetic models for bleed air systems for health and safety effects on passengers and crew.
- By 2013, develop advanced data and mathematical models for cabin air purification systems.
- By 2015, establish design criteria for aircraft cabin air quality sensing systems.
- By 2015, demonstrate advanced methods to remove contaminants from bleed air and non-bleed air ventilation systems.

## Customer/Stakeholder Involvement:

## CAMI Aeromedical Research Program

- Directly supports the bioaeronautics agenda set forth in the Executive Office of the President, National Science and Technology Council, National Plan for Aeronautics Research and Development and Related Infrastructure (NPARDRI), released 1/10/2008.
- Directly supports the bioaeronautics agenda set forth in the Executive Office of the President,
   Office of Management and Budget (OMB) and Office of Science & Technology Policy (OST) FY 2009
   Administration R&D Budget Priorities, 8/14/2007 (EOP).
- Provides research for FAA, European Aviation Safety Authority and Transport Canada under the
  Aircraft Cabin Safety Research Plan. This is a coordinated, living plan to maximize the cost/benefit
  of aerospace craft cabin safety research nationally and internationally.
- Supports multi-year collaborative studies by FAA and other government and industrial entities to evaluate flight crew and passenger symptomatology, disease, and impairment.
- Supports the NextGen Implementation Plan, Smart Sheets, Solution Set Increased Safety, Security and Environmental Performance, Safety Management Systems.

## Airliner Cabin Environment Research Program

- The Airliner Cabin Environment Research Program directly supports the FAA's Statutory Authority, 49 USC 40101D, 44701A, 40 FR 29114 DOT, 49 CFR 830.5, Public Law 106-81, 14 CFR 1.1, 21, 25, 121, 125, and 135 to protect the health and safety of passengers and crewmembers.
- The Executive Office of the President, National Science and Technology Council, National Plan for Aeronautics Research and Development and Related Infrastructure.
- The Executive Office of the President, OMB and OST FY 2009 Administration R&D Budget Priorities.
- White House Implementation Plan for National Strategy for Pandemic Influenza.
- World Heath Organization International Health Regulations agreed to by the Secretary, Department of Transportation
- Supports multi-year collaborative studies by FAA, other government agencies, and industrial
  entities to evaluate airliner cabin environment to protect the safety and health of passengers and
  crewmembers.
- Supports the Wendell H. Ford Aviation Investment and Reform Act of the 21 Century section 725;
   Public Law 106-181.
- Supports the FAA National Air Transportation Center of Excellence for Research in the Intermodal Transport Environment
- Supports the White House Implementation Plan for National Strategy for Pandemic Influenza.
- Provides collaborative research with the Civil Aviation Authority-United Kingdom on cabin air quality.
- Supports the Health and Human Services Implementation Plan to characterize viral subtypes and
  enable detection and investigation of suspected cases and detect increase in disease activity in the
  aircraft cabin environment.

## **R&D Partnerships:**

#### CAMI Aeromedical Research Program

- Direct collaboration with the DoD, NASA, and NTSB on accident investigation, crashworthiness, inflight turbulence, aerospace medicine, ocular injury from lasers, and exposure to cosmic radiation.
- Develops Cooperative Research and Development Agreements (CRDA) and Memorandums of Understanding/Agreement (MOA/U) with industry to ensure collaborative projects benefiting both FAA and the aviation industry.
- Participates in North Atlantic Treaty Organization (NATO) aerospace medical advisory groups, the European Union, and many academic institutions and government laboratories.
- Established National Research Council (NRC) postdoctoral programs to conduct research in molecular biology, bioinformatics, environmental physiology, and other aviation medicine fields at CAMI.
- Established a professional relationship with over 90 organizations and 55 committees including
  holding fellowships and other leadership positions. These scientific, medical, and bioengineering
  relationships include working in partnership on a multitude of efforts with these organizations
  including the following:
  - Cabin Safety Harmonization Working Group
  - Seat Certification Streamlining Effort
  - The National Safety Council
  - Society of Automotive Engineers
  - Aerospace Medical Association

- Civil Aviation Medical Association
- American Society of Mechanical Engineers
- American Ophthalmological Society
- Society of Forensic Toxicologists
- American Academy of Forensic Science

Airliner Cabin Environment Research Program

RITE has over 30 industry partners participating in the research and development effort. RITE researchers and Office of Aerospace Medicine staff members collaborate with leading organizations associated with aerospace medicine, aviation health, airliner cabin environment and safety, including:

- Direct coordination and collaboration with the DoD
- Direct coordination and collaboration with Department of Homeland Security, Transportation Security Administration
- Environment Protection Agency
- Health and Human Services
- Centers for Disease Control and Protection
- National Institute for Occupational Health and Safety
- International Civil Aviation Organization.
- International Aviation Transportation Association
- Air Transport Association
- Boeing
- Delta
- Honeywell
- American Society of Heating, Refrigerating and Air-Conditioning Engineers
- American Society for Testing and Materials International
- Memorandum of Cooperation with the Civil Aviation Authority-United Kingdom to collaborate and coordinate airliner cabin environment research in sampling and analyzing air quality in aircraft cabins.
- Develops cooperative research and development agreements with industry to ensure collaborative projects benefiting both FAA and the aviation industry.
- Participates and coordinates airliner cabin environment research with Air Transportation Association Medical Committee and Cabin Technical Operations Committee.

## Accomplishments:

FY 2009

CAMI Aeromedical Research Program

Aeromedical Systems Analysis

- Obesity in Civil Aviation Cross-functional Study: demographic findings in obese pilots, Body Mass Index of insulin-dependent Pilots, toxicology, medical certification, and autopsy Findings.
- Internet Research Assistant Panel Review Open Source Software and Aeromedical Websites.
- Successfully testified for the FAA in 2 court proceedings regarding research on spatial disorientation.
- Collaborated with National University of Colombia (NUC): Ischemic Heart Disease in Airline Transport Pilots.
- Under the ongoing FAA adoption of SMS, developing Probabilistic Risk Assessment (PRA) techniques to use with aeromedical certification decision making. Collaboration with NASA.
- Completed the Segmented Regression Analysis for detecting sharp changes ("breakpoints") of a response function at an increase or decrease of an influential factor. This approach allows the assessment of regulatory changes.
- Collaborated with Ministry of Health, Iraq: Psoriasis and Coronary Artery Diseases in the U.S. Civilian Pilot Population.
- Collaborated with NUC and 4th Military Medical University of China: review of aeromedical certification records - Diabetes.
- Performed Aviation Safety 2008: Year in Review.

- Aircraft Accident Injury and Autopsy Data System (AA-IADS): Functional Requirements Phase completed: Design Phase initiated.
- FAA AAM Aerospace Accident Review Program: Developed centralized medical aircraft accident review program to acquire/store pilot medical information for all fatal and high profile accidents.
- Evaluated Next-Generation Vision Testers for Aeromedical Certification of Aviation Personnel (pilots, maintenance personnel, and inspectors). These new visual screeners (testers) have been implemented by AAM for the aeromedical certification of pilot applicants.
- Revised the American National Standards Institute (ANSI) Z136.6: American National Standard for Safe Use of Lasers Outdoors.
- Developed an Aerospace Standard (AS) to establish performance criteria for control measures to prevent harmful exposure of flight crew.
- Monitored and assessed visual effects and operational problems resulting from pilot exposure to laser and high-intensity lights.

## Accident Prevention and Investigation

- Developed new procedure for screening human specimens from aviation accidents. The old method required the use of 2 different pieces of equipment and took twice as long as the new method that only requires the use of 1 instrument.
- Artificial formation of carbamazepine from oxcarbazepine: Helped to differentiate the two
  compounds derived from this anticonvulsant and mood stabilizing drug. It is used primarily in the
  treatment of epilepsy and bipolar disorder.
- Distribution of Oxycontin™ (oxycodone) in postmortem fluids and tissues Collaboration with Biochemistry Research Team. This information will help elucidate the significance of an oxycodone concentration in a tissue specimen when no blood is available for analysis (35% of analyses).
- Assessment of the 2nd seven years of FAA's Postmortem Forensic Toxicology-Proficiency Testing Program. This research verifies that CAMI maintains continuous state-of-the art analytical capabilities for aviation related toxicological substances.
- Revised Alcohol Testing in the Workplace Book Chapter. Medical Review Officer Handbook Chapter 3: "Laboratory Procedures and Analysis" 9th Edition, Quadrangle Research, Research Triangle Park, NC.
- Aerospace toxicology overview for the period of 1960–2007. This review addresses the historical aspects and recent advances in the field.
- Toxicological findings in fatally injured obese diabetic pilots involved in aviation accidents. These
  findings will be helpful in adjudicating aeromedical certification issues associated with obese and/or
  diabetic pilots.
- Assessed the Increased Cannabinoids Concentrations Found in Specimens From Fatal Aviation Accidents Between 1997 and 2006.
- Developed first-generation gene-expression-based assay for fatigue using a limited sample set.
- Investigated RNA source for gene expression from buccal cells non-invasive, easy to collect, facilitates experimental design.
- Investigated physiological effects of 6,000 ft and 7,000 ft cabin altitudes on compromised passengers with chronic and stable cardiac/ pulmonary disease. Performed cytokine analysis. Supports ACER Program.
- Explored hypoxia-induced expression changes from decreased cabin oxygen levels at altitudes significant to the aviation industry.

### Protection and Survival

- Computer simulation of airliner emergency evacuation: Continued application of the cabin
  evacuation model to assess factors that predict evacuation event outcomes. Utilize the model to
  evaluate changes to aircraft cabin layouts and procedural changes that would have impacted an
  evacuation in a negative manner. Apply lessons learned to research and the development of
  improved safety training programs.
- Evaluated the Comprehension of Symbolic Exit Signs (design and presentation context) by the general public.

- Inflation Performance of Emergency Escape Slides at High Altitude. Assisted in the evaluation of high-altitude performance of a set of slides from a single airplane type, in order to gain specific performance information that can be used to develop computation correction factors to assist certification of slides for operations at high-elevation airports and to support potential technical revision of TSO C69.
- Evaluated the Effective Presentation Media for Passenger Safety Briefings.
- Aviation Child Restraints: Combined sled tests and computer modeling to develop specifications
  and test requirements to support certification of advanced aviation child restraint systems and
  revision of TSO-C100.
- Side Facing Seat Certification: Developed comprehensive technical requirements from existing research results to support new certification policy.
- Head/Neck Injury Potential: Assessed head/neck injury potential for various aircraft interiors.
   Expansion of FAA Technical Center side impact project to include head/neck injury potential in the fore/aft direction.

### Aviation Physiology

- Computer simulation of airliner emergency evacuation: Continued application of the cabin
  evacuation model to assess factors that predict evacuation event outcomes. Utilize the model to
  evaluate changes to aircraft cabin layouts and procedural changes that would have impacted an
  evacuation in a negative manner. Apply lessons learned to research and the development of
  improved safety training programs.
- Developed programs used worldwide to determine radiation exposures of air travelers.
- Worked with NASA and NOAA in providing information to pilots on exposures from galactic and solar cosmic radiation.
- Maintained the FAA Solar Radiation Alert System.

## Airliner Cabin Environment Research Program

- Completed a laboratory study of ozone reactions with common aircraft cabin materials as well as
  ozone reactions with clothing, perfumes, skin oils, etc. Determined that resultant carbonyls,
  dicarbonyls, acids, and miscellaneous other volatile organic compounds adversely affect perceived
  air quality and may affect passenger and crew health.
- Completed initial experimental campaign of airliner pesticide sampling measurements on both domestic and international flights.
- Performed statistical analyses on physiological data from study of the effects of 7000 ft cabin altitudes on health-compromised, older people. Found a ~ 50% decrease in arterial blood oxygen at simulated altitudes as compared with the ground level baseline. Determined that age is the most highly correlated parameter, i.e., older people tend to desaturate more.
- Performed statistical analyses of 4300+ health surveys of flight attendants for underlying and occupational-related health conditions. Quantified the percentage that reported one or more work related injuries/illnesses last year and determined that respiratory symptoms were the greatest cause of visits to medical providers.
- Completed measurements of cabin air quality (ozone, carbon monoxide, carbon dioxide, volatile organic compounds, PM2.5, etc.) on 40 flight segments.
- Tricresyl phosphate sensor: Tricresyl phosphate is one of the key bleed air contaminants of
  potential concern. Refined the successful laboratory technique and packaged the components to
  enable a future demonstration of the technology in a bleed air simulator.
- Determined exhaled bioaerosol characteristics and used the data to develop a computational model
  of airborne disease transmission on aircraft
- Developed an experimental protocol and laboratory facility to assess potential hydrogen embrittlement of high strength steels due to exposure to vaporized aircraft disinfectants.
- Completed a preliminary flammability study on the effects of hydrogen peroxide on common aircraft textiles.

 Completed a feasibility study of the ability of modern atmospheric databases and models to predict atmospheric ozone and improve the ability of airline flight planners to meet ozone regulations.

#### FY 2008

## CAMI Aeromedical Research Program

## Aeromedical Systems Analysis

- The aerospace Medical Research Scientific Information System (SIS) software was documented for use by aeromedical research scientists.
- Completed phase I of a cross functional study of diabetes in civil aviation.
- Continued the development of an Aerospace Accident Injury and Autopsy Data System (AAIADS) realized significant coordination & collaborative activities.
- Accepted FAA Accident Autopsy Program responsibilities.
- Completed the program on quality control and assurance concerning the use of the CAMI Data Imaging and Workflow System (DIWS).
- Completed the Quality Control and Assurance Software Tool (computer code) to facilitate risk management processes in medical certification of aircrew.
- Examined the frequency and rate of aviation-related laser incidents by year and location.
- Evaluated All-Strobe Approach Lighting Systems.
- Evaluated new design Optometric Test Devices.
- Provided recommendations regarding Infrared Radiation Transmittance and Pilot Vision Through Civilian Aircraft Windscreens
- Provided Safety Considerations for High-Intensity Lights Projected into the Navigable Space: SAE G10-T Working Group: Aerospace Recommended Practice (ARP) document.
- Assessed the Medical Certification Of Civilian Pilots Fitted With Multifocal Contact Lenses and those Considering Laser Eye Surgery.
- Assessed Aircraft accidents and incidents associated with visual effects from bright light exposures during low-light flight operation
- Assessed Laser Exposure Incidents: Pilots Ocular Health And Aviation Safety Issues. Accident Prevention and Investigation
- Compared usage of both illegal drugs and abused prescription medications in pilots involved in civil aviation accidents with that of the general population in the United States.
- Examined the Vitreous Fluid and/or Urine Glucose Concentrations in 1,335 Civil Aviation Accident Pilot Fatalities.
- Completed the formulation of the ISO 27368 Blood Gas Analysis International Standard.
- A new equation was developed to prevent false negative drug results.
- Biomarker Response to Altitude: The test phase of two studies to assess gene expression changes that occur as a result of exposure to decreased oxygen levels have been completed.
- Biomarker Response to Alcohol: Gene expression studies have been developed to identify biomarkers associated with alcohol consumption of levels up to 0.08%.
- Biomarker Response to Fatigue: A preliminary study of the effects of fatigue was undertaken in collaboration with the United States Air Force.

## Protection and Survival

- Evacuation Models: A computer simulation of airliner emergency evacuation was developed and demonstrated for both narrow and wide body aircraft.
- Comprehension of Safety Material and Signs Commercial Airliner "EXIT" signs and symbols were evaluated.
- Comprehension of Safety Briefing Card Pictorials and Pictograms was evaluated.
- Mathematical Prediction of the Effectiveness of Emergency Evacuation Aids (slides) model continued development
- Assessed the inflation Performance of Emergency Escape Slides at High Altitude.

- Occupant Seat/Restraint Models: Measures of accuracy for dynamic mathematical models have been developed and tested.
- Side Facing Seat Safety Criteria: A study of the injury potential of side facing seats using a specialized anthropomorphic test dummy has been completed.
- Assessed head and neck injury potential for occupants of typical aircraft seats and interior configurations during forward impacts.

## **Aviation Physiology**

- Software: Refined equations used for the calculation of radiation doses received by pilots and crew were completed and implemented into the early warning radiation alert system.
- Determined the cosmic radiation exposure of aircraft occupants on simulated high-latitude flights during solar proton events from 1986 through 2008.
- In conjunction with Harvard University, a study was completed on the effect of normal cabin altitude in an older (50-80 years old) and less than healthy (smokers/cardiac conditions) passenger population.
- Supported the field evaluation of whole airliner decontamination technologies; wide-body aircraft
  with dual-use application for railcars in support of the RITE effort.
- Contributed to the development of Guidelines for Life Support Equipment and Cabin environment issues crew and passenger safety requirements for very high altitude air or spacecraft.
- Contributed to training recommendations for occupants of orbital or suborbital vehicles.
- Conducted a review of Technical Order and AC addressing the exposure of pilots & crew to excessive levels of carbon monoxide.

## Airliner Cabin Environment Research Program

- Aircraft Decontamination System: Complete field evaluations of an aircraft thermal decontamination system. The system uses the complementary dual decontamination technologies of thermal desorption (high temperature and relative humidity) and vaporized hydrogen peroxide to kill a full spectrum of biological agents. The evaluations were performed on a McDonnell Douglas DC-9 and a Boeing-747 aircraft.
- In conjunction with CAMI, a study was completed to assess the physiological effects of 7,000 ft cabin altitudes on passengers with chronic and stable cardiac and/or pulmonary disease.
- Extensive study ongoing of the chemicals deposited on high efficiency particulate air (HEPA) filters during airliner service; identification of key markers of contamination.
- Development of miniature sensor array for chemical and physical assessment of the aircraft cabin.
- Laboratory demonstration of an electrochemical sensing technique for the detection of tricresyl
  phosphate one of the principal chemicals of concern during contamination of bleed air from jet
  engine lubricants.
- Identified previously unanticipated ozone reaction chemistry to form volatile organic compound contaminants.
- Collected 4,000 health surveys of flight attendants for underlying and occupational related health conditions and begun statistical analysis air quality incidents.
- Developed protocol for measuring critical cabin pressures for at-risk passengers and crewmembers.
- Developed protocol for onboard pesticide sampling.
- Initiated research collecting baseline data for volatile organic compound contaminants on loaded filters.
- Completed materials compatibility studies of aluminum aerospace alloys and airliner cabin textiles with prototype decontamination technology.

### FY 2007

## **CAMI Aeromedical Research Program**

- Evaluated the medical aspects of extending first-class FAA medical certificate to 12 months for pilots under age 40.
- Development of software and procedures to support quality assurance evaluation of airman medical records.
- Development of an Aircraft Accident/Injury and Autopsy Data System (AA-IADS).
- Evaluated aircraft windscreen transmittance characteristics as they relate to emerging laser technologies employed in the NAS.
- Performed analysis of civilian air show accidents.
- Evaluated the effectiveness of simulators in upset recovery training.
- Determined the distribution of fluoxetine, vardenafil, glucose, hemoglobin A1c, and sedating antihistaminics levels in postmortem cases from aviation accidents.
- Determined molecular changes as a result of decreased cabin oxygen levels at altitudes with significance to both the aviation industry and military pilots.
- Provided engineering/biodynamic requirements to support revision to TSO-C100 and SAE AS5276.
- Supported development of a cabin evacuation design computer model for very large transport aircraft by developing passenger management strategies using research data from flight attendant location trials.
- Evaluated presentation media for maximum effectiveness in passenger safety briefings.
- Initiated collaborative research with industry partners to develop modeling strategies and validation techniques applicable to aircraft seat certification by analysis.
- Reviewed accidents involving Commemorative Air Force Aircraft 1968 to 2005.
- Evaluated design requirements for pulse oxygen systems to support development of engineering certification criteria.
- Determined the clinical aspects of radiation exposure resulting from a terrorist attack.

## Airliner Cabin Environment Research Program

- Collected extensive ozone measurements in aircraft cabins during flight.
- Developed advanced computer simulations for evaluation of airflow and contaminant transport inside aircraft cabins.
- Developed an 11-row airliner mock-up for experimental validation of computational models.
- Completed development and full scale demonstration of prototype biological decontamination system for narrow-body and wide-body aircraft using thermal heat and vaporized hydrogen peroxide.
- Evaluation completed for a range of commercial off-the-shelf biosensors for aircraft cabin environment.

## FY 2010 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:

#### CAMI Aeromedical Research Program

Aeromedical Safety Management System

- Completed application of Aerospace Medical Research Scientific Information System (SIS): DIABETES.
- Aerospace Accident Injury and Autopsy Data System (AAIADS) continued development. Accident Prevention and Investigation
- Gene Expression Changes in Response to Fatigue: Continued to develop methods and tools.
- Analyzed post-mortem aviation accidents specimens for fatigue gene expression.
- Assessed prevalence of abused drugs.

- Developed analytical procedures to assess the smoke toxicity of advanced materials for post-crash survivability.
- Developed analytical procedures to assess alternative aviation fuels vapor toxicity.

#### Protection and Survival

- Completed Aviation Child Restraint Certification: Develop the specifications and test requirements -TSO-C100.
- Completed Evaluation of Passenger Aircraft Safety and Emergency Information Resources.
- Completed Mathematical Prediction of Emergency Evacuation Performance.
- Completed assessment of Inflation Performance of Emergency Escape Slides at High Altitude.
- Seat Cushion Component Test Methods: Develop methods for replacement of worn seat cushions.

## Aviation Physiology

- Completed methodology to evaluate Pulse Oxygen Systems.
- Completed evaluation of Hypoxia Training Devices: Compared learning experience and symptoms
  when using portable devices (tent, mask) and an altitude chamber to make an individual hypoxic.

## Airliner Cabin Environment Research Program

- Developed and collected data to identify technologies and/or operational procedures to reliably bring cabin ozone and cabin pressure levels within current FARs or to address potential rulemaking activities for revising cabin pressure and ozone regulations.
- Quantified the effects of cabin pressure on individuals at risk due to age and/or health status.
- Conducted preliminary assessment of the compatibility of aircraft materials, such as high strength steels and aerospace composites materials, with decontamination technology to determine which products are safe to use on aircraft and which could damage the aircraft materials and potentially compromise the continued airworthiness of the aircraft.
- Demonstrated the feasibility of detecting tricresyl phosphate (TCP) from hot air streams to determine whether TCP levels that could affect health of the crew can be detected in aircraft cabins.
- Developed state-of-the-art computer simulation for influenza transmission within aircraft cabins to determine where bioaerosol droplets may be spread in addition to nearby infected passengers.
- Conducted preliminary assessment of the effectiveness of new influenza control methodologies to mitigate spread of influenza to passengers and crew members.
- Evaluated exposure risk for pesticides and volatile organic compound contaminants to determine levels of contaminants and the potential health effects to humans.
- Collected and analyzed data on airliner cabin environment relative humidity, temperature, ozone, carbon dioxide, volatile organic compounds, and sound levels to determine levels and potentially revise or create new regulations.
- Collected baseline data for volatile organic compound contaminants on loaded aircraft filters to
  determine what can be detected on aircraft filters and what, if any, effects there may be from the
  contamination to passengers and crew members.
- Developed and analyze methods to detect and analyze aircraft cabin contamination including chemical-biological hazards and other airborne irritants.
- Validated computational models of chemical air contaminants, such as volatile organic compounds, to evaluate health and safety impacts on passengers and crew.
- Provided scientific knowledge base on medical effects of combined exposures to carbon monoxide, carbon dioxide and ozone from mild hypoxic conditions associated with reduced air pressures.
- Evaluated toxicological aspects of cabin environmental (air) quality: development of reference laboratory to support aircraft cabin air contaminants analysis.
- Validated computational models of air contaminants, volatile organic compounds; biological and viral contaminants to evaluate health impacts on passengers and crew.
- Characterized the potential impact on aircraft fuel efficiency gains due to new environmental control system materials, sensing systems and methodologies.

 Developed updated scientific databases of atmospheric ozone concentrations and route planning tools.

## **FY 2011 PROGRAM REQUEST:**

**CAMI Aeromedical Research Program** 

Ongoing Activities

- Validate mathematical models to evaluate whether aircraft designs meet requirements for evacuation and emergency response capability.
- Establish design criteria for restraint systems that protect occupants at the highest impact levels that the aircraft structure can sustain.
- Apply advances in gene expression technology, toxicology, and bioinformatics to define human
  response to aerospace stressors including alcohol, drugs, hypoxia, and fatigue. Develop methods
  to collect and assess environmentally responsive genes and their protein products in the context of
  normal and abnormal physiologic states. Utilize machine learning techniques to develop a robust
  gene-set predictive for these stressors, towards a "genomics black-box" to support accident
  investigation and minimize risk to human safety and health.
- Incorporate aerospace medical issues in the development of safety strategies concerning upset
  recovery, controlled flight into terrain (CFIT), and other forms of loss of aircraft control: As
  adaptive-control techniques are developed, assess pilot performance relative to aeromedical
  considerations e.g., transfer of training from various classroom methodologies in the ground, to
  operations in static and dynamic simulators emulating physiologically stressful flight conditions
  (e.g., altitude and acceleration/acrobatic maneuvers), and ultimately in-flight.
- Develop advanced methods to extract aeromedical information for prognostic identification of human safety risks. Evaluate factors pertinent to aeromedical safety including disqualifying pathologies; pilot age; fatigue; the physiologic basis of issues commonly labeled "pilot error" such as spatial disorientation, loss of situational awareness, and confusion; assessment of toxicological findings in terms of historical medical certification data; detection and aeromedical assessment of new medications and their interactions; effectiveness of emergency response procedures and equipment; and special issues (stow-always, type aircraft, laser/radiation threats, and commercial space transportation). Enable evidence-based medical certification and effective knowledge management. Develop new metrics to better understand aeromedical certification trends and future requirements to facilitate this process, including related education/training programs.
- Develop a methodology to compile, classify, and assess aviation-related injuries, the mechanisms that resulted in these injuries, and their relationship to: autopsy findings, medical certification data, aircraft cabin configurations, and biodynamic testing: Aerospace Accident Injury and Autopsy Data System (AAIADS).

## New Initiatives

- Injury Criteria for Obliquely Oriented Seats: Occupant injury mechanisms and test methods and instrumentation and/or modeling techniques required to assess the injury potential.
- Prevention of Injuries That Impede Egress: Unconsciousness related to measurable impact
  parameters; Relationship between test measurements and probability of injury established; Injury
  mitigation capabilities of available technologies evaluated; Leg injuries related to measurable
  impact parameters; Relationship between test measurements and probability of injury established,
  Injury mitigation capabilities of available technologies evaluated; and derive injury criteria.
- Develop and maintain analytical tools; empirical data and scientific expertise to support regulatory actions; standards development; accident investigations; and enhanced safety of airplane interior arrangements and emergency equipment/ operations.
- Identification, assessment, and development of improved evacuation equipment and evacuation aids, such as lighting, aural way-finding systems, and symbolic information media.

## Airliner Cabin Environment Research Program

## **Ongoing Activities**

 Evaluate synergistic health effects of carbon monoxide, carbon dioxide and ozone under mild hypoxic conditions.

- Collect and analyze data on airliner cabin environment relative humidity, temperature, ozone, carbon dioxide, volatile organic compounds, and sound levels to determine potential health effects.
- Evaluation of exposure risk for pesticides and volatile organic compounds contaminants.
- Collect baseline data for measuring volatile organic compound contaminants on loaded aircraft filters.
- Develop advanced air chemistry models for interaction of atmospheric ozone and volatile organic compounds and their effects on cabin air quality.
- Develop real-time intelligent sensing of cabin air quality on airliners.
- Develop advanced microstructured catalytic materials for ozone conversion.
- Apply advances in weather modeling to predict atmospheric ozone disturbances that could affect cabin air quality.
- Asses risk and manage the infectious disease transmission on airliners.
- Continue preliminary assessment of aircraft material compatibility of high strength steels and aerospace composites materials with disinfection technologies.
- Quantify the effects of cabin pressure on individuals at risk due to age and/or health status.
- Evaluate and identify technologies and/or operational procedures to reliably bring cabin ozone and cabin pressure levels within current FARs.

#### **New Initiatives**

- Develop and test adaptive environmental control techniques to enable a safe and healthy cabin air environment including in-flight incidents.
- Validate software tools and methods to mitigate air contamination incidents during flight and ground operations.
- Identify potential impacts of more fuel efficient advanced airliner environmental control system and related engine designs on cabin air quality.
- Assess role of advanced weather modeling technology to predict atmospheric ozone disturbances in the aircraft cabin.
- Preliminary assessment of the efficacy of new influenza control methodologies.
- Evaluate viral outbreak mitigation strategies and methodologies for cost effect reduction of impact to the air transportation system.

### **KEY FY 2011 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:**

### CAMI Aeromedical Research Program

## Aeromedical Systems Analysis

- Provide incidental medical findings and injury description and injury mechanisms analysis to support the development of prevention and mitigation strategies: Aircraft Accident Injury and Autopsy Data System (AA-IADS).
- Conduct a Risk Assessment of Selective Serotonin Reuptake Inhibitors (SSRIs) use in civil aviation.

## Accident Prevention and Investigation

- Quantify the effects and impact of fatigue in aviation using gene expression research.
- Determine the usefulness of blood from aviation accidents as a RNA source for gene expression analysis.
- Determine the prevalence of psychotropic drugs in pilot fatalities from civil aviation accidents.
- Assess unapproved medications found in fatally injured pilots involved in homebuilt-aircraft accidents.
- Correlate the incidence of quinine positives in aircraft fatalities with elevated serotonin metabolite ratios.

## Protection and Survival

- Develop methods to qualify replacement elements for worn seat cushions used in energy absorbing seats
- Develop Mathematical Prediction of Emergency Evacuation Performance.
- Conduct the performance evaluation of Inflatable Emergency Equipment for Ditching Scenarios.

## **Aviation Physiology**

- Calculate galactic cosmic radiation dose rates in the atmosphere at altitudes above 60,000 feet.
- Develop a Windows version of the CARI program.
- Evaluate and develop oxygen system guidelines for high altitude aircraft.

## Airliner Cabin Environment Research Program

- Provide scientific knowledge base on medical effects of combined exposures to carbon monoxide, carbon dioxide and ozone from mild hypoxic conditions associated with reduced air pressures.
- Evaluate toxicological aspects of cabin environmental (air) quality: development of reference laboratory to support aircraft cabin air contaminants analysis.
- Validate computational models of air contaminants, volatile organic compounds; biological and viral contaminants to evaluate health impacts on passengers and crew.
- Characterize the potential impact on aircraft fuel efficiency gains due to new environmental control system materials, sensing systems and methodologies.
- Develop updated scientific databases of atmospheric ozone concentrations and route planning tools.

## **APPROPRIATION SUMMARY**

	Amount (\$000)
Appropriated (FY 1982-2009)	140,813
FY 2010 Enacted	10,378
FY 2011 Request	11,217
Out-Year Planning Levels (FY 2012-2015)	46,548
Total	208,956

<b>Budget Authority</b>	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
(\$000)	Enacted	Enacted	Enacted	Enacted	Request
Contracts:					
CAMI Aeromedical Research	1,504	1,712	2,038	3,811	2,847
Airliner Cabin Environment Research	0	0	0	0	1,700
Personnel Costs	5,313	5,893	6,177	6,342	6389
Other In-house Costs	145	155	180	225	281
Total	6,962	7,760	8,395	10,378	11,217

OMB Circular A-11, Conduct of Research and Development (\$000)	FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Basic	0	0	0	0	0
Applied	6,962	7,760	8,395	10,378	11,217
Development (includes prototypes)	0	0	0	0	0
Total	6,962	7,760	8,395	10,378	11,217

A11.j. – Aeromedical Research	FY 2011			Program	Schedule		
Product and Activities	Request (\$000)	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
086-110 CAMI AEROMEDICAL RESEARCH	2,847						
(CAMI)     1. Validate mathematical models to evaluate							
whether aircraft designs meet requirements for		•	<b>◊</b>	<b>◊</b>			
evacuation and emergency response capability.  2. Establish design criteria for restraint systems that							
protect occupants at the highest impact levels that		•	<b>◊</b>	♦			
the aircraft structure can sustain.  3. Apply and develop advances in gene expression,							
toxicology, and bioinformatics technology and			<b>\lambda</b>		♦		<b>\lambda</b>
methods to define human response to aerospace stressors.		•	v	, v	v	v	V
Incorporate aerospace medical issues in the							
development of safety strategies concerning pilot impairment, incapacitation, spatial disorientation,			<b>\lambda</b>	♦	♦		<b>\lambda</b>
and other aeromedical-related factors that		•	V	V	V	V	V
contribute to loss of aircraft control.							
5. Develop advanced methods to extract aeromedical information for prognostic identification		•	<b>◊</b>	♦	♦	♦	<b>◊</b>
of human safety risks.							
6. Develop a methodology to compile, classify, and assess aviation-related injuries, the mechanisms that							
resulted in these injuries, and their relationship to:							
autopsy findings, medical certification data, aircraft cabin configurations, and biodynamic testing:		•	<b>♦</b>	♦	<b>\Q</b>	♦	<b>◊</b>
Aerospace Accident Injury and Autopsy Data System							
(AAIADS).							
086-111 Airliner Cabin Environment Research	1,700						
Develop and analyze methods to detect and	1,700		^				
analyze aircraft cabin contamination.		•	<b>◊</b>				
Computational models of air contaminants, volatile organic compounds, biologicals and virals		•	<b>◊</b>				
Advanced air sensing technology for volatile		•	♦	♦			
organic compounds.  4. Bleed air contamination models of engine							
compressors and high temperature air system.		•	<b>◊</b>	<b>♦</b>			
5. Support of regulatory, certification, and operations for existing Aviation Rulemaking		•	<b>◊</b>	♦	♦	♦	♦
Committees.		,	•	,	•	,	,
6. Chemical kinetic models for bleed air systems for health and safety effects on passengers and crew.		•	<b>♦</b>	<b>◊</b>	<b>◊</b>		
and saidly should bit passongers and drow.							
Personnel and Other In-House Costs	6,670						
Total Budget Authority	11,217	10,378	11,217	11,390	11,570	11,718	11,870

Note: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual budget process.

Budget Item	Program Title	Budget Request
A11.k.	Weather Program	\$16,505,000

#### GOALS:

This program supports the following Flight Plan goals: Increased Safety and Greater Capacity; and supports the Next Generation Air Transportation System (NextGen) weather operational improvements.

Intended Outcomes: The Weather Program contributes to FAA's strategic goals for increased safety and capacity. The Weather Program provides improved weather information to minimize impacts on NAS operations. The Weather Program supports NextGen goals through research of the advanced forecast capabilities detailed in the NextGen Integrated Work Plan (IWP) and the FAA NextGen Implementation Plan 2009. Efforts undertaken in collaboration with the National Weather Service (NWS) and NASA, increase FAA's ability to provide the operational improvements required for NextGen. These improvements include short-term and mid-term forecasts of naturally occurring atmospheric hazards, such as turbulence, severe convective activity, icing, and restricted visibility. Improved forecasts enhance flight safety, reduce air traffic controller and pilot workload, enable better flight planning, increase productivity, and enhance common situational awareness.

Agency Outputs: The Weather Program provides new and improved weather products that support legacy NAS systems, NWS, and near term NextGen capabilities as well as enablers necessary for mid-term and far-term term benefits. Weather products are enhanced by upgrading algorithms for existing NAS platforms such as the Weather and Radar Processor, the Integrated Terminal Weather System, the Operational and Supportability Implementation System, and the Enhanced Traffic Management System. The NWS platforms also use the algorithms developed. Research is an integral element in providing the advanced forecast and nowcast information that can be integrated into decision support tools. This information will be transitioned by the FAA's Reduce Weather Impact (RWI) portfolio to accomplish this. The information will be developed in accordance with the NextGen Network Enabled Weather (NNEW) dissemination standards. This will allow universal access to weather information through net centric capabilities.

The Weather Program will develop advanced forecast capabilities consistent with the operational improvements specified in the NextGen IWP and FAA NextGen Implementation Plan 2009. To support transition of these advanced capabilities to operations, the Weather Program will utilize the Network-Enabled Verification System (NEVS) to verify the performance of these capabilities as well as live demonstrations of these scientific advancements. These advanced capability requirements for NextGen include the following:

- Advanced Convective weather forecast high-resolution, deterministic & probabilistic 0-8 hour forecasts for convection for aviation end users
- Hourly (Nowcasts) & 0-18 hour probabilistic forecasts of turbulence for use by Air Traffic Controllers (ATC), Aviation Operations Centers (AOC), & the pilot in the cockpit to enhance safety and capacity
- Hourly (Nowcasts) & 0-12 hour probabilistic forecasts for in-flight icing including its severity for use by ATC, AOC, and the pilot in the cockpit for preflight planning
- Analysis and 0-12 hour probabilistic forecasts of ceiling, visibility, & flight category for use by ATC, AOC, & the pilot in the cockpit, & to support estimation of capacity resources at airports as well as increased GA safety

The weather capabilities developed by the FAA provide the following benefits:

- Depiction of current and forecasted in-flight icing areas enhances safety and regulatory adherence
- Interactive data assimilation, editing, forecast and dissemination tools improves aviation
  advisories and forecasts issued by the NWS as well as accessibility to users of aviation weather
  information
- Depiction of current and forecast precipitation type and rate enhances safety in the terminal area
- Depiction of current and forecast terminal and en route convective weather enhances terminal and en route capacity

- Short-term prediction and forecast of ceiling and visibility in the national area enhances en route safety
- In-situ, remote detection, and forecast of en route turbulence, including clear-air turbulence enhances en route safety

**Research Goals:** Research is on-going to provide weather observations, warnings, and forecasts that are more accurate, accessible, and efficient, and to meet current and planned regulatory requirements. The goals of the focused research endeavors are:

- By FY 2012 to meet the NextGen requirements for 2013 IOC segment one; to develop timely and
  accurate deterministic and an initial set of probabilistic aviation weather forecasts for operational
  use by ATM, dispatchers, and pilots.
- By FY 2016 in support of NextGen segment two requirements, increased maturity of probabilistic forecasting; integration of ground, airborne, and satellite weather observation information in real time; methods to translate greater weather uncertainty and longer look ahead times; levels into operational impact linked to advances in risk based decision-making tool from Single Authorative Source (SAS).
- By FY 2020 in support of NextGen segment three requirements, enhanced accuracy of net-enabled deterministic and advanced probabilistic weather forecast information assimilated into NAS decision making. Weather observations integrated into an operational network from ground, airborne, and satellite sensors for extended weather forecast that will be disseminated in real-time from a mature SAS for operational use by ATM, dispatchers, and pilots.

**Customer/Stakeholder Involvement:** The Weather Program works within FAA, industry and government groups to assure its priorities and plans are consistent with user needs. This is accomplished through:

- Guidance from the Joint Planning and Development Office (JPDO) Next Generation Air Transportation System initiative and the Integration and Implementation Office with the FAA.
- Guidance from the FAA Research, Engineering, and Development Advisory Committee.
- Inputs from the National Aviation Weather Initiatives, which are strongly influenced by other NAS
  drivers including "Safer Skies" and Flight Plan Safety Objectives.
- Inputs from the aviation community, such as the annual National Business Aircraft Association
  /Friends/Partners in Aviation Weather Forum, JPDO, RTCA, and scheduled public user group
  meetings.
- Close collaboration with FAA organizations internal to the Agency such as the Air Traffic Organization Oceanic and Off-Shore Programs Office, various FAA Aviation Safety Offices.
- Feedback received from documents and publications.

**R&D Partnerships:** The Weather Program collaborates with the Department of Commerce in promoting and developing meteorological science, and in fostering support of research projects through the use of private and governmental research facilities. The program also leverages research activities with members of industry, academia, and other government agencies through interagency agreements, university grants, and Memorandums of Agreement.

### Partnerships include:

- National Center for Atmospheric Research (in-flight icing, convective weather, turbulence, ceiling and visibility, ground de-icing, modeling, weather radar techniques).
- National Oceanic and Atmospheric Administration laboratories (convective weather, turbulence, modeling, weather radar techniques, quality assessment/verification).
- Massachusetts Institute of Technology's Lincoln Laboratory (convective weather).
- National Weather Service's Aviation Weather Center and Environment Modeling Center (modeling).
- NASA Research Centers (in-flight icing, turbulence, satellite data).
- Universities (modeling).
- Airlines, port authorities, cities (user assessments).

## Accomplishments:

### FY 2009:

- Obtained approval to test Alaskan in-flight icing forecast capability.
- Completed guidance for certification of weather radars with forward-looking turbulence detection capability.
- Developed prototype Network-Enabled Verification Service for meeting System-Wide Information Management architecture requirements.

#### FY 2008:

- Implemented an experimental rapid refresh Weather Research and Forecast (WRF) model.
- Implemented turbulence detection algorithm into NEXRAD operations.

## FY 2007:

- Implemented in-flight icing severity nowcast capability operationally
- Obtained approval of turbulence detection algorithm by NWS NEXRAD System Recommendation and Evaluation Committee for operational implementation.
- Provided Helicopter Emergency Medical Services Aviation Digital Data Service (ADDS) enhancement to enable emergency medical services pilots to make NO-GO weather decisions.

#### FY 2006:

- Obtained approval of in-flight icing severity nowcast capability for operational use.
- Implemented four-hour winter precipitation capability into Weather Support to Decision Making System.
- Implemented terminal convective weather forecast capability into Integrated Terminal Weather System.

### FY 2005:

- Implemented improved accuracy and resolution of data on upper winds, temperature, and moisture through 13 kilometer rapid-update-cycle analyses and forecasts at the NWS.
- Implemented in-flight icing nowcast capability with higher resolution into ADDS.

### Previous Years:

- Achieved the Department of Commerce 2003 Silver Medal.
- Implemented operationally new capabilities of:
- Current and up to two-hour forecast of convective weather.
- Current and up to 12-hour forecast of in-flight icing conditions
- Current and up to 12-hour forecasts of clear-air turbulence above 30,000 feet.
- Up to 12-hour forecast of marine stratus burn-off at San Francisco International Airport.
- Implemented operationally at the NWS the enhanced ADDS with a flight path tool depicting vertical cross sections of weather along user-specified flight routes.
- Completed convective storm growth and decay field tests in Dallas, Orlando, Memphis, and New York. This research resulted in the accurate short-term prediction of the initiation, growth, and decays of storm cells, and enhanced the strategic and tactical flow management planning that allows more effective routing of traffic to and from airports and runways.

## FY 2010 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:

- Upgraded in-flight icing forecast and nowcast severity capability for WRF rapid refresh.
- Developed High Ice Water Content algorithm and provide support to field program in Puerto Rico.
- Transitioned probabilistic and mountain-wave turbulence forecast capability for implementation on operational ADDS.
- Developed CONUS 0-6 hour advanced storm prediction capability via NextGen Net-Enabled Weather standards.
- Transitioned CONUS display of ceiling, visibility, and flight category analysis capability for implementation on operational ADDS.

- Transitioned Rapid Refresh Weather Research and Forecast (WRF) model for implementation into NWS operations.
- Utilized rapid refresh WRF model forecasts to produce probabilistic forecasts for convection, and ceiling and visibility.
- Integrated Canadian radar data into real-time national 3D mosaic.
- Demonstrated initial operating capability for Network-Enabled Verification System (NEVS) utilizing advanced storm prediction capability data.
- Conducted quality assessment evaluations, utilizing automated verification tools, of weather research capabilities to support the FAA/NWS NextGen Weather Evaluation Capability process.
- Developed specification for operational approval of liquid water equivalent technology for ground icing guidance.

## **FY 2011 PROGRAM REQUEST:**

Ongoing Activities

The weather program will continue to develop/enhance forecast/nowcast capabilities, to support FAA safety and capacity Flight Plan goals and meet NextGen requirements, through the conduct of applied research in naturally occurring atmospheric hazards including turbulence, severe convective activity, icing, and restricted visibility. In FY 2011, additional turbulence forecast capabilities are being developed to enhance en route safety and capacity, an advanced convective weather forecast is be developed to enhance terminal and en route capacity, an in-flight icing forecast capability for Alaska is being developed to enhance safety especially for general aviation, and a ceiling and visibility forecast capability is being developed to enhance en route safety especially for general aviation and a volcanic ash dispersion forecast capability is being developed to enhance en route safety and capacity. Capabilities developed transition to NWS, FAA, and industry weather systems.

**New Initiatives** 

No new initiatives are planned in FY 2011

## **KEY FY 2011 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:**

- Utilize High Ice Water Content prototype algorithm to support field program.
- Develop 0-6 hour advanced probabilistic storm prediction capability.
- Approval of convectively-induced turbulence capability for operational use on ADDS.
- Develop CONUS ceiling, visibility, and flight category forecast capability.
- Test radar-based freezing drizzle algorithm.
- Conduct quality assessment evaluations, utilizing NEVS, of weather research capabilities to support the FAA/NWS NextGen Weather Evaluation Capability (NWEC) process.
- Evaluate liquid water equivalent technology system for measurement of freezing rain, freezing drizzle, snow, and ice pellets.
- Test 3KM High Resolution Rapid Refresh WRF Model at NOAA.

## **APPROPRIATION SUMMARY**

	_Amount (\$000)
Appropriated (FY 1982-2009)	388,581
FY 2010 Enacted	16,789
FY 2011 Request	16,505
Out-Year Planning Levels (FY 2012-2015)	64,224
Total	486,099

Budget Authority		FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
(\$000)		Enacted	Enacted	Enacted	Enacted	Request
Contracts:						
Weather Program		18,432	15,936	15,855	15,750	15,547
Personnel Costs		1,035	863	979	862	712
Other In-house Costs		78	89	134	177	246
	Total	19,545	16,888	16,968	16,789	16,505

OMB Circular A-11, Conduct of Research and Development (\$000)	FY 2006 Enacted	FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2011 Request
Basic	0	0	0	0	0
Applied Development (includes prototypes) Total	19,545 0 19,545	16,888 0 16,888	16,968 0 16,968	16,789 0 16,789	16,505 0 16,505

A11.k. – Weather Program –	FY 2011			Program	Schedule		
Product and Activities	Request (\$000)	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
041-110 Aviation Weather Analysis and Forecasting	5.700						
Convective Analysis and Forecast Improvement							
Developed CONUS 0-6 hr adv storm pred cap via NNEW stds		•		<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>
Develop 0-6 hr adv probabilistic storm prediction capability			<b>◊</b>				
Integrated Canadian radar data into real/time national 3D mosaic		•					
Test radar-based freezing drizzle algorithm			<b>♦</b>				
Analysis and Forecast Improvement	7.304						
Upgraded in-flight icing fc & nc severity for WRF RR		•					
Developed HIWC alg & provide support to field program		•					
Utilize HIWC prototype alg to support fld prog in Australia			♦				
Transition AK in-flight icing forecast capability for implementation on operation ADDS.					<b>◊</b>		
Obtain FAA approval to test global in-flight icing forecast capability						<b>♦</b>	
Transitioned rapid refresh WRF model for implem. into NWS		•					
Utilized RR WRF model fcs for probabilistic conv & C&V		•					
Test 3KM High Resolution Rapid Refresh WRF model at NOAA			♦				
Transition probabilistic and mountain wave turbulence forecast capability for implement on operational ADDS		•					
Approval of convectively-induced turb capability for oper use			<b>♦</b>				
Transitioned CONUS display of ceiling, vis. & flt. category analysis capability for impl. on oper. ADDS		•					
Develop CONUS ceiling, visibility, and flight category forecast capability			<b>♦</b>				
Obtain FAA approval to test AK C&V forecast						<b>♦</b>	<b>◊</b>
Verification and Technology Implementation	2.543						
Demonstrate IOC for NEVS utilizing adv storm prediction capability data		•					
Conduct QA evaluations, utilizing NEVS for NWEC process			<b>◊</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>
Implement FAA approved products at the AWC		•	<b>◊</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>
Developed specification for operational approval of liquid water equivalent for ground de-icing guidance		•					
Evaluate liquid water equivalent technology system for msr of freezing rain, frz drz, snow and ice pellets			<b>♦</b>				
Personnel and Other In-House Costs	958						
		14 700	14 505	14 277	16 222	15.050	15 // 2
Total Budget Authority	16,505	16,789	16,505	16,377	16,233	15,952	15,662

Note: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual budget process.

Budget Item	Program Title	Budget Request
A11.I.	Unmanned Aircraft Systems Research	\$3,694,000

#### GOALS:

This program supports the following Flight Plan goal: Increased Safety and NextGen Implementation Initiatives

**Intended Outcomes:** The Unmanned Aircraft Systems (UAS) Research Program supports FAA's strategic goal of increasing safety by conducting research needed to ensure the safe integration of the UAS in the NAS. It also supports FAA efforts in NextGen implementation by studying safety implications of new aircraft technology to the NAS and supporting the development of new regulatory standards to implement these new technologies. The program's research activities focus on new technology assessments, methodology development, data collection and generation, laboratory and field validation, and technology transfer.

**Agency Outputs:** Researchers are developing methodologies and tools to establish regulatory standards on UAS design and performance characteristics while operating in the NAS. They are evaluating technologies, conducting laboratory and field tests, performing analyses and simulations, and generating data to support standardization of UAS civil operations. New standards are being implemented to establish UAS certification procedures, airworthiness standards, operation requirements, inspection and maintenance processes, and safety oversight responsibilities. Policies and guidance materials are also being published to equip FAA certification engineers and safety inspectors with the knowledge and tools they need to ensure the safe integration of UAS into the NAS.

Research Goals: To safely integrate UAS into the NAS, FAA needs to develop airworthiness standards, devise operational requirements, establish maintenance procedures, and conduct safety oversight activities. The program is structured into seven research areas: technology survey; system safety; detect, sense and avoid (DSA); control, command, and communication (C3); flight termination, certification and airworthiness standards, and maintenance and continuing airworthiness issues. The research began with a baseline survey to determine the existing technologies used in UAS and needs of corresponding regulatory standards. Technologies used to avoid mid-air collisions due to UAS operations will be examined and tested. Communications issues that may arise due to the introduction of UAS into the NAS, as well as necessary safety procedures for the flight termination of UAS, will be researched. A system safety approach based on regulatory framework will be developed to identify the potential hazards, perform risk assessments, and evaluate mitigation strategies for UAS safe operations in the NAS. Data systems will be established to collect data on UAS design, operation, and maintenance that will provide technical information to support the development of design and operation standards and provide technical basis for safety oversight.

- By FY 2012, determine performance characteristics and operational requirements for DSA technologies.
- By FY 2012, analyze data on the safety implications of system performance impediments to C3 in different classes of airspaces and operational environment.
- By FY 2012, develop risk management concepts, models, and tools for unmanned aircraft systems.
- By FY 2015, conduct field evaluations of UAS technologies in an operational environment, including DSA, C3, and flight termination technologies. The documented results will be used to develop certification and airworthiness standards.

**Customer/Stakeholder Involvement:** Full and safe integration of UAS into civil aviation requires FAA to work closely with other government and private agencies that have experience in developing and operating UAS:

- FAA Research, Engineering, and Development Advisory Committee Aircraft Safety Subcommittee subcommittee representatives from industry, academia, and other government agencies annually review the activities of the program.
- Technical Community Representatives Groups FAA representatives apply formal guidelines to
  ensure that results derived from these research activities will be implemented to meet the stated
  Agency Outputs as outlined above.

- Department of Defense (DoD) the DoD is the largest UAS user requesting unrestricted access to the NAS. The FAA will collaborate with DoD through Memorandum of Understanding (MOU) and Interagency Agreements (IA) to leverage resources and implement new technologies for civil applications.
- Other Government agencies including Department of Homeland Security (DHS), Department of Commerce (DOC), state government agencies, and independent organizations that utilize UAS for national security, earth science and oceanic studies, and commercial applications.
- JPDO the JPDO has identified UAS integration to NAS and new aircraft technology as one of the
  emerging challenges to the nation's air transportation system. In particular, the NextGen related
  research will be coordinated with the JPDO Aircraft Working Group activities in support of aircraft
  equipage requirements and necessary enablers to fully utilize NextGen capabilities.
- RTCA Special Committee 203 (Unmanned Aircraft Systems members of this U.S. Federal Advisory Committee and its special committees (SC) help to ensure the effectiveness of the agency's rulemaking by identifying command and control as well as sense and avoid requirements

## **R&D Partnerships:**

- IA's with other government agencies (DoD, DHS, DOC, state governments) and Memorandum of Cooperation (MOC) with foreign civil aviation authorities.
- FAA Air Transportation Center of Excellence various consortiums of university and industry partners who conduct R&D for FAA on a cost-matching basis, which currently consists of seven centers in different technical disciplines.
- The Civil Aviation Authority of the Netherlands to conduct joint research on UAS initiatives via an MOC.

## Accomplishments:

### FY 2009:

- Continued technology surveys on UAS designs and operations.
- Continued technology surveys on UAS flight termination and recovery.
- Determined performance characteristics and operational requirements for DSA technologies.
- Established UAS data collection and information system
- Initiated the development of regulatory-based causal factor framework (RCFF) to establish a SMS approach to assess UAS safety risk analysis and mitigation strategies.
- Continued FAA-US Air Force joint flight tests to study on-board DSA technology.
- Continued to identify potential safety implications of system performance impediments to C3.
- Developed risk management concepts, models, and tools for unmanned aircraft systems.
- Performed risk analysis to determine impacts of specific hazards, mitigation strategies, recommended approaches, safety measurements, and oversight requirements.

#### FY 2008:

- Completed technology surveys of UAS propulsion systems and regulatory gap analyses.
- Completed survey of existing DSA capabilities and regulatory requirement analysis.
- Developed UAS hazard categorization and analysis system (HCAS) within the regulatory framework including standard taxonomy.
- Completed the second sets of FAA-United States Air Force (USAF) joint flight tests to study onboard DSA technology with multiple sensors and data fusion system.
- Conducted technology survey on UAS designs and operations.
- Begin determining potential safety implications of system performance impediments to C3.
- Conducted technology survey on UAS flight termination and recovery.

## FY 2007:

Completed the first set of FAA-USAF joint flight tests to evaluate a DSA technology.

## FY 2010 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:

**Technology Surveys** 

- Completed technology surveys on UAS designs and operations.
- Completed technology surveys on UAS flight termination and recovery.

### Detect and Avoid

- Determined performance characteristics and operational requirements for DSA technologies.
- Initiated the system-level safety risk assessment of UAS DSA technologies.
- Continued FAA-USAF joint flight tests to study on-board DSA technology.

#### Command and Control

• Determined potential safety implications of system performance impediments to C3.

### Safety Management System - Risk Modeling

- Using RCFF, established a SMS approach to assess UAS safety risk analysis and mitigation strategies.
- Developed risk management concepts, models and tools for unmanned aircraft systems.
- Performed risk analysis to determine impacts of specific hazards, mitigation strategies, recommended approaches, safety measurements, and oversight requirements.
- Developed the UAS data collection and information system and conducted system safety analysis on specific UAS operations.

## **FY 2011 PROGRAM REQUEST:**

## Ongoing Activities:

Researchers will continue the development of methodologies to study UAS system safety while operating in the NAS while interacting with existing NAS users. Will continue the development of the regulatory-based causal factor framework (RCFF) concept, which, once developed, will provide a systematic means to conduct safety risk analyses and assess risk mitigations. Researchers will apply the RCFF approach to determine safety requirements of DSA technologies utilized on various types of UAS operating in different classes of airspace. Researchers will also apply the RCFF approach to assess C3 safety leading to UAS airworthiness requirements.

New Initiatives:

None.

### KEY FY 2011 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:

## **Detect and Avoid**

- Determine performance characteristics and operational requirements for DSA technologies.
   Included will be the development and evaluation of specific DSA technologies including both onboard and ground based systems in compliance of regulatory requirements (airworthiness and flight operations).
- Determine system-level safety requirements of UAS DSA technology by applying the RCFF approach.
- Continue FAA-USAF joint flight tests to study on-board DSA technology.

## Command and Control

- Continue to identify potential safety implications of system performance impediments to C3.
- Develop and evaluate UAS C3 technologies to ensure operational safety including data link requirements, frequency spectrum technology, availability and reliability, communicating with ATC, and interactions with other NAS users by applying the RCFF approach.

## Safety Management System - Risk Modeling

- Continue using RCFF to establish a SMS approach to assess UAS safety risk analysis and mitigation strategies.
- Continue development of risk management concepts, models, and tools for unmanned aircraft systems.

- Perform risks analyses to determine impacts of specific hazards, mitigation strategies, recommended approaches, safety measurements, and oversight requirements.
- Continue development of UAS data collection and information system and conduct system safety analysis on specific UAS operations.
- Initiate the collection of UAS operation data and perform analyses to develop technical information required to support establishment of regulatory standards

## Minimum Requirements for UAS Control Stations

 Develop information to support the definition of minimum human factors requirements for UAS control stations.

## **APPROPRIATION SUMMARY**

	Amount (\$000)
Appropriated (FY 1982-2009)	\$5,996
FY 2010 Enacted	3,467
FY 2011 Request	3,694
Out-Year Planning Levels (FY 2012-2015)	14,870
Total	28.027

Budget Authority (\$000)	FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Contracts:					
Unmanned Aircraft System Research	1,200	2,768	735	2,368	2,450
Personnel Costs	0	136	1,080	1,024	1,135
Other In-house Costs	0	16	61	75	109
Total	1,200	2,920	1,876	3,467	3,694

OMB Circular A-11,	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
Conduct of Research and	Enacted	Enacted	Enacted	Enacted	Request
Development (\$000)					
Basic	0	0	0	0	0
Applied	1,200	2,920	1,876	3,467	3,694
Development (includes prototypes)	0	0	0	0	0
Total	1,200	2,920	1,876	3,467	3,694

A11.I. – Unmanned Aircraft Systems Research	FY 2011			Program	Schedule			
Product and Activities	Request (\$000)	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	
069-110 Unmanned Aircraft System Research								
Technology Surveys	0							
Completed technology survey on UAS designs and operations Completed technology survey on UAS		•						
flight termination and recovery	1 250	·						
Detect and Avoid  Determine performance characteristics	1,350							
and operational requirements for DSA technologies Joint USAF-FAA flight tests on DSA		•	<b>◊</b>	<b>♦</b>	<b>♦</b>			
technology Conduct system-level safety risk		•	<b>*</b>	<b>*</b>	<b>\lambda</b>	<b>\</b>		
assessment of UAS DSA technology applying RCFF approach		•	<b>♦</b>	<b>♦</b>	<b>♦</b>			
Command and, Control	300							
Determine potential safety implications of system performance impediments to C3		•	<b>♦</b>		<b>♦</b>			
Develop and evaluate UAS C3 technologies to ensure operational safety including data link requirements, frequency spectrum technology, availability and reliability, communicating with ATC, and with other NAS users Conduct C3 field tests and evaluate			<b>*</b>	<b>*</b>	<b>*</b>	<b>*</b>	<b>*</b>	
technologies				<b>♦</b>	<b>♦</b>			
Flight Termination	0							
Determine requirements, risks, and mitigation strategies for flight termination Conduct flight termination procedure field test and evaluate technologies  Safety Management System – Risk				<b>♦</b>	<b>♦</b>	<b>◊</b>	<b>◊</b>	
Modeling	500							
Using RCFF, establish a SMS approach to assess UAS safety risk analysis and mitigation strategies		•	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>	<b>♦</b>	
Develop risk management concepts, models and tools for unmanned aircraft systems		•	<b>♦</b>	<b>♦</b>	<b>♦</b>			
Perform risks analyses to determine impacts of specific hazards, mitigation strategies, recommended approaches, safety measurements, and oversight requirements		•	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>	<b>♦</b>	
Develop UAS data collection and information system and conduct system safety analysis on specific UAS operations		*	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	
Collect UAS operation data and perform analyses to develop technical information required to support establishment of regulatory standards			<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	
Minimum Requirements for UAS Control Stations	300							
Develop information to support the definition of minimum human factors requirements for UAS control stations.			<b>♦</b>	<b>♦</b>				
Personnel and Other In-House Costs	1,244							
Total Budget Authority	3,694	3,467	3,694	3,710	3,725	3,720	3,715	

Note: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual budget process.

Budget Item	Program Title	Budget Request
A11.m	NextGen – Alternative Fuels for General Aviation	\$2,000,000

### GOALS:

This program supports the following *Flight Plan* goals: Increased Safety, Greater Capacity, and International Leadership.

#### Intended Outcomes:

The NextGen - Alternative Fuels for General Aviation will address the use of alternative and renewable fuels for GA to lessen aviation environmental impacts (air and water quality). These activities will be coordinated with the FAA Office of Aviation Policy, Planning, and Environment (AEP). The program also conducts research to test new unleaded fuels and piston engine modifications to seek a safe alternative to current leaded aviation gasoline (avgas).

## **Agency Outputs:**

The FAA issues certification standards and Advisory Circulars, and reviews the specifications and practices recommended by recognized technical societies (ASTM International, SAE International) to maintain the airworthiness of aircraft engines, fuels, and airframe fuel management systems. The agency also publishes information and sponsors technology workshops, demonstrations, and other means of training and technology transfer. The NextGen - Alternative Fuels for General Aviation provides the technical information, R&D resources, and technical oversight necessary for the agency to enhance the airworthiness, reliability, and performance of propulsion and fuel systems.

### **Research Goals:**

The elimination of lead emissions from piston powered aircraft is the primary goal of this research. Various alternatives to achieve this goal will be explored through this research, including:

- Investigation of unleaded replacement alternatives to current leaded avgas (100LL) used in piston
  engines. To the greatest extent possible the replacement alternative(s) should be equivalent in
  performance to 100LL and be a seamless, transparent change to a general aviation (GA) pilot.
- Technologies for modification of piston engines to enable their safe operation using unleaded fuel.
- Qualification and certification methodologies for alternative fuel safety performance.
- Investigation of fleet lead emissions which will support evaluation of various approaches to for achieving emissions reductions.

#### Expected milestones include:

- By FY 2012, complete fleet impact study of imminent lead removal from aviation gasoline and impact on certification methodologies.
- By FY 2012, complete feasibility assessment of reducing the current lead levels in aviation gasoline as a temporary measure toward full lead removal and impact on certification methodologies.
- By FY 2014, complete upgrades to engine test facilities to enable piston engine performance and detonation evaluation across the entire operating envelope, including high altitude, high/low temperature, and high/low humidity conditions.
- By FY 2014, develop an unleaded aviation gasoline anti-knock rating method that allows for correlation to the leaded octane ratings of existing piston engines.
- By FY 2014, complete engine tests on representative high power density engines to characterize safety impacts from operation on reduced octane alternative unleaded aviation fuel.
- By FY 2015, develop engine test methods to evaluate the performance, durability and operability of unleaded aviation gasolines.
- By FY 2015, develop and validate analytical test methods to evaluate the fit-for-purpose of unleaded aviation gasolines.
- By FY 2015, evaluate the technology of modifying general aviation piston engines to run on unleaded fuels.

- By FY 2015, evaluate and characterize all candidate replacement formulations for 100LL.
- By FY 2015, complete research on safety impact of variations to current aviation specification from use of biofuels.
- By FY 2015, complete research comparing use of high aromatic biofuels to current aviation gasoline on CO, CO<sub>2</sub>, and NO<sub>x</sub> greenhouse gas pollutants.

**Customer/Stakeholder Involvement:** The NextGen-Alternative Fuels for General Aviation works with the following industry and government groups:

- Subcommittee on Aircraft Safety of the Research, Engineering and Development Advisory Committee representatives from industry, academia, and other government agencies annually review the program's activities.
- Technical Community Representative Groups FAA representatives apply formal guidelines to
  ensure that the program's research projects support new rulemaking and development of alternate
  means of compliance with existing rules.
- The Coordinating Research Council (CRC) Unleaded Aviation Gasoline Development Group representatives from ExxonMobil, ConocoPhillips, ChevronTexaco, British Petroleum, Cessna, Hawker Beechcraft, Teledyne Continental, and Lycoming Engines facilitate two-way transfer of technology between government and industry to benefit all participants.
- Aerospace manufacturers
- Aerospace repair stations and maintenance organizations
- Aerospace industry associations
- Private, commercial, government, and military operators
- International airworthiness authorities
- Standards development groups, such as ASTM International
- Academia and national laboratories

## **R&D Partnerships:**

- CRC Unleaded Aviation Gasoline Development Group includes ExxonMobil, ConocoPhillips, ChevronTexaco, British Petroleum, Cessna, Hawker Beechcraft, Teledyne Continental, and Lycoming Engines; this group facilitates two-way transfer of technology between government and industry to benefit all participants.
- General Aviation Manufacturers Association Future Avgas Strategy and Transition Plan (GAMA FAST) – includes engine and airframe OEMs; this group is developing a plan for the introduction of unleaded fuel to replace 100LL and assess the impact on the current fleet of aircraft and engines.
- The FAA General Aviation Center of Excellence in conjunction with direct grants with the Embry Riddle Aeronautical University and the University of North Dakota this relationship will support flight testing and engineering analysis of candidate unleaded fuels.

## Accomplishments:

None, this is a new program starting FY 2011.

### **FY 2011 PROGRAM REQUEST:**

- Laboratory characterization and engine ground testing of candidate unleaded fuels to replace 100LL avgas.
- Conduct research into technology of modifying general aviation piston engines to run on unleaded fuels.
- Investigate fleet lead emission impacts as a function of various lead reduction options.

## **KEY FY 2011 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:**

 Conduct initial feasibility study, including economic feasibility, environmental impacts, and assessment of potential for GA aircraft renewable alternative fuels.

- Provide data and report on laboratory characterization and engine ground testing of candidate unleaded fuels to replace 100LL avgas.
- Conduct research into technology of modifying general aviation piston engines to run on unleaded fuels.
- Provide data and report on laboratory characterization and engine ground testing of ultra-low lead fuels to replace 100LL avgas.

# **APPROPRIATION SUMMARY**

	Amount (\$000)
Appropriated (FY 1982-2009)	0
FY 2010 Enacted	0
FY 2011 Request	2,000
Out-Year Planning Levels (FY 2012-2015)	8,000
Total	

Budget Authority (\$000)		FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Contracts:						
NextGen – Alternative Fuels for General Aviation		0	0	0	0	2,000
Personnel Costs Other In-house Costs		0	0 0	0 0	0	0
1	Total	0	0	0	0	2,000

OMB Circular A-11, Conduct of Research and Development (\$000)	FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Basic	0	0	0	0	0
Applied Development (includes prototypes)	0	0	0	0	2,000
Total	0	0	0	0	2,000

A11.m – NextGen – Alternative Fuels for General Aviation	FY 2011		I	Program	Schedule	:	
Products and Activities	Request (\$000)	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
NextGen – Alternative Fuels for General Aviation	2,000						
Study fleet impact of imminent lead removal from aviation gasoline.			<b>◊</b>	<b>◊</b>			
Assess feasibility of reducing the current lead levels in aviation gasoline as a temporary measure toward full lead removal.			<b>◊</b>	<b>◊</b>			
Upgrade engine test facilities to enable piston engine performance and detonation evaluation across the entire operating envelope.			<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>◊</b>	
Develop unleaded aviation gasoline anti- knock rating method that correlates to the leaded octane ratings of existing piston engines.			<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>	
Develop engine test methods to evaluate the performance, durability and operability of unleaded aviation gasolines.			<b>◊</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>	<b>◊</b>
Develop and validate analytical test methods to evaluate the fit-for-purpose of unleaded aviation gasolines.			<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>◊</b>
Conduct engine tests on representative high power density engines to understand potential safety impacts from operation on GA alternative fuels.			<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>◊</b>	
Evaluate technology of modifying GA piston engines operating with GA alternative fuels.			<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>◊</b>
Evaluate and characterize candidate GA alternative fuels as replacements for 100LL.			<b>◊</b>	<b>\langle</b>	<b>\langle</b>	<b>◊</b>	<b>◊</b>
Complete research on safety impact of variations to current aviation specification from use of alternative fuels.			<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>	<b>◊</b>
Complete research comparing use of high aromatic biofuels to current aviation gasoline on CO, CO <sub>2</sub> , and NO <sub>x</sub> greenhouse gas pollutants.			<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>♦</b>
Personnel and Other In-House Costs							
Total Budget Authority	2,000	0	2,000	2,004	2,007	1,999	1,990

Note: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual budget process.

Budget Item	Program Title	Budget Request
A12.a.	Joint Planning and Development Office (JPDO)	14,292,000

#### GOALS:

This program supports the following Flight Plan goals: Increased Safety, Greater Capacity, International Leadership, and Organizational Excellence.

**Intended Outcomes:** As the steward of NextGen, the JPDO seeks to address long-term imbalances in aviation capacity and demand. At the same time, it seeks to ensure that the future operating environment is safe, well managed, environmentally responsible, and harmonized with international standards. JPDO's mission is to lead the transformation of today's aviation system into that of the future, the scope of which contributes to all of FAA's current strategic goals.

NextGen is expected to yield significant benefits in terms of delay reduction, fuel savings, additional capacity, improved access, enhanced safety, and reduced environmental impact. Last year we estimated that NextGen would reduce delay by 35-40 percent in 2018 compared to what the system would experience without NextGen. We are currently preparing an updated, detailed breakdown of the near- to mid-term NextGen benefits. This analysis will be completed in the near future, and updated annually in conjunction with FAA's budget submission.

**Agency Outputs:** The JPDO is responsible for defining and facilitating the implementation of NextGen. At this stage in the transformation, outputs are a series of plans and analyses that define a proposed end-state and a path for achieving it. The objective is to drive collaborative decisions—involving government and industry—that will ultimately achieve the transformation.

### Research Goals:

### FY 2011

- Continue to refine NextGen foundational documents: Concept of Operations, Enterprise Architecture, and Integrated Work Plan within the Joint Planning Environment (JPE).
- Enhance the JPE planning information to reflect integration of net-enabled weather into automation decision making, enhanced operational scenarios that describe information sharing and procedures between flight/ airline operations and NextGen trajectory based flight processing including air navigation service provider, flight operations center, and flight crew roles and responsibilities.
- Continue development of an inter-agency integrated surveillance architecture, concept of
  operations and funding profile, and governance process recommendation.
- Continue coordination of Network Enabled information sharing standards for participating agencies
   organizations including multi-agency governance processes.
- Develop FY2013 formulation package to support NextGen resource planning and performance measurement; track and ensure that partner agencies are implementing programs that support a transition to the end-state architecture as defined in the Integrated Work Plan.
- Develop FY2013 formulation package to support NextGen resource planning and development of the NextGen business case.
- Develop FY2013 NextGen business case including results of environmental mitigation methods and benefits.
- Continue Dynamic Airspace Configuration research transition planning that facilitates a concept for
  efficient partitioning of airspace and allocation of resources to meet far-term NextGen Capacity
  needs.
- Continue to coordinate and conduct demonstrations that will test operational concepts, address
  operational challenges, and provide alternatives for architectural trade-offs. Update the JPE to
  include demonstration results.

#### FY 2013-2015

• Continue research and development to support all NextGen solution sets.

## FY 2016 and Beyond

- Continue development to support all NextGen solution sets.
- Identify alternatives as a result of needed research that may be immature.

Customer/Stakeholder Involvement: The JPDO is truly a collaborative enterprise. Employees from NASA and the Departments of Transportation, Commerce, Defense, and Homeland Security actively lead and/or participate in JPDO activities. Similarly, the JPDO Board includes executives from each department/agency, as well as the White House Office of Science and Technology Policy. And the Senior Policy Committee includes Secretaries, Deputy Secretaries, and/or Administrators from the participating organizations, as well as the Director of the Office of Science and Technology Policy. The private sector is also an integral part of JPDO's work. In FY 2006, the NextGen Institute was established as an alliance of major aviation stakeholder communities. The Institute operates under quidelines set forth in the funding agreement between FAA/JPDO and the host organization, the National Center for Advanced Technologies. The agreement states that the Institute will be governed by a 16member council that is broadly representative of the aviation community. The Institute supports JPDO by recruiting and assigning industry experts to participate in forums and perform funded technical work. The Institute has already hosted a series of workshops to gather input on research, demonstrations, operational concepts, and financial implications. The Institute performs a variety of tasks in support of the planning process including studies, demonstration support, and strategic assessments and recommendations for NextGen design issues.

**Accomplishments:** Major accomplishments and associated benefits of the JPDO efforts include the following:

## FY 2009

- Deployed the web-based Joint Planning Environment (JPE) a portal that presents and relates
   NextGen Enterprise Architecture, Concept of Operations, Integrated Workplan, and Business Case information.
- Enhanced the JPE to reflect a federated architecture for participating agencies' Enterprise Architectures.
- Developed FY 2011 Formulation Package to support NextGen resource planning and development of the NextGen business case.
- Developed FY 2011 NextGen business case and released NextGen foundational documents consistent with FY 2011 plans and priorities: Concept of Operations, Enterprise Architecture, and Integrated Work Plan.
- Continued to coordinate with aviation and aeronautics research programs to ensure that research results in decisions that influence the most effective investment and implementation decisionmaking.
- Multi-sector Planner Research Transition Team defined roles & responsibilities that support efficient traffic flow for mid-term operations (2010-2018).
- Consistent with the refined foundational documents, continued to identify and facilitate all preimplementation activities to support identification and resolution of policy issues, optimized technology transfer, risk management and a broad range of analysis to support decision making.
- Tracked and coordinated changes with partner agencies to ensure that implementing programs supported a transition to the end-state architecture as defined in the Integrated Work Plan.
- Continue to coordinate and conduct demonstrations that validated operational concepts, addressed
  operational challenges, and provided alternatives for architectural trade-offs. Demonstrations
  explored human factors and safety characteristics of trajectory-based operations, high density
  airport operations, airspace security, and globally interoperable system integration

## FY 2008

- Developed FY 2010 Formulation Package to support NextGen resource planning and development of the NextGen business case.
- Developed FY 2010 NextGen business case
- Released the Enterprise Architecture and Concept of Operations supporting FY 2010 planning.

- Released the Integrated Work Plan Version 1, which outlines the steps necessary to achieve the Concept of Operations.
- Expanded NextGen Business Case including initial life-cycle cost/benefit analysis.
- Refined program processes including risk management.
- Defined Net Enabled Information Sharing (NEIS) framework and multi-agency governance
- Established NextGen Network Enabled Weather Program Office and multi-agency governance
- Defined Aviation Safety Information Analysis and Sharing Concept and multi-agency governance
- Established four Research Transition Teams: Trajectory Management, Integrated Arrival/Departure/Surface, Multi-sector Planner, and Dynamic Airspace Configuration, that defined initial plans for research transition from NASA to the FAA in these areas.

### FY 2007

- Released Version 2 of the Enterprise Architecture and Concept of Operations.
- Released the initial baseline version of the Integrated Work Plan, which outlines the steps necessary to achieve the Concept of Operations.
- Completed the first NextGen Research and Development Plan, a 5-year view of the research and investment activities required to revise, coordinate, and cost the research and implementation agendas.
- Completed the first NextGen business case (Exhibit 300).

### FY 2006

- Developed the NextGen Block-to-Block Concept of Operations and coordinated it through the NextGen stakeholder community for comment and feedback.
- Developed the NextGen Block-to-Block Enterprise Architecture, aligned the Architecture with the Concept of Operations, and began coordination and review through the NextGen stakeholder community.
- Baselined the Operational Improvement Roadmap to set research targets for the Integrated Product Teams.
- Published the NextGen FY 2008 Agency Budget Guidance for Research and Implementation, which begins to align programs to NextGen and identify key research areas.
- Delivered the FY 2005 Progress Report to Congress describing the JPDO's progress in carrying out the NextGen Integrated Plan.
- Developed initial JPDO Systems Engineering Management Plan (SEMP) to facilitate interaction with other agencies and stakeholders.
- Established the Architecture Integration Council, which includes the chief architects for all partner agencies. This body will ensure the cooperation and engagement of the relevant agencies' chief architects during development of the NextGen architecture.

## FY 2005

- Made significant progress in resource alignment within the federal government and U.S. industry to develop and implement the NextGen in the most expedient and cost-effective manner.
- Produced and updated the NextGen Integrated Plan as the long-term strategic business plan, detailing goals, objectives, and requirements for eight transformational areas.
- Established and staffed—with federal and industry participants—eight integrated product teams to
  work collaboratively with government and industry to develop research agendas and strategies for
  achieving NextGen.
- Performed the first major evaluation of the Operational Vision in Portfolio Segments, to validate the ability to deliver two to three times today's capacity.
- Established the NextGen Operational Improvement Roadmap to guide the transition from today's system to the next generation.
- Developed initial NextGen Segment Portfolios of policy, research and modernization requirements based on the OI Roadmap.

### FY 2004

- Initiated resource alignment within the federal government and U.S. industry to develop and implement the NextGen in the most expedient and cost-effective manner.
- Produced the outline for the Integrated National Plan as the long-term strategic business plan for NextGen that detailed NextGen goals and objectives, and requirements for transformation in eight specific areas, each individually significant yet interdependent on the others.
- Produced the framework for establishing with federal and industry participants eight integrated product teams that would work collaboratively with government and industry to plan for and develop research agendas and strategies for achieving NextGen.
- Established the framework for the NextGen Operational Improvement (OI) Roadmap to guide the transition from today's system to the NextGen.
- Developed initial plan for the NextGen Segment Portfolio's of needed policy, research and modernization requirements based on the NextGen OI Roadmap.

### FY 2010 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:

- Updated the Joint Planning Environment (JPE) a portal that presents and relates NextGen Enterprise Architecture, Concept of Operations, Integrated Workplan, and Business Case information.
- Developed FY2012 Formulation Package to support NextGen resource planning and development of the NextGen business case.
- Developed FY2012 NextGen business case and released NextGen foundational documents consistent with FY 2011 plans and priorities: Concept of Operations, Enterprise Architecture, and Integrated Work Plan.
- Continued to coordinate with aviation and aeronautics research programs to ensure that research results in decisions that influence the most effective investment and implementation decisionmaking.
- Consistent with the refined foundational documents, continued to identify and facilitate all preimplementation activities to support identification and resolution of policy issues, optimized technology transfer, risk management and a broad range of analysis to support decision making.
- Tracked and coordinated changes with partner agencies to ensure that implementing programs supported a transition to the end-state architecture as defined in the Integrated Work Plan.
- Continue to coordinate and conduct demonstrations that validated operational concepts, addressed
  operational challenges, and provided alternatives for architectural trade-offs. Demonstrations
  explored human factors and safety characteristics of trajectory-based operations, high density
  airport operations, airspace security, and globally interoperable system integration
- Continued development of the Enterprise Architecture and Concept of Operations aligned with the
  Integrated Work Plan. The Enterprise Architecture is a structured documentation of NextGen,
  capturing the activities, capabilities, data interchanges, and salient relationships associated with
  NextGen. The Concept of Operations provides a textual operational description of NextGen in the
  2025 timeframe. This is a key source to inform and initiate a dialog with the stakeholder
  community.
  - The Integrated Work Plan provides a long-term transition plan from the current system to that reflected in the Enterprise Architecture and Concept of Operations. It provides a framework to support ongoing planning and will be refined over the planning process to detail analysis of implementation alternatives, risks, costs and benefits as well as prioritization and allocation of resources.
  - These documents will provide the necessary foundational information to define implementation and research guidance to NextGen partner agencies.
- Engaged the Senior Policy Committee on near-term, high priority policy decisions in support of FY012 planning. Continue to use the NextGen Institute to access world-class private sector expertise, tools, and facilities for application to NextGen activities and tasks. The studies to be conducted by the Institute in FY 2010 will further address strategic trade studies that consider the technical, economic, operational, policy, organizational, and temporal dimensions of the NextGen design space.

- Conducted detailed planning and coordinate demonstrations to be undertaken in FY 2010, including Oceanic Trajectory-Based Operations, High Density Airport Operations, Domestic Trajectory-Based Operations, Network Enabled Weather, and Global Interoperability. These demonstrations will test operational concepts, demonstrate technologies that could address operational challenges, and provide alternatives for architectural tradeoffs.
- Continued system-of-system modeling, simulation, and evaluation to ensure benefits, costs, and trade-offs across the full range of NextGen goals.
- Continued outreach efforts aviation trade associations and non-traditional organizations (e.g., groups representing both leisure and business travelers) to solicit views as to how NextGen can best meet the needs of the traveling public.
- Updated, coordinate, and validate NextGen concepts.
- Coordinated aviation and aeronautics research programs to achieve the goal of more effective and directed research that will result in only performing the most promising and applicable research.
- Set goals, priorities and metrics and reporting structure, and coordinate research activities within JPDO member agencies and with U.S. aviation and aeronautical firms.
- Facilitated the transfer of technologies from research programs that are ready for implementation (e.g., NASA and DoD Advanced Research Projects Agency program) to the federal agencies with operational responsibilities and to the private sector, as appropriate.
- Continued to refine research plans, which will describe research and supporting activities required to drive implementation decisions to effect the NextGen transformation.
- Continued refining foundational documents—Concept of Operations, Enterprise Architecture, and Integrated Work Plan—in response to the outcome of demonstrations, research, changes in agency budgets, etc.
- Continued modeling planned improvements to test their efficacy in accomplishing NextGen goals.
- Conducted analyses, trade studies, and demonstrations to select the best approaches/alternatives for transforming the current air transportation system to NextGen.

## **FY 2011 PROGRAM REQUEST:**

## Ongoing Activities

- Continue modeling, simulation, and evaluation to ensure benefits, costs, and trade-offs are understood across the full range of goals.
- Revise, coordinate, and cost the research and implementation agendas for subsequent years.
- Refine NextGen business case and work with agencies and industry on research areas and implementation of NextGen-related programs.
- Continue refining foundational documents—Concept of Operations, Enterprise Architecture, and Integrated Work Plan —in response to the outcome of demonstrations, research, changes in agency budgets, etc.
- Refine NextGen metrics.
- Plan FY 2012 operational demonstrations.
- Continue alignment of agency goals and objectives with NextGen goals and objectives.

#### **New Initiatives**

- Coordinate demonstrations that will test operational concepts, demonstrate technologies that could address operational challenges, and provide alternatives for architectural tradeoffs.
- Facilitate the transfer of technologies from research programs that are ready for implementation (e.g., NASA, FAA, DHS and DoD Advanced Research Projects Agency program) to the federal agencies with operational responsibilities and to the private sector, as appropriate.

## **KEY FY 2011 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:**

Planning and Agency/Industry Alignment

- Update, coordinate, and validate NextGen concepts.
- Coordinate aviation and aeronautics research programs to achieve the goal of more effective and directed research that will result in only performing the most promising and applicable research.

- Set goals, priorities and metrics and reporting structure, and coordinate research activities within JPDO member agencies and with U.S. aviation and aeronautical firms.
- Facilitate the transfer of technologies from research programs that are ready for implementation (e.g., NASA and DoD Advanced Research Projects Agency program) to the federal agencies with operational responsibilities and to the private sector, as appropriate.

## Systems Integration and Transformation Analysis

- Continue to refine research plans, which will describe research and supporting activities required to drive implementation decisions to effect the NextGen transformation.
- Continue refining foundational documents—Concept of Operations, Enterprise Architecture, and Integrated Work Plan—in response to the outcome of demonstrations, research, changes in agency budgets, etc.
- Continue modeling planned improvements to test their efficacy in accomplishing NextGen goals.
- Conduct analyses, trade studies, and demonstrations to select the best approaches/alternatives for transforming the current air transportation system to NextGen.

## **APPROPRIATION SUMMARY**

	Amount (\$000)
Appropriated (FY 1982-2009)	72,893
FY 2010 Enacted	14,407
FY 2011 Request	14,292
Out-Year Planning Levels (FY 2012-2015)	58,345
Total	159,937

Budget Authority	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
(\$000)	Enacted	Enacted	Enacted	Enacted	Request
Contracts:  Joint Planning & Development Office	16.112	12,910	11,221	11.528	10,819
Personnel Costs	1,867	1,256	2,663	2,622	3,152
Other In-house Costs  Total	121	155	610	257	321
	<b>18,100</b>	<b>14,321</b>	<b>14,494</b>	<b>14,407</b>	<b>14,292</b>

OMB Circular A-11, Conduct of Research and Development (\$000)	FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Basic	0	0	0	0	0
Applied	18,100	14,321	14,494	14,407	14,292
Development (includes prototypes)	0	0	0	0	0
Total	18,100	14,321	14,494	14,407	14,292

A12.a Joint Planning & Development Office	FY 2011 Request			Program S	Schedule		
Product and Activities	(\$000)	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Joint Planning & Development Office							
Planning and Agency/Industry Alignment:							
Update and carry out an integrated plan for a Next Generation Air Transportation System.	1,049	•	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>
Coordinate and facilitate the transfer of technologies from aeronautics research programs and direct research that will result in achieving NextGen.	268	•	<b>◊</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>
Systems Integration and Transformation Analysis:							
Accomplish the coordination to create and carry out the plan to achieve more directed programs through applicable research and systems integration.	2,087	•	<b>◊</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>
Develop Enterprise Architecture for systems-of systems engineering and expand lower levels of the enterprise.	2,084	•	<b>◊</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>
Evaluate and validate cross IPT, integrated system-wide concepts, procedures, policies, business cases, etc. to assure potential alternatives exist that could meet all the National Plan Objectives.	1,855	•	<b>◊</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>
Conduct policy analyses that focus on early decisions to establish guiding principles for the transformation	1,287	•	<b>◊</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>
Model the planned system improvements to validate their efficacy in accomplishing the NextGen goals. Update roadmaps and research agenda's as required.	344	•	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>
Assist agencies in selecting the best approaches/alternatives for transforming the current air transportation system to NextGen;	1,345	•	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>
Conduct and report interagency budget analysis and progress	500	•	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>
Personnel and Other In-House Costs	3,473						
Total Budget Authority	14,292	14,407	14,292	14,420	14,563	14,640	14,722

Note: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual budget process.

Budget Item	Program Title	Request
A12.b.	NextGen - Wake Turbulence	\$10,685,000

#### GOALS:

This program supports the following Flight Plan goal: Greater Capacity.

Intended Outcomes: The NextGen Wake Turbulence Program addresses FAA's goal for capacity and the DOT reduced congestion strategic goal outcome of "Meet new and growing demands for air transportation services through 2011 and beyond." The program provides the research to achieve near-term objectives of increasing airport runway capacity by reducing aircraft wake separation minima under certain conditions. The program also provides the research and analysis to answer the NextGen era questions of:

- What wake turbulence mitigations will be required in implementing Trajectory Based Operations?
- How can more aircraft be accommodated in high demand airspace (terminal and en-route) and still be safe in terms of wake turbulence?

In FY 2011, the NextGen Wake Turbulence Research will continue its NextGen near term and mid-term research agenda, addressing wake turbulence restrictions in today's terminal and en route airspace and in the future NextGen airspace designs. Program outcomes include:

• Increased runway capacity in Instrument Meteorological conditions and capacity for more flights in high usage airspace, and

More capacity efficient wake separations are provided to aircraft with the same or reduced safety risk.

**Agency Outputs:** The NextGen -Wake Turbulence Program conducts applied research to improve, in terms of flight efficiency and safety, aircraft separation processes associated with today's generalized and static air navigation service provider (ANSP) wake turbulence mitigation based separation standards. As an example, during periods of less than ideal weather and visibility conditions, implementation of an ANSP decision support tool that adjusts required wake separations based on wind conditions, would allow air traffic control to operate these airports at arrival rates closer to their visual flight rule arrival capacity. Additionally, the research program is developing wake mitigation application solutions that safely enable reduced aircraft separations in congested air corridors and during arrival and departure operations at our nation's busiest airports. The research program in FY 2011 will continue work begun in FY 2008 to address the feasibility and benefit of a wake avoidance decision support capability for the flight deck.

## Research Goals:

 By FY 2012, determine the NAS infrastructure requirements (ground and aircraft) for implementing the NextGen "Trajectory Based Operation" and "High Density" concepts within the constraints of aircraft generated wake vortices and aircraft collision risk.

**Customer/Stakeholder Involvement:** The program addresses the needs of the FAA Air Traffic Organization (ATO) and works with the agency's Aviation Safety organization to ensure new capacity efficient procedures and technology solutions are safe and that the airports and air routes targeted for their implementation are those with critical needs to reduce airport capacity constraints and air route congestion. The program works with controllers, airlines, pilots and aircraft manufacturers to include their recommendations and ensure that training and implementation issues are addressed in the program's research from the start.

## Customers:

- Pilots;
- Air navigation service provider personnel;
- · Air carrier operations; and
- Airport operations.

## Stakeholders:

- Joint Planning and Development Office;
- Commercial pilot unions;
- FAA air navigation service provider unions;

- Other ICAO air navigation service providers; and
- Aircraft manufacturers.

**R&D Partnerships:** In addition to maintaining its partnership with the agency's Aviation Safety organization, this research program accomplishes its work via working relationships with industry, academia, and other government agencies. The coordination and tasking are accomplished through joint planning/reviews, contracts and interagency agreements with the program's partners:

- Volpe National Transportation Systems Center;
- Mitre/Center for Advanced Aviation System Development (CAASD) NG;
- NASA Langley Research Center (NASA Sponsored Research);
- EUROCONTROL and associated research organizations (coordination and shared research);
- Massachusetts Institute of Technology's Lincoln Laboratory NG;
- National Center of Excellence for Aviation Operations Research NG;
- National Institute of Aerospace NG
- CSSI, Incorporated. NG

Accomplishments: The following represent major accomplishments of the wake turbulence program:

- FY 2009 Developed airport specific procedure modifications to enable dependent ILS approaches to closely spaced parallel runways.
- FY 2009 Developed concept that for some airports, would allow B-757 and heavier aircraft to be the leader in dependent paired instrument approaches to the airport's closely spaced parallel runways.
- FY 2009 Developed concepts for better merging of aircraft in an airports terminal airspace, in terms of wake mitigation constraints, for the NextGen midterm timeframe
- FY 2009 Submitted for coordination a modification to the wake turbulence separations applied to B757-200 and B757-300 aircraft, resulting in an increased runway throughput for airports having B757 aircraft as a major component of their operations.
- FY 2009 Repositioned wake measuring pulsed LIDARS to airports having significant B-757 and heavier aircraft operations. Collected data will be used in defining more capacity efficient air traffic control procedures for aircraft wake turbulence mitigation.
- FY 2008 Developed a national air traffic control order for conducting dependent integrated landing system staggered approach operations on closely spaced parallel runways at five airports (Boston, Cleveland, Philadelphia, Seattle and St Louis).
- FY 2006-2008 Evaluated reports of wake turbulence encounter as part of the FAA Safety Management System assurance process for changes to air traffic control procedures.
- FY 2005-2008 Provided wake turbulence evaluation support in the integration of a new aircraft into the National Airspace System.
- FY 2004-2008 Cooperative data exchange with European wake turbulence data collection efforts.
- FY 2002-2008 Developed the most extensive wake turbulence transit and characterization data base in the world, used to determine feasibility of proposed changes to air traffic control's wake turbulence mitigation procedures.
- FY 2007 Implement dependent staggered ILS approaches to St. Louis closely spaced parallel runways 12R/L and 30R/L.
- FY 2007 Complete FAA assessment of NASA's concept for wind dependent wake turbulence mitigation procedure for aircraft arriving on closely spaced parallel runways.
- FY 2005-2007 By analysis, simulation and evaluation prototype; demonstrated feasibility of a cross-wind based air traffic wake turbulence mitigation decision support tool concept for enabling more closely spaced departures from an airport's closely spaced parallel runways.
- FY 2006 Provided wake turbulence information necessary for the ICAO determination of wake turbulence mitigation separations required for the A-380 aircraft.

- FY 2006 Completed a detailed proposal for modifying the current air traffic wake turbulence mitigation procedures used for dependent staggered instrument landing system (ILS) approaches to an airport's CSPR.
- FY 2005-2006 Enhanced the pulsed Light Detection and Ranging (LIDAR), which can measure distance, speed and rotation, for wake data collection capability, enabling it to capture wakes from both arriving and departing aircraft.
- FY 2005 Utilizing analyses of the wake turbulence data collected at San Francisco International Airport (SFO) and Lambert St. Louis International Airport (STL) upgraded FAA's wake turbulence encounter model used for evaluating proposed changes to air traffic control procedures for routing aircraft into and out of airports.

### FY 2010 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:

- Continued wake data collection and analyses at additional airports to support airport specific changes to air traffic control procedures for aircraft dependent instrument approaches to an airport's closely spaced parallel runways.
- Evaluated reports of wake turbulence encounter as part of the FAA Safety Management System assurance process for changes to air traffic control procedures.
- Analyzed wake turbulence data base and provided the analysis information to continue upgrading computational models of wake vortex transport and decay.
- Accomplished air traffic procedure/air route proposal reviews utilizing the enhanced suite of wake turbulence encounter analysis tools.
- Initiate development of wake turbulence transport and decay modeling tools for use in evaluating proposed trajectory based operational concepts.
- Developed airport specific procedure modifications to enable dependent instrument approaches to closely spaced parallel runways.
- Development of an air navigation service provider concept feasibility prototype decision support system for use in reducing required wake mitigation separations in dependent instrument landing system arrivals of B-757 and heavier aircraft on an airport's closely spaced parallel runways.
- Continue to conduct experiments/analyses and aviation community forums to define in terms of a
  wake turbulence hazard what is an "unacceptable" level of wake turbulence for an encountering
  aircraft.
- Continued development of ground based situational display concepts (and aircraft based as necessary, working jointly with EUROCONTROL) relative to separation constraints (wake, weather, and visibility) required for implementation of the NextGen concept for air routes and approach/departure paths.

## **FY 2011 PROGRAM REQUEST:**

In FY 2011, FAA must continue its development of the capabilities needed to enable aircraft separation processes supportive of NextGen shared separation and dynamic spacing super density operations. These capabilities are highly dependent on technologies that accurately predict aircraft tracks, the track/decay of their generated wake vortices and the provision of this information to pilots and controllers. Some aspects of the NextGen Concept of Operations are dependent upon the aircraft being a participant in efficient, safe air traffic control processes that would minimize the effects of required wake turbulence mitigation on the flow of air traffic in all weather and visibility conditions. The Wake Turbulence Program's research will result in enhanced technology assisted processes for safely mitigating aircraft wake encounter risks while optimizing capacity, for all flight regimes, including the effects of weather.

## **KEY FY 2011 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:**

- Continue to incorporate wake transport/decay and aircraft navigation performance analysis results into FAA wake encounter risk models.
- Provide engineering and analysis support to develop airport specific procedure modifications to enable dependent instrument approaches to the airport's closely spaced parallel runways.

- Continued data collection to determine the characteristics of wake vortices generated by departing
  and arriving aircraft. Data will be used in development of air navigation service provider decision
  support tools in reducing the required wake mitigation separation applied to airport single runway
  arrivals and departures.
- Continue development of wake turbulence transport and decay modeling tools for use in evaluating proposed trajectory based operational concepts.
- Continued development of ground and aircraft based situational display concepts (joint work with EUROCONTROL) relative to separation constraints (wake, weather, and visibility) required for implementation of the NextGen concept for air routes and approach/departure paths.
- Continue development of modeling tools to evaluate system-wide safety risk associated with the NextGen pair-wise separation concepts.
- Continue to conduct experiments/analyses and aviation community forums to define in terms of a
  wake turbulence hazard what is an "unacceptable" level of wake turbulence for an encountering
  aircraft.
- Initiate detail development of a decision support tool concept for use in determining when to apply reduced air traffic control wake mitigation separations during single runway instrument approach operations.

## **APPROPRIATION SUMMARY**

	_Amount (\$000)
Appropriated (FY 1982-2009)	45,168
FY 2010 Enacted	10,631
FY 2011 Request	10,685
Out-Year Planning Levels (FY 2012-2015)	43,142
Total	109,626

Budget Authority		FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
(\$000)		Enacted	Enacted	Enacted	Enacted	Request
Contracts						
Wake Turbulence		2,833	12,543	9,734	9,821	9,517
Personnel Costs		222	251	374	700	910
Other In-house Costs		11	19	24	110	258
	Total	3,066	12,813	10,132	10,631	10,685

OMB Circular A-11, Conduct of Research and Development (\$000)	FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Basic Applied	0 3,066	0 12,813	0 10,132	0 10,631	0 10,685
Development (includes prototypes)  Total	<u>0</u> 3,066	12,813	0 10,132	10,631	10,685

A12.b. NextGen - Wake Turbulence	FY 2011	Program Schedule					
Product and Activities	Request (\$000)	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
111-130 NextGen - Wake Turbulence	9,517						
Evaluate reports of wake turbulence encounter		•	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>
Continued data collection and analysis to determine the characteristics of wake vortices generated by aircraft – for enhancing the fidelity of wake models		•	<b>◊</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>
Incorporate wake turbulence data analysis results into wake transport and decay models and utilize the models to review proposed air route and terminal airspace change proposals		•	<b>◊</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>
Develop airport specific procedure modifications to enable dependent instrument approaches to closely spaced parallel runways		•	<b>◊</b>	<b>♦</b>	<b>♦</b>		
Continued data collection and analysis to determine the characteristics of wake vortices generated by aircraft – for use in determining potential achievable separation reduction in single runway operations		•	<b>◊</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>	<b>◊</b>
Development of modeling and other analysis tools required for evaluation of wake encounter risks of trajectory based operations		•	<b>◊</b>	<b>♦</b>	<b>♦</b>		
Accomplish wake turbulence encounter assessments of potential air traffic routing and separation changes associated with evolution to NextGen		•	<b>◊</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>
Development of ground based and flight deck based situational display concepts for showing separation constraints for aircraft operating in NextGen air corridors and high density airspace		•	<b>◊</b>	<b>*</b>	<b>*</b>	<b>*</b>	<b>*</b>
Conduct experiments/analyses and aviation community forums to define in terms of a wake turbulence hazard – what is an "unacceptable" level of wake turbulence for an encountering aircraft		•	<b>◊</b>	<b>♦</b>	<b>◊</b>	<b>♦</b>	<b>◊</b>
Complete development of ANSP feasibility prototype decision support system for use in reducing required wake mitigation separations in dependent instrument approaches for aircraft following B-757 and heavier aircraft landing on the adjacent closely spaced parallel runway		•					
Detail development of DST concept for use in determining air traffic control wake mitigation separations applied during single runway instrument approach operations			<b>◊</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	
Develop modeling tools to evaluate system-wide safety risk for NextGen era reduced separation standards		*	<b>◊</b>	<b>♦</b>	<b>♦</b>		
Personnel and Other In-House Costs*	1,168						
Total Budget Authority	10,685	10,631	10,685	10,742	10,799	10,800	10,801

Note: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual budget process.

Budget Item	Program Title	Budget Request	
A12.c.	NextGen – Air Ground Integration Human Factors	\$10,614,000	

#### GOALS:

This program supports the following Flight Plan goals: Increased Safety, Greater Capacity, International Leadership, and Organizational Excellence.

**Intended Outcomes:** By 2017, demonstrate that NextGen operations, procedures and information can be standard and predictable for users (e.g., pilots, controllers, airlines, passengers) at all types of airports and for all aircraft across the full range of environmental conditions.

Integration of air and ground capabilities poses challenges for pilots and air traffic service providers. A core human factors issue is ensuring the right information is provided to the right human operators at the right time to make the right decisions. Transitions of increasingly sophisticated automation and procedures must be accompanied by supporting interoperability with baseline systems and refinement of procedures to ensure efficient operations and to mitigate potential automation surprises. Additionally, NextGen systems, procedures and training must support safe and effective planned and unexpected transitions between NextGen and legacy airspace procedures.

The safety factors that primarily have an impact on separation assurance must be jointly approached by both the flight deck and air traffic research communities. The increased levels of automation and new enabling technologies that will likely transform the National Airspace System (NAS) in the future will bring new human factors challenges. As the NAS moves toward a more automated system and roles and responsibilities change in a series of planned steps, intent information as well as positive information on delegation of authority must be clear and unambiguous. This changing environment requires a close examination of new types of human error modes to manage safety risk in the human factors domain. Equipment design methods, training, and procedures must be developed to decrease error likelihood and/or increase timely error detection, for example in the case of blunders on closely spaced parallel approaches.

Many of the emerging NextGen concepts imply that a flight plan will become an air-ground performance contract that meets the user's needs, will be executed by the flight deck, and protected by the air traffic service provider. There are multiple parameters in aviation such as weather, unanticipated traffic, sudden denial of airspace or airport assets, emergencies, and a myriad of other factors that will require close monitoring to meet the expected flight performance goals.

Changes in roles and responsibilities will occur not only between pilots and air traffic service providers, but also for both groups and the respective automation they use to achieve NextGen safety and efficiency gains. Issues such as mode confusion, transitions, and reversions must be understood and addressed to ensure appropriate levels of situation awareness and workload are maintained.

The NextGen environment will include an increased reliance on collaborative and distributed decision making. Information must be provided to participants, e.g., pilots, air traffic service providers and airline operation centers in a fashion that facilitates a shared understanding of phenomena, such as weather, wake, etc. The format, content, timeliness and presentation of that information must be well integrated with other information provided to decision makers and their decision support tools.

Operational Improvements (OIs) to be addressed from an integrated air-ground perspective include provision for spacing, merging and passing in en route airspace via Cockpit Display of Traffic Information (CDTI) and Automatic Dependent Surveillance - Broadcast (ADS-B), with procedures for less than current levels of aircraft separation. Lateral and in-trail separation would be reduced to near Visual Flight Rules (VFR) levels for single runway and for converging and closely spaced parallel runway operations using CDTI, ADS-B and wake vortex ground detection. Aircraft-to-aircraft separation would be delegated to the flight deck in oceanic airspace, with reduced longitudinal and lateral spacing via Required Navigation Performance (RNP), ADS-B/CDTI and data communication.

**Agency Outputs:** The NextGen Air-Ground Integration research program addresses flight deck - air traffic service provider integration for each operational improvement or NextGen application considered, with a focus on those issues that primarily affect the pilot side of the air-ground integration challenge. The

program collaborates with the NextGen Self Separation Human Factors Program to ensure robust examination of NextGen human factors issues. Through use of modeling, simulation, and demonstration, the program assesses interoperability of tools, develops design guidance, determines training requirements, and verifies procedures for ensuring safe, efficient and effective human system integration in transitions of NextGen capabilities.

## Outputs include:

- Defining, understanding, and developing guidance to successfully implement the changes in roles and responsibilities between pilots and controllers, and between humans and automation required for NextGen capabilities and applications.
- Defining human and system performance requirements and guidance for the design and operation of aircraft and air traffic management systems to include examination of information needs, human capabilities, interface design and systems integration issues.
- Developing and applying risk and error management strategies, mitigating risk factors, and reducing human errors.

**Research Goals:** Research will support development of policy, standards and guidance required to design, certify and operate NextGen equipment and procedures from the perspective of air-ground integration. Additionally, this research will include integrated demonstrations of NextGen procedures and equipment in the context of ongoing air-ground integration human factors research.

- By 2016 complete research to enable safe and effective changes to pilot and ATC roles and responsibilities for NextGen procedures.
  - By 2011 develop initial taxonomy describing the relationship between pilots/ATC and associated automated systems.
  - By 2013 complete initial research to evaluate and recommend pilot-ATC procedures for negotiations and shared decision making NextGen activities.
  - By 2015 complete research to identify and recommend mitigation strategies to address potential coordination issues between humans and automated systems.
  - By 2016 complete research to identify methods for effectively allocating functions between pilots/ATC and automated systems as well as mitigating any losses of skill associated with these new roles and responsibilities.
- By 2016 complete research to identify and manage the risks posed by new and altered human error modes in the use of NextGen procedures and equipment.
  - By 2011 initiate development of guidance to support certification and flight standards personnel
    in assessing suitability of design and training methods to support human error detection and
    correction.
  - By 2013 complete initial research investigating methods to mitigate mode errors and unintended use of NextGen equipment.
  - By 2014 develop initial guidance on training methods to support detection and correction of human errors in near to mid-term NextGen procedures.
  - By 2016 complete research and modeling activities to identify, quantify and mitigate potential human errors in the use of NextGen equipment and procedures.
- By 2016 complete research on human systems integration issues related to information needs, human capabilities and limitations, interface design and system integration required to support effective guidance for NextGen equipment design, procedure development and personnel training.
  - By 2012 initiate research to assess pilot performance in normal and non-normal NextGen procedures, including single pilot operations.
  - By 2013 complete initial research to identify cognitive tasks, associated information needs and recommended display methods for tasks that require shared flight deck-ATC information.
  - By 2013 complete research to identify human factors issues and potential mitigation strategies for the use of legacy avionics in NextGen procedures.

- By 2013 complete initial research to address human-automation integration issues regarding the certification of pilots, procedures, training and equipment necessary to achieve NextGen capabilities.
- By 2014 complete initial research to provide recommendations for displays, alerts, procedures and training associated with data communications.
- By 2014 complete research to provide initial recommendations for equipment design, procedures and training to support use of 2 ½ to 4 D trajectories.
- By 2016 complete research to assess procedures, training, display and alerting requirements to support development and evaluation of planned and unplanned transitions between NextGen and legacy airspace procedures.

**Customer/Stakeholder Involvement:** Program researchers work directly with colleagues in FAA, other government agencies, academia, and industry to support the following R&D programs and initiatives:

- Guidance from the Joint Planning and Development Office (JPDO) Next Generation Air Transportation System (NextGen) initiative.
- NASA's Aviation Safety and Airspace Programs.
- Close collaboration with FAA organizations, notably Flight Standards and Aircraft Certification in the AVS line of business.
- Collaboration with specific FAA programs such as the Surveillance and Broadcast Services (SBS),
   DataComm and the NextGen-Wake programs.
- FAA Research, Engineering and Development Advisory Committee representatives from industry, academia, and other government agencies annually review the activities of the program and provide advice on priorities and budget.

**R&D Partnerships:** The NextGen Air-Ground Integration research program collaborates with industry and other government programs through:

- Collaborative research with NASA on its safety, airspace and air portal projects including the identification of human factors research issues in the NextGen as technology brings changes to aircraft capabilities.
- Complex full mission demonstrations using a distributed simulation architecture that leverages NASA cockpit and Air Traffic Management (ATM) simulation facilities and other resources.
- Cooperative research agreements used with universities to address NextGen human factors issues.
- Coordination on research issues and plans with aircraft and avionics manufacturers and operators as well as international civil aeronautics authorities.

### **ACCOMPLISHMENTS**

### FY 2009

Roles and Responsibilities

- Initiated development of a standard taxonomy for describing the relationship between flight deck and Air Traffic Control (ATC) automated systems and human operators in the context of NextGen equipment and applications.
- Initiated investigation of shared decision making methods considering potential decisions shared between flight deck, Air Navigation Service Provider (ANSP) and Aircraft Operations Center (AOC) personnel.

## **Human System Integration**

- Established preliminary equipment categories for legacy Flight Management Systems and associated cockpit displays to support future human factors evaluations of the acceptability of using legacy avionics equipment in NextGen procedures.
- Began work to identify standard methods for conducting task analyses of flight deck-ATC activities for NextGen airspace procedures.

## Error Management

- Initiated development of structured method to assist certification personnel in identifying risk areas
  related to human error and assessing system resilience to error for new and modified systems and
  procedures.
- Began assessment of nature and impact of potential errors in oceanic in trail procedures.

## **Integrated Demonstrations**

• Developed an initial simulation and demonstration roadmap laying out incremental objectives, simulation requirements, assumptions, and risks.

### FY 2010 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS

## Roles and Responsibilities

- Developed initial guidance addressing allocation of functions between the aircrew and automation.
- Developed initial guidance on procedures for flight deck-ANSP negotiations.

## Human System Integration - Information Needs

- Developed initial guidance for the design of NextGen flight deck and ATC displays and alerts, including those required for oceanic in trail procedures.
- Continued research to identify human factors issues associated with instrument procedure design and to develop human factors guidelines for instrument procedures.

## Human System Integration - Human Capabilities and Limitations

- Initiated development of a methodology to address the human capabilities and limitations of pilots (including single-pilot aircraft) to conduct a range of NextGen airspace procedures in normal and non-normal situations.
- Evaluated flight technical error in all four dimensions for TBO.

### Human System Integration – System Integration

- Initiated research to identify human factors issues and potential mitigation strategies for the use of legacy avionics in NextGen procedures.
- Conducted research to support guidance for data communications procedures, training, displays and alerts.

## Risk and Error Management

- Delivered initial results of proactive analyses of human error hazards to understand and predict human error vulnerabilities.
- Assessed human error impact and mitigation in oceanic in-trail procedures and RNP operations.

### **FY 2011 PROGRAM REQUEST:**

The program will continue to assess human system integration issues in use of airborne NextGen concepts, capabilities, and procedures, and ATM leading to a full mission demonstration. Each of these research areas, although general in nature, will continue to be conducted in the context of specific near-to mid-term NextGen applications such as closely spaced parallel operations, oceanic in-trail procedures, etc.

## Roles and Responsibilities

- Define a taxonomy for describing the relationship between flight deck and ATC automated systems and human operators within NextGen applications.
- Assess human-automation coordination methods for performance costs and benefits in the context of near-term NextGen applications.
- Initiate research to identify design and procedural methods to support collaboration and negotiation between flight deck, ANSP and AOC personnel.
- Assess various strategies for Pilot Flying/Pilot Not Flying responsibilities and coordination procedures.

Human System Integration - Information Needs

- Assess pilot information needs associated with dynamic allocation to ensure awareness of need of re-allocation, awareness that reallocation has occurred, and to ensure the pilot has the information required to effectively assume responsibility for a function.
- Develop recommendations to support guidance on minimum flight deck wake turbulence display and alerting requirements to include priority, type of alert and synchronization between flight deck and ATC systems.
- Determine which pilot and controller tasks are associated with NextGen flight procedures, using
  task and information needs analysis techniques, and develop guidelines for each type of procedure
  in NextGen.

Human System Integration – Human Capabilities and Limitations

- Continue development of a methodology to address the human capabilities and limitations of pilots (including single-pilot aircraft) to conduct a range of NextGen airspace procedures in normal and non-normal situations.
- Assess/evaluate flight deck human decision making capabilities and limitations in the context of near to mid-term NextGen applications.

Human System Integration – System Integration

- Assess human factors issues associated with use of legacy avionics in NextGen procedures.
- Initiate research to develop flight crew training recommendations for error detection and correction for NextGen operations for single pilot and two pilot crews.

## Risk and Error Management

- Develop guidance to support certification personnel in evaluating risks and mitigation of human error and potential unintended uses of new technology in NextGen systems and procedures.
- Determine the expected nature, frequency and potential impact of pilot errors that may lead to exceeding RNP containment criteria.
- Develop a structured method (e.g., checklist, decision aid, analysis process) to assist certification
  personnel in evaluating system resilience to human error, and for identifying and estimating risk of
  human error (before and after application of risk mitigation) for new or modified technologies and
  procedures.

#### KEY FY 2011 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:

Roles and Responsibilities

- Define a standard taxonomy for describing the relationship between flight deck and ATC automated systems and human operators in the context of NextGen equipment and applications.
- Select the most likely human-automation coordination methods and assess the performance costs and benefits of these human-automation coordination strategies in the context of near-term NextGen applications.
- Initiate research to identify design and procedural methods to support collaboration and negotiation between flight deck, ANSP and AOC personnel.
- Assess various strategies for Pilot Flying/Pilot Not Flying responsibilities and coordination procedures.

Human System Integration - Information Needs

- Assess pilot information needs associated with dynamic allocation to ensure awareness of need of re-allocation, awareness that reallocation has occurred, and to ensure the pilot has the information required to effectively assume responsibility for a function.
- Continue research to support guidance for data communications procedures, training, displays and alerts.
- Develop recommendations to support guidance on minimum flight deck wake turbulence display and alerting requirements to include priority, type of alert and synchronization between flight deck and ATC systems.

 Determine which pilot and controller tasks are associated with NextGen flight procedures, using task and information needs analysis techniques, and develop guidelines for each type of procedure in NextGen.

#### Human System Integration – Human Capabilities and Limitations

- Continue development of a methodology to address the human capabilities and limitations of pilots (including single-pilot aircraft) to conduct a range of NextGen airspace procedures in normal and non-normal situations.
- Assess/evaluate flight deck human decision making capabilities and limitations in the context of near to mid-term NextGen applications.

## Human System Integration – System Integration

- Continue research to identify human factors issues and potential mitigation strategies for the use of legacy avionics in NextGen procedures.
- Initiate research to develop flight crew training recommendations for error detection and correction for NextGen operations for single pilot and two pilot crews.

#### Risk and Error Management

- Develop guidance to support certification personnel in evaluating risks and mitigation of human error and potential unintended uses of new technology in NextGen systems and procedures.
- Determine the expected nature, frequency and potential impact of pilot errors that may lead to exceeding RNP containment criteria.
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  personnel in evaluating system resilience to human error, and for identifying and estimating risk of
  human error (before and after application of risk mitigation) for new or modified technologies and
  procedures.

## **APPROPRIATION SUMMARY**

	Amount (\$000)
Appropriated (FY 1982-2009)	2,554
FY 2010 Enacted	5,688
FY 2011 Request	10,614
Out-Year Planning Levels (FY 2012-	42,666
Total	61,522

Budget Authority (\$000)	FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Contracts:					
NextGen - Air Ground Integration Human Factors	0	0	2,485	5,448	10,035
Personnel Costs	0	0	69	212	416
Other In-house Costs	0	0	0	28	163
Total	0	0	2,554	5,688	10,614

OMB Circular A-11,	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
Conduct of Research and	Enacted	Enacted	Enacted	Enacted	Request
Development (\$000)					
Basic	0	0	0	0	0
Applied	0	0	2,554	5,688	10,614
Development (includes prototypes)	0	0	0	0	0
Total	0	0	2,554	5,688	10,614

Integration Human Factors Product and Activities  111-110 NextGen Air-Ground Integration	Request (\$000)	EV 0040	1			1	
111-110 NextGen Air-Ground Integration	(0000)					FV 2014	FV 2015
<u> </u>	(\$000)	11 2010	112011	11 2012	11 2013	112014	11 2013
	1,989						
Roles and Responsibilities							
Conduct research to enable safe and effective changes to pilot and ATC roles and responsibilities for NextGen procedures: Define a standard taxonomy for describing the relationship		•	<b>◊</b>	<b>◊</b>	<b>◊</b>		
between flight deck and ATC automated systems and human operators in the context of NextGen equipment and applications.			<b>◊</b>	<b>◊</b>			
Select the most likely human-automation coordination methods and assess the performance costs and benefits of these human-automation coordination strategies in the context of near-term NextGen applications.  Identify design and procedural methods to support		•	<b>◊</b>	<b>◊</b>			
collaboration and negotiation between flight deck, ANSP and AOC personnel Assess various strategies for Pilot Flying/Pilot Not Flying				<b>◊</b>	<b>◊</b>	<b>♦</b>	
responsibilities and coordination procedures.							
Human System Integration Conduct research on human systems integration issues related to information needs, interface design and system integration required to support effective guidance for NextGen equipment design, procedure development and personnel training:	4,830	•	<b>◊</b>	<b>◊</b>			
Information Needs Assess pilot information needs associated with dynamic allocation to ensure awareness of need of re-allocation,							
awareness that reallocation has occurred, and to ensure the pilot has the information required to effectively assume responsibility for a function.				<b>◊</b>	<b>◊</b>	<b>♦</b>	<b>♦</b>
Develop recommendations to support guidance on minimum flight deck wake turbulence display and alerting requirements to include priority, type of alert and synchronization between flight deck and ATC systems.  Determine which pilot and controller tasks are associated with NextGen flight procedures, using task and information needs analysis techniques, and develop guidelines for each type of		•	<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>♦</b>	<b>◊</b>
procedure in NextGen. Interface Design		•	<b>♦</b>	<b>◊</b>			
Based on pilot and controller information needs, develop and evaluate recommended display methods to facilitate predicting/detecting/resolving undesired aircraft performance for range of trajectory types (2 ½ D – 4D) to include ensuring pilot and controller knowledge or proximity of current 2 1/2 to 4D trajectory to aircraft limitations.  For abnormal situations and degradation of a system function: Determine best method(s) to alert flight crew (both own-ship and other surrounding aircraft) and controllers of the nature and implications of system failure or degradation.				<b>⋄</b>	<b>⋄</b>	<b>&gt;</b>	
System Integration		•	♦	<b>♦</b>			
Assess human factors issues associated with use of legacy avionics in NextGen procedures			<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>♦</b>	
Develop flight crew training recommendations for error detection and correction for NextGen operations for single pilot and two pilot crews.							
Risk and Error Management	2,717						
Conduct research to identify and manage the risks posed by new and altered human error modes in the use of NextGen procedures and equipment:			<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>♦</b>	<b>♦</b>
Develop guidance to support certification personnel in evaluating risks and mitigation of human error and potential unintended uses of new technology in NextGen systems and procedures		•	<b>♦</b>	<b>◊</b>	<b>◊</b>		
Determine the expected nature, frequency and potential impact of pilot errors that may lead to exceeding RNP containment criteria.			<b>◊</b>	<b>◊</b>	<b>◊</b>		
Develop a structured method to assist certification personnel in evaluating system resilience and risk of human error							
Integrated Demonstrations	499	•	<b>♦</b>				
Update simulation roadmap				<b>◊</b>	$\Diamond$	<b>◊</b>	<b>◊</b>
Demonstrate pilot and controller functional capabilities via simulation (specific demonstrations executed under activities shown above)		<b>◊</b>	<b>◊</b>	<b>◊</b>			
Personnel and Other In-House Costs	579						
Total Budget Authority	10,614	5.688	10,614	10,656	10,692	10,670	10,648

Notes: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual budget process.

Budget Item	Program Title	Budget Request
A12.d.	NextGen - Self-Separation Human Factors	\$9,971,000

#### GOALS:

This program supports the following Flight Plan goals: Increased Safety, Greater Capacity, and International Leadership.

**Intended Outcomes:** By 2016, develop initial standards and procedures to enhance spacing of aircraft using Next Generation Air Transportation System (NextGen) capabilities. In the near term, this includes reduced aircraft separation and delegated separation.

New technologies such as Global Positioning System (GPS), Automatic Dependent Surveillance-Broadcast (ADS-B), and Cockpit Display of Traffic Information (CDTI) afford the possibility of transitioning from classic air traffic control separation assurance procedures to aircraft based spacing and separation. In the near to mid-term, these procedures will focus on reduced and delegated separation as well as supporting runway/surface awareness. Many NextGen enhanced capabilities are based on various aircraft oriented activities such as spacing, merging, passing, and closely spaced parallel operations, etc. Research will assess the human factors risks and requirements associated with these various spacing policies, procedures and maneuvers. The research results will provide technical information to support the development of standards, procedures, and training by Flight Standards to implement NextGen. Human factors research required to provide the scientific and technical information to address human performance issues includes:

- Providing human factors assessments on new information requirements to allow pilots to safely maintain aircraft separation, especially during low visibility ground operations.
- Providing robust assessments of reduced separation procedures to ensure non-normal and
  emergency operations are evaluated including system failures and reversion impacts. The NextGen
  benefits associated with reduced aircraft spacing in high density terminal airspace also leave fewer
  buffers to accommodate non-normal events. The impact on safety and efficiency will be
  addressed.
- Understanding changing roles and responsibilities associated with shifting separation responsibility between pilot and controller during delegated separation operations.
- Developing advanced methods including efficient and standardized procedures to certify pilots and automation for different separation operations.
- Assessing risk of pilot error during reduced and delegated aircraft spacing operations as NextGen technologies and procedures are implemented and integrated with legacy avionics.
- Providing requirements and guidance for training pilots to assure adequate understanding of automation functions and limitations as they apply to enhanced spacing and separation operations.

**Agency Outputs:** The NextGen – Self Separation Human Factors Research Program develops human factors scientific and technical information to address human performance and coordination among pilots and air navigation service providers (air traffic controllers), human system integration, and error management strategies to implement NextGen capabilities. Human factors technical information will also support the development of standards, procedures, training, policy, and other guidance material required to implement the operational improvements leading to enhanced aircraft spacing and separation.

## Outputs include:

- Define the potential impact and human factors issues of new technologies such as enhanced vision, synthetic vision, and electronic flight bags on separation activities.
- Define human factors technical information needed to support the development of standards, procedures, and training by Flight Standards to implement plans for reduced aircraft separation and recovery to classic air traffic operations as a result of abnormal events.
- Develop procedures and training needed to implement new roles and responsibilities for pilots and controllers during delegated separation operations.
- Define human and system performance requirements for separation activities, e.g., spacing, merging, and passing.

- Develop and apply error management strategies, mitigate risk factors, and reduce automationrelated errors associated with enhanced separation operations.
- Develop human factors criteria for the successful use of flight deck performance monitoring and decision support tools as they relate to enhanced separation maneuvers such as spacing, merging, and passing, and how conformance alerts are communicated and resolved between flight deck and ground monitors, for example in Area Navigation (RNAV)/Required Navigation Performance (RNP) approach and departure operations.

**Research Goals:** Conduct R&D to support the development of standards, procedures, training, policy, and other guidance material required to implement the NextGen operational improvements leading to enhanced aircraft spacing and separation including improved awareness of surface/runway operations, reduced separation, and delegated separation.

- By 2016, complete research to enable enhanced aircraft spacing for surface movements in low
  visibility conditions guided by enhanced and synthetic vision systems, as well as cockpit displays of
  aircraft and ground vehicles and associated procedures.
  - By 2012 complete initial research to evaluate and recommend minimum display standards for use of enhanced and synthetic vision systems, as well as airport markings and signage, to conduct surface movements across a range of visibility conditions.
  - By 2014 evaluate and recommend minimum display standards and operational procedures for use of CDTI to support pilot awareness of potential ground conflicts and to support transition between taxi, takeoff and departure phases of flight.
  - By 2016 complete research to identify human capabilities and limitations with respect to ground collision avoidance and identify potential design solutions, training and procedures to mitigate risks associated with human performance.
- By 2015, complete research and provide human factors guidance to reduce arrival and departure spacing including variable separation in a mixed equipage environment.
  - By 2011 complete initial research to evaluate the impact and potential risks associated with use of Traffic Alert and Collision Avoidance System (TCAS) in NextGen procedures.
  - By 2012 initiate research to evaluate alternative methods of allocating functions and coordinating between automated systems, pilots, Air Traffic Control (ATC) and Airline Operations Center (AOC) personnel in reduced and delegated separation procedures.
  - By 2014 complete research to identify likely human error modes and recommend mitigation strategies in closely spaced arrival/departure routings, including closely spaced parallel operations.
  - By 2015 complete initial research on human performance considerations for design, training and operational procedures in conformance monitoring and detection/correction of nonconformance with reduced separation routings and procedures.
- By 2015, enable reduced and delegated separation in oceanic airspace and high density en route corridors.
  - By 2011, complete research to evaluate and recommend procedures, equipage and training to safely conduct oceanic and en route pair-wise delegated separation.
  - By 2013 complete initial research to provide recommended guidance for design of cockpit displays and alerts to support delegated separation.
  - By 2015 complete research to support recommended procedures and training required to safely and efficiently transition to/from NextGen reduced and delegated separation procedures in normal and non-normal conditions.
- By 2015, develop a repository of NextGen human factors data containing research roadmaps, results, and data from relevant ongoing and historical research, demonstrations and operational experience to provide a foundation for flight deck human factors research to support policy decisions, standards development, certification and approval to enable NextGen operational improvements, and to ensure that the future system adequately considers human systems integration issues.

**Customer/Stakeholder Involvement:** Program researchers work directly with colleagues in FAA, other government agencies, academia, and industry to support the following R&D programs and initiatives:

- Guidance from the Joint Planning and Development Office (JPDO) NextGen initiative.
- NASA's Aviation Safety and Airspace Programs.
- Close collaboration with FAA organizations, notably Flight Standards and Aircraft Certification in the AVS line of business.
- Collaboration with specific FAA programs such as the Surveillance and Broadcast Services (SBS), DataComm and the NextGen-Wake programs.
- Collaboration with specific FAA programs such as the Surveillance and Broadcast Services (SBS), DataComm and the NextGen-Wake programs.
- FAA Research, Engineering and Development Advisory Committee representatives from industry, academia, and other government agencies annually review the activities of the program and provide advice on priorities and budget.

**R&D Partnerships:** The research program collaborates with industry and other government programs through:

- Collaborative research with NASA on its aviation safety and airspace projects including the
  identification of human factors research issues in the NextGen as technology brings changes to
  aircraft capabilities. Complex full mission simulations using an aviation simnet distributed
  simulation architecture will leverage NASA cockpit and Air Traffic Management (ATM) simulation
  facilities and other resources.
- Cooperative research agreements with universities to address NextGen human factors issues.
- Coordination on research issues and plans with aircraft and avionics manufacturers and operators.
- Coordination with appropriate RTCA Committees, e.g., Airborne Separation Assurance System.

## Accomplishments:

FY 2009

Surface/Runway Operations Awareness

- Began to define pilot information requirements for the display and use of enhanced cockpit technologies (Enhanced Flight Vision Systems (EFVS)/Synthetic Vision Systems (SVS), TCAS, and CDTI to support all-weather operations.
- Initiated development of survey instruments and analysis techniques to evaluate airport signage and lighting effects on pilot navigation at night and in reduced visibility.

### **Reduced Separation**

- Began to evaluate pilot conformance, conflict detection and avoidance capabilities, and recommend pilot training and performance standards to ensure safe separation.
- For closely spaced parallel operations, began research to determine CDTI and information requirements to support dual missed approaches, and to evaluate controller and flight crew workload and effects of blunder during the missed approach.

### **Delegated Separation**

- For near to mid-term delegated separation procedures and applications for single-pilot operations, began to assess the impact of systems failures to prepare for development of procedures to safely and efficiently revert to backup separation methods.
- Began assessment of human factors issues for the design and pilot use of display technologies including CDTI and TCAS in delegated separation operations.

#### Cross-cutting

- Began human factors assessments of new information requirements for NextGen alerts and displays in reduced and delegated separation operations.
- Contributing to the development of a repository of NextGen human factors data, began a survey of human factors research relevant to near-to-mid-term NextGen applications, and a survey of the human factors issues that have arisen through operational experience with systems and

procedures relevant to near to mid-term NextGen applications, as well as the projected needs based on NextGen planning documents.

### FY 2010 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS

Surface/Runway Operations Awareness

- Continued study to define pilot information display requirements for use of enhanced cockpit technologies, including EFVS/SVS, TCAS, and CDTI to support all-weather operations.
- Evaluated airport signage and lighting effects on pilot navigation at night and reduced visibility.

## **Reduced Separation**

- Evaluated pilot conformance, conflict detection and avoidance capabilities, and recommend pilot training and performance standards to ensure safe separation.
- Developed recommendations for use of autopilot coupled collision avoidance and pilot procedures for overriding the automation in each flight phase.
- For closely spaced parallel operations, continued research to determine CDTI requirements to support dual missed approaches, and to evaluate controller and flight crew workload and effects of blunder during the missed approach.

### **Delegated Separation**

- Developed initial methodology for conducting robust systematic assessments of separation procedures to ensure non-normal and emergency operations are evaluated.
- Identified the major human factors considerations requiring research to support evaluation and recommendation of minimum display standards for use of enhanced and synthetic vision systems, as well as airport markings and signage, to conduct surface movements across a range of visibility conditions.
- Continued analysis to evaluate pilot training requirements for use of limited delegation of separation authority in the oceanic environment.
- Developed recommendations for the design and use of display technologies by pilots, including CDTI and TCAS in delegated separation operations.
- For near to mid-term delegated separation procedures and applications for single-pilot operations, continued assessing the impact of systems failures and began development of procedures to safely and efficiently revert to backup separation methods.
- For oceanic pair-wise separation procedures, continued to determine information needs, time requirements and pilot accuracy for detection and resolution of potential conflicts.
- Continued to evaluate ADS-B/CDTI displays and procedures in a robust evaluation of merging and spacing operations for a range of controller-specified spacing and a variety of aircraft (not all same carrier or aircraft type).
- Developed initial methodology for conducting robust systematic assessments of separation procedures to ensure non-normal and emergency operations are evaluated.

## Cross-cutting

- Provided human factors assessments of new information requirements for NextGen alerts and displays in reduced and delegated separation operations.
- Continued robust assessments of separation procedures to ensure non-normal and emergency
  operations are evaluated including system failures and reversion impacts.
- Provided guidance for training pilots to use automation in NextGen separation operations.
- Provided guidance for the integration and use of TCAS equipment and symbology in reduced and delegated separation operations.
- Continued to determine the expected nature, frequency and potential impact of instrument procedure design on pilot errors.
- Continued development of a repository of NextGen human factors data, incorporating results of
  efforts to survey human factors research relevant to near-to-mid-term NextGen applications, and
  surveys of the human factors issues that have arisen through operational experience with systems
  and procedures relevant to near to mid-term NextGen applications, as well as the projected needs
  based on NextGen planning documents.

### **FY 2011 PROGRAM REQUEST:**

The program will continue to assess human system integration issues in use of airborne NextGen concepts, capabilities, and procedures, and Air Traffic Management (ATM) leading to a full mission simulation in 2016.

## Surface/Runway Operations Awareness

- Complete the study defining pilot information display requirements for use of enhanced cockpit technologies to support all-weather operations.
- Complete initial research to evaluate and recommend minimum display standards for use of enhanced and synthetic vision systems, as well as airport markings and signage, to conduct surface movements across a range of visibility conditions.
- Evaluate the effects of EFVS Head-Up Display (HUD) clutter and masking on detection of potential ground conflicts during taxi operations across a range of visibility and lighting conditions.
- Conduct research on existing SVS and EFVS to evaluate time required, accuracy, and pilot workload
  associated with recognizing and reacting to potential ground collisions or conflicts with other
  aircraft, vehicles and obstructions across a range of visibility and lighting conditions, for single
  pilots and two pilot crews.

#### Reduced Separation

- For closely spaced parallel operations, complete research to determine CDTI requirements to support dual missed approaches, and to evaluate workload and effects of blunder during the missed approach.
- Continue research to evaluate the impact and potential risks associated with use of Traffic Alert and Collision Avoidance System (TCAS) in NextGen procedures.

## **Delegated Separation**

- Continue to evaluate ADS-B/CDTI displays and procedures in a robust evaluation of merging and spacing operations for a range of controller-specified spacing and a variety of aircraft (not all same carrier or aircraft type).
- Complete research to evaluate and recommend procedures, equipage and training to safely conduct oceanic and en route pair-wise delegated separation.
- Develop human performance models to predict errors, their impacts on performance, and human responses for airborne merging and spacing, and CDTI-assisted visual separation (CAVS).
- For delegated separation applications, determine factors contributing to breakdowns in coordination and develop mitigating human factors recommendations for minimum equipment design, procedural and training methods.

### Cross-cutting

- Continue development of a repository of NextGen human factors data, incorporating results of human factors research and human factors issues that surface during operational experience with systems and procedures relevant to near to mid-term NextGen applications
- For proposed delegated separation procedures and equipment, conduct task analysis (including cognitive task analysis) and training needs analysis, to support development of training guidance for NextGen applications and technologies.
- Continue research to develop risk and error management strategies to identify and mitigate human-system errors.
- Evaluate the performance costs and benefits of various methods of decision support to include ability of human operators to understand automated system strengths and weaknesses.

## **KEY FY 2011 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:**

## Surface/Runway Operations Awareness

 Complete the study defining pilot information display requirements for use of enhanced cockpit technologies to support all-weather operations.

- Complete initial research to evaluate and recommend minimum display standards for use of enhanced and synthetic vision systems, as well as airport markings and signage, to conduct surface movements across a range of visibility conditions.
- Evaluate the effects of EFVS HUD clutter and masking on detection of potential ground conflicts during taxi operations across a range of visibility and lighting conditions.
- Conduct research on existing SVS and EFVS to evaluate time required, accuracy, and pilot workload
  associated with recognizing and reacting to potential ground collisions or conflicts with other
  aircraft, vehicles and obstructions across a range of visibility and lighting conditions, for single
  pilots and two pilot crews.

## **Reduced Separation**

- For closely spaced parallel operations, complete research to determine CDTI requirements to support dual missed approaches, and to evaluate workload and effects of blunder during the missed approach.
- Continue research to evaluate the impact and potential risks associated with use of Traffic Alert and Collision Avoidance System (TCAS) in NextGen procedures.

## **Delegated Separation**

- Continue to evaluate ADS-B/CDTI displays and procedures in a robust evaluation of merging and spacing operations for a range of controller-specified spacing and a variety of aircraft (not all same carrier or aircraft type).
- Complete research to evaluate and recommend procedures, equipage and training to safely conduct oceanic and en route pair-wise delegated separation.
- Develop human performance models to predict errors, their impacts on performance, and human responses for airborne merging and spacing, and CDTI-assisted visual separation (CAVS).
- For delegated separation applications, determine factors contributing to breakdowns in coordination and develop mitigating human factors recommendations for minimum equipment design, procedural and training methods.

## Cross-cutting

- Continue development of a repository of NextGen human factors data, incorporating results of human factors research and human factors issues that surface during operational experience with systems and procedures relevant to near to mid-term NextGen applications.
- Continue research to develop risk and error management strategies to identify and mitigate human-system errors.
- For proposed delegated separation procedures and equipment, conduct task analysis (including cognitive task analysis) and training needs analysis, to support development of training guidance for NextGen applications and technologies.
- Evaluate the performance costs and benefits of various methods of decision support to include ability of human operators to understand automated system strengths and weaknesses.

## **APPROPRIATION SUMMARY**

	Amount (\$000)
Appropriated (FY 1982-2009)	8,025
FY 2010 Enacted	8,247
FY 2011 Request	9,971
Out-Year Planning Levels (FY 2012-2015)	40,074
Total	66,317

Budget Authority	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
(\$000)	Enacted	Enacted	Enacted	Enacted	Request
Contracts: NextGen - Self Separation Human Factors	0	0	7,956	7,796	9,440
Personnel Costs Other In-house Costs Total	0 0	0 0	69 0 <b>8,025</b>	451 0 <b>8,247</b>	388 143 <b>9,971</b>

OMB Circular A-11, Conduct of Research and Development (\$000)	FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Basic	0	0	0	0	0
Applied	0	0	8,025	8,247	9,971
Development (includes prototypes)	0	0	0	0	0
Total	0	0	8,025	8,247	9,971

A12.d. – NextGen – Self-Separation Human Factors	FY 2011 Request			Program	Schedule		
Product and Activities	(\$000)	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
111-120 NextGen – Self Separation							
Surface/Runway Operations Awareness	3,162						
Conduct research to enable enhanced aircraft spacing for surface movements in low visibility conditions guided by enhanced and synthetic vision systems, as well as cockpit displays of aircraft and ground vehicles and associated procedures:							
Complete the study defining pilot information display requirements for use of enhanced cockpit technologies, including EFVS/SVS, TCAS, and CDTI to support all-weather operations.		•	<b>◊</b>				
Complete initial research to evaluate and recommend minimum display standards for use of enhanced and synthetic vision systems, as well as airport markings and signage, to conduct surface movements across a range of visibility conditions. Evaluate the effects of EFVS HUD clutter and masking on		•	<b>♦</b>				
detection of potential ground conflicts during taxi operations across a range of visibility and lighting conditions.			<b>♦</b>	<b>♦</b>	<b>♦</b>		
For existing SVS and EFVS, evaluate time required, accuracy, and pilot workload associated with recognizing and reacting to potential ground collisions or conflicts with other aircraft, vehicles and obstructions across a range of visibility and lighting conditions, for single pilots and two pilot crews.			<b>♦</b>	<b>♦</b>	<b>◊</b>		
Reduced Separation	1,424						
Conduct research and provide human factors guidance to reduce arrival and departure spacing including variable separation in a mixed equipage environment:  For closely spaced parallel operations, complete research to determine CDT1 requirements to support dual missed							
approaches, and to evaluate controller and flight crew workload and effects of blunder during the missed approach.  Continue research to evaluate the impact and potential risks		•	<b>*</b>				
associated with use of Traffic Alert and Collision Avoidance System (TCAS) in NextGen procedures.  Delegated Separation	2,674	•	<b>♦</b>	<b>♦</b>			
Conduct research to enable reduced and delegated separation in oceanic airspace and high density en route corridors:  Continue to evaluate ADS-B/CDTI displays and procedures in a full evaluation of merging and spacing operations for a range of controller-specified spacing and a variety of aircraft (not all same carrier or aircraft type).		•	<b>♦</b>	<b>♦</b>	<b>♦</b>		
Complete research to evaluate and recommend procedures, equipage and training to safely conduct oceanic and en route pair-wise delegated separation		•	<b>♦</b>				
Develop human performance models to predict errors, their impacts on performance, and human responses for airborne merging and spacing, and CDTI-assisted visual separation (CAVS).			<b>♦</b>	<b>♦</b>	<b>♦</b>		
For delegated separation applications, determine factors contributing to breakdowns in coordination and develop mitigating human factors recommendations for minimum equipment design, procedural and training methods			<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>
Cross-Cutting	2,180						
Continue development of a repository of NextGen human factors data, incorporating results of human factors research and human factors issues that surface during operational experience with systems and procedures relevant to near to mid-term NextGen applications		*	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>
For proposed delegated separation procedures and equipment, conduct task analysis (including cognitive task analysis) and training needs analysis, to support development of training guidance for NextGen applications and technologies.			<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	
Continue research to develop risk and error management strategies to identify and mitigate human-system errors Evaluate the performance costs and benefits of various method(s) of decision support to include ability of human operators to understand automated system strengths and weaknesses.		•	♦	♦	♦		
Personnel and Other In-House Costs	531						
Total Budget Authority	9,971	8,247	9,971	10,009	10,043	10,022	10,000
Notes: Out year numbers are for planning numbers	· ·	-	-	· ·	· ·	· ·	

Notes: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual budget process.

Budget Item	Program Title	Budget Request
A12.e.	NextGen - Weather Technology in the Cockpit	\$9,312,000

### GOALS:

This program supports the following Flight Plan goals: Increased Safety and Greater Capacity.

**Intended Outcomes:** By 2015, demonstrate that technology and automation, combined with policy, procedures, and regulatory oversight, meets the Next Generation Air Transportation System (NextGen) goal to reduce weather delays, leading to more efficient air traffic management (ATM) and improved aviation safety. Demonstrations will show that the technology and automation used in the cockpit provides pilots and aircrews with common weather situation awareness for safety and traffic flow management and assists airborne decision-making (e.g., adverse weather avoidance, etc.) by providing realistic, practical solutions to issues involving a myriad of variables.

The NextGen Concept of Operations (ConOps) requires technology and automation in the cockpit to produce a "common weather picture" that will enhance collaborative decision-making and improve the safety, capacity, and efficiency of air transportation system by identifying the safest and most efficient route for aircraft traversing areas impacted by adverse weather conditions. The germane characteristics of the technology generally identified in the NextGen ConOps are that it assists collaborative decision-making (pilot, controller, air traffic management, etc.), leverages both human and automation capabilities, and integrates weather data and information with other necessary operational information to provide decision support and increase situational awareness. In the near term, this technology will be implemented as machine to human interface requiring human analysis and "processing" of visual presentations. However, in the long-term, the technology and automation envisioned in the NextGen ConOps is expected to migrate to automated "processing" via machine-to-machine interface between ground-based and aircraft systems (e.g., analyzes and processing of data and information are performed automatically and recommendations are provided to the human overseeing the aircraft operation). As a result, the NextGen ConOps differs dramatically from current operations regarding weather procedures; therefore, an examination of the NextGen goals and related procedures is warranted.

**Agency Outputs:** One of the weather-related goals of NextGen is to reduce weather delays allowing more efficient and flexible air traffic management. The objective of the Weather Technology in the Cockpit program is to enable flight deck weather information technologies that will provide flight crews with timely, comprehensive weather information from on-board sensors, cross-link from nearby aircraft, and up-link from ground-based processors to support flight re-planning and weather hazard avoidance in flight, as well as insitu observations to nearby aircraft for weather avoidance decisions and ground-based processors for direct and forecast use in ATM decision support processes.

The program research will be accomplished in three phases. Phase I will be applied research to identify the gaps, Phase II will be the analysis and verification of the gaps to allocate the actions for the research, and will also validate the capability to provide current weather technologies that are not being currently made available to the cockpit such as icing and turbulence products. Phase III will be the validation of the research and the weather technologies developed.

Phase I of the program research will be accomplished using the following framework:

- Needs/Benefits Identify the minimum weather data link capabilities and services are necessary to support Now and Next Generation National Airspace Operations.
- Current Capabilities From the minimum weather datalink capabilities and services, identify the commercial and government capabilities that in are in place.
- Planned Capabilities From the minimum weather datalink capabilities and services, identify the planned (within 3 years) commercial and government capabilities that is planned without WTIC support.

The following is the research methods to accomplish Phase I:

Requirements Development – Develop a comprehensive user information needs statement and concept of operations for utilizing weather information in cockpit decision making based on the NextGen Concept of Operations.

Technology Assessment – Assess currently available onboard weather information processors, cockpit/ground interface capabilities, and communications infrastructure, identify gaps, and identify emerging technological capabilities to address the gaps.

Phase II of the program research will be accomplished through the following framework:

- Gaps Verification Identify and verify the gaps between the needs and current plus planned capabilities.
- Allocation of Actions Identify the needs that require government actions and the commercial roles and expectations.

The following is the research methods to accomplish Phase II:

- Proof of Concept Demonstrations Simulate, evaluate, and validate currently available but not fully developed systems for providing weather information to the cockpit.
- Weather Technology in the Cockpit Prototyping Develop semi-automatic prototypes of weather
  information integration decision support tool modules for flight deck technologies (e.g., flight
  management systems (FMS), electronic flight bags (EFB), etc.), to perform full, mission
  demonstrations, and to assess the integration of navigation, flight, and weather information into
  cockpit decision-making processes.

Phase III of the program research is to develop Weather Technology in the Cockpit prototypes for validation. The methods to accomplish this capability are the following:

- Prototyped Automated Weather Decision Support Tools (DST) Develop and verify the technologies and capabilities to support automated weather support tools
- Proof of Concept Demonstrations Simulate, evaluate, and validate automated DST with a high fidelity system
- Policy, Standards, and Requirements Develop standards and guidance necessary to obtain design approvals for weather decision support systems for use in the cockpit, define minimum pilot training requirements, develop procedures for weather separation on the flight deck, and recommend changes to FAA and international policies pertaining to the provision and utilization of weather information in the cockpit.

**Research Goals:** Research will enable the development of policy, standards, and guidance needed to safely implement weather technologies in the cockpit to provide shared situational awareness and shared responsibilities. The goals of the research are:

- By FY 2012, demonstrate currently available, but not fully developed systems for providing weather to the cockpit.
- By FY 2013, develop prototype weather information integration modules for flight deck technologies (e.g., FMS, EFB, etc.).
- By FY 2014, simulate, test, and evaluate cockpit use of weather decision support tools, including probabilistic forecasts.
- By FY 2014, simulate test, and evaluate fully integrated cockpit use of NextGen operational concepts, including weather technology in the cockpit.
- By FY 2014, support full mission demonstrations assessing weather information integrated in NextGen air and ground capabilities for controllers and pilots.
- By FY 2014, complete research necessary to develop guidance for airmen training and evaluation criteria and enhance the use of forecast products for pilot decision making.
- By FY 2015, demonstrate the integration of navigation and flight information, including weather information, into cockpit decision-making and shared situational awareness among pilots, dispatchers, air traffic controllers supported by NextGen air and ground capabilities.

**Customer/Stakeholder Involvement:** The Weather Technology in the Cockpit Program works with FAA organizations, other government agencies, and industry groups to ensure its priorities and plans are consistent with user needs. This is accomplished through:

- Guidance from the JPDO Next Generation Air Transportation System initiative through involvement in the Aircraft, Weather, and Integration Working Groups
- Inputs from the aviation community, including weather information providers, technology providers (e.g., avionics manufacturers, etc.), simulator training centers (e.g., Flight Safety, etc.)
- The annual National Business Aviation Association conference, the Friends/Partners in Aviation Weather Forum, scheduled public user group meetings, and domestic and international aviation industry partners
- Subcommittees of the FAA Research, Engineering and Development Advisory Committee representatives from industry, academia, and other government agencies annually review program activity, progress, and plans.
- RTCA SC-206 and Society of Automotive Engineers G-10 subcommittees

**R&D Partnerships:** The Weather Technology in the Cockpit Program leverages research activities with members of other government agencies, academia, and the private sector through interagency agreements, university grants, and Memorandums of Agreement.

## Partnerships include:

- National Center for Atmospheric Research.
- NASA Langley and Glenn Research Centers.
- Army Cold Regions Research and Engineering Laboratory.
- Public and private universities.
- Initiatives with airlines, pilots, and manufacturers.

**Accomplishments:** The Weather Technology in the Cockpit program was a new start in FY 2009. The program developed the initial Now Generation Concept of Operations v.01 for weather technology in the cockpit based on foundational elements identified in the NextGen Concept of Operations, weather dissemination management, and GA operations.

## FY 2010 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:

- Developed Mid-Term Concept of Operations and obtained partners, stakeholder, and user
  concurrence for weather technology in the cockpit based on foundational elements identified in the
  NextGen Concept of Operations, including integration of weather in flight deck decision support
  tools, weather dissemination management, and GA operations.
- Based on capabilities described in the NextGen Concept of Operations, developed initial
  comprehensive weather information user needs statement for the cockpit environment in different
  types of operation (e.g., Part 121, Part 135, etc.) for each phase of flight (pre-flight, departure, en
  route, etc.) in the near-, mid-, and long-term NextGen operating environments.
- Assessed currently available onboard weather information processing technology.
- Identified the specific types of weather information being integrated into cockpit flight management systems (FMS) and the decisions supported by the information.
- Assessed currently available and emerging ground and cockpit communications interface technologies.
- Assessed currently available options for communications systems (air-ground, ground-air, and air-air).
- Assessed the bandwidth demand of graphical icing products (Current Icing Product and Forecast Icing Product) and graphical turbulence products (Graphical Turbulence Guidance) for potential delivery via existing and planned FAA data link services.
- Identified test bed(s) to develop prototype weather information integration modules for flight deck technologies (e.g., FMS, EFB, etc.).

### **FY 2011 PROGRAM REQUEST:**

### Ongoing Activities

Work will continue in FY 2011 on the development of prototype weather information integration modules for flight deck technologies (e.g., FMS, EFB, etc.), and will continue research activities necessary to develop the concepts and the requirements for the provision, use, and integration of weather technology and information in NextGen cockpit operations.

#### **New Initiatives**

The new research initiatives that will commence in FY 2011 are related to the cockpit decision support systems. There will be an emphasis on simulations to identify weather-alerting capabilities, specific cognitive or skill deficiencies related to weather knowledge and weather encounters.

## **KEY FY 2011 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:**

- Determine what incremental weather information is needed in cockpit operations and when is it needed for tactical (less than 20 minutes) decision support and situational awareness planning (121, 135, 91).
- Determine standards necessary for obtaining design approvals for cockpit weather decision support systems.
- Quantify the regulatory impact of employing new types of weather information, weather technologies, and operational concepts.
- Evaluate procedures for utilizing weather information in cockpit decision-making processes and define pilot training requirements.
- Recommend changes to national and international policies pertaining to the provision of aviation weather information.
- Research building prototypes of the integrated weather information with flight crew decision making processes through various flight deck technologies, such as Flight Management Systems, multi-function displays, etc.
- Research general aviation community to identify best practices to incorporate VFR ceiling and visibility limitations in conjunction with minimum safe altitudes (terrain avoidance planning).
- Research and evaluate currently available systems for providing weather information to the cockpit, in both machine-to-human and machine-to-machine modes, for the new types of operations anticipated in the fully implemented NextGen operating environment, including Trajectory-Based Operations (TBO), Equivalent Visual Operations (EVO), Super Density Operations.
- Research and simulate real world weather hazards to flight and determine most appropriate way to alert pilots of weather hazards influencing their flight.

## **APPROPRIATION SUMMARY**

	Amount
	(\$000)
Appropriated (FY 1982-2009)	8,049
FY 2010 Enacted	9,570
FY 2011 Request	9,312
Out-Year Planning Levels (FY 2012-2015)	37,577
Total	64,508

<b>Budget Authority</b>	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
(\$000)	Enacted	Enacted	Enacted	Enacted	Request
Contracts					
Weather Technology in the Cockpit	0	0	7,894	8,945	8,369
Personnel Costs	0	0	155	539	764
Other In-house Costs	0	0	0	86	179
Total	0	0	8,049	9,570	9′312

OMB Circular A-11, Conduct of Research and Development (\$000)	FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Request	FY 2011 Request
Basic	0	0	0	0	0
Applied	0	0	8,049	9,570	9,312
Development (includes prototypes)	0	0	0	0	0
Total	0	0	8,049	9,570	9,312

A12.e. – Weather Technology in the Cockpit	FY 2011 Program Schedule						
Product and Activities	Request	FY	FY	FY	FY	FY	FY
111-140 Weather in the Cockpit	(\$000) 8,369	2010	2011	2012	2013	2014	2015
Concept and Requirements Development							
Develop comprehensive program plan for Weather Technology in the Cockpit.		•					
Develop Concept of Operations for weather technology in the cockpit.		•		<b>◊</b>	<b>◊</b>		<b>◊</b>
Develop comprehensive weather information user needs statement.		•	<b>◊</b>				
Determine how the "common weather picture" is to be maintained when the 4D Wx Cube is being constantly updated (e.g., appropriate update rate impacts, workload).			<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>◊</b>	
Technology Assessment	0						
Identify weather information currently being integrated in cockpit FMS		•	<b>◊</b>				
Assess currently available onboard weather information processing technology		•	<b>◊</b>				
Assess currently available and emerging ground and cockpit communications interface technologies		•	<b>◊</b>				
Assess currently available options for communications systems (air-ground, ground-air, and air-air)		٠	<b>◊</b>				
Proof of Concept Demonstrations							
Simulate and evaluate candidate systems for weather in the cockpit		•	<b>◊</b>	<b>◊</b>	<b>◊</b>		
Identify, validate, and document communications systems attributes affecting weather in the cockpit			<b>◊</b>	<b>◊</b>	<b>♦</b>		
Develop standards and guidance necessary to obtain design approvals of weather decision support tools			<b>◊</b>	<b>◊</b>	<b>◊</b>		
Simulate, test, and evaluate cockpit use of weather decision support tools and probabilistic forecasts				<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>◊</b>
Simulate, test, and evaluate fully integrated cockpit use of NextGen operational concepts, including WTIC				<b>◊</b>	<b>♦</b>	<b>◊</b>	<b>◊</b>
Weather Technology in the Cockpit Prototype							
Develop prototype weather information integration modules for flight deck technologies (e.g., FMS, etc.)		•	<b>◊</b>	<b>◊</b>	<b>♦</b>	<b>◊</b>	
Perform and support full mission demonstrations assessing weather information integrated in the cockpit				<b>◊</b>	<b>♦</b>	<b>◊</b>	<b>◊</b>
Policy, Standards, and Requirements							
Conduct research to develop guidance for airmen training and evaluation criteria		•	<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>◊</b>
Conduct research to necessary to develop guidance to enhance use of forecasting products for pilot decision making		•	<b>◊</b>	<b>◊</b>	<b>♦</b>	<b>◊</b>	<b>♦</b>
Conduct research necessary to evaluate procedures for including weather information in the flight deck decision making processes		•	<b>◊</b>	<b>♦</b>	<b>◊</b>		
Quantify the regulatory impact of integrating weather into flight deck decision-making processes			<b>◊</b>	<b>◊</b>			
Recommend changes and revisions to US and international policies pertaining to WTIC				<b>◊</b>	<b>♦</b>	<b>◊</b>	<b>♦</b>
Personnel and Other In-House Costs	943						
Total Budget Authority	9,312	9,570	9,312	9,360	9,407	9,406	9,404
Notes: Out year numbers are for planning nurnoses only. A	atual funding n						

Notes: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual budget process.

Budget Item	Program Title	Budget Request
A13.a.	Environment and Energy	\$15,374,000

#### GOALS:

This program supports the following Flight Plan goals: Greater Capacity and International Leadership.

**Intended Outcomes:** The Environment and Energy Program helps achieve FAA's environmental compatibility goal and supports the FAA Flight Plan. The program also provides fundamental knowledge and tools to support the Next Generation Air Transportation System (NextGen) research and development plan. The efforts complement activities in aircraft technology, alternative fuels, and operational solutions, environmental operational assessments and environmental management systems development under NextGen investments.

The Program specifically supports the following outcomes:

The Flight Plan Noise Exposure Performance Target to reduce the number of people exposed to significant noise by four percent per year through FY 2013 as measured by a three-year moving average, from the three-year average for calendar year 2000 – 2002. FY 2011 Target is -20%. Specific activities include:

- Conduct research and develop analytical tools to understand better the relationship between noise
  and emissions and different types of emissions, and to provide the cost-benefit analysis capability
  necessary for data-driven decision-making.
- Leverage a broad cross section of stakeholders through the Partnership for Air Transportation
  Noise and Emissions Reduction (PARTNER) Center of Excellence (COE) to foster breakthrough
  scientific, operations, policy and work force advances to mitigate noise impacts.
- Identify and assess the impact and enable implementation of operational procedures to reduce noise in the National Air Space (NAS).
- Minimize the impact of aircraft noise actions include: advancing the state of science/knowledge
  concerning effects of aircraft noise and assessing the need to refine noise impact criteria;
  improving aircraft certification standards and current operational procedures; and assessing the
  benefits of implementing improved noise control and mitigation measures.

The Flight Plan Aviation Fuel Efficiency Performance Target to improve aviation fuel efficiency by another 1 percent over the FY 2008 level (for a total of 7 percent) through FY 2009, and 1 percent each subsequent year through FY 2013 to 11 percent, as measured by a three-year moving average of the fuel burned per revenue mile flown, from the three-year average for calendar years 2000-2002. FY 2011 Target is - 8%. Specific activities include:

- Conduct research and develop analytical tools to better understand the relationship between noise, fuel burn and emissions and different types of emissions, and to provide the cost-benefit analysis capability necessary for data-driven decision making.
- Leverage a broad cross section of stakeholders through the PARTNER COE to foster breakthrough scientific, operations, policy and work force advances to mitigate emissions impacts.
- Assess the impact and enable implementation of operational procedures to enhance fuel efficiency and reduce aviation emissions in the NAS.
- Minimize the impact of aviation emissions actions include: advancing the state of science/knowledge concerning atmospheric/health effects of aviation emissions; and improving aircraft certification standards and operational procedures; and assessing the benefits of implementing improved emissions control and mitigation measures.

The Flight Plan International targets to foster international environmental standards, recommended practices, and guidance material that are technically feasible, economically reasonable, provide a measurable environmental benefit and take interdependencies among various emissions and between emissions and noise into account. Specific activities include:

Working with the international aviation community to reduce aircraft noise and emissions

- Improving aircraft noise and engine exhaust emissions certification standards and operational procedures.
- Promoting compatible land use.
- Assessing the benefits of abatement measures to reduce population impacted by aircraft noise.
- Assessing the benefits of measures to improve fuel efficiency and reduce aviation emissions, and the potential to reduce health and climate impacts.
- Assessing the interrelationships and tradeoffs between measures to reduce aircraft noise and engine exhaust emissions.

The Program also contributes to the following outcomes:

- Providing the foundation for the NextGen investments that help achieve and manage the NextGen
  goal to promote environmental stewardship by reducing significant community noise and air quality
  emissions impacts in absolute terms, limiting or reducing the impact of aviation greenhouse gas
  emissions on global climate, and balancing aviation's environmental impact with other societal
  objectives. Specific activities include:
  - Develop fundamental knowledge to aid in better science-based understanding of impacts
    of aircraft noise and aviation emissions on air quality and climate change to enable the
    NextGen goal of sustained aviation growth by 2025, while reducing significant community
    noise and air quality emissions in absolute terms.
  - Developing tools to assess the ability of technologies for airframes, more efficient engines, advanced propulsion concepts, new fuels, new materials, market based options and policies to reduce source noise and emissions.

**Agency Outputs:** The program is developing and validating methodologies, models, metrics, and tools to assess and mitigate the effect of aircraft noise and aviation emissions in a manner that balances the interrelationships between emissions and noise and considers economic consequences. It is also developing computer models and impact criteria for use by civil aviation authorities in assessing proposed actions. Researchers are also developing a better science-based understanding of the impacts of aircraft noise and aviation emissions.

### **Research Goals:**

- By FY 2011, demonstrate enhanced capability to conduct comprehensive cost-benefit analyses of environmental policy options with quantified uncertainties.
- By FY 2011, deliver Version 1.0 of AEDT local for airport applications to Design Review Group.
- By FY 2011, develop architecture for AEDT noise and emissions modules communications
- By FY 2011, harmonize AEDT and Aviation environmental Portfolio Management Tool (APMT) databases for tradeoffs and interdependency analyses
- By FY 2011, continue to develop and implement as they become available methods and models to analyze aircraft, auxiliary power units, and ground support equipment emissions and their impact on air quality.
- By FY 2011, advance modeling capability for dispersion of chemically reactive aircraft plume
- By FY 2011, advance our understanding of the evolution of volatile PM emissions in order to specify measurement and sampling procedures.
- By FY 2011, develop new technical guidance for noise and aircraft engine emissions certification.
- By FY 2011, develop new standards and methodologies to quantify and assess the impact of aircraft noise and aviation emissions.
- By FY 2011 provide computer models and impact criteria for use by civil aviation authorities in environmental assessments.
- By FY 2011, develop noise propagation models to better capture air turbulence, meteorology, terrain, and wave nature of low-frequency noise.
- By 2011, initiate effort to include renewable fuels analytical capability in aviation environmental models
- By 2011, provide analyses of the effects of application of cap and trade schemes to aviation

- By FY 2012, develop and disseminate a preliminary planning version of Aviation Environmental Design Tool that will allow integrated assessment of noise and emissions inventories at the local, regional and global levels.
- By FY 2013, develop and field a fully validated suite of tools, including the Environmental Design Space (EDS) and APMT, which will allow cost benefit analyses.
- By FY 2013, use collected hazardous air pollutant and particulate matter emissions data, directly
  measured from aircraft engines to replace, to the extent possible, approximation methods and
  factors used in modeling tools.
- By FY 2014, initiate development of simulation based environmental models
- By FY 2015, advance capability for aviation noise ,emissions and fuel burn related integrated impact assessment
- By 2015, initiate development of environmental models components to enable intermodal analyses
- By 2015, demonstrate a first version of a simulation based environmental model

In addition, the program is conducting government-industry sponsored research through the PARTNER COE to develop methodology and collect data to identify and more accurately characterize the sources and incremental impacts associated with aircraft noise and aviation emissions, and generate improved solutions to deal with these impacts. Specifics of these cooperative research efforts include:

- By FY 2011 develop and disseminate new methodologies and procedures to quantify and assess
  the impact of aircraft noise and aviation emissions for use by industry, government, and the public

   also suggest a new metric to assess the acceptability of sonic boom from supersonic aircraft.
- By FY 2011, advance best practices in aviation emissions PM and HAPs measurements and characterize in-service aircraft
- By FY 2011, assess current understanding of aviation impacts on sleep disturbance and/or annoyance.
- By FY 2011, assess the impacts of aviation on regional air quality including the effects of PM emissions that result when aircraft climb and cruise
- By FY 2011, test and deploy elements of an Internet capability to educate and inform the public about aviation and the environment.
- By FY 2011, demonstrate capability to conduct comprehensive cost-benefit analyses of environmental policy options with quantified uncertainties.
- By FY 2011, Initiate investigation of the combined health effects from aircraft noise and emissions exposure.
- By FY 2011, begin investigating new methodologies to establish acceptability of noise from future unconventional aircraft such as open rotor-engine aircraft and low-boom supersonic jets.
- By FY 2011, assess the level of certainty of aviation's impact on climate change and advance the state of practical science research, with special emphasis on addressing the identified major uncertainties and gaps in our understanding of current and projected impacts of aviation on climate and to develop metrics that will enable us to characterize those impacts for purposes of advising options for mitigation.

**Customer/Stakeholder Involvement:** FAA works closely with other federal agencies, industry, academia, and international governments and organizations to design research and development (R&D) efforts that can mitigate the environmental impact of aviation. This unified regulatory approach to research identifies and influences technologies, models, regulations, certification criteria and policies that can improve our present and future global environment.

- The FAA Aviation Rulemaking Advisory Committee -- a formal standing committee composed of representatives from aviation associations and industry. The committee conveys its recommendations, advice, and information to FAA for consideration in rule making activities, and its harmonization working groups ensure that domestic and international aircraft noise certification regulations impose uniform standards upon the aircraft of all countries.
- International Civil Aviation Organization's (ICAO) Committee on Aviation Environmental Protection (CAEP) -- this committee establishes and continually assesses the adequacy of international aviation environmental standards for aircraft noise and engine exhaust emissions.

- The Federal Interagency Committee on Aviation Noise (FICAN) -- provides forums for debate over future research needs to better understand, predict and control the effects of aviation noise, and to encourage new technical development efforts in these areas. FICAN also evaluates such research and publishes its findings, which sometimes lead to recommendations on improving the state of the practice of aviation noise impact assessment and abatement. FICAN may conduct annual public forums in different geographic regions as a means to better align noise abatement research with local public concerns.
- Aviation Emissions Characterization (AEC) Roadmap developed by government and industry to
  coordinate research and regulatory activities. The objective of this long-range coordination
  mechanism is to advance the necessary understanding of particle formation, composition, and
  growth and transport mechanisms for assessing aviation's particulate emissions, secondary
  particulate formation from gaseous emissions, and hazardous air pollutants, and understanding
  their impact on human health and the environment. Ultimately, if warranted, this activity will help
  guide the development of aviation related technology that results in reduced emissions.
- NextGen -- FAA is leading an Environmental Working Group (EWG) responsible for leading
  environmental dimensions of the JPDO. The EWG comprises FAA, the National Aeronautics and
  Space Administration (NASA), the Environmental Protection Agency (EPA), DoD, Department of
  Commerce, Council on Environmental Quality, and Office of the Secretary of Transportation, as well
  as industry, academia, local government, and community groups. The efforts of the EWG are
  centered on advancing the national vision and recommendations for aviation in the NextGen and in
  the congressionally mandated study on "Aviation and the Environment."
- Climate Change Science Program (CCSP) The FAA is working with the CCSP program office and
  its individual member agencies to focus research efforts that address the uncertainties and gaps in
  our understanding of current and projected impacts of aviation on climate, and to develop metrics
  to characterize these impacts.
- Commercial Alternative Aviation Fuel Initiative (CAAFI) -- Concerns about rising fuel costs, energy supply security and the environmental effects of aviation are providing a significant stimulus to take a fresh look at the use of alternative fuels for aviation. To forge a way ahead, FAA founded the Commercial Aviation Alternative Fuels Initiative (CAAFI) together with Airports Council International-North America (ACI-NA), the Air Transport Association (ATA) and the Aerospace Industries Association (AIA). CAAFI is teaming with the DoD to leverage their substantial efforts advancing alternative fuels for military aviation— driven by energy security considerations. CAAFI is also working with other Federal agencies such as NASA.
- Aviation Climate Change Research Initiative (ACCRI) The FAA worked with NASA and NOAA to
  establish the ACCRI. The primary objective is to coordinate and sponsor collaborative research
  efforts to reduce key scientific uncertainties in quantifying aviation-related climate impacts while
  providing timely scientific input to inform optimum mitigation actions and policies for NextGen and
  ICAO.

**R&D Partnerships:** Through a series of Memorandums of Agreement (MOA), FAA works closely with NASA to identify long-term source abatement technologies for noise and emissions. Together, the agencies also work with industry and academia to assess the possible global impact of aircraft engine exhaust emissions. In FY 2005, FAA signed an MOA with DoD to pursue joint activities to understand and mitigate aviation noise and emissions. The FAA is also pursuing collaborative agreements with DoE, and EPA to leverage resources to address aviation's environmental impact. The FAA plans to pursue collaborative agreements with the US Department of Health and Human Services, the US Department of Education, as well as international agencies and international researchers, to study the public health and welfare impacts of aircraft noise exposure.

Through the JPDO NextGen, the program supports the EWG comprising FAA, NASA, EPA, DoD,
Department of Commerce, Council on Environmental Quality, and Office of the Secretary of
Transportation, as well as industry, academia, local government, and community groups. The
EWG is pursuing an intensive, balanced approach, emphasizing alignment across stakeholders in
developing needed business and technology architectures and policy options and approaches, as
well as other relevant tools, metrics, and products to address aviation's environmental impact.

- The Volpe National Transportation Systems Center continues, in collaboration with the Environment and Energy Program, to provide substantial technical assistance in the areas of aircraft noise and engine emissions measurement and assessment.
- FICAN also offers a forum for partnership, as the Committee comprises all federal agencies concerned with aviation noise. The FAA works with this committee to foster greater, more cost-effective partnering in aviation noise research among all agencies.

**Accomplishments:** The number of people exposed to significant noise levels was reduced by about 90 percent between 1975 and 2008. Today's aircraft are also 70 percent more fuel-efficient than jet aircraft of the 1960s. Reduced fuel consumption and technologies to reduce emissions have also led to a 90 percent reduction in carbon monoxide, smoke, and other aircraft emissions. Specific recent accomplishments include:

#### FY 2009:

Developed methodologies to quantify and assess the impact of PM and HAPs.

### FY 2008:

- Developed a comprehensive greenhouse gas life cycle assessment methodology for alternative fuels
- Released updated version of EDMS (Emissions and Dispersion Modeling System) model that allows emissions inventory and dispersion of airport hazardous air pollutants
- Released a simplified version of AEDT to support environmental assessment efforts of other Government agencies and research establishments
- Enhanced capability of EDS model as technology evaluator with addition of more engine and airframe combinations
- Conducted environmental assessments to support the NextGen program office and international negotiations
- Developed preliminary cost-benefit estimates of using ultra low sulfur jet fuels
- Developed estimates of health impacts for NextGen 2025 emission scenarios
- Improved climate model and advanced simulations and analysis for estimation of aviation climate impacts
- Developed a strategic noise research framework aimed at improving understanding and quantification of aviation's noise impacts, and developing more effective mitigation solutions.
- Develop and distributed APMT, the first generation of integrated noise and emission prediction and modeling tools, including an environmental cost module.
- Enabled implementation of a new continuous-descent approach noise abatement and fuel burn (emissions) reduction procedure at low-traffic airports during nighttime operations and optimize aircraft routing to reduce fuel usage.

## FY 2007:

- Developed and demonstrated the first versions of AEDT, EDS and APMT. These tools will
  revolutionize approaches to aviation environmental assessment and regulation by enabling a
  comprehensive approach that assesses interdependencies and optimizes solutions based on costbenefit analyses of impacts and mitigation. The tools will provide significant cost savings and other
  benefits to users.
- Released new versions of computer models to assess noise and emissions exposure incorporating the latest science and methodologies
- Completed the analyses supporting a Report to Congress, jointly with EPA, on the impact of aircraft
  emissions on air quality in nonattainment areas; ways to promote measures that allow aviation to
  enhance fuel efficiency and to reduce emissions; and opportunities to reduce air traffic
  inefficiencies that both waste fuel and increase emissions.
- Completed an assessment of the feasibility of using alternative fuels in commercial aviation. The
  assessment included a comprehensive assessment of well to tail emissions from coal and gas
  derived and renewable alternative fuels.

### FY 2006:

- Released advanced version of highly influential advanced computer models for airport and heliport
  noise analysis –over 1000 users in over 40 countries. The models are used in over 160 U.S. airport
  studies involving more than \$1.8 billion in airport noise compatibility grants, and recently provided
  the basis for an aircraft noise exposure prediction model for air tours in the Grand Canyon National
  Park.
- Released advanced version of a computer model that is used extensively by over 300 domestic and international users in airport air quality analyses and has won the EPA's highest endorsement.
- JPDO Environmental Integrated Product Team (E-IPT, now EWG) instituted a framework for
  establishing national goals for aviation and the environment and completed a "gap analysis" of
  environmental R&D programs necessary to meet NextGen goals.
- Reported to Congress regarding a comprehensive national study of ways to reduce aircraft noise and emissions.

### FY 2010 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:

Noise and Emissions Analyses and interrelationships

- Completed an annual assessment of noise exposure and fuel burn.
- Completed a significant example analysis to demonstrate the benefit of cost-benefit analyses.
- Delivered AEDT Version 3.0 for CAEP/8 related analysis.
- Delivered APMT Version 3.0 for CAEP/8 related analysis.
- Delivered EDS Version 3.0, including validated vehicle library and demonstrated capability within AEDT framework for CAEP/8 related analysis.
- Completed upgrades to INM (Integrated Noise Model), EDMS, MAGENTA (Model for Assessing Global Exposure to the Noise of Transport Aircraft), and SAGE (System for Assessing Aviation's Global Emissions) modules for incorporation into AEDT and to support existing customers as necessary.
- Continued comprehensive assessment, including quantified uncertainties, of EDS, AEDT, and APMT.
- Continued developments of tools to aid in demonstrating Continuous Descent Arrival (CDA) procedures in high-density environment.
- Continued development of tools to aid in demonstrating other environmentally beneficial procedures in the NAS.
- Developed beta version of integrated framework for AEDT, APMT, and EDS tools.
- Incorporated methodology to account for population growth in the environmental impact assessments.
- Tested and deployed first elements of the website to educate and inform the public about aviation and the environment and to enable the community to participate actively in public processes.

### Aircraft noise

- Updated and/or developed, as well as published: procedures and technical guidance for noise certification of aircraft (transport category and subsonic jet airplanes, small propeller airplanes, and rotorcraft, as well as unmanned aerial vehicles, supersonic airplanes, and very light jets, if data are available) that are both harmonized internationally and simplified.
- Established comprehensive research plans to better understand which noise exposure metrics best correlate with health and welfare impacts such as community annoyance and sleep disturbance.
- Continued updating current understanding of aviation noise impacts on annoyance and or sleep disturbance.
- Continued work to establish acceptability of low-boom supersonic flight as perceived indoors.
- Continued developing noise propagation models to better capture effects of air turbulence, meteorology, and terrain on outdoor community noise.
- Assessed state of knowledge on potential health impacts of aircraft noise and investigate methodologies to incorporate these impacts in the APMT framework.
- Supported efforts to update land use planning compatibility guidance.

- Continued to assess potential global benefits of using newly-developed noise reduction technologies; identify technology goals for long term reduction of aircraft noise.
- Continued to improve NoiseQuest website and assess its efficacy.
- Assessed land use practice and investigated mitigation strategies beyond 65 dB DNL
- Conducted two COE focused sessions at a national and an international conference.

#### Aviation emissions

- Continued to develop and publish procedures and technical guidance materials for affordable engine exhaust emissions testing and certification that are both simplified and harmonized.
- Developed and disseminated methodologies and procedures to quantify and assess the impact of PM and HAPs emissions in the aviation environment.
- Assessed potential global benefits of using newly developed emissions reduction technologies, and identify technology goals for long term reduction of aircraft engine emissions and fuel burn.
- Advanced best practices in aviation emissions PM and HAPs measurements.
- Continued collecting PM and HAPs measurement data and develop speciation profiles to improve and/or replace approximation methods and advance those data sources in models used to isolate sources, and identify aviation's contribution to impacts.
- Continued comparison of detailed chemistry computations to aviation environmental tools approximations.
- Continued developing a model of near field plume evolution/expansion to feed air quality models.
- Assessed whether there are unique health impacts or other environmental effects, particularly for NextGen scenarios, including particulate matter emissions and hazardous air pollutants from aviation sources, with specific focus on the aircraft engine.
- Completed assessment of the impacts of aviation on air quality including the effects of particulate matter emissions attributable to aircraft climb and cruise operations.
- Initiated development of guidance material related to dispersion, chemical and transport modeling (i.e., assessment of aviation-related air pollutant concentrations that effect air quality).
- Continued evaluation of the necessity for establishing standards pertaining to particulate matter emissions from aircraft engines.
- Incorporate climate impacts metrics in environmental assessment models and examine their suitability for environmental cost-benefit analyses
- Conducted two COE focused sessions at a national and an international conference.
- Exercised databases of PM emissions to assess trends as a function of engine combustor technology and other emissions, and impacts on health and welfare, in order to advise options for mitigation, as required.
- Published guidance material related to dispersion, chemical and transport modeling
- Continue to develop and publish:
- Procedures and technical guidance materials for affordable engine exhaust emissions testing and certification that are both harmonized and simplified.
- Develop and disseminate methodologies and procedures to quantify and assess the impact of Particulate Matter (PM) and Hazardous Air Pollutant (HAP) emissions in the aviation environment.
- Assess potential global benefits of using newly developed emissions reduction technologies, and identify technology goals for long term reduction of aircraft engine emissions and fuel burn.
- Advance best practices in aviation emissions PM and HAPs measurements.
- Continue collecting PM and HAPs measurement data and develop speciation profiles to improve and/or replace approximation methods and advance those data sources in models used to isolate sources, and identify aviation's contribution to impacts.
- Continue assessment of the relative effect of various emissions on climate forcing functions.
- Continue comparison of detailed chemistry computations to aviation environmental tools approximations.
- Continue developing a model of near field plume evolution/expansion to feed air quality models.

- Assess whether there are unique health impacts or other environmental effects, particularly for NextGen scenarios, including particulate matter emissions and hazardous air pollutants from aviation sources, with specific focus on the aircraft engine.
- Continue assessment of uncertainty of impact of aviation on climate change.
- Complete assessment of the impacts of aviation on air quality including the effects of particulate matter emissions attributable to aircraft climb and cruise operations.
- Initiate development of guidance material related to dispersion, chemical and transport modeling (i.e., assessment of aviation-related air pollutant concentrations that effect air quality).
- Continue evaluation of the necessity for establishing standards pertaining to particulate matter emissions from aircraft engines.

#### FY 2011 PROGRAM REQUEST:

In accordance with the agency's mission and legislative mandates, FAA must assess and mitigate the environmental impacts of aviation. The FAA will continue to work with NASA, other Departments and Agencies, the manufacturing industry, and international authorities to support the development and implementation of aircraft environmental certification regulations through proactive response to changes in airplane and engine technology, measurement/analysis technology, regulatory policy, and international regulatory initiatives.

FAA will continue to work with NASA and other Departments and Agencies as appropriate in research efforts identifying noise and emissions reduction technologies that may enter the marketplace within the next 10-15 years. The agency will use these research findings to consider new environmental certification standards and procedures for the next generation of transport aircraft.

## Ongoing Activities

Aerospace systems have historically been designed – and regulations for their certification and use have been written – as though aviation noise and various emissions had nothing to do with one another. However, aviation noise and emissions are highly interdependent phenomena. Future environmentally responsible aviation policy and rule making must be based on a new, interdisciplinary approach. Furthermore, this approach must be made as affordable as it is effective.

Existing analytical tools are inadequate to assess interdependencies between noise and emissions or analyze the cost/benefit of proposed actions. Accordingly, FAA is developing a robust new comprehensive framework of aviation environmental analytical tools and methodologies to perform these functions. The long-term aim is to provide a seamless, comprehensive set of tools to address all aspects of noise and emissions. The elements of this framework include:

- EDS' capability to provide integrated analysis of noise and emissions at the aircraft level.
- AEDT comprises of other integrated aviation noise and emissions modules and incorporates input from EDS- will provide integrated capability of generating interrelationships between noise and emissions and among emissions at the local, regional and global levels.
- APMT incorporates input from AEDT, EDS and other modules will provide the common, transparent cost/benefit methodology needed to optimize national aviation policy in harmony with environmental policy.
- These suite of tools will allow:
  - Government agencies to understand how proposed actions and policy decisions affect aviation noise and emissions.
  - Industry to understand how operational decisions affect proposed projects affecting aviation noise and emissions.
  - The public to understand how actions by government and industry affect aviation noise and emissions.

Anticipated benefits of this initiative include the ability to:

- Optimize environmental benefits of proposed actions and investments.
- Improve data and analysis on airport/airspace capacity projects.

- Increase capability to address noise and emissions interdependencies in the resolution of community concerns.
- Aid in more effective R&D portfolio management.
- Remove environmental roadblocks to capacity growth.
- Maximize efficiency of energy usage
- Continue global leadership for the United States in environmentally responsible aviation.

#### Other activities include:

- Continue activities through the PARTNER COE to develop methodology and collect data to identify and more accurately characterize the sources and incremental impacts associated with aircraft noise and aviation emissions, and generate improved solutions to deal with these problems.
- Provide analytical support to complete transition of existing analytical tool modules (e.g., INM, EDMS, SAGE, MAGENTA), to AEDT.
- Support FAA role in the International Civil Aviation Organization Committee on Aviation
   Environmental protection (ICAO/CAEP) working groups for assessing the technological, scientific,
   operational, and economic aspects associated with setting international standards and
   recommended practices for aircraft noise and engine exhaust emissions.
- Continue efforts to ensure the currency of the regulation and technical guidance materials concerning aircraft noise and engine exhaust emissions certification requirements.

#### KEY FY 2011 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:

Noise and Emissions Analyses and interrelationships

- Complete an annual assessment of noise exposure and fuel burn.
- Complete a significant example analysis to demonstrate the benefit of cost-benefit analyses.
- Develop architecture for noise and emissions modules communications
- Develop model for assessing global exposure to noise from transport aircraft
- Enhance aircraft noise and emissions modeling for airspace management activities
- Release screening model and its updates for airport air quality analyses
- Publish handbook for airport air quality analysis
- Develop guidance document for estimating and reducing emissions from airport ground support equipments
- Continue upgrades to and assessment of AEDT, EDS and APMT models and use these models for analyses to support the work program of the 9<sup>th</sup> cycle of CAEP
- Release AEDT model for local applications
- Harmonize AEDT and APMT databases and code management protocols
- Integrate cost and socio-economic data for APMT model
- Develop tools to aid in demonstrating other environmentally beneficial procedures in the National Airspace System (NAS).

#### Aircraft noise

- Continue to update and/or develop, as well as publish: procedures and technical guidance for noise certification of aircraft (transport category and subsonic jet airplanes – including open-rotor engine airplanes, small propeller airplanes, and rotorcraft, as well as unmanned aerial vehicles, supersonic airplanes, and very light jets, if data are available) that are both harmonized internationally and simplified.
- Begin investigating feasibility of more stringent international noise certification standards for transport category and subsonic jet airplanes.
- Continue assessing land use practice and investigating mitigation strategies beyond 65 dB DNL.
- · Apply methodologies to incorporate potential health impacts of aircraft noise exposure within APMT
- Continue studies to:

- Better understand which noise exposure metrics best correlate with health and welfare impacts such as community annoyance and sleep disturbance, according to comprehensive research plans.
- Advance understanding of long-term health impacts of noise exposure
- Establish acceptability of low-boom supersonic flight as perceived indoors.
- Validate methodologies in noise propagation models to better capture the effects of air turbulence, meteorology, and terrain on outdoor community noise.
- Assess potential global benefits of using newly-developed noise reduction technologies; identify technology goals for long term reduction of aircraft noise.
- Identify technology goals for long term reduction of aircraft noise.
- Support efforts to update land use planning compatibility guidance.
- Improve interaction with the public on potential aviation noise impacts on communities
- With the "Aviation emissions activity," conduct two COE focused sessions at a national and an
  international conference.
- Publish COE PARTNER research findings

#### Aviation emissions

- Continue to develop and publish procedures and technical guidance materials for affordable engine
  exhaust emissions testing and certification that are both harmonized and simplified.
- Develop and disseminate methodologies and procedures to quantify and assess the impact of aircraft emissions on the aviation environment.
- Continue assessment of potential global benefits of using newly developed emissions reduction technologies, and identify technology goals for long term reduction of aircraft engine emissions and fuel burn.
- Continue advance best practices in aviation PM, HAPs and speciated HC emissions measurements.
- Continue comparison of detailed chemistry computations to aviation environmental tools approximations.
- Continue development of a model of near field plume evolution/expansion to feed air quality models.
- Examine need for further assessment of the impacts of aviation on air quality including the effects of particulate matter emissions attributable to aircraft climb and cruise operations.
- Continue development of guidance material related to dispersion, chemical and transport modeling (i.e., assessment of aviation-related air pollutant concentrations that effect air quality)
- Continue evaluation of the necessity for establishing standards pertaining to particulate matter emissions from aircraft engines.
- With the "Aircraft noise activity," conduct two COE focused sessions at a national and an
  international conference.

## **APPROPRIATION SUMMARY**

	Amount (\$000)
Appropriated (FY 1982-2008)	184,078
FY 2010 Enacted	15,522
FY 2011 Request	15,374
Out-Year Planning Levels (FY 2012-2015)	60,722
Total	275,696

Budget Authority		FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
(\$000)		Enacted	Enacted	Enacted	Enacted	Request
Contracts:				·		
Aircraft Noise		1,667	1,359	1,572	1,245	1,228
Engine Emissions		1,846	1,600	1,700	1,451	1,430
Noise & Emissions Analyses		10,320	10,213	9,900	10,100	9,957
Personnel Costs		2,005	2,036	2,127	2,319	2,276
Other In-house Costs		170	261	309	407	483
Т	otal	16,008	15,469	15,608	15,522	15,374

OMB Circular A-11,	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
Conduct of Research and	Enacted	Enacted	Enacted	Enacted	Request
Development (\$000)					_
Basic	0	0	0	0	0
Applied	16,008	15,469	15,608	15,522	15,374
Development (includes prototypes)	0	0	0	0	0
Total	16,008	15,469	15,608	15,522	15,374

A13.a Environment and Energy	FY 2011			Progran	Schedule		
Product and Activities	Request (\$000)	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
091-016 Noise and Emissions Analysis	(, , , , , ,						
Noise and Emissions Analysis	9,957						
Develop architecture for noise/emissions			<b>◊</b>	$\Diamond$			
modules communication  Develop model for assessing global exposure to			<b>\lambda</b>	<b>♦</b>			
noise from transport aircraft			v	V			
Validate the methodologies used to assess		•		$\Diamond$			<b>◊</b>
aircraft noise exposure and impact							
Release INM updates							
Enhance aircraft noise and emissions modeling for airspace management activities			<b>◊</b>	<b>♦</b>			
Release EDMS updates							
·		•	♦	<b>♦</b>	<b>♦</b>	<b>\lambda</b>	♦
Forecast future global emissions and noise		•		V		V	V
Release screening model for airport air quality, version 1, and updates			<b>◊</b>		<b>◊</b>		
Validate methodologies used to assess aviation		•		<b>◊</b>			♦
emissions and their impact on air quality							
Advance approximation methods for aircraft		•		<b>◊</b>		<b>◊</b>	<b>◊</b>
engine PM emissions Publish handbook for airport air quality analysis			♦	<b>♦</b>	♦		◊
and updates		·	v	v	v		v
Guidance document for estimating and reducing			<b>◊</b>	$\Diamond$		<b>◊</b>	
emissions from ground support equipment Resource and guidance materials, and		•		<b>\lambda</b>		♦	♦
assessment protocol concerning hazardous air		•		V		V	V
pollutants							
Develop AEDT		•	<b>♦</b>	<b>◊</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>
Release AEDT for local applications			<b>♦</b>		<b>♦</b>	<b>♦</b>	
Develop EDS/Develop APMT		•		<b>◊</b>		<b>♦</b>	<b>◊</b>
Harmonize AEDT and APMT databases and code			<b>♦</b>	$\Diamond$		<b>◊</b>	
management protocols							
Integrate cost and socioeconomic data			<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>◊</b>	
Integrated noise and emissions impacts		•	<b>♦</b>	<b>◊</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>
analysis Aircraft Noise	1,228						
Update/develop procedures and technical	1,220	•	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>
guidance for aircraft noise certification							
Assess land use practices and investigate mitigation strategies beyond 65 dB DNL			<b>◊</b>	<b>♦</b>	<b>◊</b>	<b>◊</b>	<b>◊</b>
Update and publish AC 36-4			♦		♦		
Investigate feasibility of more stringent				<b>♦</b>		<b>♦</b>	♦
international noise standard for transport				V		v	v
category and subsonic jet airplanes							
Investigate which noise exposure metrics best			<b>◊</b>				
correlate with health and welfare impacts Apply methodologies to incorporate potential		•	♦				♦
health impacts of aircraft noise exposure within			-				•
APMT							
Engine Emissions	1,430						
Assess technological and scientific bases to support future ICAO engine emission standards			<b>◊</b>		<b>◊</b>		<b>◊</b>
Develop alternative, simplified engine exhaust		•		<b>♦</b>	♦	<b>♦</b>	♦
emissions certification test procedures		•		Ť		•	•
Update AC 34-1		<b>*</b>		<b>◊</b>	<b>◊</b>		
Develop measurement/sampling protocol for PM		•		$\Diamond$	<b>◊</b>	<b>◊</b>	$\Diamond$
emissions from aircraft engines			,			,	
Develop science/metrics and reduce uncertainties to assess impact of aviation		•	<b>◊</b>			<b>◊</b>	<b>◊</b>
emissions							
Personnel and Other In-House Costs	2,759						
Total Budget Authority	15,374	15,522	15,374	15,335	15,287	14,131	14,969
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Note: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual budget process.

Budget Item	Program Title	Budget Request
A13.b	NextGen Environmental Research – Aircraft Technologies,	\$20,600,000
	Fuels and Metrics	

#### Goals:

This program supports the following Flight Plan goals: Greater Capacity and International Leadership.

**Intended Outcomes:** The NextGen Technologies, Fuels and Metrics program helps achieve the NextGen goals to increase capacity by reducing significant community noise and air quality emissions impacts in absolute terms, and reducing aviation greenhouse gas emissions impacts on the global climate. The program is focused on reducing current levels of aircraft noise, air quality and greenhouse gas emissions and energy use and advancing sustainable alternative aviation jet fuels

The Program specifically supports the following outcomes:

Demonstrate aircraft and engine technologies that reduce noise and air quality and greenhouse gas emissions at the source to a developmental level that will allow quicker industry uptake of these new environmental technologies in order to produce a fleet that will operate more efficiently with less energy usage and permit expansion of airports and airspace capacity in a manner consistent with the environmental goals of the NextGen plan.

Specific activities include developing and demonstrating:

- Certifiable aircraft technology that reduces aircraft fuel burn by 33% compared to current technology, reducing energy consumption and greenhouse gas (CO<sub>2</sub>) emissions;
- Certifiable engine technology that reduces landing and takeoff cycle (LTO) nitrogen oxide
  emissions by 60 percent, without increasing other gaseous or particle emissions, over the
  International Civil Aviation Organization (ICAO) standard adopted at the sixth meeting of the ICAO
  Committee on Aviation Environmental Protection (CAEP/6);
- Certifiable aircraft technology that reduces noise levels by 32 dB at each of the three certification points, relative to Stage 4 standards; and
- Determination of the extent to which new engine and aircraft technologies may be used to retrofit or re-engine aircraft so as to increase the level of penetration into the commercial fleet.

Demonstrate alternative fuels for aviation to reduce emissions affecting air quality and greenhouse gas emissions and increase energy supply security for NextGen.

Specific activities include developing and demonstrating:

- The feasibility of use of alternative fuels in aircraft systems, including successful demonstration and quantification of benefits and internationally agreed criteria to quantify relative carbon content; and
- Processing capability and technical data to support certification and assured safety of a "drop in" replacement for petroleum derived turbine engine fuels.

Determining the appropriate enhancements of goals and metrics to manage NextGen aviation environmental impacts that are needed to support Environmental Management Systems (EMSs) and achieve environmental protection that enables sustained aviation growth.

Specific activities include:

- Evaluate, establish and implement advanced metrics to better assess and control noise, air quality impacts and greenhouse gas emissions that may influence climate impacts from anticipated NextGen commercial aircraft operations.
- Evaluate and refine required technology and operational goals and targets to mitigate the environmental impact of NextGen and support NextGen EMS implementation.

**Agency Outputs:** The program is protecting the environment by reducing significant aviation environmental impacts associated with noise, exhaust emissions and energy production. The program is also seeking to enhance energy efficiency and availability. The program will advance and mature, collaboratively with industry, engine and airframe technologies to reduce aviation noise, air quality and greenhouse gas emissions and energy use. It will also provide data and methodologies to assess the life cycle environmental impact and support certification of alternative aviation fuels that could serve as "drop

in" replacements for today's petroleum derived turbine engine fuels. This will lead to faster deployment of these fuels, and accompanying reductions in greenhouse gas and air quality emissions from aviation. Ultimately the program will demonstrate advanced technologies and alternative fuels in integrated ground and flight demonstrations.

The program is also helping to achieve NextGen goals by improving metrics to define and measure significant aviation environmental impacts. The program will improve the fundamental understanding of aviation environmental health and welfare and climate impacts and translate impact into improved metrics that can be used to better assess and mitigate aviation's contribution. This program will identify the gaps in scientific knowledge to support NextGen; focus research in areas that will reduce key uncertainties to levels that allow action; and develop enhanced metrics to enable sound analyses. Ultimately, the program will enable the refinement of goals and targets to support the NextGen EMS to better manage and reduce aviation's environmental impacts.

### Research Goals:

By FY 2015, complete system analyses and demonstrations of near-and mid-term CLEEN airframe and engine technologies to reduce noise, emissions and fuel burn in integrated flight demonstrations for civil subsonic jet aircraft

Airframe and engine technologies supporting milestones:

- Complete demonstration of first phase CLEEN technologies in ground rig tests. (by FY 2011)
- Complete demonstration of CLEEN technologies in ground rig tests. (by FY 2012)
- Demonstrate airframe and engine technologies to reduce noise, emissions and fuel burn in integrated ground demonstrations for civil subsonic jet aircraft. (by FY 2013)
- Complete system analyses to identify the most promising CLEEN technologies for flight tests. (by FY 2013)
- Initiate demonstrations of first round of CLEEN airframe and engine technologies to reduce noise, emissions and fuel burn in integrated flight demonstrations for civil subsonic jet aircraft (by FY 2013)
- Complete system analyses and identify and pursue the development of second round engine and airframe technologies that will be the most effective at producing environmental benefits. (by FY 2015)
- Complete demonstrations of first round of CLEEN airframe and engine technologies to reduce noise, emissions and fuel burn in integrated flight demonstrations for civil subsonic jet aircraft(by FY 2015)
- Develop plans for analyses and demonstration of evolving technologies in a potential second Phase to CLEEN (by FY2015)

By FY 2015, complete comprehensive assessment and research to support certification of "drop in" and renewable alternative turbine engine fuels and develop implementation plan to foster implementation in the commercial fleet.

Alternative fuels supporting milestones:

- Complete detailed feasibility study, including economic feasibility, environmental impacts, and assessment of potential for gas turbine renewable alternative fuels. (by FY 2011)
- Initiate efforts to experimentally assess environmental impacts and benefits and costs of renewable alternative turbine engine fuels. (by FY 2011)
- Develop internationally-agreed methodology to conduct environmental impact life cycle analyses for a range of renewable alternative turbine fuels (by FY 2012)
- Conduct a significant demonstration of "drop-in" alternative turbine engine fuels (by FY 2012)
- Conduct a study of strategies to incentivize implementation of renewable alternative fuels in commercial aviation (by FY 2012)
- Conduct safety assessment of renewable fuels (by FY 2013)
- Determine potential production capacity of alternative aviation fuels for aviation (by FY 2012)

- Conduct significant demonstration of additional "drop in" alternative turbine engine fuels. (by FY 2013)
- Complete assessment of benefits of use of alternative fuels in operational aircraft fleet (by FY 2013)
- Complete renewable alternative turbine engine fuels safety, environmental and business case assessments (by FY 2013)
- Complete transition plans for "drop-in" alternative fuels (by FY 2014)
- Complete renewable fuels safety assessment (by FY 2014)
- Complete transition plans for renewable alternative fuels (by FY 2015)

By FY 2016 identify and initiate assessment of non drop-in fuels.

- Conduct initial feasibility study, including economic feasibility, environmental impacts, and assessment of potential for non drop in alternative aviation fuels (by FY 2015)
- Conduct a demonstration of the performance characteristics of a non-drop in alternative aviation fuel (FY 2016)

By FY 2015, investigate metrics, uncertainties on aviation emissions health and welfare and climate impact to facilitate NextGen EMS implementation.

Metrics supporting milestones:

- Complete preliminary assessment of aviation's impact on climate. (by FY 2011)
- Complete initial assessment of NextGen air quality and noise impacts. (by FY 2011)
- Continue refinements of aviation environmental impacts and metrics (by FY 2013)
- Reduce key uncertainties of aviation impacts to levels that better inform appropriate action. (by FY 2013)
- Refine metrics that more accurately capture aviation emissions health and welfare and climate impact and goals to facilitate EMSs implementation. (by FY 2014)
- Continue refined assessment of aviation environmental, health and climate impacts (by FY 2015)
- Complete an updated assessment of aviation environmental, health and climate impacts (by FY 2015)

**Customer/Stakeholder Involvement:** FAA works closely with other federal agencies, industry, academia, and international governments and organizations to design R&D efforts that can mitigate the environmental impact of aviation and explore alternative gas turbine fuels.

- NextGen -- FAA leads an Environmental Working Group (EWG) responsible for leading environmental dimensions of the JPDO. The EWG comprises FAA, NASA, the Environmental Protection Agency (EPA), DoD, Department of Commerce, Council on Environmental Quality, and Office of the Secretary of Transportation, as well as industry, academia, local government, and community groups. The efforts of the WG are centered on advancing the national vision and recommendations for aviation in the NextGen and in the congressionally mandated study on "Aviation and the Environment", including advanced technology and alternative fuels development.
- Commercial Alternative Aviation Fuel Initiative (CAAFI) -- Concerns about rising fuel costs, energy supply security and the environmental effects of aviation are providing a significant stimulus to take a fresh look at the use of alternative fuels for aviation. To forge a way ahead, FAA founded the Commercial Aviation Alternative Fuels Initiative (CAAFI) together with Airports Council International-North America (ACI-NA), the Air Transport Association (ATA) and the Aerospace Industries Association (AIA). CAAFI is teaming with the DoD to leverage their substantial efforts advancing alternative fuels for military aviation— driven by energy security considerations. CAAFI is also working with other Federal agencies such as NASA.
- Climate Change Science Program (CCSP) The FAA is working with the CCSP program office and
  its individual member agencies to focus research efforts that address the uncertainties and gaps in
  our understanding of current and projected impacts of aviation on climate, and to develop metrics
  to characterize these impacts.
- Aviation Climate Change Research Initiative (ACCRI) The FAA worked with NASA and NOAA to
  establish the ACCRI. The primary objective is to coordinate and sponsor collaborative research

efforts to reduce key scientific uncertainties in quantifying aviation-related climate impacts while providing timely scientific input to inform optimum mitigation actions and policies for NextGen and ICAO.

• Environmental Protection Agency – The FAA is working with the EPA to leverage the Life Cycle Analysis (LCA) model being developed by the EPA under the Energy Security and Independence Act of 2007 to expand applicability to aviation.

**R&D Partnerships:** As does the Environment and Energy Research Program and other NextGen activities, the NextGen Aircraft Technologies, Fuels and Metrics Program relies on a series of Memorandums of Agreement (MOA), to work closely with NASA and DoD. The FAA is also pursuing collaborative agreements with DoE, and EPA to leverage resources to address aviation's environmental impact.

Through the JPDO NextGen, the program supports the EWG comprising FAA, NASA, EPA, DoD,
Department of Commerce, Council on Environmental Quality, and Office of the Secretary of
Transportation, as well as industry, academia, local government, and community groups. The
EWG is pursuing an intensive, balanced approach, emphasizing alignment across stakeholders in
developing needed business and technology architectures, as well as other relevant tools, metrics,
and products to address aviation's environmental impact.

**Accomplishments:** This effort started in FY 2009 to address the challenges of NextGen. The program was stood up and contracts issued in 2009. However, relevant stakeholders have achieved significant accomplishments mitigating aviation's environmental impact. The number of people exposed to significant noise levels was reduced by over 90 percent between 1975 and 2008. Today's aircraft are also 70 percent more fuel-efficient than jet aircraft of the 1960s. Reduced fuel consumption has also led to a 90 percent reduction in carbon monoxide, smoke, and other aircraft emissions. The outputs of this program will continue to enable future environmental performance improvements.

### FY 2010 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:

Noise, emissions and fuel burn reduction technologies maturation

- Continued advancement of CLEEN system level assessments.
- Initiated CLEEN component level assessment.
- Conducted detailed integrated system level analyses to identify the most promising technologies.
- Identified CLEEN airframe and engine technologies to be pursued.
- Completed Round 1 demonstration of CLEEN technologies in ground rig tests.
- Completed preliminary design of CLEEN demonstration experiment.

#### Alternative turbine engine fuels

- Measured experimentally environmental impacts of "drop in" alternative turbine engine fuels.
- Initiated planning for comprehensive "drop in" alternative fuel demonstration
- Initiated efforts to experimentally quantify renewable fuels environmental impacts

## NextGen Environmental Metrics, Goals and Targets

- Continued efforts to determine how projected NextGen operations-generated emissions and noise
  impact human health and welfare, and global climate and identify key uncertainties.
- Initiated implementation of research efforts necessary to reduce key uncertainties in our scientific
  understanding of environmental impacts and enhance models to assess those impacts for improved
  decision-making on mitigation and regulatory considerations.
- Continued comprehensive modeling efforts to establish the relationship between aviation engine
  exhaust and the gaseous and particulate matter emissions that are deposited in the atmosphere.
- Initiated a comprehensive particulate matter (PM), hazardous air pollutants (HAPs) and noise measurement campaign.

- Continued assessing potential metrics to quantify the climate related impacts of commercial aircraft operations.
- Continued baseline analyses of potential climate response due to aviation emissions with quantified uncertainties, based on the best available science and modeling tools.
- Initiated comprehensive assessment of NextGen air quality and noise impacts.

#### FY 2011 PROGRAM REQUEST:

Anticipated increases in air transportation demand will place significant environmental pressures on various segments of the NextGen. The primary environmental constraints on the capacity, efficiency and flexibility of the NextGen could be community noise, air quality, global climate impacts, and energy production and consumption. Environmental issues have constrained airport and airspace growth over the past decade. To ensure environmental impacts don't become a constraint on growth in NextGen, we need to accelerate introduction of quieter and cleaner technology in our fleets. Ninety percent of the environmental improvements (noise and emissions reductions) in the aviation system in the last 30 years have come from improved technology. Without a pipeline of near term (5-10 years) technology improvements, we cannot achieve the absolute reduction of significant noise and air quality impacts that we believe are necessary to enable NextGen growth. We need robust research and development to enable technology solutions to manage and mitigate environmental constraints. The goal is to have a fleet of quieter, cleaner aircraft that operate more efficiently with less energy.

We are currently facing larger research and development challenges at a time when we need to make larger technological leaps. Solutions that involve technology improvements in engines and airframes in a foreseeable timeframe require successful maturation and certification of new technologies within the next 5-10 years. This initiative establishes a world-class research consortium that can pursue technology goals to significantly reduce aviation noise, emissions, and fuel consumption. Establishing a world-class research consortium with industry- targeted on maturing technology- will help accelerate introduction of quieter and cleaner technology in our fleets so environmental issues do not become constraints.

The NextGen environmental goal is to reduce significant health and welfare impacts of aviation community noise and air quality (namely  $NO_X$ ) emissions in absolute terms, notwithstanding growth. Although there is no quantitative goal for greenhouse gas emissions, the NextGen environmental goal does call for limiting or reducing the impact of aviation greenhouse gas emissions on global climate. There is a need to explore the appropriate metrics and system goals to establish significant impacts. There is also a need to develop a robust science-based understanding of impacts of NextGen aviation emissions on earth's climate and translate these impacts into improved metrics that can be used to better assess and mitigate aviation's contribution to climate change. These goals and metrics will enable NextGen Environmental Management Systems (EMSs) to mitigate impacts in a dynamic and cost-beneficial manner.

### Elements of this initiative include:

- In collaboration with industry, mature noise, emissions and fuel burn reductions technologies (previously conceived by NASA and industry to Technology Readiness Levels (TRL) of 3-4) to levels (TRL 6) that enable industry to expedite introduction of these technologies into current and future products.
- Advance the development of alternative "drop in" and renewable turbine fuels for aviation and assess their environmental impacts to expedite deployment.
- Develop metrics to better assess and control noise, air quality and climate impacts from NextGen commercial aircraft operations and establish goals and targets to support NextGen EMS implementation to mitigate impacts.

## Ongoing Activities

Anticipated increases in air transportation demand will place significant environmental pressures on the national airspace system. Current operational trends show that environmental impacts resulting from aircraft noise and aviation emissions will be the principal constraint on the capacity and flexibility of the NextGen unless managed and mitigated. Aviation impacts affect community noise footprints, surface air quality, water quality, and the global climate. Environmental issues have already resulted in the delay and/or down-scaling of certain airport capacity projects over the past decade. Therefore, the NextGen environmental

challenge is to reduce, in absolute terms the number of people exposed to significant noise levels; and the significant health and welfare impacts on the population of aviation

The challenge is also to reduce the impact of aviation greenhouse gas emissions on global climate – despite remaining scientific uncertainties regarding the nature of these impacts. And the overarching challenge is to better understand the impacts of aircraft noise and emissions on the population and climate, enabling appropriate mitigation actions. NextGen must achieve a balance between aviation's environmental impacts and other societal objectives, both domestically and internationally.

The FAA's strategic plan to address these challenges has five elements: (1) enhance scientific understanding and develop integrated environmental models; (2) accelerate air traffic management efficiencies and improvements; (3) hasten the development of promising environmental improvements in aircraft technology; (4) hasten the development renewable aviation alternative fuels; and (5) explore market-based measures to offer assistance in managing aviation emissions growth.

This program is focusing on efforts to accelerate the aircraft technology and aviation alternative fuels development/penetration cycle. It is also focusing on enhancing scientific understanding of metrics and targets that more accurately capture aviation noise and emissions health and welfare and climate impacts to enable cost beneficial actions to mitigate these impacts.

The effort is pursuing the national goals and objectives delineated in the Energy and Environment component of the National Plan for Aeronautics R&D and Related Infrastructure (http://www.ostp.gov/cs/nstc/documents\_reports) which provides quantitative integrated energy, fuel efficiency, emissions and noise research goals.

The ongoing elements of the effort include:

- Continue the Continuous, Low Energy, Emissions, and Noise (CLEEN) effort focused on accelerating the maturation of lower energy, emissions and noise technology for aircraft and advancing environmentally beneficial alternative fuels.
- Continue efforts to develop the fundamental scientific understanding to enable Environmental Management Systems to dynamically manage aviation environmental impacts in a cost beneficial manner.

## **KEY FY 2011 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:**

Noise, emissions and fuel burn reduction technologies maturation

- Advance CLEEN systems analyses for most promising technologies
- Continue CLEEN component level tests for most promising technologies
- Initiate Round 2 ground rig tests
- Continue design of CLEEN demonstration experiment

## Alternative turbine engine fuels

- Complete detailed feasibility study, including economic feasibility, environmental impacts, and assessment of potential for gas turbine renewable alternative fuels. (by FY 2011)
- Develop federally-agreed methodology to conduct environmental impact life cycle analyses for a range of renewable alternative turbine fuels (by FY 2011)
- Initiate efforts to experimentally assess environmental impacts and benefits and costs of renewable alternative turbine engine fuels. (by FY 2011)

## NextGen Environmental Metrics, Goals and Targets

- Continue analysis of targets to achieve NextGen environmental goals
- Continue efforts to determine how projected NextGen operations-generated emissions and noise impact human health and welfare, and global climate and identify key uncertainties.
- Continue research efforts necessary to reduce key uncertainties in our scientific understanding of
  environmental impacts and enhance models to assess those impacts for improved decision-making
  on mitigation and regulatory considerations.

- Continue comprehensive modeling efforts to establish the relationship between aviation engine exhaust and the gaseous and particulate matter emissions that are deposited in the atmosphere.
- Complete analysis of data collected during comprehensive particulate matter (PM), hazardous air pollutants (HAPs) and noise measurement campaign.
- · Develop plans for next round of emissions and noise measurement campaign and analysis
- Continue assessing potential metrics to quantify the climate related impacts of commercial aircraft operations.
- Continue baseline analyses of potential climate response due to aviation emissions with quantified uncertainties, based on the best available science and modeling tools.
- Continue comprehensive integrated assessment of NextGen air quality and noise impacts.

## **APPROPRIATION SUMMARY**

	Amount
Appropriated (FY 1982-2009)	16,050
FY 2010 Enacted	26,509
FY 2011 Request	20,600
Out-Year Planning Levels (FY 2012-	82,947
Total	146,106

Budget Authority	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
(\$000)	Enacted	Enacted	Enacted	Enacted	Request
Contracts: NextGen Environmental Research— Aircraft Technologies, Fuels and Metrics	0	0	15,829	25,351	19,043
Personnel Costs	0	0	221	954	1,150
Other In-house Costs	0	0	0	204	407
Total	<b>0</b>	<b>0</b>	<b>16,050</b>	<b>26,509</b>	<b>20,600</b>

OMB Circular A-11, Conduct of Research and Development (\$000)	FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Basic	0	0	0	0	0
Applied	0	0	16,050	26,509	20,600
Development (includes prototypes)	0	0	0	0	0
Total	0	0	16,050	26,509	20,600

A13.b NextGen Environmental Research—Aircraft Technologies, Fuels and Metrics	FY 2011 Request (\$000)			Program	Schedule		
Product and Activities	(4000)	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
111-150 NextGen Environmental Research							
Technology Maturation	14,239						
Establish CLEEN Consortium							
System Level Assessments		•	♦	♦	♦	♦	<b>♦</b>
Component Assessments		•			♦		
Rig Tests – Round 1		•					
Rig Tests – Round 2			<b>♦</b>	<b>♦</b>			
Integrated Ground Demonstrators				<b>♦</b>	<b>♦</b>		
Flight Demonstrations					<b>♦</b>	<b>♦</b>	<b>◊</b>
Prepare Annual Report		•	♦	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>
Alternative Turbine Fuels	2,467						
"Drop in" Fuels Feasibility Study		•					
Renewable Fuels Feasibility Study			<b>♦</b>				
Lifecycle and sustainability analyses for renewable fuels			<b>◊</b>				
Qualification testing		•	♦	♦	♦		
Production Capacity Assessment				<b>♦</b>	<b>♦</b>	<b>♦</b>	
Renewable Fuels Safety Assessment				<b>♦</b>	<b>♦</b>	<b>♦</b>	
Renewable Alternative Fuels Demonstration					<b>♦</b>		
Transition Plans for "drop-in" fuels				<b>♦</b>	<b>◊</b>	<b>♦</b>	
Transition Plans for renewable alternative fuels					<b>♦</b>	<b>*</b>	<b>◊</b>
Benefit assessment of use of alternative fuels in operational aircraft fleet Assess feasibility of non drop-in alternative fuels					<b>*</b>		<b>⋄</b>
Prepare Annual Report		•	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>
Metrics, Goals and Targets	2,337						
Define potential metrics		•					
Evaluate metrics and models		•		<b>♦</b>		<b>♦</b>	
Advance measurement approaches		•	<b>♦</b>	<b>♦</b>			
Climate impact assessments		•	♦			<b>♦</b>	<b>◊</b>
Air Quality assessments		•		<b>◊</b>		<b>♦</b>	<b>♦</b>
Noise assessments		•		<b>◊</b>		<b>♦</b>	<b>♦</b>
Refine metrics			♦	<b>◊</b>		<b>♦</b>	
Assess efficacy of metrics			♦	<b>◊</b>		<b>♦</b>	<b>♦</b>
Upgrade Assessment Models		•			<b>◊</b>	<b>♦</b>	
Integrated noise and emissions impacts analysis		•	<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>◊</b>
Assessment of Environmental goal targets		•	<b>*</b>	<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>◊</b>
Publish Research Reports		•	<b>\</b>	<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>◊</b>
Personnel and Other In-House Costs	1,557						
Total Budget Authority	20,600	26,509	20,600	20,691	20,778	20,752	20,72

Note: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual budget process.

Budget Item	Program Title	Contract Dollars
A14.a.	System Planning and Resource Management	\$1,733,000

#### GOALS:

This program supports the following Flight Plan goals: Increased Safety. Greater Capacity, International Leadership, Organizational Excellence

**Intended Outcomes:** Demonstrate the value of working with international partners to leverage research programs and studies to improve safety and promote seamless operations worldwide. The ongoing activity will manage the FAA's R,E&D portfolio, meet the President's criteria for R&D, increase program efficiency, and maintain management and operating costs.

This activity produces the National Aviation Research Plan (NARP), an annual strategic plan for FAA R&D; administers the congressionally mandated R,E&D Advisory Committee (REDAC); conducts external program coordination; fosters future research opportunities; and provides program advocacy and outreach.

### Agency Outputs: In FY 2011, the FAA will:

R,E&D Portfolio Development

- Publish the annual National Aviation Research Plan (NARP).
- Manage the R,E&D portfolio development.
- Prepare the annual R,E&D budget submission.
- Host two REDAC meetings and multiple subcommittee meetings. The Committee provides advice
  on and reviews plans for the annual FAA R&D budget, and produces periodic and special reports
  providing advice and recommendations to FAA on its R&D portfolio.

#### Research Partnerships

- Establish and cultivate research partnerships both domestically and internationally to leverage programs, laboratories, and facilities to support the implementation of NextGen operational improvements.
- Manage the formulation and execution of interagency agreements and action plans with external research partners such as NASA, Air Force Research Lab (AFRL), EUROCONTROL, and SESAR Joint Undertaking.
- Identify, validate, and catalog existing and needed research and technology activities internal and external to the FAA to support the operational needs of the FAA's NAS Enterprise Architecture.
- Conduct the 2011 USA/Europe Air Traffic Management R&D Seminar on NextGen and SESAR.

## Performance Measurement

- Develop a strategic mapping for international collaboration.
- Identify a process to measure quality, timeliness, and value of collaboration.

## **Research Management Goals:**

- In FY 2011, the FAA will maintain an R,E&D management workforce of no more than 10 percent of the total R,E&D workforce and will sustain the System Planning and Resource Management budget at 2 percent or less of the total R,E&D budget.
- In FY 2011, publish the NARP, which documents the annual R&D budget portfolio, describes activities of the RE&D Advisory Committee, and contains the FY 2011-2016 R&D plans.
- By 2011, develop a strategic mapping for international research collaboration.
- By 2011, identify a process to measure quality, timeliness, and value of international research collaboration.
- By 2016, determine the value of international research collaborations.

**Customer/Stakeholder Involvement:** The REDAC reviews FAA research commitments annually and provides guidance for future R,E&D investments. The members of this committee and its associated subcommittees are subject matter experts drawn from various associations, user groups, corporations,

government agencies, universities, and research centers. Their combined presence in the REDAC fulfills a congressional requirement for FAA R&D to be mindful of aviation community and stakeholder input.

**R&D Partnerships:** DOT, JPDO, NASA, other Federal Agencies, and EUROCONTROL.

Accomplishments: Program accomplishments for FY 2009 include:

- Developed the FY 2011 R,E&D budget submission.
- Met the research goal for R,E&D management workforce and funding for System Planning and Resource Management.
- Managed two REDAC meetings and over twelve subcommittee meetings, where FAA's proposed FY 2011 R,E&D portfolio was reviewed.
- Published the 2009 National Aviation Research Plan and submitted to Congress with the President's FY 2010 Budget.
- Mapped FAA NextGen R&D programs to the JPDO Integrated Work Plan and the FAA's NextGen Implementation Plan.

#### FY 2010 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:

- Developed the FY 2012 R,E&D budget submission.
- Obtained REDAC guidance for the FY 2012 R,E&D portfolio.
- Obtained REDAC review of and recommendations for FY 2012 R,E&D portfolio.
- Provided strategic direction for the FAA R,E&D program.
- Delivered the 2010 National Aviation Research Plan to Congress with the President's FY 2011 Budget.
- Coordinated R&D activities with internal and external partners.
- Determined criteria for assessing the benefits of the international research collaboration.

#### **FY 2011 PROGRAM REQUEST:**

#### **Ongoing Activities**

FAA will continue supporting the work of the REDAC in its task to advise the Administrator on the R&D program. In particular, it will seek the counsel and guidance of the committee for the FY 2013 program, review the proposed FY 2013 program prior to submission of the budget requirements to the DOT, and seek the committee's guidance during the execution of the R&D program. The agency will publish, as required by Congress, the National Aviation Research Plan and submit it to Congress concurrent with the FY 2012 President's Budget Request.

The program will review the President's R&D criteria, ensuring that the agency's R&D program remains viable and meets national priorities. It will also publish program activities and accomplishments, as well as foster external review of and encourage customer input to the R&D program.

The agency will maintain its field offices at the NASA Ames and Langley Research Centers as a vital part of efforts to coordinate and integrate the research and development programs of NASA and the FAA.

The program will manage the FAA R&D portfolio, identify high value products being produced by the R&D program, and promote the use of these products globally to benefit the international market. In FY 2011, this initiative will develop strategic mapping for international collaboration and identify a process to measure quality, timeliness, and value of collaboration.

#### KEY FY 2011 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:

### R,E&D Portfolio Development

- Prepare the FY 2013 R,E&D budget submission
- Manage FAA's R,E&D portfolio to meet efficiency goals

- Obtain REDAC recommendations on planned R,E&D investments for FY 2013.
- Support the REDAC in its preparation of other reports, as requested by the Administrator.
- Deliver the 2011 National Aviation Research Plan to the Congress with the President's FY 2012 Budget.

## Research Partnerships

- Coordinate R&D activities with internal and external partners.
- Conduct the 2011 USA/Europe Air Traffic Management R&D Seminar on NextGen and SESAR.
- Update the Integrated Plan for Research Transition Teams with NASA.

## Performance Measurement

- Develop strategic mapping for international research collaboration.
- Identify a process to measure quality, timeliness, and value of International research collaboration.

## **APPROPRIATION SUMMARY**

	Amount (\$000)
Appropriated (FY 1982-2009)	\$42,320
FY 2010 Enacted	1,766
FY 2011 Request	1,733
Out-Year Planning Levels (FY 2012-2015)	6,719
Total	52,538

Budget Authority	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
(\$000)	Enacted	Enacted	Enacted	Enacted	Request
Contracts:					
R,E&D Plans and Programs	1,346	1,075	1,714	1,706	1,678
Personnel Costs	39	37	103	44	32
Other In-house Costs	3	72	0	16	23
Tota	1,388	1,184	1,817	1,766	1,733

OMB Circular A-11, Conduct of Research and Development (\$000)	FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Basic	0	0	0	0	0
Applied	1,388	1,184	1,817	1,766	1,733
Development (includes prototypes)	0	0	0	0	0
Total	1,388	1,184	1,817	1,766	1,733

A14.a – System Planning and Resource Management	FY 2011 Request							
Product and Activities	(\$000)	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	
011-130 R,E&D Plans and Programs			-					
R,E&D Portfolio Development	221							
Prepare guidance for budget formulation		•	<b>◊</b>	<b>◊</b>	♦	♦	<b>♦</b>	
Conduct R,E&D financial management		•	<b>◊</b>	<b>◊</b>	♦	♦	<b>♦</b>	
Prepare annual budget submissions		•	<b>◊</b>	<b>◊</b>	♦	♦	<b>♦</b>	
Congressionally Mandated	438							
Publish National Aviation Research Plan (NARP)		•	<b>◊</b>	<b>◊</b>	♦	♦	<b>♦</b>	
Conduct REDAC Meetings		•	♦	♦	♦	♦	<b>◊</b>	
Research Partnerships	344							
Sponsor NASA Field Offices Facilitate the development of Integrated Plan for RTT		•	♦	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	
with NASA  Performance Measurement	675	·	v					
Determine measures for exchange of research information Develop a strategic mapping for international collaboration Identify a process to measure quality, timeliness, and value of collaboration Calculate value of collaboration		•		<b>♦</b>	<b>♦</b>	<b>*</b>	<b>*</b>	
Personnel and Other In-House Costs	55							
Total Budget Authority	1,733	1,766	1,733	1,717	1,700	1,668	1,63	

Note: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual budget process.

Budget Item	Program Title	Budget Request
A14.b.	William J. Hughes Technical Center Laboratory Facility	\$3,717,000

#### GOALS:

This program supports the following Flight Plan goals: Increased Safety, Greater Capacity, International Leadership, and Organizational Excellence.

**Intended Outcomes:** The FAA sustains research facilities located at the William J. Hughes Technical Center (WJHTC) in support of its R&D program goals. These facilities consist of the Flight Program's Airborne Laboratories, Simulation Facilities including the Target Generation Facility and the Cockpit Simulators, and the Concepts and Systems Integration Facilities, including the Human Factors Laboratory and the NextGen Integration and Evaluation Capability.

**Agency Outputs:** R&D programs require specialized facilities to emulate and evaluate field conditions. Human factors projects require flexible, high fidelity laboratories to perform full mission, ground to air, human-in-the-loop simulations. Researchers measure baseline human performance using existing ATC configurations, and deltas in performance when new systems or procedures are introduced in order to evaluate human factors issues. These laboratories are comprised of integrated cockpit and air traffic control workstation simulators, and the performance issues they delve into reflect the perspectives of the pilot and flight crew. Airborne and navigation projects require flying laboratories, aircraft utilized for research and development, which are specially instrumented and reconfigurable to support a variety of projects.

**Research Goals:** The FAA will work to provide an integrated laboratory platform for the purpose of demonstrating operational procedures, defining human and system performance requirements, full mission demonstrations integrating NextGen air and ground capabilities for pilot separation responsibility and controller efficiencies, and analysis, evaluation, and validation of R&D milestones.

**Customer/Stakeholder Involvement:** The WJHTC facilities directly support agency projects and integrated product teams in the following areas:

FAA's Air Traffic Organization (ATO) – The WJHTC laboratories support the ATO in the areas of capacity and air traffic management; communications, navigation, and surveillance; NextGen concept validation; weather; airport technology; aircraft safety; human factors; information security; environment and energy.

Communications, Navigation, and Surveillance – The Flight Program Team supports on-site flight tests of the Precision Runway Monitoring System in Detroit to aid in the development of a system for reduction of runway incursions.

Next Generation Air Transportation System (NextGen) – The WJHTC laboratories support concept validation and system integration.

Automated Dependent Surveillance-Broadcast – Numerous flight test hours have been expended in support of field testing the new ITT system in southern Florida. Each test leads to improvements made to enhance the overall system.

Terminal Instrumentation Procedures (TERPS) – Routine flight tests are ongoing in the development of GPS Helicopter precision approaches to a heliport.

Wide Area Augmentation System – The Flight Program Team has been working with the WAAS program, Bombardier Aircraft, Canadian Marconi, and Honeywell to design, test and certify a WAAS installation into a Bombardier Global 5000 aircraft.

**R&D Partnerships:** In addition to FAA's research programs, WJHTC laboratories partnerships include: U.S. Air Force – The Flight Program Team has performed numerous test of the GPS signal security with the U.S. Air Force.

National Transportation Safety Board – The Flight Program Team has participated in the recreation of aircraft accidents for the purpose of collecting data in an attempt to determine the underlying cause.

Boeing - The Simulation team is working a under cooperative research and development to build capability to perform R&D of 4-D trajectory negotiation and execution, and Unmanned Aerial Systems (UAS) EUROCONTROL - The simulation team exchanges aircraft modeling data for use in TGF Industry –

- Flight tests are on-going to help develop and deploy the ITT ADS-B system in southern Florida as
  well as the work being done with Bombardier, Canadian Marconi, and Honeywell in the design,
  installation and certification on GPS WAAS onboard a Bombardier Global 5000 aircraft.
- The Simulation team has partnered with UFA Inc. to quantify voice recognition and response (VRR) system performance in Technical Center Human in the Loop (HITL) simulations.

**Facilities supporting R&D Goals at the FAA's WJHTC:** The following laboratory facilities provide the reliable test bed infrastructure to support these R&D customers, program goals, and outputs for the FAA: Simulation Facilities – Target Generator Facility (TGF) and Cockpit Simulators

- Approach Procedures
- Next Generation Air Transportation System
- Airspace Design
- Operational Evolution Plan Concept Validation
- Dynamic Vertical Reduced Separation Minima
- Unmanned Aerial Systems
- ADS-B Concept Evaluation

Research & Development Flight Program – Airborne Laboratories

- Satellite Communications and Navigation Programs
- Separation Standards
- Wide Area Augmentation System
- Terminal Instrumentation Procedures
- Safety
- Runway Incursion
- Next Generation Air Transportation System
- Local Area Augmentation System
- ADS-B
- Common Automated Radar Terminal System

Concepts and System Integration Facilities

- Air Traffic Control Human Factors
- Airway Facilities Human Factors
- NextGen Integration & Evaluation Capability (NIEC)
- Airspace Design
- Unmanned Aerial Systems (UAS)
- ADS-B
- SWIM
- DataComm
- TMA

**Accomplishments:** The FAA's WJHTC's laboratory facilities provide the reliable test bed infrastructure to support R&D program goals and outputs. Outstanding program accomplishments include: FY 2009:

Simulation Facilities

• Simulation Team integrated TGF and Boeing Simulation Lab for UAS simulation capability.

- Simulation Team added 4-D trajectory negotiation capability using AIDL to its B-737 flight management system trainer.
- Simulation Team completed the evaluation of the UFA VRR system.

## Flight Program's Airborne Laboratories

 The Flight Program Team made improvements to its operational aircraft to enhance their ability to support project flight test. These included the installation of new antennas to support the ADS-B and NextGen programs and the modification of the aircraft to permit the display of Advanced Navigational signals unto the basic cockpit displays, into the Bombardier Global 5000 test aircraft (N47).

### Concepts and Systems Integration

- The Research Development & Human Factors Laboratory (RDHFL) Future Terminal Workstation (FTWS) supported Human-in-the-Loop simulations that evaluated three user interfaces: STARS; STARS+ (STARS plus DataComm, ADS-B, use of RNAVs, tailored arrivals and functionality from DRS/ERAM; and FTWS: 2020 NextGen Automation Platform common EnRoute/TRACON UI extrapolated from future EnRoute Workstation simulations.
- The NIEC integrated UAS Pilot Stations to support demonstration for the FAA UAS Planning Team.
- The NIEC laboratory environment has been improved to enhance capabilities to support NextGen, including upgrades to the laboratory infrastructure and installing component systems to support DataComm, ADS-B, SWIM, TFMM, and TMA.

#### FY 2008:

- The Flight Program Team has participated in the development and acceptance flight testing of the ITT ADS-B system in southern Florida. These test consisted on numerous dual aircraft, highly scripted, flights to test system resolution, accuracy and performance.
- Simulation Team successfully implemented Boeing's Aircraft Intent Description Language (AIDL)
- Simulation Team successfully completed manual flight capability in its Embraer-175 cockpit simulator using the manufacturer's software.
- Research Development & Human Factors Laboratory (RDHFL) developed Aircraft Geometric Height Measurement Element (AGHME): 2006 – 2009 In support of Domestic Reduced Vertical Separation Minimum (D-RVSM) – consists of changing the current 2,000-ft vertical separation standard applicable to pairs of aircraft operating between 29,000 and 41,000 (flight levels 290 and 410), inclusive, to 1,000 ft. AGHME estimates aircraft geometric height. An already existing analysis process will then make use of this geometric height, in conjunction with other information, to determine aircraft height-keeping performance.

## FY 2007:

- The Flight Program Team has participated in the development and improvement flight testing of the FAA's "Legacy" ADS-B system operational on the east coast of the US. These test consisted on numerous multi-aircraft flights to test system resolution, accuracy and performance.
- Simulation Team successfully completed baseline evaluations of the UFA VRR system.
- Simulation Team successfully demonstrated a control tower visualization capability.
- Research Development & Human Factors Laboratory (RDHFL) Future Terminal Workstation (FTWS): 2007- 2010 The project is part of the Federal Aviation Administration (FAA) human factors research program to design and evaluate new air traffic control (ATC) capabilities for the 2015-2020 timeframe. The new capabilities include new automation tools; user interfaces (UIs) and interaction techniques, and ATC procedures. The FTWS project focuses on the environment known today as the Terminal Radar Approach Control (TRACON).
- The NextGen Laboratory Team gave several demonstrations of PAS throughout the week ending September 28, 2007, to the FAA UAS Planning Team, showing some basic scenarios in support of the SC203 Document concerning Unmanned Aerial Systems integration into the NAS.
- Research Development & Human Factors Laboratory (RDHFL) Tower Operations Digital Data System (TODDS): 2007 – 2010 Integrated tool to display aircraft location, electronic flight data, and other digital data for the ground and local controller positions in ATC Towers. Address the current limitations of paper and electronic flight strip systems by:
  - Consolidating information into a single source

- Connecting flight data to aircraft position
- Providing a means to organize flight data information spatially; touch screen displays
- Presenting only the information that controllers need when they need it
- Providing timing capability, reminders, and notices of expired information

### FY 2010 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:

The test beds at the WJHTC provide the necessary infrastructure for R&D programs to achieve agency goals. Specific milestones and products are contained within individual programs.

#### Simulation Facilities

- Simulation Team conducted human in the loop (HITL) simulations of UAS in the NAS.
- Simulation Team conducted an end-to-end evaluation of 4-D trajectory prediction and negotiation using TGF and B-737-800 cockpit simulator.

#### Flight Program's Airborne Laboratories

• The Flight Program enhanced our assets of flying laboratories to meet the anticipated future needs of our flight test customers. These include adding the capability to the Global 5000 to capture and record aircraft engine parameters such as: fuel flow, temperatures, pressures, etc.

#### Concepts and Systems Integration

 The NIEC team improved the laboratory environment to enhance our capability to support NextGen.

### **FY 2011 PROGRAM REQUEST:**

#### Ongoing Activities

The FAA will continue to modify, configure, and sustain the research facilities located at the William J. Hughes Technical Center (WJHTC) to support its R&D program goals.

#### **New Initiatives**

No new initiatives are planned in FY 2011.

#### **KEY FY 2011 MAJOR ACTIVITIES AND ANTICIPATED ACCOMPLISHMENTS:**

#### Simulation Facilities

- Target Generation Facility (TGF) will fully realize its capability to support air traffic control tower visualization and surface movement studies. This capability will support research in the areas of runway incursions, and taxi clearances.
- The Cockpit Simulation Facility (CSF) will achieve a fully integrated simulation environment with its B-737-800/900, EMB-175, and A-320 simulators.

## Flight Program's Airborne Laboratories

• The Flight Program will work to enhance the flying laboratories to meet the anticipated future needs of our flight test customers. These include the capability to capture all "Flight Data Recorder" information and make it available to project personnel in a variety of formats. The first aircraft to be equipped with this capability will be the Global 5000.

#### Concepts and Systems Integration

- Research Development & Human Factors Laboratory (RDHFL) will continue to merge results from three ongoing projects: Future En Route Workstation (FEWS), Future Terminal Workstation (FTWS) and Tower Operations Digital Data System (TODDS). Lessons learned will be applied to continued development work on the common automation platform to create one UI for all ATC environments.
- The NIEC team intends on continuously improving the laboratory environment to enhance our capability to support NextGen.

## **APPROPRIATION SUMMARY**

	Amount (\$000)
Appropriated (FY 1982-2009)	110,426
FY 2010 Enacted	4,588
FY 2011 Request	3,717
Out-Year Planning Levels (FY 2012-2015)	15,548
Total	134,279

Budget Authority (\$000)		FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Contracts: WJHTC Laboratory Facility Personnel Costs Other In-house Costs		779 2,584 67	667 2,642 106	684 2,672 180	1,833 2,675 80	1,251 2,377 89
Other III house costs	Total	3,430	3,415	3,536	4,588	3,717

OMB Circular A-11, Conduct of Research and Development (\$000)	FY 2007 Enacted	FY 2008 Enacted	FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
Basic Applied	0 3,430	0 3,415	0 3,536	0 4,588	0 3,717
Development (includes prototypes)	0	0	0	. 0	0
Total	3,430	3,415	3,536	4,588	3,717

A14.b – WJHTC Laboratory Facility	FY 2011			Program	Schedule		
Products and Activities	Request (\$000)	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
011-140 WJHTC Laboratory Facility	(\$000)						
Simulation Facilities (Target Generator Facility, Cockpit Simulators)	250						
Approach Procedures		•					
Next Generation Air Transportation System (NextGen)		•	<b>♦</b>	<b>♦</b>	<b>◊</b>	<b>◊</b>	<b>♦</b>
Airspace Design		•	<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>♦</b>	<b>◊</b>
Operational Evolution Plan Concept Validation		•					
Dynamic Vertical Reduced Separation Minima (DRVSM)		•	<b>♦</b>	<b>◊</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>
Unmanned Aerial Systems (UAS)		•	<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>♦</b>	♦
ADS-B Concept Evaluations			<b>♦</b>	<b>◊</b>	<b>◊</b>	<b>♦</b>	<b>♦</b>
Research & Development Flight Program (Airborne Laboratories)	751						
Satellite Communications and Navigation Programs		•	<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>♦</b>	<b>◊</b>
Separation Standards		•	<b>♦</b>	<b>◊</b>	$\Diamond$	<b>♦</b>	<b>♦</b>
Wide Area Augmentation System (WAAS).		•	<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>♦</b>	<b>◊</b>
TERPS		•	<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>♦</b>	<b>◊</b>
Safety		•	<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>♦</b>	<b>◊</b>
Runway Incursion		•	<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>♦</b>	<b>◊</b>
Next Generation Air Transportation System (NextGen)		•	<b>♦</b>	<b>♦</b>	<b>◊</b>	<b>♦</b>	<b>♦</b>
Local Area Augmentation System (LAAS)		•	<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>♦</b>	<b>◊</b>
ADS-B		•	<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>♦</b>	<b>◊</b>
Common Automated Radar Terminal System		•	<b>♦</b>	<b>◊</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>
Concepts & Systems Integration	250						
Air Traffic Control Human Factors		•	<b>◊</b>	<b>◊</b>	<b>◊</b>	<b>♦</b>	<b>◊</b>
Airway Facilities Human Factors		•	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>
Operational Evolution Plan Concept Validation		•					
NextGen Integration & Evaluation Capability			<b>◊</b>	<b>◊</b>	<b>◊</b>	♦	<b>◊</b>
Airspace Design			<b>◊</b>	<b>◊</b>	<b>◊</b>	♦	<b>◊</b>
Unmanned Aerial Systems (UAS)			<b>♦</b>	<b>♦</b>	<b>◊</b>	<b>◊</b>	<b>◊</b>
ADS-B			<b>♦</b>	<b>♦</b>	<b>◊</b>	<b>◊</b>	<b>◊</b>
SWIM			<b>♦</b>	<b>♦</b>	<b>◊</b>	<b>◊</b>	<b>◊</b>
DataComm			<b>◊</b>	<b>◊</b>	<b>◊</b>	♦	<b>◊</b>
ТМА			♦	<b>◊</b>	<b>♦</b>	<b>♦</b>	<b>◊</b>
Personnel and Other In-House Costs	2,466						
Total Budget Authority  Note: Out year numbers are for planning purp	3,717	4,588	3,717	3,785	3,857	3,920	3,986

Note: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual budget process

# GRANTS-IN-AID FOR AIRPORTS (LIQUIDATION OF CONTRACT AUTHORIZATION) (LIMITATION ON OBLIGATIONS) (AIRPORT AND AIRWAY TRUST FUND)

For liquidation of obligations incurred for grants-in-aid for airport planning and development, and noise compatibility planning and programs as authorized under subchapter I of chapter 471 and subchapter I of chapter 475 of title 49, United States Code, and under other law authorizing such obligations; for procurement, installation, and commissioning of runway incursion prevention devices and systems at airports of such title; for grants authorized under section 41743 of title 49. United States Code; and for inspection activities and administration of airport safety programs, including those related to airport operating certificates under section 44706 of title 49, United States Code, \$3,550,000,000, to be derived from the Airport and Airway Trust Fund and to remain available until expended: Provided, That none of the funds under this heading shall be available for the planning or execution of programs the obligations for which are in excess of \$3,515,000,000 in fiscal year 2011, notwithstanding section 47117(g) of title 49, United States Code: Provided further, That none of the funds under this heading shall be available for the replacement of baggage conveyor systems, reconfiguration of terminal baggage areas, or other airport improvements that are necessary to install bulk explosive detection systems: Provided further, That notwithstanding any other provision of law, of funds limited under this heading, not more than \$100,208,000 shall be obligated for administration, not less than \$15,000,000 shall be available for the airport cooperative research program, not less than \$27,217,000 shall be for Airport Technology Research.

# **Program and Financing** (in millions of dollars)

		FY 2009	FY 2010	FY 2011
Identifi	cation code: 69-8106-0-7-402	Actual	Estimate	Estimate
	Obligations by program activity:	_	_	
	Direct Program:			
00.01	Grants-in-aid for airports	3,529	3379	3373
00.02	Personnel and related expenses	87	93	100
00.03	Airport technology research	19	22	27
00.05	Small community air service	10	6	
00.06	Airport Cooperative Research	15	15	15
01.00	Total direct program	3,660	3,515	3,515
09.01	Reimbursable program		. 1	. 1
10.00	Total new obligations	3,660	3,516	3,516
	Budgetary resources available for obligation:		2/2.2	5/5/15
21.40	Unobligated balance carried forward, start of year	103	396	487
22.00	New budget authority (gross)	3,807	3,607	3,516
22.10	Resources available from recoveries of prior year	-,	-,	-7
	obligations	146		
23.90	Total budgetary resources available for obligation	4,056	4,003	4,003
23.95	Total new obligations	-3,660	3,516	3,516
24.40	Unobligated balance carried forward, end of year	396	487	487
24.40	New budget authority (gross), detail:	370	407	407
	Discretionary:			
40.26	Appropriation (trust fund)	3,600	3,000	3,550
40.49	Portion applied to liquidate contract authority	-3,600	-3,000	-3,550
43.00	Appropriation (total discretionary)			
49.00	Contract authority			
49.35	Contract authority Permanently reduced			
49.36	Unobligated balance permanently reduced			
49.90	Contract authority (total discretionary)			
	Mandatory:			
66.10	Contract authority (Vision 100)	3,900		
66.10	Contract authority (49 USC 48112)			
66.10	Contract authority (HJ Res 52)			
66.10	Contract authority		4,000	3,515
66.35	Contract authority permanently reduced	-93	-394	
66.90	Contract authority (total mandatory)	3,807	3,606	3,515
58.00	Spending authority from offsetting collections			1
70.00	Total new budget authority (gross)	3,807	3,607	3,516
	Change in obligated balances:			
72.40	Obligated balance, start of year	5,064	4,702	4,829
73.10	Total new obligations	3,660	3,516	3,516
73.20	Total outlays (gross)	-3,876	-3,389	-3,387
73.45	Recoveries of prior year obligations	-146		
74.00	Change in uncollected customer payments			
74.40	Obligated balance, end of year	4,702	4,829	4,958
7 11 10	Outlays (gross), detail:	1,702	1,02,	17766
86.90	Outlays from new discretionary authority	818	719	723
86.93	Outlays from discretionary balances	3,058	2,670	2,664
87.00	Total outlays (gross)	3,876	3,389	3,387
07.00	Offsets:	3,070	3,307	3,307
	Against gross budget authority and outlays:			
88.40	Offsetting collections (cash) from: Non-Federal sources		1	1
00.40	onsetting collections (cash) from fivering collections		1	'

	Net budget authority and outlays:			
89.00	Budget authority	3,807	3,606	3,515
	Outlays	3,876	3,388	3,386

Subchapter I of chapter 471, title 49, U.S. Code (formerly the Airport and Airway Improvement Act of 1982, as amended) provides for airport improvement grants, including those emphasizing capacity development, safety and security needs; and chapter 475 of title 49 provides for grants for aircraft noise compatibility planning and programs.

## **Object Classification** (in millions of dollars)

		FY 2009	FY 2010	FY 2011
Identif	ication code: 69-8106-0-7-402	Actual	Estimate	Estimate
	Direct obligations:			_
	Personnel compensation			
11.1	Full-time permanent	54	61	67
11.3	Other than full-time permanent	1	1	1
11.5	Other personnel compensation	1	1	1
11.9	Total personnel compensation	56	63	69
12.1	Civilian personnel benefits	15	14	15
21.0	Travel and transportation of persons	4	5	5
25.2	Other services	41	45	50
26.0	Supplies and materials	1	1	1
31.0	Equipment	2	3	3
41.0	Grants, subsidies, and contributions	3,541	3,384	3,372
99.0	Subtotal, direct obligations	3,660	3,515	3,515
99.0	Reimbursable obligations		1	1
99.9	Total new obligations	3,660	3,516	3,516

## **Personnel Summary**

		FY 2009	FY 2010	FY 2011
Identif	ication code: 69-8106-0-7-402	Actual	Estimate	Estimate
	Direct:			
1001	Civilian full-time equivalent employment	557	566	584
	Reimbursable:			
2001	Civilian full-time equivalent employment	1	6	3

#### **EXHIBIT III-1**

# GRANTS-IN-AID FOR AIRPORTS Summary by Program Activity Appropriations, Obligation Limitations, and Exempt Obligations (\$000)

	FY 2009 ACTUAL*	FY 2010 ENACTED	FY 2011 REQUEST	CHANGE FY 2010- 2011
Grants-in-Aid for Airports	4,482,498	3,378,106	3,372,575	-5,531
Personnel & Related Expenses	89,654	93,422	100,208	6,786
Airport Technology Research	19,348	22,472	27,217	4,745
Small Community Air Service	8,000	6,000	0	-6,000
Airport Cooperative Research	<u>15,000</u>	<u>15,000</u>	<u>15,000</u>	<u>0</u>
TOTAL	4,614,500	3,515,000	3,515,000	O
FTEs				
Direct Funded	557	566	584	18.0
Reimbursable	1	6	3	0

<sup>\*</sup> Includes funding provided by the American Recovery and Reinvestment Act of 2009. This Act provided supplemental funding of \$1.1 billion to Grants-in-Aid for Airports.

## **Program and Performance Statement**

This account provides funds for planning and developing a safe and efficient national airport system to satisfy the needs of the aviation interests of the United States, with due consideration for economics, environmental compatibility, local proprietary

## EXHIBIT III-2

# GRANTS-IN-AID FOR AIRPORTS SUMMARY ANALYSIS OF CHANGE FROM FY 2010 TO FY 2011 Appropriations, Obligation Limitations, and Exempt Obligations

Item	Change from FY 2010 to FY 2011	FY 2011 PC&B by Program Note Co	FY 2011 FTEs by Program olumns are	FY 2011 Contract Expenses Non-Add	Total
FY 2010 Base					
Grants-in-aid for Airports		78,131	566	42,950	\$3,515,000
Appropriations, Obligations, Limitations, and Exempt					
Obligations					
Adjustments to Base					
AIP Grants	(\$11,531)				
Annualized FTEs	1,229	1,229	8		
Annualized FY 2010 Pay Raise	391	391			
FY 2011 OSI	1,048	1,758			
FY 2011 SCI	369	369			
Non-pay Inflation	99			49	
Subtotal, Adjustments to Base	(\$8,395)	\$3,747	8	\$49	(\$8,395)
New or Expanded Programs					
Engineering Staffing	172	172	1.0		
Airport Safety Management Systems (SMS) staff	172	172	1.0		
Airport GIS ISO 9001 Audit Process/GIS/Airspace	1,158	258	1.5	900	
Private Airport Data Collection	400			400	
AIP Financial Management & Oversight	1,360	860	5.0	500	
NexGen/JPDO	586	86	0.5	500	
Safety & Pavement Research (ATR)	4,461	86	0.5	4,375	
Engineer (ACRP)	86	86	0.5		
Subtotal, New or Expanded Programs	8,395	1,720	10.0	6,675	8,395
Total FY 2011 Request	(\$0)	\$83,598	584.0	\$49,674	\$3,515,000

### **Detailed Justification for Grants-in-Aid for Airports**

Grants-in-Aid for Airports	FY 2011 Request: 3,372,575
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### Overview:

Airports are an essential part of the aviation system infrastructure. Their design, structural integrity, and ongoing maintenance have a direct impact on safety, capacity and efficiency. Through the Airport Improvement Program (AIP), the agency funds a range of activities to ensure the safety and capacity of U.S. airports. The proposed AIP funding level will provide sufficient funding for all high priority safety, capacity, and security projects.

### FY 2010 Base:

In FY 2010, FAA is emphasizing initiatives to implement airport Safety Management Systems (SMS), to continue the reduction in runway incursions caused by vehicle/pedestrian deviations, and to continue progress at improving Runway Safety Areas (RSAs). In addition, the AIP program provides priority consideration for funding safety-related development for airports that benefit both commercial service and general aviation operations.

In FY 2010, the Office of Airports (ARP) will increase capacity at the 35 Operational Evolution Partnership (OEP) airports or major metropolitan areas by supporting, processing, and approving Airport Master Plans and Environmental Studies and by directing funding investments toward the construction of runway projects (new runways, runway extensions, and airfield reconfigurations) as the most effective method of increasing throughput. ARP expects to administer the AIP program by issuing approximately 2,200 grants to airport sponsors. We will also strive to increase the safety, security and capacity of the global civil aerospace system in an environmentally sound manner.

#### **Anticipated FY 2010 Accomplishments:**

- Continue improvements to RSAs. 36 priority RSAs will be improved in FY 2010.
- Develop schedule to address FAA owned NAVAIDs in RSAs.
- Continue Airport Cooperative Research by working with the Transportation Research Board to select and fund projects.
- Continue progress on reducing Runway incursions by 10 percent from the FY 2008 baseline within 5 years.
- Continue rulemaking processes to implement Airport SMS for Part 139 airports.
- Undertake pilot program for performing airport program SRMD's.
- Undertake pilot program for performing "green" airport master plans, or sustainability plans.
- Provide AIP funding for three rural airports permitting a minimum 24 hour Visual Flight Rules (VFR)
  access.
- Undertake pilot program to prepare Airport-GIS information needed for the development of electronic Airport Layout Plans.
- Implement AIP funding for all approved Runway Safety Action Team (RSAT) recommendations identified in the FY 2010 Airport Capital Improvement Program.
- Provide technical assistance for Master Plan studies in support of increasing the annual service volume at the 35 OEP airports.
- Support and assist AEE in updating FAA environmental order 10501.E.
- Update airport planning training courses.
- Monitor and maintain scheduled progress for Environmental Impact Statements at airports to enable airport capacity enhancing projects in congested metropolitan areas to proceed in a timely manner.
- Direct AIP funding to address up to 75 surveys and/or infrastructure needs in support of WAAS/LPV approaches.
- Direct AIP funding to infrastructure development to meet airport safety and design standards.

- Continue support of Airports working group for NextGen.
- Continue work on Future Airport Capacity and Task (FACT) next steps and identify solutions at airports projected to have anticipated capacity shortfalls through 2025.
- Continue or complete regional studies to identify potential delay reduction measures.
- Commission a new runway at Charlotte International Airport, complete capacity enhancing taxiway improvements at Boston-Logan and JFK International Airports.
- Provide AIP funding for OEP runways identified in the Airports Capital Improvement Program (ACIP).
- Ensure approximately 20,000 people (residents and school students), or appropriately determined numbers of people, in the Day-Light average sound level (DNL) 65dB (decibels) or greater receive benefits from noise compatibility projects funded under AIP.

## FY 2011 Budget Request:

Safety-related development receives priority consideration for AIP funding. The FY 2011 request will allow the agency to continue supporting the following key initiatives:

Improvements to runway safety areas (RSA) that do not conform to FAA standards: The agency's long-term goal is to eliminate airport conditions that contribute to accidents by improving RSAs. Since FY 2000, FAA has completed 351 RSA projects. As of September 2009, 104 priority RSAs remain to be upgraded. Nineteen priority RSAs will be brought up to standards or improved to the extent practicable in FY 2011. By 2011, 89 percent of practicable improvements will be completed at priority runways, with all practicable improvements completed by 2015. RSA projects will continue to carry a high priority for obtaining AIP funding.

*Runway incursion reduction*: The FAA places a high priority on initiatives that reduce runway incursions. AIP funding will continue to be targeted to implement RSAT recommendations that reduce runway incursions. AIP funding will be used to install additional signs and lights, construct perimeter roads, reconfigure airport taxiways, increase training, and improve procedures.

Airport Safety Management System (SMS): FAA is implementing SMS at airports to harmonize with the International Civil Aviation Organization (ICAO) standard. An Airport SMS Advisory Circular (AC) was issued in FY 2007. With the issuance of the AC development of an airport's initial SMS plan/manual became eligible for funding under AIP planning grants. In addition, a pilot program was initiated to implement SMS at up to 20 airports in FY 2007. The pilot program was completed in June 2008 and will provide useful information as we proceed with an Airport SMS rulemaking action. An SMS Order will be issued in 2010 that will establish the internal Airport (ARP) SMS process. The rulemaking process to amend Part 139 to require certificated airports to implement SMS is underway. A final rule is anticipated in spring 2011.

Infrastructure condition: The agency recognizes the safety benefits of ensuring that pavement, marking and lighting at airports identified in the National Plan of Integrated Airport Systems (NPIAS) meet current safety and design standards. AIP funding will be directed to ensure that 93 percent of runways at airports in the NPIAS are maintained in good or fair condition, ensure support of the Military Airport Program, develop reliever airports, and support research of airfield pavements to carry existing and new generation aircraft. AIP funding will continue to support this goal by funding: airport pavement and lighting system rehabilitation projects, treatments to minimize hydroplaning in wet conditions, obstruction removal in runway approach zones, perimeter fencing to prevent wildlife entry, and aircraft firefighting equipment. This also includes establishment of navigation aids (NAVAID) such as: instrument landing systems, runway end identifier lights, precision approach path indicators, and non-directional beacons to assist in approach and landing. The AIP and ATO capital programs share the same eligibility for funding NAVAID projects. AIP flexibility will continue to be used to maximize the funding of eligible NAVAID projects.

The agency has a special emphasis in directing AIP investments to reduce accidents in Alaska for general aviation and all Part 135 operations. AIP funding will be directed, where practical, to continue improving

rural airports to provide at a minimum 24 hour Visual Flight Rules (VFR) access.

ARP will finalize, implement, and provide outreach on the comprehensively updated Advisory Circular 150/5020-1, on Noise Control and Land Use Compatibility Planning.

ARP will continue to update and enhance the VALE (Voluntary Airport Low Emission) Program. The program provides opportunities for airports to reduce air emissions in areas that are in non-attainment for National Ambient Air Quality Standards or in areas designated as maintenance areas.

ARP will continue work to develop a Land Acquisition Airport Land Project Certification System (ALPCS) which will be a web-based project management system. Generally ALPCS will allow airport sponsors, property owners and displaced persons a project website location to fill out forms (claims for payments), receive explanations and for property owners to ask for help and contact. ALPCS is intended for small airport land projects that will typically be conducted by a single agent (either sponsor staff or consultant). ALPCS will improve the performance of the sponsor to document its compliance with Uniform Act requirements. It will also improve program delivery to property owners and displaced persons. FAA project managers will have a web interface to evaluate work for compliance to FAA and Uniform Act requirements, certification acceptance, grant management and close out, or to respond to inquiries. Current FAA oversight, grant initiation and close out processes are expected to be significantly improved and streamlined with the application of ALPCS on sponsor land projects.

ARP will continue to undertake actions to expand the list of categorical exclusions under the National Environmental Policy Act (NEPA). This will assist in streamlining the environmental review process under NEPA by permitting certain additional FAA actions to be categorically excluded from environmental review rather than utilizing a more costly and longer environmental assessment process.

ARP will also continue to expand on the Environmental Management System Program and awareness both at headquarters and throughout its field organization.

The 35 airports included in the OEP account for about 75 percent of all passenger enplanements. Much of the delay to air traffic can be traced to inadequate throughput at some of these airports. Airfield construction (new runways, runway extensions, new taxiways, end around perimeter taxiways, and airfield reconfigurations) is the most effective method of increasing throughput and reducing delay. Consequently, constructing new and/or extending runways, taxiways, and airfield reconfiguration are contained in the FAA's NextGen Implementation Plan (formerly OEP). Arrival and departure rates at the nation's busiest airports are constrained by the limited number of runways that can be in active use simultaneously. The addition of new or extended runways and airfield reconfigurations will expand airport throughput at the target airports, and possibly for other airports in the same metropolitan area. In most cases, the airfield projects are sufficient to keep pace with forecasted demand. Since FY 2000, 15 new runways, two endaround perimeter taxiways, one runway extension, and one airfield reconfiguration have opened with another airfield reconfiguration two-thirds completed at the 35 OEP airports, allowing 1.9 million more annual operations. Currently, four OEP Airports have airfield projects (one new runway, one taxiway, one runway extension, and the third project in Phase 1 of the Chicago O'Hare Modernization) under construction. These projects will be commissioned through 2012 providing these airports with the potential to accommodate 111,000 more annual operations and reduce runway crossings. The complete listing of airfield projects included in the OEP are shown in the table below.

Airport	Anticipated Opening Date	Status
Chicago O'Hare	September 2008	Opened (9R/27L Ext)
(Reconfig.; Phase 1 w/3 projects)	November 2008	Opened (9L/27R)
	CY 2012	Under Construction (10C/28C)
Boston Logan	November 2009	Under Construction

Charlotte	February 2010	Under Construction
Portland	November 2010	Under Construction

In addition, 10 other OEP projects (3 airfield reconfiguration and 7 new runway/ runway extensions) are currently in various stages of the planning and environmental processes. New projects are included in the FAA Plan when the environmental processing has been completed, the Record of Decision has been issued, and the sponsor has provided the FAA with the dimensions, timing, alignment, and planned use of the runway. For details on these proposed projects, see the table below.

Airport or Metropolitan Area	Project	ROD will be Issued (Est.)	<u>Status</u>
Ft. Lauderdale	Extension	2008	FEIS issued June 2008
Atlanta Int'l	Extension	2009	Environmental underway
Philadelphia	Reconfiguration	2009	Draft EIS issued Sept 2008
Houston	New Runway	TBD	Environmental underway
Intercontinental			
Denver Int'l	New Runway	TBD	Study underway
Chicago O'Hare	Reconfiguration Phase 2	2005	ROD issued
Los Angeles	Reconfiguration – North Runway Complex	2005	ROD issued. Reconfiguration studies in progress
Washington Dulles	New Runway	2005	ROD issued
Salt Lake City	Runway Extension	TBD	Begin planning around 2010
Tampa	Runway	TBD	Begin planning around 2013

For runways, runway extensions and airfield reconfigurations included in the NextGen Implementation Plan, a horizontal integration team was established, comprised of all involved FAA lines of business along with a military representative. The team develops a runway template action plan comprised of tasks that must be considered when commissioning that runway and assigns accountability to the airport, airline, and FAA. This allows for early identification and resolution of issues that might impact the runway schedule. Quarterly meetings are held with airport operators and airlines. The FAA provides vital technical and financial assistance for planning, environmental analysis, and construction/rehabilitation of runways, taxiways, and aprons as well as other measures to expand and make more efficient use of airports. AIP funding plan will reflect a special emphasis on increasing capacity and improving the airport arrival efficiency rate. AIP funding of the following airport projects contributes to these goals:

- Construct, rehabilitate or overlay existing runways, taxiways, and aprons.
- Extend runways, taxiways, and aprons.
- Construct/improve terminal buildings.
- Acquire and install visual approach aids.
- Acquire and install Instrument Landing Systems (ILS).
- Acquire and install weather-reporting equipment.
- Bring pavement and other facilities up to design standards.
- Construct new airports/heliport

ARP assesses the environmental impacts of proposed airport projects submitted for AIP and Passenger Facility Charge (PFC) program funding or other approval, and provides technical and funding support to mitigate impacts. Noise is still the impact of greatest concern, and the AIP and PFC programs provide funding to assist in abating the impacts of aircraft noise in the neighborhoods surrounding airports.

ARP strives to reduce undue delays in the environmental review of airport projects while maintaining the integrity of the environmental process and complying with all environmental protection requirements. ARP has streamlined environmental documentation requirements; undertaken actions to improve interagency

coordination; issued revised environmental guidance for airport development; and has developed and utilizes recommended best practices for conducting environmental analysis and processing. In addition, efforts have been taken to integrate the airport planning and environmental processes. This will help streamline these processes and provide airport sponsors with opportunities for early input on both planning and environmental issues.

In FY 2011, ARP will continue to implement environmental streamlining provisions for capacity enhancement projects at congested airports, as specified by Congress in the Vision 100-Century of Aviation Reauthorization Act. Commissioning of new commercial service runways is dependent on the timely completion of environmental reviews. FAA staff will continue to apply new streamlining provisions of Executive Order 13274 on Environmental Stewardship and Transportation Infrastructure Project Reviews in order to facilitate the completion of designated airport projects.

After the identification of the impacted areas, often through AIP-funded studies, funding may help to purchase and relocate residences and businesses, soundproof residential homes or buildings used for educational or medical purposes, and purchase and install noise barriers or monitors. The AIP funding plan contributes to mitigating the harmful effects of aircraft noise for those living, working or going to school inside the significant aviation noise footprint.

The grants issued under AIP also provide funding to airports for equipment and facilities used to control access to their critical operations areas. In order to receive funding, projects must have been identified in TSA-approved security plans for airports covered by Part 1542, Airport Security or at airports not covered by Part 1542 and having security requirements.

Security projects required by statute or regulation carry a high priority for AIP funding. Projects providing for the security of passengers and other persons in the terminal, as well as the terminal buildings themselves, are treated equally with projects to secure aircraft and the aircraft operations area. ARP will continue to work with both airport owners and TSA representatives in identifying security requirements and discussing appropriate funding sources. The most common type of security project supported by AIP funding is the installation of access control equipment. This includes perimeter fencing, security gates, security lighting, and cameras.

# **Explanation of Funding Changes for Grants-in-Aid for Airports**

<b>Dollars (\$000)</b>	<u>FTE</u>
-11,531	0
-11,531	0
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### **Detailed Justification for Personnel & Related Expenses**

Personnel & Related Expenses FY 2011 Request: \$100,208

#### Overview:

The Associate Administrator for Airports (ARP) provides leadership in planning and developing a safe and efficient national airport system to satisfy the needs of the aviation interests of the United States, with due consideration for economics, environmental compatibility, local proprietary rights, and safeguarding the public investment. The Management Staff (ARP-10) is the principal advisor to the associate administrator in the management and administrative requirements areas, provides the focal point for coordination, and represents the Associate Administrator in matters relating to planning and utilization of agency resources. The Office of Airport Safety and Standards (AAS) is the principal FAA organization responsible for all airport program matters pertaining to standards for airport design, construction, maintenance, operations, safety, and data, including ensuring adequacy of the substantive aspects of FAA rulemaking actions relating to the certification of airports. The Office of Airport Planning and Programming (APP) is the principal FAA organization responsible for all program matters pertaining to national airport planning and environmental requirements, airport grants, property transfers, passenger facility charges, and ensuring adequacy of the substantive aspects of FAA rulemaking actions relating to these programs. The Office of Airport Compliance and Field Operations (ACO), is responsible for ensuring compliance with Federal airport grant and surplus property obligations, and economic regulatory oversight and providing executive direction and oversight of regional activities. This office serves as the first level decision maker for adjudication of complaints filed against airports under 14 C.F.R Part 16. Additionally, this office has oversight of strategic management goals for field operations in coordination with headquarter policies and guidance.

#### FY 2010 Base:

ARP establishes regulations for safe operation of commercial service airports and regularly inspects certificated airports for compliance. In FY 2010, we are emphasizing efforts to continue the reduction in runway incursions caused by vehicle/pedestrian deviations. This will require ensuring airports maintain effective driver training programs as well as implementing approved Runway Safety Action Team recommendations. We also have a special emphasis program to accelerate improvements to runway safety areas that do not meet current standards. Another significant initiative is implementation of Safety Management Systems (SMS) at airports to harmonize with ICAO standards. Further, AIP provides priority consideration for funding safety-related development for airports that benefit both commercial service and general aviation operations.

In FY 2010, ARP will increase capacity at the 35 OEP airports or major metropolitan areas by supporting, processing, and approving Airport Master Plans and Environmental Studies, directing funding investments toward capacity and delay reduction development, increasing the safety and capacity of the global civil aerospace system in an environmentally sound manner, and ensuring the success of its mission through stronger leadership, a better-trained workforce, a closer eye on spending, and improved decision-making based on reliable data.

#### **Anticipated FY 2010 Accomplishments:**

- Publish Advisory Circulars (AC) in FY 2010 that were contracted in FY 2009 or FY 2008.
- Award contracts for ACs in FY 2010 within 90 days of funds authorization as funding permits.
- Maintain average age of ACs at five years or less.
- Continue implementation of Airport SMS.
- Manage and execute Part 139 Airport Safety Certification program.
- Meet Part 16 compliance schedules.
- ACO will conduct two on-site airport compliance inspections for revenue diversion by September 30, 2010.
- Each region will conduct at least two land use inspections at General Aviation airports by September 30, 2010.
- Support the Joint Planning Development Office by identifying and implementing operational improvements from CONOPS.

- Integrate SMS into FAA airport planning and environmental processes and guidance.
- Support the President's initiative for E-Government by participating and providing resources to the Grants.gov and DOT grants portal initiative.
- Establish and implement ARP performance target for administering AIP based on identified Best Practices and Program Review.
- Administer the \$3.5 billion AIP by issuing approximately 2,200 grants meeting FAA Flight Plan and ARP Business Plan performance targets.
- Maximize the return on AIP investments by increasing the outlay rate on AIP grants.
- Maximize the return on PFC investments by ensuring PFC applications are closed out in a timely manner.
- Increase oversight of AIP payments by improving the FAA's Risk-Based Management Project Management System.
- Fund WAAS/LPV surveys and/or infrastructure needs by September 30, 2010.

## FY 2011 Budget Request:

FY 2011 funding will continue supporting the establishment and maintenance of high safety standards for U.S. airports. High standards reduce risks and contribute directly to a reduction in fatal accidents.

The requested increase will provide FTEs to support increased workload requirements on Program Managers as a result of the agency's implementation of Safety Management Systems (SMS) and increased Grants Management Oversight requirements. As part of the FAA's implementation of SMS, program managers in Airport District Offices will be required to participate in the preparation of Safety Risk Management Documents (SRMDs). SRMDs will be required for any changes to the National Airspace System including changes to airports such as new runways or taxiways. These airport projects will require study and analysis to identify risk, quantify risk, and develop and implement mitigation measures to reduce risk to acceptable levels. This will be a complex study for large airport projects. ARP representation on the teams developing SRMD documents is essential to ensure the proper risks are identified and the mitigation to reduce risk to acceptable levels does not impact capacity improvements expected from the airport projects. In addition, the program managers are needed to support new documentation requirements and Grants Management Oversight responsibilities which were established to enhance the internal controls of the Airport Improvement Program. The additional FTEs will help achieve clean audit of the AIP program by ensuring required grant documentation is collected and maintained in accordance with standardized grant documentation requirements.

Through the Airport Safety Data Program, the agency gathers information on all public-use airports for dissemination to pilots. The information is gathered by FAA's airport certification safety inspectors and through state inspectors funded by the agency. Information on the airport, such as lighting systems, pavement condition, runway lengths, and type of fuel available is entered into the National Flight Data Center database. The information is used to publish the Airport Facility Directory as well as for incorporation on aeronautical charts.

The FAA's engineering and technical support staff develops ACs and technical specifications. These technical documents provide airports with guidance on how to comply with airport safety regulations. ACs and technical specifications are maintained for areas such as airport signage, airport design and planning, airport rescue and firefighting, and on reducing wildlife hazards near airports. Regional engineers also review proposed airport safety and development projects.

ARP staff manages and executes the AIP grant program, providing funding for eligible Part 1542 security requirements identified in security plans approved by the Transportation Security Administration (TSA). ARP staff provides guidance on AIP eligibility, formulate the ACIP identifying security needs, and work closely with the respective airport owners and TSA to fund eligible security requirements. The Office of Airports will continue to work with both airport owners and TSA representatives in identifying security requirements and discussing appropriate funding sources.

ARP will provide vital technical and financial assistance for planning, environmental analysis, and construction, rehabilitation, or overlays of runways, taxiways, and aprons as well as other measures to expand and make more efficient use of airports. ARP staff actively participates in developing and

maintaining the Runway Template Action Plan (RTAP) supporting the timely commissioning of the runways. ARP staff will continue to ensure timely review of planning, environmental and financial efforts for infrastructure development with an emphasis on capacity enhancing projects.

ARP staff assesses the environmental impacts of proposed airport projects submitted for AIP funding or other approval, and provide technical and funding support to mitigate impacts. Noise and air quality are the impacts of greatest concern, and the AIP and Passenger Facility Charge (PFC) programs provide funding to assist in abating the impacts of aircraft noise and emissions in the neighborhoods surrounding airports. ARP staff will continue to apply new streamlining provisions in both the Executive Order 13274 on Environmental Stewardship and Transportation Infrastructure Project Reviews and Vision 100 to OEP projects. Increased concerns regarding emission of greenhouse gases will also be addressed.

ARP also promotes improved international safety and regulatory oversight by participating in International Civil Aviation Organization (ICAO) panels and workgroups and by providing technical assistance to countries seeking to improve airport safety and operations.

# **Explanation of Funding Changes for Personnel & Related Expenses**

<u>Dollars (\$000)</u>		
Personnel and Related Expenses (Net change from FY 2010)	6,786	16.5
Overview:		
For FY 2011, the Associate Administrator for Airports requires \$100 its mission of providing leadership in planning and developing a sa system to satisfy the needs of the aviation interests of the United Seconomics, environmental compatibility, local proprietary rights, an investment. Covering the administrative expenses for the Office of an increase of \$6,786,000 from the FY 2010 enacted level.	fe and efficient nation States, with consideral nd safeguarding the pu	al airport tion for ublic
The increase is due to a combination of several program increases discretionary increases.	, pay raises, inflation,	and
Annualized FTEs:	1,152	7.5
Allitualized FTES:	1,152	7.5
This represents the net annualized costs of FY 2010 new hires and attrition.		
Annualized FY 2010 Pay Raise:	373	
This pay raise has been calculated separately based on the employee population under the Core Compensation pay plan. This increase is needed to provide for the full-year cost associated with the Organizational Success Increase (OSI) and the Superior Contribution Increase (SCI) awarded in FY 2010. The OSI is 100 percent of the 2.0 percent average government-wide pay raise plus 1.0 percent (3.0 percent). The Core Compensation system awards three different pay raises—20 percent of the population receive the OSI plus a 1.8 percent SCI, 45 percent receive the OSI plus a 0.6 percent SCI, and 35 percent receive just the OSI. The FY 2010 portion of this pay raise is funded within enacted amounts; this increase covers the first quarter of FY 2011.		
FY 2011 Organizational Success Increase (OSI):	967	
This pay raise has been calculated separately based on the employee population under the Core Compensation pay plan. This increase is required to provide for costs associated with base salary increases that are provided to employees meeting or exceeding job expectations. The factor used is 3.0 percent, composed of the projected 2.0 percent government-wide pay raise in January 2011 plus 1.0 percent for the full OSI increase (derived from the elimination of Within-Grade increases). A fundamental component of the FAA's pay-for-performance system, this increase assumes FAA will meet most of its FY 2010 performance goals.		
FY 2011 Superior Contribution Increase (SCI):	352	
1 1 20 11 Juponor Continuation morease (301).	332	

	<b>Dollars (\$000)</b>	<u>FTE</u>
This increase is required to provide for costs associated with base salary increases that are provided to employees in the Core Compensation system providing superior contributions to the organization. The factor used is 1.8 percent for 20 percent of the population and 0.6 percent for 45 percent of the population. The remaining 35 percent do not receive this increase.		
Non-Pay Inflation:	94	
This increase is needed to provide for inflationary cost increases consistent with OMB guidance that uses the FY 2011 GDP price index (year over year) of 0.5 percent.		
Airport Safety Management Systems (SMS):	172	1.0
The requested increase will provide two positions and one FTE to complete the build up for SMS staffing. SMS is the documentation of risk, risk analysis, mitigation, and tracking. It is labor intensive as staff is required to coordinate with ATO and the airport community. This is required during the planning and development process when SMS staff is needed to participate on Safety Risk Management Document (SMRD) teams. SMRDs will be required for any airport development project requiring a Federal action or impacting safety. The positions are required to fully implement SMS and allow regions to adequately participate in SRMD panels and complete their SMS requirements.		
AIP Financial Management and Oversight:	1,360	5.0
The requested increase will provide 10 positions, 5 FTE's and funding to support increased oversight of grantee use of AIP funds and will improve the financial management and integrity of the program.	.,	
This funding provides for contract support and staff oversight to develop, implement and monitor an appropriate oversight program to test grant transactions and verify grant file documentation. These actions will assure that the requisite internal controls are in place and in use to assure prudent financial management and program integrity.		
During its FY 2005 annual audit of the Airport Improvement Program (AIP) conducted, in accordance with the Chief Financial Officers Act, KPMG identified the potential for misuse of AIP funds. The auditor's concluded that the FAA Office of Airport's lacks an effective risk based approach to oversee and monitor sponsor activities which increases the risk of program funds being misused, wasted, or used fraudulently by non-FAA entities.		
Under the FAA's Risk Based Project Management System, oversight requirements increase when an airport sponsor is determined to pose a "moderate" and "elevated" risk. The number of increased risk sponsors has gone up since implementation of the risk based approach, increasing the level of oversight reviews required by project managers. Additionally,		

	Dollars (\$000)	<u>FTE</u>
over the past three years, the shear number and complexity of grants has increased significantly due to repeated split-year appropriations (25 percent increase from FY 2007 to 2008 alone) and the passage of American Recovery and Reinvestment Act of 2009.		
Finally, the Office of Inspector General (OIG) has provided preliminary information indicating its belief that the AIP program lacks adequate internal controls to properly protect AIP from making "improper payments" to airport sponsors. According to the OIG's preliminary findings, there is not a sufficient number of airport sponsors at the moderate and elevated risk levels. An increase in risk level of even a moderate number of airport sponsors will create additional workload necessary to review supporting documentation for AIP payments. These reviews can be very time consuming and require a significant attention to details and knowledge of procurement and accounting regulations and standards. In addition, most employees currently employed by ARP do not have the required financial and/or accounting education and experience necessary to be proficient in the review of accounting documentation for the purpose of detecting improper payments.		
Engineering Support:	172	1.0
The requested increase will provide two positions and one FTE to address the divisions increased workload.		
A civil engineer is required to work on airport design issues. These include issuing changes to keep the airport Design AC up to date, coordinating modifications to standards, and providing guidance to regions on airport design issues.		
A program analyst is also required to address improvements to the Runway Safety Area database that were highlighted as required by the OIG. The analyst will also be responsible for improving data collection and analysis of aircraft overruns. This was also pointed out as an area needing improvement in the GAO Runway Safety Report.		
Airport Geographic Information Systems (GIS):	1,158	1.5
The requested increase will provide \$500,000 for contract support to increase the Airport-GIS (AGIS) which will support implementation of AGIS in ARP. Increased funding will be used to implement the program ARP wide and develop the program improvements in the following areas:  - eALP coordination process improvements - Digital Notams		
- 5010 program interface		
<ul><li>- Automated design standards review</li><li>- Automated planning review</li></ul>		
Automated planning review     Automated airspace review with AVN and TERPS data		
<ul><li>SOAR graphical interface</li><li>Certification Inspection graphical toolkit</li></ul>		
- Airport owner/sponsor graphical toolkit (outside the firewall)		

400	
586	0.5

The video will help tell the story of how airport infrastructure and NextGen improvements will make a real difference in	s (\$000)	FIE
improving capacity, reducing delay, and improving the overall passenger experience at an airport. Stakeholder buy-in and public support are critical to the success of the NextGen program. Without the additional position our ability to keep up with the advancing NextGen program will be compromised.		

## **Detailed Justification for Airport Technology Research (ATR)**

Airport Technology Research FY 2011 Request: \$27,217

#### Overview:

For FY 2011, research will be conducted in the areas of airport pavement, airport marking and lighting, airport rescue and firefighting, airport planning and design, wildlife hazard mitigation, runway surface technology, and visual guidance. The results of this research are used to update ACs, manuals, and technical specifications that airports rely on when expending AIP funds.

#### FY 2010 Base:

FAA managers and engineering staff both at Headquarters and at the William J. Hughes Technical Center review projects proposed for research. The FAA's Research and Advisory Airport Subcommittee meets with FAA engineers and managers every six months to review research progress as well as the proposed future research requirements and priorities that are reflected in this submittal. The Subcommittee includes representatives from airports, aviation associations, aviation industry, aircraft manufacturers, and the Airline Pilots Association. This mix of airport users ensures the research proposed is what the airport community needs and reflects their priorities.

The research conducted is producing significant benefits in increased safety and potential cost savings. In support of capacity, the research results from the National Airport Pavement Test Facility (NAPTF) are providing technical data needed to validate new design standards and to assure compatibility between aircraft and airport runways worldwide. The cooperative research and development agreement and collaboration with international research organizations has led to the creation of many innovative, FAA-developed software programs that have changed the way airport pavements are designed and evaluated. Some examples include:

- FAARFIELD 1.0, or FAA Rigid and Flexible Iterative Elastic Layer Design, provides a simpler way for
  airport planners to determine the needed thickness of runway and taxiway pavements. It also helps me
  the standards for different airplanes, and model the thicknesses needed to handle them all. It has the
  potential to save the FAA and airport authorities tens of millions of dollars in airport pavement redesign
  efforts.
- **ProFAA**, a runway profile data analysis software program, is an innovative method that allows users to calculate roughness and simulate aircraft response to obtain a better understanding of overall pavement life and aircraft fatigue.
- COMFAA computes Aircraft Classification Numbers following the internationally mandated ICAO standard. A library of common aircraft types is provided and the user can also define arbitrary gear configurations. This is useful for computing the Pavement Classification Number, once a critical aircraft and maximum allowable load has been defined.
- BAKFAA is a program designed to be used with falling-weight deflectometer (FWD) equipment as part of a pavement evaluation program. BAKFAA reads the data from a variety of FWD devices and returns backcalculated layer properties. The computational engine in BAKFAA is LEAF (Layered Elastic Analysis FAA). LEAF is built into FAARFIELD, but can also be downloaded and run separately under BAKFAA. The FAA has made the Visual Basic™ source code for BAKFAA and LEAF available for programmers to run LEAF from their own applications.

Achieving the overall FAA goal of reducing accidents requires improvement in airport safety as well as aircraft safety. Outputs of the program include guidance regarding: new technology and techniques that can improve airport lighting and marking to help reduce surface accidents and runway incursions; improve aircraft rescue and fire fighting to address double decked aircraft carrying up to 800 passengers; and modify the habitats of increasing numbers of wildlife on or near airports. Wildlife habitat management research results are published in a widely distributed manual. FAA's wildlife strike database provides information about incidents and accidents involving wildlife strikes around the nation. The FAA is evaluating bird detection radar in a cooperative program with the Department of Defense and industry to provide real-time bird hazard data to airport users. Ongoing research is also conducted in aircraft rescue and firefighting technology leading to more efficient fire fighting techniques. Research in the surface technology issues such as the – leads to a safe and environmentally friendly operations.

Past research also led to the development of engineered materials arresting systems (EMAS) that have been installed at more than 35 airports and have safely stopped overrunning aircraft in fiver separate instances.

### **Anticipated FY 2010 Accomplishments:**

- Complete study of Next Generation High Reach Extendible Turret.
- Complete validation of commercial avian radars.
- Complete evaluation of alternative runway groove shape on asphalt and concrete runway surfaces.
- Complete evaluation of camera based FOD detection systems at Boston Logan and Chicago O'Hare.
- Complete evaluation of a mobile FOD detection system at Chicago's Midway Airport.
- Complete evaluation of Taxiway Deviation data collection at Manchester, NH and West Palm Beach and Orlando, FL, and Chicago O'Hare.
- Complete phase 1 study of fire fighting agent quantities for NLA.
- Initiate full scale testing of composite fires at NLA Facility, Tyndall AFB, Panama City, FL.
- Complete Report on New Photoluminescent Technology for Visible Surface Markings
- Evaluate effectiveness of a prototype alternative runway groove shape.
- · Complete Study of Engineered Material Arresting System cold region freeze-thaw durability
- Complete Testing of Effects of Runway De/Anti-Icing Chemicals on Traction
- Initiate Experimentation on Alternative Arresting System Concepts
- Continue analyzing full-scale data from the NAPTF.
- Improve upon airport pavement thickness design package, including 3D finite element structural models, using FAARFIELD, an analytical program developed for the Agency.
- Complete a final report on rubblization of airfield pavements.
- Start development of a web-based application for airport pavement database management system.
- Develop models for airport funding strategies and passenger surveys.
- Continue full scale testing and analyze effects of subgrade quality and aircraft wheel gear spacing.
- Perform full scale testing and analyze effects of high tire pressure of aircraft wheels.

#### FY 2011 Budget Request:

The table below summarizes the research activities funded by this request. (\$000)

Research Project	FY 2010	FY 2011	Increase/
		Request	Decrease
Contracts			
Advanced Airport Pavement Design	468	450	(18)
Pavement Design & Evaluation Methodology	936	1,000	64
National Airport Dynamic Tests	2,850	2,850	0
Heavy vehicle simulator	0	2,400	2,400
Field Instrumentation & Testing	750	750	0
Improved Paving Materials	1,350	1,300	(50)
Non-Destructive Pavement Testing	1,100	1,100	0
Pavement Roughness	437	450	27
Material Testing Laboratory	200	250	50
CEAT-University of Illinois	312	350	38

TOTAL	22,472	27,217	4,745
In-House (FTEs)	3,481	4,060	579
Subtotal—Contracts	18,991	23,157	4,166
Rescue and Fire Fighting	624	650	26
Surface Technology	1,607	2,002	395
Soft Ground Systems Follow on	312	300	(12)
Airport Visual Guidance test bed	2,000	2,300	300
Airport visual guidance/runway incursions reduction	1,200	2,125	925
Airport Wildlife Hazards Abatement	2,500	2,500	0
Composite Materials Firefighting	453	500	47
Operation of NLA	800	800	0
Airport Design	728	700	(28)
Airport Planning	364	380	16

The main increases for FY 2011 are \$2,400,000 for the Heavy Vehicle Simulator for pavement testing under high tire-pressure; \$300,000 for Phase II visual guidance test bed; and \$925,000 for the Airport Visual Guidance/incursion reduction program. The additional money will be used in three areas: (1) Lighting Technologies - \$450K (install, evaluate, and validate new electrical circuits, and provide more efficient ways of powering LEDs and other new technology lighting systems to replace the standard constant current power systems which are too costly and inefficient for powering LED fixtures. New lighting circuits are presently being developed by an industry/government working group); (2) Sign Technologies - \$225K (install, test and evaluate variable message signs for use with ASDE-X and runway status light type systems to improve situational awareness and reduce the potential for runway incursions); and (3) Vertical Flight - \$250K (install, test, and evaluate existing and new technologies for the development of new and improved heliport standards to revise the existing Advisory Circular (AC)). There are other increases and decreases in the above table that add up to the total increase of \$4,745 for FY 2011.

The research conducted utilizing this test bed will provide the FAA and our nation's airports a better understanding of what is needed to properly design and operate various airport lighting systems that use new state of the art lighting devices. The results will be published and may also be adopted into an FAA AC. Conducted properly, this effort will bring the FAA to the forefront of airport visual guidance technology and better align our airports so that they can support demands expected with the NextGen of aviation.

In **Phase 1 (FY-2010)**, research would be conducted to determine the requirements of the test site, perform coordination with an existing airport for cooperation, site surveying, etc. At the end of this phase, the proposed system layout would be fully completed, with the site selected, and a schedule of installation complete.

In **Phase 2 (FY-2011)**, all of the necessary material, equipment, contractors, etc., would be procured to perform the required duties to construct the test site. At the conclusion of this phase, the site would be complete with all wiring, conduit, access holes, fixtures, paint markings, etc., in place.

In the final **Phase 3 (FY-2012)**, the necessary data acquisition systems, monitoring equipment, etc. would be procured and installed to complete the test site, giving researchers sufficient data tools to operate and monitor the various technologies that were installed.

The trend in aircraft industry is to produce aircraft with extended range capability, which results in high gross weight and tire pressures. The effects of high tire pressure are localized and concentrated in the surface layers (like HMA). This makes it imperative to study the effects of high tire pressures on the HMA surface and also develop HMA mix design procedures to produce mixes that can withstand these anticipated high tire pressures.

The Heavy Vehicle Simulator (HVS) will be used to perform the testing. It will be easier and economical to

insulate and heat the test pavement under the HVS. Also, heating is applied from the top which is more representative of an in situ pavement. For testing pavement rehabilitation techniques, the structurally failed pavement under NAPTF test vehicle during a construction cycle can be rehabilitated with different techniques (reflective cracking resistant HMA mixes, concrete overlays, etc.) and then tested with HVS.

#### **Explanation of Funding Changes for Airport Technology Research (ATR)**

Dollars (\$000) FTE

Airport Technology Research (Net change from FY 2010)	4,745	1
Overview		
Overview:  For FY 2011, the Associate Administrator for Airports requires 27,216,58 in the areas of airport pavement, airport marking and lighting, airport replanning and design, wildlife hazard mitigation, runway surface technologiesults of this research are used in updating Advisory Circulars, manuals airports rely on when expending Airport Improvement Program (AIP) grants are supported by the control of t	escue and firefighting, a ogy, and visual guidance s, and technical specifica	irport e. The
Annualized FTEs:	78	0.5
This represents the net annualized costs of FY 2010 new hires and attrition.		
A U LEVOQUE D. D. I	47	
Annualized FY 2010 Pay Raise:  This pay raise has been calculated separately based on the employee population under the Core Compensation pay plan. This increase is needed to provide for the full-year cost associated with the Organizational Success Increase (OSI) and the Superior Contribution Increase (SCI) awarded in FY 2010. The OSI is 100 percent of the 2.0 percent average government-wide pay raise plus 1.0 percent (3.0 percent). The Core Compensation system awards three different pay raises—20 percent of the population receive the OSI plus a 1.8 percent SCI, 45 percent receive the OSI plus a 0.6 percent SCI, and 35 percent receive just the OSI. The FY 2010 portion of this pay raise is funded within enacted amounts; this increase covers the first quarter of FY 2011.	17	
FY 2011 Organizational Success Increase (OSI):	78	
This pay raise has been calculated separately based on the employee population under the Core Compensation pay plan. This increase is required to provide for costs associated with base salary increases that are provided to employees meeting or exceeding job expectations. The factor used is 3.0 percent, composed of the projected 2.0 percent government-wide pay raise in January 2011 plus 1.0 percent for the full OSI increase (derived from the elimination of Within-Grade increases). A fundamental component of the FAA's pay-for-performance system, this increase assumes FAA will meet most of its FY 2010 performance goals.		
EV 2011 Superior Contribution Incress (SCI).	14	
FY 2011 Superior Contribution Increase (SCI):  This increase is required to provide for costs associated with base salary increases that are provided to employees in the Core Compensation system providing superior contributions to the organization. The factor used is 1.8 percent for 20 percent of the population and 0.6 percent for 45 percent of the population. The	16	

Dollars (\$000) FTE

remaining 35 percent do not receive this increase.		
Non-Pay Inflation:	95	
This increase is needed to provide for inflationary cost increases consistent with OMB guidance that uses the FY 2011 GDP price index (year over year) of 0.5 percent.		
Discretionary Increases		
Safety & Pavement Research:	4,461	0.5
The requested increase of \$86,000 for one additional position (0.5 FTE) in FY 2011; will bring the total staffing in the Airport Technology Research Program to 23 positions and 23.5 FTE.		
The Testing Material Laboratory will be operational in late FY-2010. The new materials testing lab will be certified by the AASHTO Materials Reference Laboratory (AMRL) for asphalt materials and Cement and Concrete Reference Laboratory (CCRL). This certification will allow us to do all our in-house materials testing and also provide certified and reliable material testing services to other agencies and organizations.		
A full-time Laboratory Manager is needed to first complete required Certifications, and then to oversee the performance of tests and analyze the test results, as well as, manage a minimum of one to two contract lab technicians. He/she will also be responsible for overall lab management including equipment calibrations, test and lab certifications, quality assurance program and report writing.		
The additional \$750,000 is a net increase of the other research project areas captured in the table captured under the FY 2011 Budget Request section.		
This research project is designed as a multi-year effort that would be conducted in three phases:		
Phase 1 was requested in FY 2010.		
Phase 2 of the Visual Aids Test Bed will be funded in FY 2011 for an increase of \$300,000. All of the necessary material, equipment, contractors, etc would be procured to construct the test site. At the conclusion of this phase, the site would be complete with all wiring, conduit, access holes, fixtures, paint markings, etc. in place.		
In the final Phase 3, the necessary data acquisition systems, monitoring equipment, etc. would be procured and installed to complete the test site, giving researchers sufficient data tools to operate and monitor the various technologies that were installed.		
Heavy Vehicle Simulator funding increase of \$2,400,000. The trend in aircraft industry is to produce aircraft with extended range capability, which results in high gross weight and tire pressures. The effects of high tire pressure are localized and concentrated in the surface layers (like HMA). This makes it imperative to study the effects of high tire		

Dollars (\$000)	FTE
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pressures on the HMA surface and also develop HMA mix design procedures to produce mixes that can withstand these anticipated high tire pressures.

The National Airport Pavement Test Facility (NAPTF) and test vehicle (NAPTV) is used for full scale pavement tests and is ideal for testing pavement structure as a whole (structural failure which is related to subgrade failure) but is to some extent deficient in the following areas of research:

- testing the effects of high tire pressures in the pavement surface layers,
- testing the performance of individual pavement layers (especially the upper layers) and layer materials (like Hot Mix Asphalt, Warm Mix Asphalt and Stone Matrix Asphalt), and
- testing the effects of temperature variation in the pavement surface layers.

The work to-date for high tire pressures has primarily been laboratory tests. Full-scale tests are needed so that the performance prediction models for HMA from laboratory tests can be validated/calibrated to the in situ pavements. Full-scale tests at high HMA temperatures are essential for the success of these projects. In the projects related to pavement material properties and surface layers, wheel load and tire pressures in combination with surface temperature are more critical than the gear load (due to minimum wheel load interaction affects). The NAPTF is an indoor facility and there are limitations on achievable pavement temperatures. One way is to heat the asphalt pavement section from underneath, and the cost estimate is approximately \$2.25 million to heat a 300 ft long by 60 ft wide test section.

Airport Visual Guidance and runway incursion reduction - \$925,000. The funding will be used in three areas: (1) Lighting Technologies - \$450K – install, evaluate, and validate new electrical circuits, and provide more efficient ways of powering LEDs and other new technology lighting systems to replace the standard constant current power systems which are too costly and inefficient for powering LED fixtures. New lighting circuits are presently being developed by an industry/government working group; (2) Sign Technologies - \$225K – install, test and evaluate variable message signs for use with ASDE-X and runway status light type systems to improve situational awareness and reduce the potential for runway incursions; and (3) Vertical Flight - \$250K – install, test and evaluate existing and new technologies for the development of new and improved heliport standards to revise the existing Advisory Circular.

#### Detailed Justification for Airport Cooperative Research Program (ACRP)

Airport Cooperative Research Program FY 2011 Request: \$ 15,000

#### Overview:

For FY 2011, FAA proposes to continue funding this program from the Grants-in-Aid for Airports appropriation and maintain the funding level at \$15,000,000. ACRP was authorized by section 712 of Vision 100 – Century of Aviation Reauthorization Act.

#### FY 2010 Base:

The Secretary of Transportation signed the Memorandum of Agreement among DOT, FAA, and National Academy of Sciences to implement the ACRP. The Secretary also appointed the 13 members of the board of governors of the ACRP. The Transportation Research Board (TRB) of the National Academy is administering the program. The ACRP board of governors has met every six months to review progress and select additional topics to fund. Over 200 submitted topics will be reviewed at the July 2009 meeting and the most promising topics selected for contract award in FY 2010. The Board of Governors selects the highest rated topics, subject to the funds available, to proceed to contract solicitation and award. The TRB appoints expert technical panels for each selected project. The technical panels convert the topics into requests for proposals to select contractors to perform the research. The panels also monitor each project to ensure it stays on track and meets project deliverables.

ACRP program is off to a good start. One hundred twenty-seven projects have been initiated and 36 published as of June 2009.

#### **Anticipated FY 2010 Accomplishments:**

- ACRP awards contracts that are selected for funding in FY 2010.
- Board of Governors will meet twice during FY 2010 to select projects to fund with the funds appropriated in FY 2011.
- TRB appoint project technical panels to monitor FY 2010 research projects awarded.

#### FY 2011 Budget Request:

The ACRP FY 2011 budget request is \$15,000,000 as it was in the FY 2010 President's Budget request. We are requesting to hold the total the same as in FY 2010 and not request mandatory or inflation increases. We will absorb these increases within the authorized level of \$15,000,000. Within the \$15,000,000 we are also requesting one engineer position. When the ACRP was initiated and funded at \$10 million, it included one position for FAA. The 50 percent increase in funding from \$10 million (in FY 2008) to \$15 million requires this second position to effectively manage the increased level of ACRP. Topics received have increased from about 100 in prior years to over two hundred now that the program is at the \$15 million level. This means more topics will be reviewed, more topics funded, and more technical panels required to develop the request for proposals, select contractors, monitor the contractors, and review the deliverables. The FAA needs to have an engineer on each project panel. The ACRP Board of Governors will meet in July 2009 to select the most promising topics (more than 200 submitted) for funding in FY 2010.

#### **Explanation of Funding Changes for Airport Cooperative Research Program (ACRP)**

	<u>Dollars (\$000)</u>	<u>FTE</u>
Airport Cooperative Research Program (Net change from FY 2010)	0	0.5
Overview:  For FY 2011, we are maintaining the Airport Cooperative Research Prog \$15,000,000. There is a discretionary reduction in the contracts portion increase.		
Annualized FY 2010 Pay Raise:  This pay raise has been calculated separately based on the employee population under the Core Compensation pay plan. This increase is needed to provide for the full-year cost associated with the Organizational Success Increase (OSI) and the Superior Contribution Increase (SCI) awarded in FY 2010. The OSI is 100 percent of the 2.0 percent average government-wide pay raise plus 1.0 percent (3.0 percent). The Core Compensation system awards three different pay raises—20 percent of the population receive the OSI plus a 1.8 percent SCI, 45 percent receive the OSI plus a 0.6 percent SCI, and 35 percent receive just the OSI. The FY 2010 portion of this pay raise is funded within enacted amounts; this increase covers the first quarter of FY 2011.	0.9	
FY 2011 Organizational Success Increase (OSI):  This pay raise has been calculated separately based on the employee population under the Core Compensation pay plan. This increase is required to provide for costs associated with base salary increases that are provided to employees meeting or exceeding job expectations. The factor used is 3.0 percent, composed of the projected 2.0 percent government-wide pay raise in January 2011 plus 1.0 percent for the full OSI increase (derived from the elimination of Within-Grade increases). A fundamental component of the FAA's pay-for-performance system, this increase assumes FAA will meet most of its FY 2010 performance goals.	4	
FY 2011 Superior Contribution Increase (SCI):  This increase is required to provide for costs associated with base salary increases that are provided to employees in the Core Compensation system providing superior contributions to the organization. The factor used is 1.8 percent for 20 percent of the population and 0.6 percent for 45 percent of the population. The remaining 35 percent do not receive this increase.  Non-Pay Inflation:	0.8	
Non-Pay Inflation:  This increase is needed to provide for inflationary cost increases consistent with OMB guidance that uses the FY 2011 GDP price index	74	

#### Dollars (\$000) FTE

ACRP Unavoidable Decrease  There is a discretionary reduction in contracts to offset unavoidable personnel increases.  ACRP Engineer  The requested increase is for one additional engineer. When the ACRP was initiated and funded at \$10 million, it included one position	-166	
The requested increase is for one additional engineer. When the		
The requested increase is for one additional engineer. When the		
for FAA. The 50 percent increase in funding from \$10 million (in FY 2008) to \$15 million requires this second position to effectively manage the increased level of ACRP. Topics received have increased from about 100 in prior years to over 200 now that the program is at the \$15 million level. Each of these projects requires an FAA engineer to serve on the project technical panel that develops the request for proposals from the topic, reviews proposals and selects contractors, monitors contractor performance, and evaluates deliverables.	86	0.5

#### AIRPORT IMPROVEMENT PROGRAM

Personnel and Related Expenses (\$000)

The request for Personnel and Related Expenses under the Grants-in-Aid for Airports for FY 2011 is \$100.208 million, an increase of \$6.786 million from the FY 2010 level of \$93.422 million. This increase is the result of unavoidable personnel increases of \$2.938 million and discretionary increases of \$3.848 million. Details on these discretionary increases can be found in the Explanation of Funding Changes table for Personnel and Related Expenses.

Summary Information			
	<u>EOY</u>	<u>FTE</u>	<b>Dollars</b> (\$000)
FY 2010 Request	550	542.5	93,422
FY 2011 Adjustments to Base		7.5	2,938
FY 2011 Discretionary Increases	18	9.0	3,848
FY 2011 Proposed Program Level	568	559.0	100,208
FY 2011 Adjustments to Base			
			Dollars (\$000)
1. Annualized FTE's			
2. Annualized FY 2010 Pay Raise			373
3. FY 2011 Organizational Success Increase (OSI)			967
4. FY 2011 Superior Contribution Increase (SCI)			352
5. Non-Pay Inflation			. 94
Cubtatal Adiustments to Dage			
Subtotal, Adjustments to Base			2,938
Subtotal, Adjustments to Base			2,938
Subtotal, Adjustments to Base			2,938
FY 2011 Discretionary Increases			2,938
•			2,938 <u>Dollars (\$000)</u>
•			2,938 <u>Dollars (\$000)</u>
FY 2011 Discretionary Increases	st		<b>2,938</b> <u>Dollars (\$000)</u> 172
FY 2011 Discretionary Increases  1. Airport Safety Management System (SMS) Speciali 2. AIP Financial Management & Oversight	st		2,938  Dollars (\$000)  172 1,360
FY 2011 Discretionary Increases  1. Airport Safety Management System (SMS) Specialis	st		2,938  Dollars (\$000) 172 1,360 172
FY 2011 Discretionary Increases  1. Airport Safety Management System (SMS) Speciali 2. AIP Financial Management & Oversight	st		2,938  Dollars (\$000) 172 1,360 172 1,158
FY 2011 Discretionary Increases  1. Airport Safety Management System (SMS) Speciali 2. AIP Financial Management & Oversight	st		2,938  Dollars (\$000) 172 1,360 172 1,158 400
FY 2011 Discretionary Increases  1. Airport Safety Management System (SMS) Speciali 2. AIP Financial Management & Oversight	st		2,938  Dollars (\$000) 172 1,360 172 1,158 400
FY 2011 Discretionary Increases  1. Airport Safety Management System (SMS) Speciali 2. AIP Financial Management & Oversight	st		2,938  Dollars (\$000)  172  1,360  172  1,158  400  586

#### **AIRPORT IMPROVEMENT PROGRAM**

Airport Technology Research (\$000)

The request for Airport Technology Research under the Grants-in-Aid for Airports for FY 2011 is \$27,217 million, an increase of \$4,745 million from the FY 2010 level. This increase is a result of a discretionary increase of \$4,461 million, and annualization of the FTEs. Details on this discretionary increase can be found in the Explanation of Funding Changes table for Airport Technology Research.

Summary Information			
	<u>EOY</u>	<u>FTE</u>	<b>Dollars</b> (\$000)
FY 2010 Request	23	22.5	22,472
FY 2011 Adjustments to Base		0.5	284
FY 2011 Discretionary Increases	1	0.5	4,461
FY 2011 Program Level	24	23.5	27,217
FY 2011 Adjustments to Base			Dollars (\$000)
1. Annualized FTE's			78
2. Annualized FY 2010 Pay Raise			17
3. FY 2010 Organizational Success Increase (OSI)			77
4. FY 2010 Superior Contribution Increase (SCI)			16
5. Non-Pay Inflation.			95
Subtotal, Adjustments to Base			284
FY 2011 Discretionary Increases			
			Dollars (\$000)
1. Safety and Pavement Research			4,461
Subtotal, Discretionary Increases			4,461

#### AIRPORT IMPROVEMENT PROGRAM

Airport Cooperative Research (\$000)

The request for Airport Cooperative Research Program under the Grants-in-Aid for Airports for FY 2011 is \$15.000 million. Details can be found in the Explanation of Funding Changes table for Airport Cooperative Research.

Summary Information			
	<u>EOY</u>	<u>FTE</u>	<b>Dollars</b> (\$000)
FY 2010 Request	1	1	15,000
FY 2011 Adjustments to Base			-86
FY 2011 Discretionary Increase	1	0.5	86
FY 2011 Proposed Program Level	2	1.5	15,000
FY 2011 Adjustments to Base			
			<u>Dollars (\$000)</u>
1. Annualized FTE's			0
2. Annualized FY 2010 Pay Raise			0.9
3. FY 2011 Organizational Success Increase (OSI)			4
4. FY 2011 Superior Contribution Increase (SCI)			0.8
5. Non-Pay Inflation			74
6. ACRP Unavoidable Decrease			-166
Subtotal, Adjustments to Base			-86
FY 2011 Discretionary Increases			
			Dollars (\$000)
1. Airport Cooperative Research Program Engineer			86

Subtotal, Discretionary Increases .....

# Passenger Facility Charge (PFC) Approved Locations As of January 1<sup>st</sup>, 2010

#### (Whole Dollars) PFC APPROVED LOCATIONS

Locations approved to collect at a \$4.50 PFC level are indicated by shaded row.

Associated City	State	Airport Name Birmingham -	LOC ID	Hub size	Level	Total Approved	Duration	Start Date	Est. Expir. Date
Birmingham	AL	Shuttlesworth International Birmingham -	ВНМ	S	\$3.00	\$24,548,436	6y3m	8/1/1997	11/1/2003
Birmingham	AL	Shuttlesworth International	внм	S	\$3.00	\$16,712,010	4y10m	12/1/2003	10/1/2008
Birmingham	AL	Birmingham - Shuttlesworth International	ВНМ	S	\$4.50	\$15,173,639	1y9m	10/1/2008	7/1/2010
Dothan	AL	Dothan Regional	DHN	N	\$3.00	\$5,515,948	3y6m	2/1/1998	8/1/2001
Dothan	AL	Dothan Regional	DHN	N	\$4.50	**	19y4m	8/1/2001	12/1/2020
Huntsville	AL	Huntsville International - Carl T. Jones Field	HSV	S	\$3.00	\$18,439,464	12y3m	6/1/1992	9/1/2004
Huntsville	AL	Huntsville International - Carl T. Jones Field	HSV	S	\$4.50	\$18,636,856	7y8m	9/1/2004	5/1/2012
Mobile	AL	Mobile Regional	MOB	Ν	\$3.00	\$4,715,747	6y7m	12/1/1997	7/1/2004
Mobile	AL	Mobile Regional	МОВ	N	\$3.00	\$7,689,876	6y11m	3/1/2005	2/1/2012
Montgomery	AL	Montgomery Regional (Dannelly Field) Northwest Alabama	MGM	N	\$4.50	\$28,599,933	21y8m	5/1/2005	1/1/2027
Muscle Shoals	AL	Regional	MSL	CS	\$3.00	\$267,600	11y4m	6/1/1992	10/1/2003
Muscle Shoals	AL	Northwest Alabama Regional	MSL	CS	\$3.00	\$54,730	4y5m	12/1/2004	4/1/2009
Muscle Shoals	AL	Northwest Alabama Regional	MSL	CS	\$4.50	\$41,425	1y	4/1/2009	4/1/2010
Muscle Silvais	AL	Ted Stevens	IVIOL	CS	φ4.50	<b>Ψ41,42</b> 5	ı y	4/ 1/2009	4/1/2010
Anchorage	AK	Anchorage International Fairbanks	ANC	М	\$3.00	\$57,200,000	14y9m	10/1/2000	7/1/2015
Fairbanks	AK	International	FAI	S	\$3.00	\$4,345,172	3y6m	10/1/2000	4/1/2004
Fairbanks	AK	Fairbanks International Fairbanks	FAI	S	\$4.50	**	2y6m	4/1/2004	10/1/2006
Fairbanks	AK	International	FAI	S	\$4.50	\$33,217,000	20y	10/1/2006	10/1/2026
Juneau	AK	Juneau International	JNU	S	\$3.00	\$1,520,391	2y4m	10/1/1998	2/1/2001
Juneau	AK	Juneau International	JNU	S	\$4.50	\$16,861,748	16y3m	8/1/2001	11/1/2017
Ketchikan	AK	Ketchikan International	KTN	N	\$3.00	\$6,644,400	2y6m	2/1/1999	8/1/2001
Ketchikan	AK	Ketchikan International	KTN	N	\$4.50	**	16y8m	8/1/2001	4/1/2018
Sitka	AK	Sitka Rocky Gutierrez	SIT	N	\$4.50	\$1,100,000	4y11m	7/1/2007	6/1/2012
Pago Pago	AS	Pago Pago International Pago Pago	PPG	N	\$3.00	\$950,000	4y11m	7/1/1995	6/1/2000
Pago Pago	AS	International	PPG	N	\$4.50	\$765,000	4y	9/1/2001	9/1/2005
Pago Pago	AS	Pago Pago International	PPG	N	\$4.50	\$5,848,954	14y6m	6/1/2006	12/1/2020
Bullhead City	AZ	Laughlin/Bullhead International	IFP	N	\$2.00	\$744,600	4y2m	5/1/2008	7/1/2012
Flagstaff	AZ	Flagstaff Pulliam	FLG	N	\$3.00	\$2,932,317	16y11m	12/1/1992	2/1/2015
Mesa	AZ	Phoenix-Mesa Gateway	IWA/AZA	N	\$4.50	\$3,585,510	4y3m	11/1/2008	2/1/2013
Peach Springs	AZ	Grand Canyon West	1G4/PGS	Ν	\$3.00	\$308,210	2y	9/1/2004	9/1/2006
Peach Springs	AZ	Grand Canyon West	1G4/PGS	Ν	\$3.00	\$9,614,736	15y7m	6/1/2008	1/1/2024
Phoenix	ΑZ	Phoenix Sky Harbor International	PHX	L	\$3.00	\$241,106,516	6у	4/1/1996	4/1/2002
Phoenix	AZ	Phoenix Sky Harbor International	PHX	L	\$4.50	\$2,491,171,800	26y4m	7/1/2002	11/1/2028
Tucson	AZ	Tucson International	TUS	М	\$3.00	\$100,461,860	8y8m	2/1/1998	10/1/2006
Tucson	AZ	Tucson International	TUS	М	\$4.50	**	6y6m	10/1/2006	4/1/2013
Tucson	AZ	Tucson International	TUS	М	\$4.50	\$44,194,512	4y5m	4/1/2013	9/1/2017

Yuma	AZ	Yuma MCAS/Yuma International	NYL/YUM	N	\$3.00	\$2,390,423	12y10m	12/1/1993	10/1/2005
Yuma	AZ	Yuma MCAS/Yuma International	NYL/YUM	N	\$4.50	**	1y6m	10/1/2005	4/1/2007
Yuma	AZ	Yuma MCAS/Yuma International	NYL/YUM	N	\$4.50	\$2,407,035	9y8m	11/1/2007	7/1/2017
Bentonville	AR	Northwest Arkansas Regional	XNA	s	\$3.00	\$125,025,221	2y4m	12/1/1998	4/1/2001
Bentonville	AR	Northwest Arkansas Regional	XNA	S	\$4.50	**	39y2m	4/1/2001	6/1/2040
Fayetteville	AR	Drake Field	FYV		\$3.00	\$2,221,887	5y	1/1/1996	1/1/2001
Fort Smith	AR	Fort Smith Regional	FSM	N	\$3.00	\$4,038,371	13y6m	8/1/1994	2/1/2008
Fort Smith	AR	Fort Smith Regional	FSM	N	\$4.50	**	1y2m	2/1/2008	4/1/2009
Fort Smith	AR	Fort Smith Regional	FSM	N	\$4.50	\$1,250,500	3y	4/1/2009	4/1/2012
Little Rock	AR	Adams Field	LIT	S	\$3.00	\$24,383,919	6y4m	5/1/1995	9/1/2001
Little Rock	AR	Adams Field	LIT	S	\$4.50	\$53,743,837	10y2m	9/1/2001	11/1/2011
Texarkana	AR	Texarkana Regional- Webb Field	TXK	N	\$3.00	\$649,532	6y7m	2/1/1995	9/1/2001
		Texarkana Regional-					, i		
Texarkana	AR	Webb Field Texarkana Regional-	TXK	N	\$4.50	\$258,861	3y6m	9/1/2001	3/1/2005
Texarkana	AR	Webb Field	TXK	N	\$4.50	\$564,071	1y9m	7/1/2008	4/1/2010
Arcata/Eureka	CA	Arcata	ACV	N	\$3.00	\$169,564	1y1m	2/1/1993	3/1/1994
Arcata/Eureka	CA	Arcata	ACV	N	\$3.00	\$594,758	Зу	11/1/1994	11/1/1997
Arcata/Eureka	CA	Arcata	ACV	N	\$3.00	\$1,482,300	5y2m	4/1/1998	6/1/2003
Arcata/Eureka	CA	Arcata	ACV	N	\$4.50	\$671,450	1y9m	6/1/2003	3/1/2005
Arcata/Eureka	CA	Arcata	ACV	N	\$4.50	\$392,265	3m	7/1/2005	10/1/2005
Arcata/Eureka	CA	Arcata	ACV	N	\$4.50	*	4m	12/1/2005	4/1/2006
Arcata/Eureka	CA	Arcata	ACV	N	\$4.50	\$2,437,950	5y1m	4/1/2006	5/1/2011
Bakersfield	CA	Meadows Field	BFL	N	\$3.00	\$1,562,876	6y11m	6/1/1995	5/1/2002
Bakersfield	CA	Meadows Field	BFL	N	\$4.50	\$9,086,000	12y8m	5/1/2002	1/1/2015
Burbank	CA	Bob Hope	BUR	М	\$3.00	\$107,029,194	8y7m	9/1/1994	4/1/2003
Burbank	CA	Bob Hope	BUR	М	\$4.50	**	4y9m	4/1/2003	1/1/2008
Burbank	CA	Bob Hope	BUR	M	\$4.50	\$82,193,006	<b>7</b> y	1/1/2008	1/1/2015
Carlsbad	CA	McCellan-Palomar	CRQ/CLD	N	\$4.50	\$4,947,065	34y1m	1/1/2009	2/1/2043
Chico	CA	Chico Municipal	CIC	N	\$3.00	\$211,117	4y9m	12/1/1993	9/1/1998
Chico	CA	Oliver Manager and	010				•	12/1/1995	3/1/1330
Chico		Chico Municipal	CIC	N	\$3.00	\$25,000	1y8m	6/1/1999	2/1/2001
Croscont City	CA	Chico Municipal Chico Municipal	CIC	N N	\$3.00 \$3.00		-		
Crescent City	CA CA	•				\$25,000	1y8m	6/1/1999	2/1/2001
Crescent City Crescent City		Chico Municipal	CIC	N	\$3.00	\$25,000 \$536,747	1y8m 8y1m	6/1/1999 11/1/2001	2/1/2001 12/1/2009
,	CA	Chico Municipal Jack McNamara Field	CIC CEC	N N	\$3.00 \$3.00	\$25,000 \$536,747 \$58,330	1y8m 8y1m 1y9m	6/1/1999 11/1/2001 9/1/1998	2/1/2001 12/1/2009 6/1/2000
Crescent City	CA CA	Chico Municipal Jack McNamara Field Jack McNamara Field Jack McNamara Field Jack McNamara Field	CIC CEC CEC	N N N	\$3.00 \$3.00 \$3.00	\$25,000 \$536,747 \$58,330 \$223,807	1y8m 8y1m 1y9m 2y5m	6/1/1999 11/1/2001 9/1/1998 1/1/2001	2/1/2001 12/1/2009 6/1/2000 6/1/2003
Crescent City Crescent City	CA CA	Chico Municipal Jack McNamara Field Jack McNamara Field Jack McNamara Field Jack McNamara Field Fresno Yosemite International	CIC CEC CEC	N N N	\$3.00 \$3.00 \$3.00 \$4.50	\$25,000 \$536,747 \$58,330 \$223,807	1y8m 8y1m 1y9m 2y5m 3y10m	6/1/1999 11/1/2001 9/1/1998 1/1/2001 6/1/2003	2/1/2001 12/1/2009 6/1/2000 6/1/2003 4/1/2007
Crescent City Crescent City Crescent City Fresno	CA CA CA CA	Chico Municipal Jack McNamara Field Jack McNamara Field Jack McNamara Field Jack McNamara Field Fresno Yosemite International Fresno Yosemite	CIC CEC CEC CEC FAT	N N N N N	\$3.00 \$3.00 \$3.00 \$4.50 \$4.50 \$3.00	\$25,000 \$536,747 \$58,330 \$223,807 ** \$253,123	1y8m 8y1m 1y9m 2y5m 3y10m 5y5m	6/1/1999 11/1/2001 9/1/1998 1/1/2001 6/1/2003 4/1/2007 12/1/1996	2/1/2001 12/1/2009 6/1/2000 6/1/2003 4/1/2007 9/1/2012 12/1/2004
Crescent City Crescent City Crescent City Fresno Fresno	CA CA CA CA CA	Chico Municipal Jack McNamara Field Jack McNamara Field Jack McNamara Field Jack McNamara Field Fresno Yosemite International Fresno Yosemite International	CIC CEC CEC CEC FAT FAT	N N N N S S	\$3.00 \$3.00 \$3.00 \$4.50 \$4.50 \$3.00	\$25,000 \$536,747 \$58,330 \$223,807 ** \$253,123 \$55,936,482	1y8m 8y1m 1y9m 2y5m 3y10m 5y5m 8y 15y1m	6/1/1999 11/1/2001 9/1/1998 1/1/2001 6/1/2003 4/1/2007 12/1/1996 12/1/2004	2/1/2001 12/1/2009 6/1/2000 6/1/2003 4/1/2007 9/1/2012 12/1/2004 1/1/2020
Crescent City Crescent City Crescent City Fresno Fresno Imperial	CA CA CA CA CA CA CA CA	Chico Municipal Jack McNamara Field Jack McNamara Field Jack McNamara Field Jack McNamara Field Fresno Yosemite International Fresno Yosemite International Imperial County	CIC CEC CEC CEC FAT FAT IPL	N N N N S S CS	\$3.00 \$3.00 \$3.00 \$4.50 \$4.50 \$3.00 \$4.50 \$4.50	\$25,000 \$536,747 \$58,330 \$223,807 ** \$253,123 \$55,936,482 ** \$892,781	1y8m 8y1m 1y9m 2y5m 3y10m 5y5m 8y 15y1m 9y	6/1/1999 11/1/2001 9/1/1998 1/1/2001 6/1/2003 4/1/2007 12/1/1996 12/1/2004 4/1/2003	2/1/2001 12/1/2009 6/1/2000 6/1/2003 4/1/2007 9/1/2012 12/1/2004 1/1/2020 4/1/2012
Crescent City Crescent City Crescent City Fresno Fresno Imperial Inyokern	CA CA CA CA CA CA CA CA CA	Chico Municipal Jack McNamara Field Jack McNamara Field Jack McNamara Field Jack McNamara Field Fresno Yosemite International Fresno Yosemite International Imperial County Inyokern	CIC CEC CEC CEC FAT FAT IPL IYK	N N N N S S CS N	\$3.00 \$3.00 \$3.00 \$4.50 \$4.50 \$4.50 \$4.50 \$3.00	\$25,000 \$536,747 \$58,330 \$223,807 ** \$253,123 \$55,936,482 ** \$892,781 \$395,852	1y8m 8y1m 1y9m 2y5m 3y10m 5y5m 8y 15y1m 9y 10y	6/1/1999 11/1/2001 9/1/1998 1/1/2001 6/1/2003 4/1/2007 12/1/1996 12/1/2004 4/1/2003 3/1/1993	2/1/2001 12/1/2009 6/1/2000 6/1/2003 4/1/2007 9/1/2012 12/1/2004 1/1/2020 4/1/2012 3/1/2003
Crescent City Crescent City Crescent City Fresno Fresno Imperial Inyokern Inyokern	CA	Chico Municipal Jack McNamara Field Jack McNamara Field Jack McNamara Field Jack McNamara Field Fresno Yosemite International Fresno Yosemite International Imperial County Inyokern	CIC CEC CEC CEC FAT FAT IPL IYK	N N N N S S CS N	\$3.00 \$3.00 \$3.00 \$4.50 \$4.50 \$3.00 \$4.50 \$3.00 \$3.00	\$25,000 \$536,747 \$58,330 \$223,807 ** \$253,123 \$55,936,482 ** \$892,781 \$395,852 \$51,000	1y8m 8y1m 1y9m 2y5m 3y10m 5y5m 8y 15y1m 9y 10y 6m	6/1/1999 11/1/2001 9/1/1998 1/1/2001 6/1/2003 4/1/2007 12/1/1996 12/1/2004 4/1/2003	2/1/2001 12/1/2009 6/1/2000 6/1/2003 4/1/2007 9/1/2012 12/1/2004 1/1/2020 4/1/2012 3/1/2003 10/1/2004
Crescent City Crescent City Crescent City Fresno Fresno Imperial Inyokern Inyokern	CA	Chico Municipal Jack McNamara Field Jack McNamara Field Jack McNamara Field Jack McNamara Field Fresno Yosemite International Fresno Yosemite International Imperial County Inyokern Inyokern	CIC CEC CEC CEC FAT FAT IPL IYK IYK	N N N N S S CS N	\$3.00 \$3.00 \$4.50 \$4.50 \$3.00 \$4.50 \$3.00 \$3.00 \$3.00 \$4.50	\$25,000 \$536,747 \$58,330 \$223,807 ** \$253,123 \$55,936,482 ** \$892,781 \$395,852 \$51,000 \$89,999	1y8m 8y1m 1y9m 2y5m 3y10m 5y5m 8y 15y1m 9y 10y 6m 2y5m	6/1/1999 11/1/2001 9/1/1998 1/1/2001 6/1/2003 4/1/2007 12/1/1996 12/1/2004 4/1/2003 3/1/1993 4/1/2004 9/1/2006	2/1/2001 12/1/2009 6/1/2000 6/1/2003 4/1/2007 9/1/2012 12/1/2004 1/1/2020 4/1/2012 3/1/2003 10/1/2004 2/1/2009
Crescent City Crescent City Crescent City Fresno Fresno Imperial Inyokern Inyokern	CA	Chico Municipal Jack McNamara Field Jack McNamara Field Jack McNamara Field Jack McNamara Field Fresno Yosemite International Fresno Yosemite International Imperial County Inyokern Inyokern Inyokern Inyokern Long	CIC CEC CEC CEC FAT FAT IPL IYK	N N N N S S CS N N	\$3.00 \$3.00 \$3.00 \$4.50 \$4.50 \$3.00 \$4.50 \$3.00 \$3.00	\$25,000 \$536,747 \$58,330 \$223,807 ** \$253,123 \$55,936,482 ** \$892,781 \$395,852 \$51,000	1y8m 8y1m 1y9m 2y5m 3y10m 5y5m 8y 15y1m 9y 10y 6m	6/1/1999 11/1/2001 9/1/1998 1/1/2001 6/1/2003 4/1/2007 12/1/1996 12/1/2004 4/1/2003 3/1/1993 4/1/2004	2/1/2001 12/1/2009 6/1/2000 6/1/2003 4/1/2007 9/1/2012 12/1/2004 1/1/2020 4/1/2012 3/1/2003 10/1/2004
Crescent City Crescent City Crescent City Fresno Fresno Imperial Inyokern Inyokern	CA	Chico Municipal Jack McNamara Field Jack McNamara Field Jack McNamara Field Jack McNamara Field Fresno Yosemite International Fresno Yosemite International Imperial County Inyokern Inyokern Inyokern Inyokern	CIC CEC CEC CEC FAT FAT IPL IYK IYK	N N N N S S CS N N	\$3.00 \$3.00 \$4.50 \$4.50 \$3.00 \$4.50 \$3.00 \$3.00 \$3.00 \$4.50	\$25,000 \$536,747 \$58,330 \$223,807 ** \$253,123 \$55,936,482 ** \$892,781 \$395,852 \$51,000 \$89,999	1y8m 8y1m 1y9m 2y5m 3y10m 5y5m 8y 15y1m 9y 10y 6m 2y5m	6/1/1999 11/1/2001 9/1/1998 1/1/2001 6/1/2003 4/1/2007 12/1/1996 12/1/2004 4/1/2003 3/1/1993 4/1/2004 9/1/2006	2/1/2001 12/1/2009 6/1/2000 6/1/2003 4/1/2007 9/1/2012 12/1/2004 1/1/2020 4/1/2012 3/1/2003 10/1/2004 2/1/2009
Crescent City Crescent City Crescent City Fresno Fresno Imperial Inyokern Inyokern Inyokern Inyokern	CA C	Chico Municipal Jack McNamara Field Jack McNamara Field Jack McNamara Field Jack McNamara Field Fresno Yosemite International Fresno Yosemite International Imperial County Inyokern Inyokern Inyokern Long Beach/Daugherty Field Long Beach/Daugherty Field	CIC CEC CEC CEC FAT FAT IPL IYK IYK IYK		\$3.00 \$3.00 \$4.50 \$4.50 \$3.00 \$4.50 \$3.00 \$4.50 \$3.00 \$4.50 \$4.50	\$25,000 \$536,747 \$58,330 \$223,807 ** \$253,123 \$55,936,482 ** \$892,781 \$395,852 \$51,000 \$89,999 \$502,105	1y8m 8y1m 1y9m 2y5m 3y10m 5y5m 8y 15y1m 9y 10y 6m 2y5m 10y	6/1/1999 11/1/2001 9/1/1998 1/1/2001 6/1/2003 4/1/2007 12/1/1996 12/1/2004 4/1/2003 3/1/1993 4/1/2004 9/1/2006 3/1/2009	2/1/2001 12/1/2009 6/1/2000 6/1/2003 4/1/2007 9/1/2012 12/1/2004 1/1/2020 4/1/2012 3/1/2003 10/1/2004 2/1/2009 3/1/2019
Crescent City Crescent City Crescent City Fresno Fresno Imperial Inyokern Inyokern Inyokern Inyokern Long Beach	CA C	Chico Municipal Jack McNamara Field Jack McNamara Field Jack McNamara Field Jack McNamara Field Fresno Yosemite International Fresno Yosemite International Imperial County Inyokern Inyokern Inyokern Inyokern Long Beach/Daugherty Field Long Beach/Daugherty Field Long	CIC CEC CEC CEC FAT FAT IPL IYK IYK IYK LGB	N N N N N S S CS N N N N N N N N N N N N	\$3.00 \$3.00 \$4.50 \$4.50 \$3.00 \$4.50 \$3.00 \$4.50 \$3.00 \$4.50 \$4.50 \$3.00	\$25,000 \$536,747 \$58,330 \$223,807 ** \$253,123 \$55,936,482 ** \$892,781 \$395,852 \$51,000 \$89,999 \$502,105	1y8m 8y1m 1y9m 2y5m 3y10m 5y5m 8y 15y1m 9y 10y 6m 2y5m 10y	6/1/1999 11/1/2001 9/1/1998 1/1/2001 6/1/2003 4/1/2007 12/1/1996 12/1/2004 4/1/2003 3/1/1993 4/1/2004 9/1/2006 3/1/2009	2/1/2001 12/1/2009 6/1/2000 6/1/2003 4/1/2007 9/1/2012 12/1/2004 1/1/2020 4/1/2012 3/1/2003 10/1/2004 2/1/2009 3/1/2019
Crescent City Crescent City Crescent City Fresno Fresno Imperial Inyokern Inyokern Inyokern Inyokern Long Beach	CA C	Chico Municipal Jack McNamara Field Jack McNamara Field Jack McNamara Field Jack McNamara Field Fresno Yosemite International Fresno Yosemite International Imperial County Inyokern Inyokern Inyokern Inyokern Long Beach/Daugherty Field	CIC CEC CEC CEC FAT FAT IPL IYK IYK IYK LGB	N N N N N S S CS N N N N N N N N N N N N	\$3.00 \$3.00 \$4.50 \$4.50 \$3.00 \$4.50 \$3.00 \$4.50 \$3.00 \$4.50 \$4.50 \$3.00	\$25,000 \$536,747 \$58,330 \$223,807 ** \$253,123 \$55,936,482 ** \$892,781 \$395,852 \$51,000 \$89,999 \$502,105	1y8m 8y1m 1y9m 2y5m 3y10m 5y5m 8y 15y1m 9y 10y 6m 2y5m 10y	6/1/1999 11/1/2001 9/1/1998 1/1/2001 6/1/2003 4/1/2007 12/1/1996 12/1/2004 4/1/2003 3/1/1993 4/1/2004 9/1/2006 3/1/2009	2/1/2001 12/1/2009 6/1/2000 6/1/2003 4/1/2007 9/1/2012 12/1/2004 1/1/2020 4/1/2012 3/1/2003 10/1/2004 2/1/2009 3/1/2019
Crescent City Crescent City Crescent City Fresno Fresno Imperial Inyokern Inyokern Inyokern Long Beach Long Beach	CA C	Chico Municipal Jack McNamara Field Jack McNamara Field Jack McNamara Field Jack McNamara Field Fresno Yosemite International Fresno Yosemite International Imperial County Inyokern Inyokern Inyokern Long Beach/Daugherty Field Long Beach/Daugherty Field Long Beach/Daugherty Field Long Beach/Daugherty	CIC CEC CEC CEC FAT FAT IPL IYK IYK IYK IYK LGB	N N N N N N N N N N N N N N N N N N N	\$3.00 \$3.00 \$4.50 \$4.50 \$3.00 \$4.50 \$3.00 \$4.50 \$3.00 \$4.50 \$4.50 \$4.50	\$25,000 \$536,747 \$58,330 \$223,807 ** \$253,123 \$55,936,482 ** \$892,781 \$395,852 \$51,000 \$89,999 \$502,105 \$69,493,089	1y8m 8y1m 1y9m 2y5m 3y10m 5y5m 8y 15y1m 9y 10y 6m 2y5m 10y 4y9m	6/1/1999 11/1/2001 9/1/1998 1/1/2001 6/1/2003 4/1/2007 12/1/1996 12/1/2004 4/1/2003 3/1/1993 4/1/2006 3/1/2009 8/1/2003	2/1/2001 12/1/2009 6/1/2000 6/1/2003 4/1/2007 9/1/2012 12/1/2004 1/1/2020 4/1/2012 3/1/2003 10/1/2009 3/1/2019 5/1/2008

Los Angeles	CA	Los Angeles International Los Angeles	LAX	L	\$4.50	**	2y5m	7/1/2003	12/1/2005
Los Angeles	CA	International	LAX	L	\$4.50	\$782,779,968	6y1m	12/1/2005	1/1/2012
Mammoth Lakes	CA	Mammoth Lakes	MMH		\$3.00	\$166,632	10y	9/1/1995	9/1/2005
Mammoth Lakes	CA	Mammoth Lakes	ММН		\$4.50	\$399,917	16y2m	11/1/2009	11/1/2025
Modesto	CA	Modesto City County- Harry Sham Field	MOD	N	\$3.00	\$400,757	10y7m	8/1/1994	3/1/2005
Modesto	CA	Modesto City County- Harry Sham Field	MOD	N	\$4.50	\$395,134	7y4m	8/1/2008	12/1/2015
Monterey	CA	Monterey Peninsula	MRY	N	\$3.00	\$5,606,756	9y6m	1/1/1994	7/1/2003
Monterey	CA	Monterey Peninsula	MRY	N	\$4.50	\$2,156,077	2y9m	7/1/2003	4/1/2006
Monterey	CA	Monterey Peninsula	MRY	N	\$4.50	\$3,598,136	4y3m	5/1/2006	8/1/2010
Oakland	CA	Metropolitan Oakland International	OAK	М	\$3.00	\$64,407,665	6y9m	9/1/1992	6/1/1999
Oakland	CA	Metropolitan Oakland International	OAK	М	\$3.00	\$95,380,000	3y8m	9/1/1999	5/1/2003
Oakland	CA	Metropolitan Oakland International	OAK	М	\$4.50	**	4m	5/1/2003	9/1/2003
Oakland	CA	Metropolitan Oakland International	OAK	М	\$4.50	\$498,104,000	17y7m	9/1/2003	4/1/2021
		Metropolitan Oakland					,		
Oakland	CA	International	OAK	M	\$3.00	\$70,259,000	2y1m	4/1/2021	5/1/2023
Ontario	CA	Ontario International	ONT	M	\$3.00	\$27,333,931	3y5m	7/1/1993	12/1/1996
Ontario	CA	Ontario International	ONT	M	\$3.00	\$118,454,000	9y4m	7/1/1998	11/1/2007
Ontario	CA	Ontario International	ONT	M	\$4.50	\$96,648,998	5y6m	11/1/2007	5/1/2013
Oxnard	CA	Oxnard Palm Springs	OXR	N	\$4.50	\$872,000	9y2m	1/1/2002	3/1/2011
Palm Springs	CA	International	PSP	S	\$3.00	\$88,415,656	9y4m	9/1/1992	1/1/2002
Palm Springs	CA	Palm Springs International	PSP	S	\$4.50	**	27y6m	1/1/2002	7/1/2029
Redding	CA	Redding Municipal	RDD	N	\$3.00	\$1,009,264	5y	4/1/1997	4/1/2002
Redding	CA	Redding Municipal	RDD	N	\$4.50	**	8m	4/1/2002	12/1/2002
Redding	CA	Redding Municipal	RDD	N	\$4.50	\$1,251,567	4y4m	12/1/2002	4/1/2007
Redding	CA	Redding Municipal	RDD	N	\$4.50	\$809,295	3y1m	8/1/2007	9/1/2010
Sacramento	CA	Sacramento International	SMF	М	\$3.00	\$160,918,497	8y9m	4/1/1993	1/1/2002
		Sacramento				**			
Sacramento	CA	International Sacramento	SMF	M	\$4.50	••	1y1m	1/1/2002	2/1/2003
Sacramento	CA	International Sacramento	SMF	M	\$3.00	\$126,841,350	6m	2/1/2003	9/1/2003
Sacramento	CA	International Sacramento	SMF	М	\$4.50	**	7y6m	9/1/2003	3/1/2011
Sacramento	CA	International	SMF	M	\$4.50	\$603,497,524	16y11m	3/1/2011	2/1/2028
San Diego	CA	San Diego International	SAN	L	\$3.00	\$149,301,528	7y10m	10/1/1995	8/1/2003
San Diego	CA	San Diego International San Francisco	SAN	L _	\$4.50	\$304,624,012	9y2m	8/1/2003	10/1/2012
San Francisco	CA	International	SFO	L	\$4.50	\$833,142,518	15y3m	10/1/2001	1/1/2017
San Jose	CA	Norman Y. Mineta San Jose International	SJC	М	\$3.00	\$165,128,424	8y7m	9/1/1992	4/1/2001
		Norman Y. Mineta San Jose	SJC			**			
San Jose	CA	International Norman Y. Mineta San Jose	510	M	\$4.50		2у	4/1/2001	4/1/2003
San Jose	CA	International San Luis County	SJC	M	\$4.50	\$899,142,803	26y1m	4/1/2003	5/1/2029
San Luis Obispo	CA	Regional San Luis County	SBP	N	\$3.00	\$615,677	2y	2/1/1993	2/1/1995
San Luis Obispo	CA	Regional	SBP	N	\$3.00	\$7,432,277	7y3m	6/1/1995	9/1/2002
San Luis Obispo	CA	San Luis County Regional	SBP	N	\$4.50	**	11y10m	9/1/2002	7/1/2012
San Luis Obispo	CA	San Luis County Regional	SBP	N	\$3.00	\$1,040,111	Зу	7/1/2012	7/1/2015
San Luis Obispo	CA	San Luis County Regional John Wayne Airport -	SBP	N	\$4.50	\$3,681,070	6y6m	7/1/2015	1/1/2022
Santa Ana	CA	Orange County	SNA	M	\$4.50	\$321,351,002	15y6m	7/1/2006	1/1/2022

		Santa Barbara		_					
Santa Barbara	CA	Municipal Santa Barbara	SBA	S	\$3.00	\$9,499,365	4y10m	1/1/1998	11/1/2003
Santa Barbara	CA	Municipal	SBA	S	\$4.50	**	2y3m	11/1/2003	2/1/2006
Santa Barbara	CA	Santa Barbara Municipal Santa Maria	SBA	S	\$4.50	\$6,944,000	4y2m	2/1/2006	4/1/2010
Santa Maria	CA	Public/Capt G Allan Hancock Field	SMX	N	\$4.50	\$5,380,346	21y	10/1/2007	10/1/2028
Santa Rosa	CA	Charles M. Schultz - Sonoma County	STS	N	\$3.00	\$711,232	7y11m	5/1/1993	4/1/2001
Santa Rosa	CA	Charles M. Schultz - Sonoma County	STS	N	\$4.50	**	4y	4/1/2001	4/1/2005
Santa Rosa	CA	Charles M. Schultz - Sonoma County	STS	N	\$4.50	\$1,594,049	3y9m	5/1/2008	2/1/2012
South Lake Tahoe	CA	Lake Tahoe	TVL		\$3.00	\$928,747	14y7m	8/1/1992	3/1/2007
Stockton	CA	Stockton Metropolitan	SCK	N	\$4.50	\$322,665	2y6m	2/1/2007	8/1/2009
Stockton	CA	Stockton Metropolitan	SCK	N	\$4.50	\$187,241	1y	9/1/2009	9/1/2010
Alamosa	СО	San Luis Valley Regional/Bergman Field Aspen-Pitkin	ALS	CS	\$3.00	\$288,836	27y2m	3/1/1997	5/1/2024
Aspen	CO	County/Sardy Field	ASE	N	\$3.00	\$3,869,200	7y10m	7/1/1995	5/1/2003
Aspen	СО	Aspen-Pitkin County/Sardy Field Aspen-Pitkin	ASE	N	\$4.50	\$713,146	1y3m	5/1/2003	8/1/2004
Aspen	CO	County/Sardy Field	ASE	N	\$4.50	\$4,352,162	5y7m	1/1/2005	8/1/2010
Colorado Springs	СО	City of Colorado Springs Municipal	cos	S	\$3.00	\$70,903,468	22y6m	3/1/1993	9/1/2015
Cortez	CO	Cortez Municipal	CEZ	CS	\$3.00	\$200,078	8y4m	11/1/1999	3/1/2008
Cortez	CO	Cortez Municipal	CEZ	CS	\$4.50	\$339,072	8y	3/1/2008	3/1/2016
Denver	CO	Denver International	DEN	L	\$3.00	\$3,137,099,200	8y9m	7/1/1992	4/1/2001
Denver	CO	Denver International	DEN	L	\$4.50	**	25y9m	4/1/2001	1/1/2026
Denver	CO	Denver International	DEN	L	\$4.50	\$80,386,000	3y1m	1/1/2026	2/1/2029
Durango	СО	Durango-La Plata County Durango-La Plata	DRO	N	\$3.00	\$534,282	2y6m	2/1/1995	8/1/1997
Durango	CO	County	DRO	N	\$3.00	\$1,289,455	5y6m	9/1/1997	3/1/2003
Durango	СО	Durango-La Plata County Eagle County	DRO	N	\$4.50	\$3,130,691	5y10m	6/1/2005	4/1/2011
Eagle	CO	Regional	EGE	N	\$3.00	\$8,855,961	7y7m	9/1/1993	4/1/2001
Eagle	СО	Eagle County Regional Eagle County	EGE	N	\$4.50	**	8y2m	4/1/2001	6/1/2009
Eagle	СО	Regional	EGE	N	\$3.00	\$300,000	1m	6/1/2009	7/1/2009
Eagle Fort Collins-	СО	Eagle County Regional Fort Collins-Loveland	EGE	N	\$4.50	\$13,861,907	15y	7/1/2009	7/1/2024
Loveland	СО	Municipal	FNL	N	\$3.00	\$307,046	5y7m	10/1/1993	5/1/1999
Fort Collins- Loveland	СО	Fort Collins-Loveland Municipal Grand Junction	FNL	N	\$4.50	\$1,055,884	8y5m	8/1/2004	1/1/2013
Grand Junction	СО	Regional Grand Junction	GJT	N	\$3.00	\$4,879,574	13y5m	4/1/1993	9/1/2006
Grand Junction	CO	Regional Gunnison-Crested	GJT	N	\$4.50	\$8,330,000	16y11m	9/1/2006	8/1/2023
Gunnison	СО	Butte Regional Gunnison-Crested	GUC	N	\$3.00	\$1,089,036	7y5m	11/1/1993	4/1/2001
Gunnison	CO	Butte Regional	GUC	N 	\$4.50	\$2,568,969	18y	4/1/2001	4/1/2019
Hayden	CO	Yampa Valley	HDN	N N	\$3.00	\$2,190,009	7y8m	11/1/1993	7/1/2001
Hayden	CO	Yampa Valley	HDN	N	\$4.50		7m	7/1/2001	2/1/2002
Hayden Montroso	CO	Yampa Valley  Mantropa Ragional	HDN MT I	N N	\$4.50	\$6,115,140	13y7m	2/1/2002	9/1/2015
Montrose	CO	Montrose Regional	MTJ MTJ	N N	\$3.00	\$1,422,535	9y9m	11/1/1993	8/1/2003
Montrose	CO	Montrose Regional  Montrose Regional	MTJ	N N	\$4.50 \$4.50	\$821,694	2y10m	8/1/2003	6/1/2006
Montrose Pueblo			PUB	CS		\$1,386,487 \$305,322	4y 21v1m	8/1/2006	8/1/2010 12/1/201 <i>A</i>
Pueblo Steamboat Springs	co	Pueblo Memorial Steamboat Springs/Bob Adams	SBS	CS	\$3.00 \$3.00	\$395,322 \$159,576	21y1m 4y2m	11/1/1993 4/1/1993	12/1/2014 6/1/1997
Telluride	СО	Telluride Regional	TEX	N	\$3.00	\$778,287	9y2m	2/1/1993	4/1/2002
Telluride	СО	Telluride Regional	TEX	N	\$4.50	\$6,268,750	16y9m	4/1/2002	1/1/2019

New Heven	CT	Tweed New Hoven	111/61	NI	<b>62.00</b>	<b>\$000.606</b>	4, 4,00	10/1/1000	4/4/4000
New Haven	CT CT	Tweed-New Haven Tweed-New Haven	HVN HVN	N N	\$3.00 \$4.50	\$983,636	4y4m	12/1/1993	4/1/1998 7/1/2005
New Haven	CT	Tweed-New Haven	HVN	N N	\$4.50	\$572,848 \$1,158,509	3y9m 5y5m	5/1/2006	10/1/2011
Windsor Locks	CT	Bradley International	BDL	M	\$3.00	\$8,607,831	2y2m	10/1/1993	12/1/1995
Windsor Locks	CT	Bradley International	BDL	M	\$3.00	\$3,263,971	6m	7/1/1996	1/1/1997
Windsor Locks	CT	Bradley International	BDL	M	\$3.00	\$27,749,445	2y11m	9/1/1997	8/1/2000
Windsor Locks	СТ	Bradley International	BDL	M	\$4.50	\$257,534,407	14y10m	5/1/2001	3/1/2016
Windsor Locks	CT	Bradley International	BDL	M	\$3.00	\$4,152,000	6m	3/1/2016	9/1/2016
Windsor Locks	СТ	Bradley International	BDL	M	\$4.50	\$13,634,909	9m	9/1/2016	6/1/2017
		Daytona Beach							
Daytona Beach	FL	International Daytona Beach	DAB	N	\$3.00	\$29,469,817	8y1m	7/1/1993	8/1/2001
Daytona Beach	FL	International	DAB	N	\$3.00	*	3y8m	2/1/2002	11/1/2005
Daytona Beach	FL	Daytona Beach International	DAB	N	\$4.50	**	14y4m	11/1/2005	3/1/2020
		Fort Lauderdale/Hollywood							
Fort Lauderdale	FL	International	FLL	L	\$3.00	\$228,064,335	10y10m	1/1/1995	10/1/2005
		Fort Lauderdale/Hollywood							
Fort Lauderdale	FL	International	FLL	L	\$4.50	\$554,795,822	12y4m	10/1/2005	2/1/2018
Fort Myers	FL	Southwest Florida International	RSW	М	\$3.00	\$109,252,734	11y	11/1/1992	11/1/2003
Fort Myers	FL	Southwest Florida International	RSW	М	\$4.50	**	2y10m	11/1/2003	9/1/2006
,		Southwest Florida				<b>****</b>			
Fort Myers	FL	International	RSW	M	\$4.50	\$137,410,598	8y5m	9/1/2006	2/1/2015
Gainsville	FL	Gainsville Regional	GNV	N	\$3.00	\$484,900	1y7m	7/1/2000	2/1/2002
Gainsville	FL	Gainsville Regional Jacksonville	GNV	N	\$4.50	\$4,637,954	8y1m	1/1/2003	2/1/2011
Jacksonville	FL	International  Jacksonville	JAX	M	\$3.00	\$72,695,093	9y1m	4/1/1994	5/1/2003
Jacksonville	FL	International	JAX	M	\$4.50	\$263,676,115	20y5m	5/1/2003	10/1/2023
Key West	FL	Key West International	EYW	N	\$3.00	\$1,922,283	3y5m	3/1/1993	8/1/1996
•		Key West					-		
Key West	FL	International Key West	EYW	N	\$3.00	\$4,272,834	5y7m	12/1/1997	6/1/2003
Key West	FL	International Key West	EYW	_ N _	\$4.50	\$751,313	2y1m	6/1/2003	7/1/2005
Key West	FL	International	EYW	N	\$4.50	\$12,801,919	10y2m	10/1/2005	12/1/2015
Marathon	FL	Marathon	MTH		\$3.00	\$390,001	5y3m	3/1/1993	6/1/1998
Melbourne	FL	Melbourne International	MLB	N	\$3.00	\$11,080,917	12y7m	5/1/1997	12/1/2009
Melbourne	FL	Melbourne International	MLB	N	\$4.50	**	9y3m	12/1/2009	3/1/2019
Miami	FL	Miami International	MIA	L	\$3.00	\$176,730,162	7y2m	11/1/1994	1/1/2002
Miami	FL	Miami International	MIA	L	\$4.50	**	1y2m	1/1/2002	3/1/2003
Miami	FL	Miami International	MIA	L	\$4.50	\$2,420,400,341	34y7m	3/1/2003	10/1/2037
Naples	FL	Naples Municipal	APF	CS	\$3.00	\$899,685	6у	2/1/1995	2/1/2001
Naples	FL	Naples Municipal	APF	CS	\$3.00	\$91,651	2y3m	2/1/2002	5/1/2004
Orlando	FL	Orlando International	MCO	L	\$3.00	\$542,752,812	14y2m	2/1/1993	4/1/2007
Orlando	FL	Orlando International	MCO	L	\$4.50	\$418,990,968	5y6m	4/1/2007	10/1/2012
Orlando	FL	Orlando International	MCO	L	\$4.00	\$806,783,011	7y6m	10/1/2012	4/1/2020
Orlando	FL	Orlando International	мсо	L	\$3.00	\$276,368,000	5y10m	4/1/2020	2/1/2026
Orlando	FL	Orlando Sandford International	SFB	s	\$1.00	\$1,187,005	2y9m	3/1/2001	12/1/2003
		Orlando Sandford					-		
Orlando	FL	International Panama City - Bay	SFB	S	\$2.00	\$13,312,090	10y7m	12/1/2003	7/1/2014
Panama City	FL	County International	PFN	N	\$3.00	\$6,732,080	10y3m	2/1/1994	5/1/2004
Panama City	FL	Panama City - Bay County International	PFN	N	\$4.50	**	4y11m	5/1/2004	4/1/2009
r anama Ony	I.F	Panama City - Bay	1-1114	IN	φ4.50		4y 1 1111	3/1/2004	4/1/2009
Panama City	FL	County International	PFN/ ECP	N	\$4.50	\$32,560,982	30y	4/1/2009	4/1/2039
Pensacola	FL	Penscola Regional	PNS	S	\$3.00	\$24,954,478	9y10m	2/1/1993	12/1/2002
Pensacola	FL	Penscola Regional	PNS	S	\$4.50	**	4y9m	12/1/2002	9/1/2007

Pensacola	FL	Penscola Regional	PNS	S	\$4.50	\$119,534,914	23y1m	9/1/2007	10/1/2031
Sarasota	FL	Sarasota/Bradenton International	SRQ	S	\$3.00	\$82,727,280	9y8m	9/1/1992	5/1/2002
Sarasota	FL	Sarasota/Bradenton International	SRQ	S	\$4.50	**	19y9m	5/1/2002	2/1/2022
		St Petersburg-			*			<u> </u>	
St Petersburg	FL	Clearwater International	PIE	N	\$3.00	\$4,051,039	1y6m	5/1/2005	11/1/2006
		St Petersburg- Clearwater							
St Petersburg	FL	International St Petersburg- Clearwater	PIE	N	\$4.50	**	2y3m	11/1/2006	2/1/2009
St Petersburg	FL	International	PIE	N	\$4.50	\$2,668,450	2y4m	2/1/2009	6/1/2011
Tallahassee	FL	Tallahassee Regional	TLH	S	\$3.00	\$11,090,606	9y8m	2/1/1993	10/1/2002
Tallahassee	FL	Tallahassee Regional	TLH	S	\$4.50	\$38,504,827	13y3m	10/1/2002	1/1/2016
Tampa	FL	Tampa International	TPA	L	\$3.00	\$170,777,120	8y8m	10/1/1993	6/1/2002
Tampa	FL	Tampa International	TPA	L	\$4.50	\$625,065,074	14y11m	6/1/2002	5/1/2017
Valparaiso	FL	Eglin AFB	VPS	S	\$3.00	\$34,407,710	1y5m	1/1/2001	6/1/2002
Valparaiso	FL	Eglin AFB	VPS	S	\$4.50	**	16y2m	6/1/2002	8/1/2018
Valparaiso	FL	Eglin AFB Palm Beach	VPS	S	\$4.50	\$3,862,384	2y8m	8/1/2018	4/1/2021
West Palm Beach	FL	International	PBI	М	\$3.00	\$122,491,222	14y3m	4/1/1994	7/1/2008
West Palm Beach	FL	Palm Beach International	PBI	М	\$4.50	\$22,283,317	2y3m	7/1/2008	10/1/2010
Albany	GA	Southwest Georgia Regional	ABY	N	\$3.00	\$348,383	2y9m	9/1/1995	6/1/1998
Albany	GA	Southwest Georgia Regional	ABY	N	\$3.00	\$539,645	3y8m	6/1/1999	2/1/2003
Albany	GA	Southwest Georgia Regional	ABY	N	\$4.50	**	6m	2/1/2003	8/1/2003
Albany	GA	Southwest Georgia Regional	ABY	N	\$4.50	\$457,111	4y6m	8/1/2003	2/1/2008
		Southwest Georgia					-		
Albany	GA	Regional	ABY	N	\$4.50	\$341,518	2y1m	7/1/2008	8/1/2010
Athens	GA	Athens/Ben Epps Hartsfield-Jackson	AHN	CS	\$3.00	\$165,615	4y5m	8/1/1997	1/1/2002
Atlanta	GA	Atlanta Internatiional	ATL	L	\$3.00	\$1,463,359,982	3y11m	5/1/1997	4/1/2001
Atlanta	GA	Hartsfield-Jackson Atlanta Internatiional	ATL	L	\$4.50	**	7y6m	4/1/2001	10/1/2008
Atlanta	GA	Hartsfield-Jackson Atlanta Internatiional	ATL	L	\$4.50	\$1,920,004,074	11y8m	10/1/2008	6/1/2020
Augusta	GA	Augusta Regional @ Bush Field	AGS	N	\$3.00	\$31,482,000	1y10m	9/1/1999	7/1/2001
		Augusta Regional @				ψο1,102,000			
Augusta	GA	Bush Field Augusta Regional @	AGS	N	\$4.50	**	29y	7/1/2001	7/1/2030
Augusta	GA	Bush Field Brunswick Golden	AGS	N	\$4.50	\$2,007,000	2y1m	7/1/2030	8/1/2032
Brunswick	GA	Isles	BQK	N	\$3.00	\$813,170	2y6m	5/1/2001	11/1/2003
Brunswick	GA	Brunswick Golden Isles	BQK	N	\$4.50	**	5y6m	11/1/2003	5/1/2009
Brunswick	GA	Brunswick Golden Isles	BQK	N	\$4.50	\$860,268	7y11m	5/1/2009	4/1/2017
Columbus	GA	Columbus Metropolitan	CSG	N	\$3.00	\$530,103	1y9m	12/1/1993	9/1/1995
Columbus	GA	Columbus Metropolitan	CSG	N	\$3.00	\$1,251,387	2y10m	8/1/2000	6/1/2003
Columbus	GA	Columbus Metropolitan	CSG	N	\$4.50	**	3y5m	6/1/2003	11/1/2006
Columbus	GA	Columbus Metropolitan	CSG	N	\$4.50	\$991,631	2y	2/1/2010	2/1/2012
		Middle Georgia							
Macon	GA	Regional Savannah/ Hilton	MCN	N	\$4.50	\$1,052,392	9y2m	3/1/2002	5/1/2011
Savannah	GA	Head International	SAV	S	\$3.00	\$49,908,639	8y9m	7/1/1992	4/1/2001
Savannah	GA	Savannah/ Hilton Head International	SAV	S	\$4.50	**	8y10m	4/1/2001	2/1/2010
Savannah	GA	Savannah/ Hilton Head International	SAV	S	\$3.00	\$977,956	3m	2/1/2010	5/1/2010
		Savannah/ Hilton							
Savannah	GA	Head International	SAV	S	\$4.50	\$14,519,343	3y6m	5/1/2010	11/1/2013
Valdosta	GA	Valdosta Regional	VLD	N	\$3.00	\$369,077	6y7m	3/1/1993	10/1/1999

Valdosta	GA	Valdosta Regional	VLD	N	\$3.00	\$230,300	1y2m	4/1/2000	6/1/2001
Valdosta	GA	Valdosta Regional	VLD	N	\$4.50	**	3m	6/1/2001	9/1/2001
Valdosta	GA	Valdosta Regional	VLD	N	\$4.50	\$438,675	Зу	9/1/2001	9/1/2004
Valdosta	GA	Valdosta Regional	VLD	N	\$3.00	\$67,858	3m	2/1/2006	5/1/2006
Valdosta	GA	Valdosta Regional	VLD	N	\$3.00	\$12,140	2m	11/1/2006	1/1/2007
Valdosta	GA	Valdosta Regional	VLD	N	\$3.00	\$94,727	11m	8/1/2009	7/1/2010
Agana	GU	Guam International	GUM	S	\$3.00	\$238,370,758	9y9m	2/1/1993	11/1/2002
Agana	GU	Guam International	GUM	S	\$4.50	**	22y4m	11/1/2002	3/1/2025
Hilo	HI	Hilo International	ITO	S	\$3.00	\$548,196	1y7m	2/1/2007	11/1/2008
Hilo	HI	Hilo International	ITO	S	\$4.50	**	1y2m	11/1/2008	1/1/2010
Honolulu	HI	Honolulu International	HNL	L	\$3.00	\$87,641,419	4y1m	10/1/2004	11/1/2008
Honolulu	HI	Honolulu International	HNL	L	\$4.50	**	1y2m	11/1/2008	1/1/2010
Honolulu	HI	Honolulu International	HNL	L	\$4.50	\$105,909,130	4y1m	1/1/2010	2/1/2014
Kahului	HI	Kahului	OGG	М	\$3.00	\$19,664,231	4y1m	10/1/2004	11/1/2008
Kahului	HI	Kahului	OGG	M	\$4.50	**	1y2m	11/1/2008	1/1/2010
Kahului	HI	Kahului	OGG	M	\$4.50	\$24,663,770	4y1m	1/1/2010	2/1/2014
		Kona International @							
Kailua/Kona	HI	Keohole  Kona International @	KOA	S	\$3.00	\$6,929,851	4y1m	10/1/2004	11/1/2008
Kailua/Kona	HI	Keohole	KOA	S	\$4.50	**	1y2m	11/1/2008	1/1/2010
Kailua/Kona	HI	Kona International @ Keohole	KOA	S	\$4.50	\$7,254,050	4y1m	1/1/2010	2/1/2014
Lihue	HI	Lihue	LIH	S	\$3.00	\$3,987,100	4y1m	10/1/2004	11/1/2008
Lihue	HI	Lihue	LIH	S	\$4.50	**	1y2m	11/1/2008	1/1/2010
Lihue	HI	Lihue	LIH	S	\$4.50	\$7,254,050	4y1m	1/1/2010	2/1/2014
		Boise Air Terminal/							
Boise	ID	Gowen Field  Boise Air Terminal/	BOI	S	\$3.00	\$20,191,058	<b>7</b> y	8/1/1994	8/1/2001
Boise	ID	Gowen Field	BOI	S	\$4.50	\$102,262,147	18y	8/1/2001	8/1/2019
Hailey	ID	Friedman Memorial	SUN	N	\$3.00	\$188,000	1y1m	9/1/1993	10/1/1994
Hailey	ID	Friedman Memorial	SUN	N	\$3.00	\$1,721,835	10y3m	3/1/1995	6/1/2005
Hailey	ID	Friedman Memorial	SUN	N	\$4.50	\$1,435,356	5y5m	6/1/2005	11/1/2010
Idaho Falls	ID	Idaho Falls Regional	IDA	N	\$3.00	\$1,473,899	5у	1/1/1993	1/1/1998
Idaho Falls	ID	Idaho Falls Regional	IDA	N	\$3.00	\$836,239	2y8m	2/1/1998	10/1/2000
Idaho Falls	ID	Idaho Falls Regional	IDA	N	\$3.00	\$8,950,000	6m	10/1/2000	4/1/2001
Idaho Falls	ID	Idaho Falls Regional	IDA	N	\$4.50	**	19y3m	4/1/2001	7/1/2020
Idaho Falls	ID	Idaho Falls Regional	IDA	N	\$4.50	\$1,628,299	3y3m	7/1/2020	10/1/2023
Lewiston	ID	Lewiston-Nez Perce County	LWS	N	\$3.00	\$2,509,907	<b>7</b> y	5/1/1994	5/1/2001
		Lewiston-Nez Perce				**			
Lewiston	ID	County Lewiston-Nez Perce	LWS	N	\$4.50	**	5y5m	5/1/2001	10/1/2006
Lewiston	ID	County	LWS	N	\$4.50	\$1,171,746	9y9m	10/1/2006	7/1/2016
Pocatello	ID	Pocatello Regional	PIH	N	\$3.00	\$814,719	6y8m	9/1/1994	5/1/2001
Pocatello	ID	Pocatello Regional	PIH	N	\$4.50	**	5m	5/1/2001	10/1/2001
Pocatello	ID	Pocatello Regional	PIH	N	\$4.50	\$1,249,580	9y8m	10/1/2001	6/1/2011
Twin Falls	ID	Joslin Field - Magic Valley Regional	TWF	N	\$3.00	\$1,628,107	8y7m	11/1/1992	6/1/2001
i wiii I aliə	טו	Joslin Field - Magic	1 4 4 1 .	IN	ψ3.00	ψ1,020,107	Oy / III	11/1/1992	U/ 1/2001
Twin Falls	ID	Valley Regional	TWF	N	\$4.50	**	6y	6/1/2001	6/1/2007
Twin Falls	ID	Joslin Field - Magic Valley Regional	TWF	N	\$4.50	\$560,416	4y3m	7/1/2007	10/1/2011
		Scott					•		
Belleville	IL	AFB/Midamerica Central Illinois	BLV	N	\$3.00	\$7,000,000	41y4m	11/1/2005	3/1/2047
		Regional Airport at							
Bloomington	IL	Bloomington-Normal Central Illinois	BMI	N	\$3.00	\$28,084,564	6y5m	11/1/1994	4/1/2001
Bloomington	IL	Regional Airport at Bloomington-Normal Central Illinois	ВМІ	N	\$4.50	**	16y6m	4/1/2001	10/1/2017
Bloomington	IL	Regional Airport at Bloomington-Normal	ВМІ	N	\$4.50	\$1,161,019	7m	10/1/2017	6/1/2018
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Champaign/Urbana	IL	University of Illinois- Willard	СМІ	N	\$3.00	\$2,464,310	8y2m	12/1/1995	2/1/2004
		University of Illinois-							
Champaign/Urbana	IL	Willard Chicago Midway	CMI	N	\$4.50	\$2,135,160	5y5m	10/1/2005	3/1/2011
Chicago	IL	International	MDW	L	\$3.00	\$704,211,936	13y4m	9/1/1993	1/1/2007
Chicago	IL	Chicago Midway International	MDW	L	\$4.50	**	5y11m	1/1/2007	11/1/2012
Chicago	IL	Chicago Midway International	MDW	L	\$4.50	\$1,539,990,549	41y	11/1/2012	11/1/2053
Chicago	IL	Chicago O'Hare International	ORD	L	\$3.00	\$1,697,731,167	7y7m	9/1/1993	4/1/2001
		Chicago O'Hare				**			
Chicago	IL	Intenational Chicago O'Hare	ORD	L	\$4.50		4y10m	4/1/2001	2/1/2006
Chicago	IL 	International	ORD	L	\$4.50	\$2,006,669,248	22y2m	2/1/2006	4/1/2028
Decatur	IL	Decatur Williamson County	DEC		\$4.50	\$732,628	12y9m	6/1/2006	3/1/2019
Marion	IL	Regional Quad City	MWA	CS	\$4.50	\$509,499	10y6m	9/1/2005	3/1/2016
Moline	IL	International Quad City	MLI	S	\$3.00	\$29,523,476	7y11m	12/1/1994	1/1/2002
Moline	IL	International	MLI	S	\$4.50	**	14y6m	1/1/2002	7/1/2016
Moline	IL	Quad City International	MLI	S	\$4.50	\$1,520,320	1y	7/1/2016	7/1/2017
Peoria	IL	Greater Peoria Regional	PIA	N	\$3.00	\$8,145,036	6y7m	12/1/1994	7/1/2001
Peoria	IL	Greater Peoria Regional	PIA	N	\$4.50	**	5y7m	7/1/2001	2/1/2007
		Greater Peoria							
Peoria	IL	Regional Greater Peoria	PIA	N	\$4.50	\$1,476,770	1y6m	2/1/2007	8/1/2008
Peoria	IL	Regional Quincy Regional-	PIA	N	\$4.50	\$7,550,000	6y3m	11/1/2008	2/1/2015
Quincy	IL	Baldwin Field  Quincy Regional-	UIN		\$3.00	\$115,517	2y9m	10/1/1994	7/1/1997
Quincy	IL	Baldwin Field	UIN		\$3.00	\$298,153	7y7m	11/1/1997	6/1/2005
Quincy	IL	Quincy Regional- Baldwin Field	UIN		\$3.00	*	2y2m	11/1/2005	1/1/2008
Quincy	IL	Quincy Regional- Baldwin Field	UIN		\$4.50	\$635,573	11y2m	1/1/2008	3/1/2019
		Chicago/ Rockford	_			* /	,		
Rockford	п		RED	N	\$3.00	\$385 <b>681</b>	Δv	10/1/1002	10/1/1006
Rockford	IL 	International Chicago/ Rockford	RFD	N	\$3.00	\$385,681	4y	10/1/1992	10/1/1996
Rockford	IL	International Chicago/ Rockford International Chicago/ Rockford	RFD	N	\$3.00	\$7,066,659	10y1m	5/1/1997	6/1/2007
		International Chicago/ Rockford International	RFD RFD				•		
Rockford	IL	International Chicago/ Rockford International Chicago/ Rockford International Abraham Lincoln Capital	RFD	N	\$3.00	\$7,066,659	10y1m	5/1/1997	6/1/2007
Rockford  Rockford	IL IL	International Chicago/ Rockford International Chicago/ Rockford International Abraham Lincoln Capital Abraham Lincoln Capital	RFD RFD	N N	\$3.00 \$4.50	\$7,066,659 **	10y1m 6y11m	5/1/1997 6/1/2007	6/1/2007 5/1/2014
Rockford  Rockford  Springfield	IL IL	International Chicago/ Rockford International Chicago/ Rockford International Abraham Lincoln Capital Abraham Lincoln	RFD RFD SPI	N N N	\$3.00 \$4.50 \$3.00	\$7,066,659 ** \$4,922,593	10y1m 6y11m 9y11m	5/1/1997 6/1/2007 6/1/1992	6/1/2007 5/1/2014 5/1/2002
Rockford  Rockford  Springfield  Springfield	IL IL IL	International Chicago/ Rockford International Chicago/ Rockford International Abraham Lincoln Capital Abraham Lincoln Capital Abraham Lincoln	RFD RFD SPI SPI	N N N	\$3.00 \$4.50 \$3.00 \$4.50	\$7,066,659 ** \$4,922,593 **	10y1m 6y11m 9y11m 5y5m	5/1/1997 6/1/2007 6/1/1992 5/1/2002	6/1/2007 5/1/2014 5/1/2002 10/1/2005
Rockford  Rockford  Springfield  Springfield  Springfield	IL IL IL IL	International Chicago/ Rockford International Chicago/ Rockford International Abraham Lincoln Capital Abraham Lincoln Capital Abraham Lincoln Capital Evansville Regional	RFD RFD SPI SPI SPI	N N N N	\$3.00 \$4.50 \$3.00 \$4.50 \$4.50	\$7,066,659  **  \$4,922,593  **  \$1,173,000	10y1m 6y11m 9y11m 5y5m 6y2m	5/1/1997 6/1/2007 6/1/1992 5/1/2002 10/1/2005	6/1/2007 5/1/2014 5/1/2002 10/1/2005 12/1/2011
Rockford  Rockford  Springfield  Springfield  Springfield  Evansville	IL IL IL IN	International Chicago/ Rockford International Chicago/ Rockford International Abraham Lincoln Capital Abraham Lincoln Capital Abraham Lincoln Capital Evansville Regional Evansville Regional Fort Wayne International	RFD RFD SPI SPI SPI EVV	N N N N	\$3.00 \$4.50 \$3.00 \$4.50 \$4.50 \$4.50	\$7,066,659  **  \$4,922,593  **  \$1,173,000  \$1,270,789	10y1m 6y11m 9y11m 5y5m 6y2m 1y3m	5/1/1997 6/1/2007 6/1/1992 5/1/2002 10/1/2005 8/1/2007	6/1/2007 5/1/2014 5/1/2002 10/1/2005 12/1/2011 11/1/2008
Rockford  Rockford  Springfield  Springfield  Springfield  Evansville  Evansville	IL IL IL IL IN IN	International Chicago/ Rockford International Chicago/ Rockford International Abraham Lincoln Capital Abraham Lincoln Capital Abraham Lincoln Capital Evansville Regional Evansville Regional Fort Wayne International	RFD RFD SPI SPI SPI EVV EVV	N N N N N	\$3.00 \$4.50 \$3.00 \$4.50 \$4.50 \$4.50 \$4.50	\$7,066,659  **  \$4,922,593  **  \$1,173,000  \$1,270,789  \$3,983,706	10y1m 6y11m 9y11m 5y5m 6y2m 1y3m 4y2m	5/1/1997 6/1/2007 6/1/1992 5/1/2002 10/1/2005 8/1/2007 12/1/2008	6/1/2007 5/1/2014 5/1/2002 10/1/2005 12/1/2011 11/1/2008 2/1/2013
Rockford  Rockford  Springfield  Springfield  Springfield  Evansville  Evansville  Fort Wayne	IL IL IL IL IN IN	International Chicago/ Rockford International Chicago/ Rockford International Abraham Lincoln Capital Abraham Lincoln Capital Abraham Lincoln Capital Evansville Regional Fort Wayne International Fort Wayne	RFD RFD SPI SPI SPI EVV EVV FWA	N N N N N N	\$3.00 \$4.50 \$3.00 \$4.50 \$4.50 \$4.50 \$4.50 \$3.00	\$7,066,659  **  \$4,922,593  **  \$1,173,000  \$1,270,789  \$3,983,706	10y1m 6y11m 9y11m 5y5m 6y2m 1y3m 4y2m 12y5m	5/1/1997 6/1/2007 6/1/1992 5/1/2002 10/1/2005 8/1/2007 12/1/2008 7/1/1993	6/1/2007 5/1/2014 5/1/2002 10/1/2005 12/1/2011 11/1/2008 2/1/2013 12/1/2005
Rockford  Rockford  Springfield  Springfield  Springfield  Evansville  Evansville  Fort Wayne  Fort Wayne	IL IL IL IL IN IN IN IN IN	International Chicago/ Rockford International Chicago/ Rockford International Abraham Lincoln Capital Abraham Lincoln Capital Abraham Lincoln Capital Evansville Regional Evansville Regional Fort Wayne International Fort Wayne International Fort Wayne International Indianapolis	RFD RFD SPI SPI EVV EVV FWA FWA FWA	N N N N N N N N N N N N N N N N N N N	\$3.00 \$4.50 \$3.00 \$4.50 \$4.50 \$4.50 \$3.00 \$4.50 \$4.50	\$7,066,659  **  \$4,922,593  **  \$1,173,000  \$1,270,789  \$3,983,706  \$26,563,457  **  \$2,045,000	10y1m 6y11m 9y11m 5y5m 6y2m 1y3m 4y2m 12y5m 10y10m 1y5m	5/1/1997 6/1/2007 6/1/1992 5/1/2002 10/1/2005 8/1/2007 12/1/2008 7/1/1993 12/1/2005 10/1/2016	6/1/2007 5/1/2014 5/1/2002 10/1/2005 12/1/2011 11/1/2008 2/1/2013 12/1/2005 10/1/2016 3/1/2018
Rockford  Rockford  Springfield  Springfield  Springfield  Evansville  Evansville  Fort Wayne  Fort Wayne  Indianapolis	IL IL IL IL IN IN IN IN IN IN	International Chicago/ Rockford International Chicago/ Rockford International Abraham Lincoln Capital Abraham Lincoln Capital Abraham Lincoln Capital Evansville Regional Evansville Regional Fort Wayne International Fort Wayne International Fort Wayne International Indianapolis International Indianapolis	RFD RFD SPI SPI SPI EVV EVV FWA FWA IND	N N N N N N N N N N N N N N N N N N N	\$3.00 \$4.50 \$3.00 \$4.50 \$4.50 \$4.50 \$3.00 \$4.50 \$4.50 \$3.00	\$7,066,659  **  \$4,922,593  **  \$1,173,000  \$1,270,789  \$3,983,706  \$26,563,457  **	10y1m 6y11m 9y11m 5y5m 6y2m 1y3m 4y2m 12y5m 10y10m 1y5m 7y7m	5/1/1997 6/1/2007 6/1/1992 5/1/2002 10/1/2005 8/1/2007 12/1/2008 7/1/1993 12/1/2005 10/1/2016 9/1/1993	6/1/2007 5/1/2014 5/1/2002 10/1/2005 12/1/2011 11/1/2008 2/1/2013 12/1/2005 10/1/2016 3/1/2018 4/1/2001
Rockford  Rockford  Springfield  Springfield  Springfield  Evansville  Evansville  Fort Wayne  Fort Wayne  Indianapolis	IL IL IL IL IN IN IN IN IN IN	International Chicago/ Rockford International Chicago/ Rockford International Abraham Lincoln Capital Abraham Lincoln Capital Abraham Lincoln Capital Evansville Regional Evansville Regional Fort Wayne International Fort Wayne International Fort Wayne International Indianapolis International Indianapolis International Indianapolis	RFD RFD SPI SPI EVV EVV FWA FWA IND	N N N N N N N N N N N N N N M	\$3.00 \$4.50 \$3.00 \$4.50 \$4.50 \$4.50 \$4.50 \$4.50 \$4.50 \$4.50 \$4.50	\$7,066,659  **  \$4,922,593  **  \$1,173,000  \$1,270,789  \$3,983,706  \$26,563,457  **  \$2,045,000  \$80,825,898	10y1m 6y11m 9y11m 5y5m 6y2m 1y3m 4y2m 12y5m 10y10m 1y5m 7y7m 6m	5/1/1997 6/1/2007 6/1/1992 5/1/2002 10/1/2005 8/1/2007 12/1/2008 7/1/1993 12/1/2005 10/1/2016 9/1/1993 4/1/2001	6/1/2007 5/1/2014 5/1/2002 10/1/2005 12/1/2011 11/1/2008 2/1/2013 12/1/2005 10/1/2016 3/1/2018 4/1/2001 10/1/2001
Rockford  Rockford  Springfield  Springfield  Springfield  Evansville  Evansville  Fort Wayne  Fort Wayne  Indianapolis	IL IL IL IL IN IN IN IN IN IN	International Chicago/ Rockford International Chicago/ Rockford International Abraham Lincoln Capital Abraham Lincoln Capital Abraham Lincoln Capital Evansville Regional Evansville Regional Fort Wayne International Fort Wayne International Fort Wayne International Indianapolis International Indianapolis International	RFD RFD SPI SPI SPI EVV EVV FWA FWA IND	N N N N N N N N N N N N N N N N N N N	\$3.00 \$4.50 \$3.00 \$4.50 \$4.50 \$4.50 \$3.00 \$4.50 \$4.50 \$3.00	\$7,066,659  **  \$4,922,593  **  \$1,173,000  \$1,270,789  \$3,983,706  \$26,563,457  **  \$2,045,000	10y1m 6y11m 9y11m 5y5m 6y2m 1y3m 4y2m 12y5m 10y10m 1y5m 7y7m	5/1/1997 6/1/2007 6/1/1992 5/1/2002 10/1/2005 8/1/2007 12/1/2008 7/1/1993 12/1/2005 10/1/2016 9/1/1993	6/1/2007 5/1/2014 5/1/2002 10/1/2005 12/1/2011 11/1/2008 2/1/2013 12/1/2005 10/1/2016 3/1/2018 4/1/2001
Rockford  Rockford  Springfield  Springfield  Springfield  Evansville  Evansville  Fort Wayne  Fort Wayne  Indianapolis  Indianapolis  Indianapolis	IL IL IL IL IN	International Chicago/ Rockford International Chicago/ Rockford International Abraham Lincoln Capital Abraham Lincoln Capital Abraham Lincoln Capital Evansville Regional Evansville Regional Fort Wayne International Fort Wayne International Indianapolis International	RFD RFD SPI SPI EVV EVV FWA FWA IND IND IND	N N N N N N N N N N N N N N M M	\$3.00 \$4.50 \$3.00 \$4.50 \$4.50 \$4.50 \$3.00 \$4.50 \$4.50 \$4.50 \$3.00	\$7,066,659  **  \$4,922,593  **  \$1,173,000  \$1,270,789  \$3,983,706  \$26,563,457  **  \$2,045,000  \$80,825,898  **  \$4444,022,707  \$59,000	10y1m 6y11m 9y11m 5y5m 6y2m 1y3m 4y2m 12y5m 10y10m 7y7m 6m 20y10m 1m	5/1/1997 6/1/2007 6/1/1992 5/1/2002 10/1/2005 8/1/2007 12/1/2008 7/1/1993 12/1/2005 10/1/2016 9/1/1993 4/1/2001 10/1/2001 9/1/2022	6/1/2007 5/1/2014 5/1/2002 10/1/2005 12/1/2011 11/1/2008 2/1/2013 12/1/2016 3/1/2018 4/1/2001 10/1/2001 9/1/2022 10/1/2022
Rockford  Rockford  Springfield  Springfield  Springfield  Evansville  Evansville  Fort Wayne  Fort Wayne  Indianapolis  Indianapolis	IL IL IL IL IN IN IN IN IN IN IN IN	International Chicago/ Rockford International Chicago/ Rockford International Abraham Lincoln Capital Abraham Lincoln Capital Abraham Lincoln Capital Evansville Regional Evansville Regional Fort Wayne International Fort Wayne International Indianapolis	RFD RFD SPI SPI SPI EVV EVV FWA FWA IND	N N N N N N N N N N N N M M	\$3.00 \$4.50 \$3.00 \$4.50 \$4.50 \$4.50 \$3.00 \$4.50 \$3.00 \$4.50 \$4.50	\$7,066,659  **  \$4,922,593  **  \$1,173,000  \$1,270,789  \$3,983,706  \$26,563,457  **  \$2,045,000  \$80,825,898  **  \$4444,022,707	10y1m 6y11m 9y11m 5y5m 6y2m 1y3m 4y2m 12y5m 10y10m 1y5m 7y7m 6m 20y10m	5/1/1997 6/1/2007 6/1/1992 5/1/2002 10/1/2005 8/1/2007 12/1/2008 7/1/1993 12/1/2005 10/1/2016 9/1/1993 4/1/2001	6/1/2007 5/1/2014 5/1/2002 10/1/2005 12/1/2011 11/1/2008 2/1/2013 12/1/2005 10/1/2016 3/1/2018 4/1/2001 10/1/2001 9/1/2022
Rockford  Rockford  Springfield  Springfield  Springfield  Evansville  Evansville  Fort Wayne  Fort Wayne  Indianapolis  Indianapolis  Indianapolis	IL IL IL IL IN	International Chicago/ Rockford International Chicago/ Rockford International Abraham Lincoln Capital Abraham Lincoln Capital Abraham Lincoln Capital Evansville Regional Evansville Regional Fort Wayne International Fort Wayne International Indianapolis International South Bend Regional Southeast Iowa Regional	RFD RFD SPI SPI EVV EVV FWA FWA IND IND IND	N N N N N N N N N N N N N N M M	\$3.00 \$4.50 \$3.00 \$4.50 \$4.50 \$4.50 \$3.00 \$4.50 \$4.50 \$4.50 \$3.00	\$7,066,659  **  \$4,922,593  **  \$1,173,000  \$1,270,789  \$3,983,706  \$26,563,457  **  \$2,045,000  \$80,825,898  **  \$4444,022,707  \$59,000	10y1m 6y11m 9y11m 5y5m 6y2m 1y3m 4y2m 12y5m 10y10m 7y7m 6m 20y10m 1m	5/1/1997 6/1/2007 6/1/1992 5/1/2002 10/1/2005 8/1/2007 12/1/2008 7/1/1993 12/1/2005 10/1/2016 9/1/1993 4/1/2001 10/1/2001 9/1/2022	6/1/2007 5/1/2014 5/1/2002 10/1/2005 12/1/2011 11/1/2008 2/1/2013 12/1/2016 3/1/2018 4/1/2001 10/1/2001 9/1/2022 10/1/2022
Rockford  Rockford  Springfield  Springfield  Springfield  Evansville  Evansville  Fort Wayne  Fort Wayne  Indianapolis  Indianapolis  Indianapolis  South Bend		International Chicago/ Rockford International Chicago/ Rockford International Abraham Lincoln Capital Abraham Lincoln Capital Abraham Lincoln Capital Evansville Regional Evansville Regional Fort Wayne International Fort Wayne International Indianapolis International South Bend Regional South Bend Regional	RFD RFD SPI SPI EVV EVV FWA FWA IND IND IND SBN	N N N N N N N N N N N N N N N N N N N	\$3.00 \$4.50 \$3.00 \$4.50 \$4.50 \$4.50 \$4.50 \$3.00 \$4.50 \$4.50 \$3.00 \$4.50 \$3.00 \$3.00	\$7,066,659  **  \$4,922,593  **  \$1,173,000  \$1,270,789  \$3,983,706  \$26,563,457  **  \$2,045,000  \$80,825,898  **  \$4444,022,707  \$59,000  \$34,172,802	10y1m 6y11m 9y11m 5y5m 6y2m 1y3m 4y2m 12y5m 10y10m 1y5m 7y7m 6m 20y10m 1m 26y11m	5/1/1997 6/1/2007 6/1/1992 5/1/2002 10/1/2005 8/1/2007 12/1/2008 7/1/1993 12/1/2005 10/1/2016 9/1/1993 4/1/2001 10/1/2001 9/1/2022 11/1/1994	6/1/2007 5/1/2014 5/1/2002 10/1/2005 12/1/2011 11/1/2008 2/1/2013 12/1/2005 10/1/2016 3/1/2018 4/1/2001 10/1/2001 9/1/2022 10/1/2022
Rockford  Rockford  Springfield  Springfield  Springfield  Evansville  Evansville  Fort Wayne  Fort Wayne  Indianapolis  Indianapolis  Indianapolis  South Bend  Burlington	IL IL IL IN	International Chicago/ Rockford International Chicago/ Rockford International Abraham Lincoln Capital Abraham Lincoln Capital Abraham Lincoln Capital Evansville Regional Evansville Regional Fort Wayne International Fort Wayne International Indianapolis International South Bend Regional Southeast Iowa Regional Southeast Iowa	RFD RFD SPI SPI EVV EVV FWA FWA IND IND IND SBN BRL	N N N N N N N N N N N N N N N CS	\$3.00 \$4.50 \$3.00 \$4.50 \$4.50 \$4.50 \$3.00 \$4.50 \$3.00 \$4.50 \$3.00 \$3.00 \$3.00	\$7,066,659  **  \$4,922,593  **  \$1,173,000  \$1,270,789  \$3,983,706  \$26,563,457  **  \$2,045,000  \$80,825,898  **  \$4444,022,707  \$59,000  \$34,172,802  \$521,304	10y1m 6y11m 9y11m 5y5m 6y2m 1y3m 4y2m 12y5m 10y10m 7y7m 6m 20y10m 1m 26y11m 4y2m	5/1/1997 6/1/2007 6/1/1992 5/1/2002 10/1/2005 8/1/2007 12/1/2008 7/1/1993 12/1/2005 10/1/2016 9/1/1993 4/1/2001 10/1/2001 9/1/2022 11/1/1994 7/1/1997	6/1/2007 5/1/2014 5/1/2002 10/1/2005 12/1/2011 11/1/2008 2/1/2013 12/1/2016 3/1/2018 4/1/2001 10/1/2001 9/1/2022 10/1/2022 10/1/2021 9/1/2001
Rockford  Rockford  Springfield  Springfield  Springfield  Evansville  Evansville  Fort Wayne  Fort Wayne  Indianapolis  Indianapolis  Indianapolis  South Bend  Burlington	IL IL IL IL IN	International Chicago/ Rockford International Chicago/ Rockford International Abraham Lincoln Capital Abraham Lincoln Capital Abraham Lincoln Capital Evansville Regional Evansville Regional Fort Wayne International Fort Wayne International Indianapolis International South Bend Regional Southeast Iowa Regional	RFD RFD SPI SPI SPI EVV EVV FWA FWA IND IND IND SBN BRL BRL	N N N N N N N N N N N N N N N N CS CS	\$3.00 \$4.50 \$4.50 \$4.50 \$4.50 \$4.50 \$3.00 \$4.50 \$3.00 \$4.50 \$3.00 \$3.00 \$3.00 \$3.00	\$7,066,659  **  \$4,922,593  **  \$1,173,000  \$1,270,789  \$3,983,706  \$26,563,457  **  \$2,045,000  \$80,825,898  **  \$444,022,707  \$59,000  \$34,172,802  \$521,304  **	10y1m 6y11m 9y11m 5y5m 6y2m 1y3m 4y2m 12y5m 10y10m 1y5m 7y7m 6m 20y10m 1m 26y11m 4y2m 9y5m	5/1/1997 6/1/2007 6/1/1992 5/1/2002 10/1/2005 8/1/2007 12/1/2008 7/1/1993 12/1/2005 10/1/2016 9/1/1993 4/1/2001 10/1/2001 9/1/2022 11/1/1994 7/1/1997 9/1/2001	6/1/2007 5/1/2014 5/1/2002 10/1/2005 12/1/2011 11/1/2008 2/1/2013 12/1/2005 10/1/2016 3/1/2018 4/1/2001 10/1/2001 9/1/2022 10/1/2022 10/1/2021 9/1/2001 2/1/2011

Des Moines	IA	Des Moines International	DSM	S	\$3.00	\$17,933,852	7y5m	3/1/1994	8/1/2001
Des Moines	IA	Des Moines International	DSM	S	\$4.50	**	9m	8/1/2001	5/1/2002
Des Moines	IA	Des Moines International	DSM	S	\$4.50	\$58,169,494	15y8m	5/1/2002	1/1/2018
Dubuque	IA	Dubuque Regional	DBQ	N	\$3.00	\$1,106,761	8y4m	1/1/1993	5/1/2001
Dubuque	IA	Dubuque Regional	DBQ	N	\$4.50	\$2,185,830	11y8m	5/1/2001	1/1/2013
Fort Dodge	IA	Fort Dodge Regional	FOD	cs	\$3.00	\$169,331	6y6m	3/1/1995	9/1/2001
Fort Dodge	IA	Fort Dodge Regional	FOD	CS	\$4.50	\$315,570	9y3m	1/1/2002	4/1/2011
Mason City	IA	Mason City Municipal	MCW	N	\$3.00	\$302,090	5y9m	2/1/1996	10/1/2001
Mason City	IA	Mason City Municipal	MCW	N	\$4.50	**	1y6y	10/1/2001	4/1/2003
Mason City	IA	Mason City Municipal	MCW	N	\$4.50	\$379,500	10y8m	8/1/2003	4/1/2014
Sioux City	IA	Sioux Gateway/Col. Bud Day Field Sioux Gateway/Col.	SUX	N	\$3.00	\$204,465	1y	6/1/1993	6/1/1994
Sioux City	IA	Bud Day Field	SUX	N	\$3.00	\$2,505,560	7y1m	2/1/1995	3/1/2002
Sioux City	IA	Sioux Gateway/Col.  Bud Day Field  Sioux Gateway/Col.	SUX	N	\$4.50	**	1y10m	3/1/2002	1/1/2004
Sioux City	IA	Bud Day Field	SUX	N	\$4.50	\$969,350	8y6m	11/1/2004	5/1/2013
Spencer	IA	Spencer Municipal	SPW		\$3.00	\$77,638	10y6m	9/1/1995	3/1/2006
Waterloo	IA	Waterloo Regional	ALO	N	\$3.00	\$628,088	4y	6/1/1994	6/1/1998
Waterloo	IA	Waterloo Regional	ALO	N	\$3.00	\$784,036	1y10m	9/1/1999	7/1/2001
Waterloo	IA	Waterloo Regional	ALO	N	\$4.50	**	1y10m	7/1/2001	5/1/2003
Waterloo	IA	Waterloo Regional	ALO	N	\$4.50	\$1,169,836	8y6m	5/1/2003	11/1/2011
Manhattan	KS	Manhattan Regional	MHK	N	\$3.00	\$401,978	3y5m	10/1/1998	3/1/2002
Manhattan	KS	Manhattan Regional	MHK	N	\$4.50	**	6y4m	3/1/2002	7/1/2008
Manhattan	KS	Manhattan Regional	MHK	N	\$4.50	\$601,007	9y11m	7/1/2008	6/1/2018
Topeka	KS	Forbes Field	FOE		\$4.50	\$823,720	15y7m	8/1/2007	3/1/2023
Wichita	KS	Wichita Mid-Continent	ICT	S	\$3.00	\$25,595,179	10y6m	12/1/1994	5/1/2005
Wichita	KS	Wichita Mid-Continent	ICT	S	\$4.50	**	2y1m	5/1/2005	6/1/2007
Wichita	KS	Wichita Mid-Continent	ICT	S	\$4.50	\$7,548,050	2y2m	7/1/2007	9/1/2009
Covington	KY	Cincinnati/Northern Kentucky International	CVG	М	\$3.00	\$153,297,555	6y2m	6/1/1994	8/1/2000
Covington	KY	Cincinnati/Northern Kentucky International	CVG	М	\$3.00	\$74,141,278	2y1m	7/1/2001	8/1/2003
Covington	KY	Cincinnati/Northern Kentucky International	CVG	М	\$4.50	\$213,098,000	5y9m	8/1/2003	5/1/2009
Covington	KY	Cincinnati/Northern Kentucky International	CVG	М	\$3.00	\$112,337,000	5y4m	5/1/2009	9/1/2014
Lexington	KY	Blue Grass	LEX	S	\$3.00	\$11,889,520	7y7m	11/1/1993	6/1/2001
Lexington	KY	Blue Grass	LEX	S	\$4.50	**	2y	6/1/2001	6/1/2003
Lexington	KY	Blue Grass	LEX	S	\$3.00	\$500,557	4m	8/1/2003	12/1/2003
Lexington	KY	Blue Grass	LEX	S	\$4.50	\$87,804,742	34y2m	12/1/2003	2/1/2038
Louisville	KY	Louisville International - Standiford Field	SDF	М	\$3.00	\$90,600,000	8y10m	5/1/1997	3/1/2006
Louisville	KY	Louisville International - Standiford Field	SDF	М	\$4.50	**	7m	3/1/2006	10/1/2006
Louisville	KY	Louisville International - Standiford Field	SDF	М	\$3.00	**	1y11m	10/1/2006	9/1/2008
Louisville	KY	Louisville International - Standiford Field	SDF	M	\$4.50	**	1m	9/1/2008	10/1/2008
Louisville	KY	Louisville International - Standiford Field Louisville International	SDF	М	\$3.00	**	6y1m	10/1/2008	11/1/2014
Louisville	KY	- Standiford Field  Louisville International	SDF	М	\$3.00	\$15,678,940	3y5m	11/1/2014	4/1/2018
Louisville	KY	- Standiford Field	SDF	M	\$4.50	\$2,167,315	3m	4/1/2018	7/1/2018
Paducah	KY	Barkley Regional Alexandria	PAH	N	\$3.00	\$1,696,178	20y	3/1/1994	3/1/2014
Alexandria	LA	International Alexandria	AEX	N	\$3.00	\$10,284,927	2y8m	5/1/1999	1/1/2002
Alexandria	LA	International	AEX	N	\$4.50	**	20y11m	1/1/2002	12/1/2022

Baton Rouge	LA	Baton Rouge Metropolitan, Ryan Field Baton Rouge	BTR	s	\$3.00	\$37,469,799	12y10m	12/1/1992	10/1/2005
Baton Rouge	LA	Metropolitan, Ryan Field Baton Rouge	BTR	S	\$4.50	**	13y4m	10/1/2005	2/1/2018
Baton Rouge	LA	Metropolitan, Ryan Field	BTR	s	\$4.50	\$43,889,437	12y5m	2/1/2018	7/1/2031
Lafayette	LA	Lafayette Regional	LFT	N	\$3.00	\$1,083,024	Зу	9/1/1995	9/1/1998
Lafayette	LA	Lafayette Regional	LFT	N	\$3.00	\$2,273,692	1y	4/1/2001	4/1/2002
Lafayette	LA	Lafayette Regional	LFT	N	\$4.50	**	2y8m	4/1/2002	1/1/2005
Lafayette	LA	Lafayette Regional	LFT	N	\$4.50	\$3,433,629	2y11m	5/1/2005	4/1/2008
Lafayette	LA	Lafayette Regional	LFT	N	\$4.50	\$3,950,000	3y9m	8/1/2008	5/1/2012
Lake Charles	LA	Lake Charles Regional	LCH	N	\$3.00	\$1,377,234	4y2m	3/1/2001	5/1/2005
Lake Charles	LA	Lake Charles Regional Lake Charles	LCH	N	\$4.50	**	4y5m	5/1/2005	10/1/2009
Lake Charles	LA	Regional	LCH	N	\$4.50	\$420,000	2y2m	10/1/2009	12/1/2011
Monroe	LA	Monroe Regional	MLU	N	\$4.50	\$1,359,504	4y5m	4/1/2003	9/1/2007
Monroe	LA	Monroe Regional	MLU	N	\$4.50	\$16,400,000	25y7m	11/1/2008	6/1/2036
Na Odaana		Louis Armstrong New	MOV		<b>#0.00</b>	<b>#404 000 000</b>	040	0/4/4000	4/4/0000
New Orleans	LA	Orleans International  Louis Armstrong New	MSY	М	\$3.00	\$131,233,363	8y10m	6/1/1993	4/1/2002
New Orleans	LA	Orleans International Louis Armstrong New	MSY	M	\$4.50	**	1y4m	4/1/2002	8/1/2003
New Orleans	LA	Orleans International	MSY	М	\$4.50	\$368,133,997	19y11m	8/1/2003	7/1/2023
Shreveport	LA	Shreveport Regional	SHV	N	\$3.00	\$29,841,353	8y9m	2/1/1994	11/1/2002
Shreveport	LA	Shreveport Regional	SHV	N	\$4.50	**	11y10m	11/1/2002	9/1/2014
Bangor	ME	Bangor International	BGR	N	\$3.00	\$8,961,006	15y3m	6/1/1995	9/1/2010
Portland	ME	Portland International Jetport	PWM	S	\$3.00	\$35,323,691	15y	2/1/1994	2/1/2009
Portland	ME	Portland International Jetport Northern Maine	PWM	S	\$4.50	**	1y9m	2/1/2009	11/1/2010
Presque Isle	ME	Regional Airport at Presque Isle Baltimore/Washington	PQI	N	\$4.50	\$245,853	4y9m	9/1/2004	6/1/2009
Baltimore	MD	International Thurgood Marshal	BWI	L	\$3.00	\$241,627,775	9y8m	10/1/1992	6/1/2002
		Baltimore/Washington International					, i		
Baltimore	MD	Thurgood Marshal Baltimore/Washington	BWI	L _	\$4.50	**	5m	6/1/2002	11/1/2002
Baltimore	MD	International Thurgood Marshal	BWI	L	\$4.50	\$628,240,115	15y11m	11/1/2002	10/1/2018
Cumberland	MD	Greater Cumberland Reg	CBE		\$3.00	\$150,000	5у	7/1/1994	7/1/1999
		Greater Cumberland				*			
Cumberland	MD	Reg Hagerstown Regional- Richard A Henson	CBE		\$3.00		6y8m	10/1/1999	6/1/2006
Hagerstown	MD	Field	HGR		\$3.00	\$308,817	2y7m	8/1/1999	3/1/2002
Hagerstown	MD	Hagerstown Regional- Richard A Henson Field Hagerstown Regional-	HGR		\$4.50	**	1y10m	3/1/2002	1/1/2004
Hagerstown	MD	Richard A Henson Field	HGR		\$4.50	\$108,124	3y7m	1/1/2004	8/1/2007
Salisbury	MD	Salisbury-Ocean City Wicomico Regional	SBY	N	\$3.00	\$1,911,033	6y1m	2/1/2002	3/1/2008
Salisbury	MD	Salisbury-Ocean City Wicomico Regional	SBY	N	\$4.50	**	4y3m	3/1/2008	6/1/2012
		General Edward			,		<i>y</i> =		
Boston	MA	Lawrence Logan International General Edward	BOS	L	\$3.00	\$702,015,217	11y11m	11/1/1993	10/1/2005
Boston	MA	Lawrence Logan International General Edward	BOS	L	\$4.50	**	5y4m	10/1/2005	2/1/2011
Boston	MA	Lawrence Logan International	BOS	L	\$4.50	\$293,018,000	5y	2/1/2011	2/1/2016
Worcester	MA	Worcester Regional	ORH		\$3.00	\$614,336	5y	10/1/1992	10/1/1997
		<del>-</del> - <del>-</del>					- ,		

Worcester	MA	Worcester Regional	ORH		\$3.00	\$1,021,417	13y3m	9/1/1999	12/1/2011
Alpena	MI	Alpena County Regional	APN	CS	\$3.00	\$268,480	4y4m	8/1/2001	12/1/2005
Alpena	MI	Alpena County Regional	APN	CS	\$4.50	**	2y8m	12/1/2005	8/1/2008
·		Alpena County				<b>#</b> 400.050			
Alpena	MI	Regional	APN	CS	\$4.50	\$193,958	4y5m	8/1/2008	1/1/2013
Detroit	MI	Detroit City Detroit Metropolitan	DET		\$3.00	\$240,053	4y2m	1/1/2000	3/1/2004
Detroit	MI	Wayne County	DTW	L	\$3.00	\$2,253,182,360	8y9m	1/1/1993	10/1/2001
Detroit	MI	Detroit Metropolitan Wayne County	DTW	L	\$4.50	**	24y7m	10/1/2001	5/1/2026
Detroit	MI	Detroit Metropolitan Wayne County	DTW	L	\$4.50	\$909,777,476	8y3m	5/1/2026	8/1/2034
Escanaba	MI	Delta County	ESC	cs	\$3.00	\$149,319	5y2m	2/1/1993	11/1/1997
Escanaba	MI	Delta County	ESC	CS	\$3.00	\$197,877	1y11m	8/1/1998	7/1/2000
Escanaba	MI	Delta County	ESC	CS	\$3.00	\$114,900	2y5m	10/1/2001	3/1/2004
Escanaba	MI	Delta County	ESC	CS	\$4.50	\$40,000	1y10m	3/1/2004	1/1/2006
Escanaba	MI	Delta County	ESC	CS	\$4.50	\$322,158	6y9m	4/1/2006	1/1/2013
Flint	MI	Bishop International	FNT	S	\$3.00	\$31,865,870	8y1m	9/1/1993	10/1/2001
Flint	MI	Bishop International	FNT	S	\$4.50	**	16y3m	10/1/2001	1/1/2018
Grand Rapids	MI	Gerald R. Ford International	GRR	S	\$3.00	\$94,359,802	12y11m	12/1/1992	11/1/2005
Grand Rapids	MI	Gerald R. Ford	GRR	S	\$4.50	**	10y11m	11/1/2005	10/1/2016
Grand Rapids	MI	Gerald R. Ford International	GRR	S	\$4.50	\$7,654,985	2y4m	10/1/2016	2/1/2019
Hancock	MI	Houghton County Memorial	CMX	N	\$3.00	\$164,920	2y8m	7/1/1993	3/1/1996
Hancock	MI	Houghton County Memorial	CMX	N	\$3.00	\$149,326	Зу	7/1/1996	7/1/1999
Hancock	MI	Houghton County Memorial	CMX	N	\$3.00	\$387,250	5y9m	10/1/1999	7/1/2005
Hancock	MI	Houghton County Memorial	CMX	N	\$4.50	**	1y4m	7/1/2005	11/1/2006
Hancock	MI	Houghton County Memorial	CMX	N	\$4.50	\$719,220	6y3m	11/1/2006	2/1/2013
Iron Mountain	1411	Wellonal	OWIX	.,	ψ4.00	Ψ113,220	Oyom	11/1/2000	2/1/2010
Kingsford	MI	Ford	IMT	CS	\$3.00	\$204,029	8y9m	9/1/1995	6/1/2004
Ironwood	MI	Gogebic-Iron County	IWD		\$3.00	\$90,531	13y2m	8/1/1993	10/1/2006
Ironwood	MI	Gogebic-Iron County	IWD		\$4.50	\$128,549	18y8m	6/1/2007	2/1/2026
Kalamazoo	МІ	Kalamazoo/Battle Creek Internaitonal	AZO	N	\$3.00	\$1,089,716	3y2m	4/1/1997	6/1/2000
Kalamazoo	MI	Kalamazoo/Battle Creek Internaitonal	AZO	N	\$3.00	\$5,312,429	4y	1/1/2001	1/1/2005
Kalamazoo	MI	Kalamazoo/Battle Creek Internaitonal	AZO	N	\$4.50	**	1y7m	1/1/2005	8/1/2006
Kalamazoo	MI	Kalamazoo/Battle Creek Internaitonal	AZO	N	\$4.50	\$1,500,000	1y6m	10/1/2006	4/1/2008
		Kalamazoo/Battle							
Kalamazoo	MI	Creek Internaitonal	AZO	N	\$4.50	\$14,821,076	16y	9/1/2008	9/1/2024
Lansing	MI	Capital City	LAN	N	\$3.00	\$6,422,640 **	8y9m	10/1/1993	7/1/2002
Lansing	MI	Capital City	LAN	_ N _	\$4.50		6y	7/1/2002	7/1/2008
Lansing	MI	Capital City Manistee County-	LAN	N	\$4.50	\$30,028,805	10y6m	7/1/2008	1/1/2019
Manistee	MI	Blacker	MBL		\$4.50	\$388,986	32y5m	6/1/2008	11/1/2040
Marquette	MI	Marquette County	MQT	Ν	\$3.00	\$62,225	4y	12/1/1992	12/1/1996
Marquette	MI	Sawyer International	SAW/MQT	N	\$3.00	\$1,077,540	4y3m	4/1/1998	7/1/2002
Marquette	MI	Sawyer International	SAW/MQT	N	\$4.50	**	6m	7/1/2002	1/1/2003
Marquette	MI	Sawyer International	SAW/MQT	N	\$4.50	\$773,078	3y8m	1/1/2003	9/1/2006
Marquette	MI	Sawyer International	SAW/MQT	N	\$4.50	\$150,711	1y7m	10/1/2006	5/1/2008
Marquette	MI	Sawyer International	SAW/MQT	N	\$4.50	\$852,250	Зу	8/1/2008	8/1/2011
Muskegon	MI	Muskegon County	MKG	N	\$3.00	\$5,013,088	10y1m	5/1/1994	5/1/2004
Muskegon	MI	Muskegon County	MKG	N	\$4.50	**	16y6m	5/1/2004	11/1/2020
Pellston	МІ	Pellston Regional Airport of Emmet	PLN	N	\$3.00	\$159,752	4y6m	3/1/1993	9/1/1997

		County							
		Pellston Regional							
Dallatan	MI	Airport of Emmet	PLN	N	¢2.00	<b>PO46 422</b>	10,700	10/1/1007	7/4/2014
Pellston	MI	County Pellston Regional	PLIN	N	\$3.00	\$916,433	13y7m	12/1/1997	7/1/2011
Pellston	MI	Airport of Emmet County	PLN	N	\$4.50	\$415,974	3y3m	7/1/2011	10/1/2014
Saginaw	MI	MBS International	MBS	N	\$3.00	\$7,552,127	10y5m	2/1/1997	7/1/2007
Saginaw	MI	MBS International	MBS	N	\$4.50	**	9m	7/1/2007	4/1/2008
Saginaw	MI	MBS International	MBS	N	\$4.50	\$2,783,693	2y10m	4/1/2008	2/1/2011
Sault Ste. Marie	MI	Chippewa County International	CIU	N	\$4.50	\$1,087,463	17y8m	11/1/2005	7/1/2023
Traverse City	MI	Cherry Capital	TVC	N	\$3.00	\$4,071,280	5y	1/1/1997	1/1/2002
Traverse City	MI	Cherry Capital	TVC	N	\$4.50	**	1y9m	1/1/2002	10/1/2003
Traverse City	MI	Cherry Capital	TVC	N	\$4.50	\$6,410,729	7y2m	10/1/2003	12/1/2010
Bemidji	MN	Bemidji Regional	BJI	N	\$3.00	\$362,099	5y3m	11/1/1996	2/1/2002
Bemidji	MN	Bemidji Regional	BJI	N	\$4.50	\$401,336	3y6m	2/1/2002	8/1/2005
Bemidji	MN	Bemidji Regional	BJI	N	\$4.50	\$790,324	7y7m	6/1/2006	1/1/2014
Brainerd	MN	Brainerd Lakes Regional	BRD	N	\$3.00	\$313,455	7y11m	8/1/1993	7/1/2001
Brainerd	MN	Brainerd Lakes Regional	BRD	N	\$4.50	\$1,845,905	22y3m	7/1/2001	7/1/2024
Duluth	MN	Duluth International	DLH	N	\$3.00	\$2,341,795	7y6m	10/1/1994	4/1/2002
Duluth	MN	Duluth International	DLH	N	\$4.50	\$1,278,964	2y7m	4/1/2002	11/1/2004
Duluth	MN	Duluth International	DLH	N	\$4.50	\$3,561,375	6y7m	4/1/2005	11/1/2011
Grand Rapids	MN	Grand Rapids/Itasca Countv	GPZ		\$3.00	\$151,263	3y10m	12/1/1997	10/1/2001
		Grand Rapids/Itasca	GPZ			**			
Grand Rapids	MN MN	County Chisholm-Hibbing	HIB	cs	\$4.50 \$3.00	\$338,299	5y3m 7v1m	10/1/2001 6/1/1996	1/1/2007 7/1/2003
Hibbing Hibbing	MN	Chisholm-Hibbing	HIB	CS	\$4.50	φ330,299 **	7y1m 3y10m	7/1/2003	5/1/2007
Hibbing	MN	Chisholm-Hibbing	HIB	CS	\$4.50	\$461,737	10y6m	5/1/2007	11/1/2017
International Falls	MN	Falls International	INL	N	\$3.00	\$597,058	7y6m	12/1/1994	6/1/2002
International Falls	MN	Falls International	INL	N	\$4.50	**	3y	6/1/2002	6/1/2005
International Falls	MN	Falls International	INL	N	\$4.50	\$477,226	5y8m	11/1/2005	7/1/2011
		Minneapolis-St Paul International/Wold-							
Minneapolis	MN	Chamberlain	MSP	L	\$3.00	\$430,142,570	8y10m	6/1/1992	4/1/2001
		Minneapolis-St Paul International/Wold-							
Minneapolis	MN	Chamberlain Minneapolis-St Paul	MSP	L	\$4.50	**	1y10m	4/1/2001	2/1/2003
		International/Wold-							
Minneapolis	MN	Chamberlain Rochester	MSP	L	\$4.50	\$1,121,742,107	16y5m	2/1/2003	7/1/2019
Rochester	MN	International Rochester	RST	N	\$3.00	\$5,889,069	5y10m	5/1/1996	3/1/2002
Rochester	MN	International	RST	N	\$4.50	**	6y5m	3/1/2002	8/1/2008
Rochester	MN	Rochester International	RST	N	\$4.50	\$1,555,114	2y5m	8/1/2008	1/1/2011
St. Cloud	MN	St. Cloud Regional	STC	N	\$3.00	\$1,147,578	2y5m	2/1/2000	7/1/2002
St. Cloud	MN	St. Cloud Regional	STC	N	\$4.50	**	11y6m	7/1/2002	1/1/2014
Thief River Falls	MN	Thief River Falls Regional	TVF	CS	\$4.50	\$636,828	20y	6/1/2003	6/1/2023
Rota Island	MP	Rota International	GRO/ROP	N	\$4.50	\$1,797,042	11y8m	1/1/2005	8/1/2016
		Francisco C.			_,	¥ ,			
Saipan Island	MP	Ada/Saipan International	GSN/SPN	S	\$4.50	\$29,920,680	11y8m	1/1/2005	8/1/2016
Tinian Island	MP	Tinian International	TNI/TIQ	N	\$4.50	\$1,724,826	11y8m	1/1/2005	8/1/2016
Columbus	MS	Golden Triangle Regional	GTR	N	\$3.00	\$1,749,635	8y8m	8/1/1992	4/1/2001
Columbus	MS	Golden Triangle Regional	GTR	N	\$4.50	**	2y9m	4/1/2001	1/1/2004
		Golden Triangle							
Croopyillo	MS MS	Regional Mid Dolta Bagianal	GTR	N	\$4.50	\$1,616,835 \$1,40,972	12y9m	1/1/2004	10/1/2016
Greenville	MS	Mid Delta Regional	GLH	CS	\$3.00	\$148,873 *	4y4m 4m	10/1/1998	2/1/2003
Greenville	MS	Mid Delta Regional	GLH	CS	\$3.00		4m	4/1/2003	8/1/2003

Greenville	MS	Mid Delta Regional	GLH	CS	\$3.00	\$88,495	1y8m	8/1/2003	4/1/2005
Greenville	MS	Mid Delta Regional	GLH	CS	\$4.50	**	8m	4/1/2005	12/1/2005
Greenville	MS	Mid Delta Regional Gulfport-Biloxi	GLH	CS	\$4.50	\$175,041	5y4m	12/1/2005	8/1/2011
Gulfport	MS	International Gulfport-Biloxi	GPT	S	\$3.00	\$8,247,199	9y1m	7/1/1992	8/1/2001
Gulfport	MS	International	GPT	S	\$3.00	*	6m	12/1/2001	6/1/2002
Gulfport	MS	Gulfport-Biloxi International	GPT	S	\$3.00	\$1,031,474	9m	6/1/2002	5/1/2003
		Gulfport-Biloxi							
Gulfport	MS	International Hattiesburg-Laurel	GPT	S	\$4.50	\$57,145,388	24y8m	5/1/2003	1/1/2028
Hattiesburg	MS	Regional Hattiesburg-Laurel	PIB	N	\$3.00	\$237,929	8y11m	7/1/1992	6/1/2001
Hattiesburg	MS	Regional	PIB	N	\$4.50	\$697,709	11y11m	6/1/2001	5/1/2013
Jackson	MS	Jackson-Evers International	JAN	S	\$3.00	\$22,296,401	10y5m	5/1/1993	10/1/2003
Jackson	MS	Jackson-Evers International	JAN	S	\$4.50	**	2y3m	10/1/2003	1/1/2006
		Jackson-Evers							
Jackson	MS	International	JAN	S	\$4.50	\$29,712,969	9y2m	1/1/2006	3/1/2015
Meridian	MS	Key Field	MEI	N	\$3.00	\$293,059	3y9m	11/1/1992	8/1/1996
Meridian	MS	Key Field	MEI	N	\$3.00	\$436,597	4y9m	3/1/1997	12/1/2001
Meridian	MS	Key Field	MEI	N	\$4.50	**	2y5m	12/1/2001	5/1/2004
Meridian	MS	Key Field	MEI	N	\$4.50	\$1,400,134	11y10m	10/1/2005	8/1/2017
Tupelo	MS	Tupelo Regional	TUP	N	\$3.00	\$457,216	8y5m	11/1/1994	4/1/2003
Tupelo	MS	Tupelo Regional	TUP	N	\$4.50	**	8m	4/1/2003	1/1/2004
Tupelo	MS	Tupelo Regional	TUP	N	\$4.50	\$1,285,973	14y11m	1/1/2004	12/1/2018
Columbia	MO	Columbia Regional	COU	N	\$4.50	\$809,302	10y3m	11/1/2002	2/1/2013
Joplin	MO	Joplin Regional Kansas City	JLN	CS	\$4.50	\$889,664	7y2m	4/1/2003	6/1/2010
Kansas City	MO	International	MCI	М	\$3.00	\$339,142,503	9y5m	3/1/1996	8/1/2005
Kansas City	MO	Kansas City International	MCI	М	\$4.50	**	7y11m	8/1/2005	7/1/2013
Kansas City	MO	Kansas City International	MCI	М	\$4.50	\$30,646,859	1y	7/1/2013	7/1/2014
•		Kansas City							
Kansas City	MO	International Springfield-Branson	MCI	М	\$3.00	\$22,679,060	11m	7/1/2014	6/1/2015
Springfield	MO	National	SGF	S	\$3.00	\$3,110,598	3y9m	11/1/1993	5/1/1997
Springfield	МО	Springfield-Branson National	SGF	S	\$3.00	\$6,370,614	2y10m	7/1/1998	5/1/2001
Springfield	MO	Springfield-Branson National	SGF	S	\$4.50	**	2y7m	5/1/2001	1/1/2004
		Springfield-Branson							
Springfield	MO	National Springfield-Branson	SGF	S	\$4.50	\$2,168,000	1y3m	5/1/2004	8/1/2005
Springfield	MO	National	SGF	S	\$4.50	\$900,000	6m	9/1/2005	3/1/2006
Springfield	MO	Springfield-Branson National	SGF	S	\$4.50	\$83,651,097	29y	1/1/2007	1/1/2036
St Louis	МО	Lambert-St Louis International	STL	М	\$3.00	\$325,379,031	_	12/1/1992	12/1/2001
		Lambert-St Louis					9y		
St Louis	MO	International Lambert-St Louis	STL	M	\$4.50	**	12y1m	12/1/2001	5/1/2002
St Louis	MO	International	STL	M	\$4.50	\$783,625,489	19y9m	5/1/2002	2/1/2022
Billings	MT	Billings Logan International	BIL	S	\$3.00	\$15,578,512	17y4m	4/1/1994	8/1/2011
Bozeman	MT	Gallatin Field	BZN	N	\$3.00	\$9,144,326	15y7m	8/1/1993	3/1/2009
Bozeman	MT	Gallatin Field	BZN	N	\$4.50	\$31,200,000	20y	3/1/2009	3/1/2029
Butte	MT	Bert Mooney	втм	N	\$3.00	\$1,289,307	11y11m	7/1/1994	6/1/2006
Butte	MT	Bert Mooney	втм	N	\$3.00	\$110,883	1y1m	7/1/2006	8/1/2007
Butte	MT	Bert Mooney	втм	N	\$3.00	\$146,916	2y4m	11/1/2007	3/1/2010
		Great Falls					•		
Great Falls	MT	International Great Falls	GTF	N	\$3.00	\$3,059,263	9y8m	11/1/1992	7/1/2002
Great Falls	MT	International	GTF	N	\$4.50	\$8,501,340	20y4m	7/1/2002	9/1/2018
Helena	MT	Helena Regional	HLN	N	\$3.00	\$1,949,098	9y4m	4/1/1993	8/1/2002
Helena	MT	Helena Regional	HLN	N	\$4.50	**	1y2m	8/1/2002	10/1/2003
Helena	MT	Helena Regional	HLN	N	\$4.50	\$3,831,691	11y4m	10/1/2003	2/1/2015

Kalispell	MT	Glacier Park International	GPI/FCA	N	\$3.00	\$10,997,914	11y5m	12/1/1993	4/1/2005
·		Glacier Park							
Kalispell	MT	International Glacier Park	GPI/FCA	N	\$4.50	**	11y3m	4/1/2005	7/1/2016
Kalispell	MT	International	GPI/FCA	N	\$4.50	\$833,138	1y4m	7/1/2016	11/1/2017
Missoula	MT	Missoula International	MSO	N	\$3.00	\$5,875,760	8y7m	9/1/1992	4/1/2001
Missoula	MT	Missoula International	MSO	N	\$4.50	**	1y11m	4/1/2001	3/1/2003
Missoula	MT	Missoula International Central Nebraska	MSO	N	\$4.50	\$14,367,186	14y8m	3/1/2003	11/1/2017
Grand Island	NE	Regional	GRI	cs	\$3.00	\$50,370	2y2m	2/1/1999	4/1/2001
Grand Island	NE	Central Nebraska Regional	GRI	CS	\$4.50	\$545,219	12y6m	5/1/2001	11/1/2013
Kearney	NE	Kearney Regional	EAR	N	\$4.00	\$0	1y10m	11/1/2005	9/1/2007
Kearney	NE	Kearney Regional	EAR	N	\$4.50	\$231,600	3y10m	9/1/2007	7/1/2011
Scottsbluff	NE	Western Nebraska Regional/ William B. Heilig Field	BFF	N	\$3.00	\$0	Зу	3/1/2000	3/1/2003
Scottsbluff	NE	Western Nebraska Regional/ William B. Heilig Field	BFF	N	\$4.50	\$1,299,534	20y	7/1/2004	7/1/2024
Elko	NV	Elko Regional	EKO	N	\$3.00	\$6,790,017	5y2m	9/1/1998	11/1/2003
Elko	NV	Elko Regional	EKO	N	\$4.50	**	17y3m	11/1/2003	2/1/2021
Las Vegas	NV	McCarran International	LAS	L	\$3.00	\$850,343,056	12y5m	6/1/1992	11/1/2004
Las Vegas	NV	McCarran International	LAS	L	\$4.50	**	1y10m	11/1/2004	9/1/2006
Las Vegas	NV	McCarran International	LAS	L	\$3.00	**	4m	9/1/2006	1/1/2007
Las Vegas	NV	McCarran International	LAS	L	\$4.00	**	1y9m	1/1/2007	10/1/2008
Las Vegas	NV	McCarran International	LAS	L	\$4.50	\$1,986,920,936	18y2m	10/1/2008	12/1/2026
		Reno/Tahoe							
Reno	NV	International Reno/Tahoe	RNO	М	\$3.00	\$61,222,704	7y1m	1/1/1994	2/1/2001
Reno	NV	International Reno/Tahoe	RNO	M	\$4.50	\$7,258,689	10m	8/1/2001	6/1/2002
Reno	NV	International	RNO	М	\$3.00	\$6,734,192	8m	6/1/2002	2/1/2003
Reno	NV	Reno/Tahoe International	RNO	М	\$4.50	\$11,922,040	1y8m	2/1/2003	10/1/2004
Reno	NV	Reno/Tahoe International Reno/Tahoe	RNO	М	\$3.00	**	2m	10/1/2004	12/1/2004
Reno	NV	International	RNO	М	\$3.00	\$49,500,000	5m	12/1/2004	4/1/2005
Reno	NV	Reno/Tahoe International	RNO	М	\$4.50	**	2y4m	4/1/2005	7/1/2007
Reno	NV	Reno/Tahoe International	RNO	М	\$3.00	\$3,400,000	5m	7/1/2007	12/1/2007
		Reno/Tahoe							
Reno	NV	International	RNO	M	\$4.50	\$32,878,000	3y -	12/1/2007	12/1/2010
Lebanon	NH	Lebanon Municipal	LEB	CS	\$3.00	\$530,630	7y	8/1/1995	8/1/2002
Lebanon	NH	Lebanon Municipal	LEB	CS	\$4.50	\$63,774	2y6m	11/1/2003	5/1/2006
Lebanon	NH	Lebanon Municipal	LEB	CS	\$4.50	\$140,625	2y6m	10/1/2007	4/1/2010
Manchester	NH NH	Manchester	MHT	S S	\$3.00 \$4.50	\$123,305,983 **	15y	1/1/1993	1/1/2008
Manchester  Manchester	NH NH	Manchester  Manchester	MHT MHT	S	\$4.50		7y7m 6m	1/1/2008 8/1/2015	8/1/2015 2/1/2016
Manchester	NH	Manchester	MHT	S	\$4.50	\$3,033,074 \$678,332	6m 1m	2/1/2016	3/1/2016
Manchester	NH	Manchester	MHT	S	\$3.00	\$50,771,446	4y10m	3/1/2016	1/1/2021
Manchester	NH	Manchester	MHT	S	\$4.50	\$19,803,043	1y11m	1/1/2021	12/1/2022
Atlantic City	NJ	Atlantic City International	ACY	S	\$3.00	\$10,494,508	6y2m	10/1/1999	12/1/2005
Atlantic City	NJ	Atlantic City International Atlantic City	ACY	S	\$4.50	**	3y5m	12/1/2005	4/1/2009
Atlantic City	NJ	International Newark Liberty	ACY	S	\$4.50	\$10,933,281	2y2m	4/1/2009	6/1/2011
Newark	NJ	International	EWR	L	\$3.00	\$917,873,055	13y6m	10/1/1992	4/1/2006
Newark	NJ	Newark Liberty International	EWR	L	\$4.50	**	4y11m	4/1/2006	3/1/2011
Trenton	NJ	Trenton Mercer	TTN		\$3.00	\$0	3y4m	1/1/2001	5/1/2004
Trenton	NJ	Trenton Mercer	TTN		\$4.50	\$1,061,436	6y10m	5/1/2004	3/1/2011

		Albuquerque							
Albuquerque	NM	International Sunport Four Corners	ABQ	M	\$3.00	\$160,504,404	20y	7/1/1996	7/1/2016
Farmington	NM	Regional	FMN	N	\$3.00	\$661,102	7y11m	6/1/2003	5/1/2011
Roswell	NM	Roswell International Air Center	ROW	N	\$3.00	\$334,477	4y10m	4/1/1999	2/1/2004
Roswell	NM	Roswell International Air Center	ROW	N	\$4.50	**	4m	2/1/2004	6/1/2004
Roswell	NM	Roswell International Air Center	ROW	N	\$3.00	**	1y	6/1/2004	6/1/2005
Roswell	NM	Roswell International Air Center	ROW	N	\$4.50	**	2y8m	6/1/2005	2/1/2008
Roswell	NM	Roswell International Air Center	ROW	N	\$4.50	\$659,582	5y9m	3/1/2008	12/1/2013
Albany	NY	Albany International	ALB	S	\$3.00	\$116,740,338	15y6m	3/1/1994	9/1/2009
Albany	NY	Albany International	ALB	S	\$4.50	**	10y5m	9/1/2009	2/1/2020
Binghamton	NY	Greater Binghamton/Edwin A. Link Field	BGM	N	\$3.00	\$4,684,325	8y10m	11/1/1993	9/1/2002
2g.iaten		Greater	20		ψο.σσ	ψ 1,00 1,0±0	o, 10	1 17 17 1000	0, 1,2002
Binghamton	NY	Binghamton/Edwin A. Link Field Greater	BGM	N	\$4.50	**	3y10m	9/1/2002	7/1/2006
Binghamton	NY	Binghamton/Edwin A. Link Field Greater	BGM	N	\$4.50	\$559,849	3y2m	7/1/2006	2/1/2008
Binghamton	NY	Binghamton/Edwin A. Link Field	BGM	N	\$4.50	\$3,244,215	4y2m	5/1/2008	7/1/2012
Buffalo	NY	Buffalo Niagara International	BUF	М	\$3.00		-	8/1/1992	8/1/2007
		Buffalo Niagara				\$145,371,195	14y11m		
Buffalo	NY	International Elmira/Corning	BUF	M	\$4.50	**	5y3m	8/1/2007	11/1/2012
Elmira	NY	Regional Elmira/Corning	ELM	N	\$3.00	\$733,042	3y1m	12/1/2004	1/1/2008
Elmira	NY	Regional	ELM	N	\$4.50	\$2,721,673	6y5m	5/1/2008	10/1/2014
Islip	NY	Long Island MacArthur	ISP	S	\$3.00	\$27,535,501	10y9m	12/1/1994	9/1/2005
Islip	NY	Long Island MacArthur	ISP	S	\$4.50	\$37,133,218	9y7m	9/1/2005	4/1/2015
Ithaca	NY	Ithica Tompkins Regional	ITH	N	\$3.00	\$6,872,612	16y2m	1/1/1993	3/1/2009
Ithaca	NY	Ithica Tompkins Regional	ITH	N	\$4.50	**	7y2m	3/1/2009	5/1/2016
		Chautauqua				ΦΕΩΩ ΩΕΩ	•		
Jamestown	NY	County/Jamestown Chautauqua	JHW	CS	\$3.00	\$593,058	9y2m	6/1/1993	8/1/2002
Jamestown	NY	County/Jamestown Massena International	JHW	CS	\$4.50	\$200,112	11y2m	9/1/2004	11/1/2015
Massena	NY	- Richards Field John F. Kennedy	MSS		\$3.00	\$163,429	19y7m	4/1/1996	11/1/2015
New York	NY	International John F. Kennedy	JFK	L	\$3.00	\$972,345,400	13y6m	10/1/1992	4/1/2006
New York	NY	International	JFK	L	\$4.50	**	4y11m	4/1/2006	3/1/2011
New York	NY	LaGuardia	LGA	L	\$3.00	\$689,167,604	13y6m	10/1/1992	4/1/2006
New York	NY	LaGuardia	LGA	L	\$4.50	**	4y11m	4/1/2006	3/1/2011
Newburgh	NY	Stewart International	SWF	S	\$3.00	\$8,827,899	6y4m	11/1/1995	3/1/2002
Newburgh	NY	Stewart International	SWF	S	\$4.50	**	3y8m	3/1/2002	11/1/2005
Newburgh	NY	Stewart International	SWF	S	\$4.50	\$254,187	4m	5/1/2007	9/1/2007
Ogdensburg	NY	Ogdensburg Intl	ogs		\$3.00	\$125,050	23y8m	4/1/1996	12/1/2019
Plattsburgh	NY	Clinton County	PLB	N	\$3.00	\$184,658	7y8m	7/1/1993	3/1/2001
Plattsburgh	NY	Clinton County Plattsburgh	PLB	N	\$3.00	\$46,317	3y10m	6/1/2001	4/1/2003
Plattsburgh	NY	International Greater Rochester	PBG	N	\$4.50	\$732,355	2y11m	1/1/2009	12/1/2012
Rochester	NY	International	ROC	S	\$3.00	\$20,664,219	6y8m	12/1/1997	9/1/2004
Rochester	NY	Greater Rochester International	ROC	S	\$4.50	\$77,242,638	16y9m	9/1/2004	6/1/2021
Saranac Lake	NY	Adirondack Regional	SLK	CS	\$3.00	\$121,952	13y1m	8/1/1994	9/1/2007
Syracuse	NY	Syracuse Hancock International	SYR	s	\$3.00	\$15,445,446	6y3m	10/1/1995	1/1/2002
Syracuse	NY	Syracuse Hancock International	SYR	S	\$4.50	\$10,495,193	2y10m	10/1/2002	8/1/2005
Syracuse	NY	Syracuse Hancock International	SYR	S	\$4.50	\$4,248,443	1y3m	11/1/2005	2/1/2007

Syracuse	NY	Syracuse Hancock International	SYR	S	\$4.50	\$96,732,010	19y4m	4/1/2007	8/1/2026
Utica	NY	Oneida County	UCA	3	\$3.00	\$1,298,631	12y10m	8/1/1997	6/1/2010
White Plains	NY	Westchester County	HPN	S	\$3.00	\$15,546,546	•	2/1/1993	12/1/2001
White Plains	NY	Westchester County	HPN	S	\$4.50	**	8y10m 2y5m	12/1/2001	5/1/2004
White Plains	NY	Westchester County	HPN	S	\$4.50	\$34,300,018	9y3m	5/1/2004	8/1/2013
Asheville	NC	Asheville Regional	AVL	N	\$3.00	\$5,622,844	7y10m	12/1/1994	10/1/2002
Asheville	NC	Asheville Regional	AVL	N	\$4.50	\$4,936,653	4y1m	10/1/2002	11/1/2006
Asheville	NC	Asheville Regional	AVL	N N	\$4.50	\$478,051	5m	4/1/2007	9/1/2007
Asheville	NC	Asheville Regional	AVL	N N	\$4.50	\$3,521,375	2y7m	10/1/2007	5/1/2010
		Charlotte/Douglas							
Charlotte	NC	International Fayetteville Regional/Grannis	CLT	L	\$3.00	\$874,329,196	15y8m	11/1/2004	7/1/2020
Fayetteville	NC	Field Fayetteville Regional/Grannis	FAY	N	\$3.00	\$1,676,077	5y3m	11/1/2000	2/1/2006
Fayetteville	NC	Field	FAY	N	\$4.00	\$3,796,330	4y11m	7/1/2009	6/1/2014
Greenville	NC	Pitt-Greenville	PGV	N	\$3.00	\$494,486	3y6m	10/1/1997	4/1/2001
Greenville	NC	Pitt-Greenville	PGV	N	\$4.50	**	3m	4/1/2001	7/1/2001
Greenville	NC	Pitt-Greenville	PGV	N	\$4.50	\$2,034,185	11y1m	7/1/2001	8/1/2012
Jacksonville	NC	Albert J. Ellis	OAJ	N	\$3.00	\$208,878	2y9m	1/1/1996	10/1/1998
Jacksonville	NC	Albert J. Ellis	OAJ	N	\$3.00	*	11m	9/1/1999	8/1/2000
Jacksonville	NC	Albert J. Ellis	OAJ	N	\$3.00	\$988,225	3y10m	3/1/2005	1/1/2009
Jacksonville	NC	Albert J. Ellis	OAJ	N	\$3.00	\$2,117,969	4y6m	2/1/2009	8/1/2013
New Bern	NC	Coastal Carolina Regional	EWN	N	\$3.00	\$10,681,398	6y9m	2/1/1997	11/1/2003
New Bern	NC	Coastal Carolina Regional Coastal Carolina	EWN	N	\$4.50	**	21y	11/1/2003	11/1/2024
New Bern	NC	Regional	EWN	N	\$4.50	\$519,477	11m	11/1/2024	10/1/2025
Raleigh	NC	Raleigh-Durham International	RDU	М	\$3.00	\$7,439,029	1y6m	4/1/2003	10/1/2004
		Raleigh-Durham							
Raleigh	NC	International Wilmington	RDU	M	\$4.50	\$765,251,376	28y11m	10/1/2004	9/1/2032
Wilmington	NC	International Wilmington	ILM	S	\$3.00	\$1,526,487	2y7m	2/1/1994	9/1/1996
Wilmington	NC	International	ILM	s	\$3.00	\$7,984,994	4y11m	6/1/1998	5/1/2003
Wilmington	NC	Wilmington International Wilmington	ILM	s	\$4.50	**	3y11m	5/1/2003	4/1/2007
Wilmington	NC	International	ILM	S	\$4.50	\$15,574,579	12y6m	4/1/2007	10/1/2019
Bismarck	ND	Bismarck Municipal	BIS	N	\$3.00	\$349,092	1y	7/1/1996	7/1/1997
Bismarck	ND	Bismarck Municipal	BIS	N	\$3.00	\$1,342,095	3y10m	6/1/1998	4/1/2002
Bismarck	ND	Bismarck Municipal	BIS	N	\$4.50	\$6,572,561	12y5m	4/1/2002	9/1/2014
Fargo	ND	Hector International	FAR	N	\$3.00	\$4,633,814	5y7m	1/1/1997	8/1/2002
Fargo	ND	Hector International	FAR	N	\$4.50	**	1y11m	8/1/2002	7/1/2004
Fargo	ND	Hector International Grand Forks	FAR	N	\$4.50	\$21,050,536	19y1m	7/1/2004	8/1/2023
Grand Forks	ND	International Grand Forks	GFK	N	\$3.00	\$621,965	3y6m	2/1/1993	8/1/1996
Grand Forks	ND	International Grand Forks	GFK	N	\$3.00	\$1,707,243	3y11m	5/1/1997	4/1/2001
Grand Forks	ND	International Grand Forks	GFK	N	\$4.50	**	2y2m	4/1/2001	6/1/2003
Grand Forks	ND	International Grand Forks	GFK	N	\$4.50	\$1,506,569	4y5m	5/1/2004	10/1/2008
Grand Forks	ND	International	GFK	N	\$4.50	\$3,062,824	18y7m	1/1/2009	8/1/2017
Minot	ND	Minot International	MOT	N	\$3.00	\$825,445	4y4m	3/1/1994	7/1/1998
Minot	ND	Minot International	MOT	N	\$3.00	\$990,656	2y11m	3/1/1999	2/1/2002
Minot	ND	Minot International	MOT	N	\$4.50	**	1y2m	2/1/2002	4/1/2003
Minot	ND	Minot International Akron-Canton	MOT	N	\$4.50	\$2,432,182	8y3m	4/1/2003	7/1/2011
Akron	ОН	Regional Akron-Canton	CAK	S	\$3.00	\$8,906,039	10y	9/1/1992	9/1/2002
Akron	ОН	Regional	CAK	S	\$4.50	\$31,034,854	13y8m	9/1/2002	8/1/2016

0	011	Cleveland-Hopkins	0.5			<b>*</b> * * * * * * * * * * * * * * * * * *			0/4/0000
Cleveland	OH	International Cleveland-Hopkins	CLE	M	\$3.00	\$199,934,647	9y4m	11/1/1992	3/1/2002
Cleveland	ОН	International Cleveland-Hopkins	CLE	M	\$4.50	**	2y5m	3/1/2002	8/1/2004
Cleveland	ОН	International Port Columbus	CLE	M	\$4.50	\$156,080,500	6y8m	8/1/2004	4/1/2011
Columbus	ОН	International Port Columbus	СМН	М	\$3.00	\$128,445,302	9y6m	10/1/1992	4/1/2002
Columbus	ОН	International Port Columbus	СМН	M	\$4.50	**	2y6m	4/1/2002	10/1/2004
Columbus	ОН	International	CMH	M	\$4.50	\$149,337,185	8y3m	10/1/2004	1/1/2013
Dayton	ОН	James M Cox Dayton International	DAY	S	\$3.00	\$28,098,728	6y11m	10/1/1994	9/1/2001
Dayton	ОН	James M Cox Dayton International	DAY	S	\$4.50	**	1y10m	9/1/2001	7/1/2003
Dayton	ОН	James M Cox Dayton International	DAY	S	\$4.50	\$95,294,745	14y4m	7/1/2003	11/1/2017
Toledo	ОН	Toledo Express	TOL	N	\$3.00	\$2,246,374	3y	9/1/1993	9/1/1996
Toledo	ОН	Toledo Express	TOL	N	\$3.00	\$6,442,493	4y	7/1/1997	7/1/2001
Toledo	ОН	Toledo Express	TOL	N	\$4.50	**	2y6m	7/1/2001	1/1/2004
Toledo	ОН	Toledo Express	TOL	N	\$4.50	\$5,312,436	5y11m	1/1/2004	12/1/2010
Youngstown	ОН	Youngstown-Warren Regional Youngstown-Warren	YNG	N	\$3.00	\$214,384	2y2m	5/1/1994	7/1/1996
Youngstown	ОН	Regional	YNG	N	\$3.00	\$477,044	4y6m	8/1/1997	2/1/2002
Youngstown	ОН	Youngstown-Warren Regional	YNG	N	\$4.50	\$441.000	5y5m	4/1/2007	9/1/2012
<u>~</u>		Lawton-Fort Sill	_		·	, , , , , , , , , , , , , , , , , , , ,			
Lawton	OK	Regional Lawton-Fort Sill	LAW	N	\$2.00	\$452,189	1y5m	8/1/1992	1/1/1994
Lawton	OK	Regional Lawton-Fort Sill	LAW	N	\$3.00	**	2y3m	1/1/1994	4/1/1996
Lawton	OK	Regional Lawton-Fort Sill	LAW	N	\$3.00	\$380,745	2y7m	1/1/1998	8/1/2000
Lawton	OK	Regional Lawton-Fort Sill	LAW	N	\$4.50	\$303,687	1y9m	6/1/2002	3/1/2004
Lawton	OK	Regional Lawton-Fort Sill	LAW	N	\$4.50	\$249,492	1y1m	9/1/2004	10/1/2005
Lawton	OK	Regional	LAW	N	\$4.50	\$1,269,888	6y	11/1/2007	11/1/2013
Oklahoma City	OK	Will Rogers World	OKC	S	\$3.00	\$131,260,905	21y7m	7/1/1997	2/1/2019
Tulsa	OK	Tulsa International	TUL	S	\$3.00	\$15,986,724	3y7m	8/1/1992	3/1/1996
Tulsa	OK	Tulsa International	TUL	S	\$3.00	\$126,442,172	29y8m	1/1/1997	9/1/2026
Eugene	OR	Mahlon Sweet Field	EUG	N	\$3.00	\$6,537,176	7y7m	11/1/1993	6/1/2001
Eugene	OR	Mahlon Sweet Field	EUG	N	\$4.50	\$14,683,202	10y6m	6/1/2001	12/1/2011
Klamath Falls	OR	Klamath Falls	LMT	N	\$3.00	\$426,251	1y1m	3/1/2000	4/1/2001
Klamath Falls	OR	Klamath Falls	LMT	N	\$4.50	**	3y1m	4/1/2001	5/1/2004
Klamath Falls	OR	Klamath Falls Rogue Valley	LMT	N	\$4.50	\$877,799	7y7m	5/1/2004	12/1/2011
		International -							
Medford	OR	Medford Rogue Valley	MFR	N	\$3.00	\$4,881,207	7y9m	7/1/1993	4/1/2001
Medford	OR	International - Medford Rogue Valley	MFR	N	\$4.50	**	2у	4/1/2001	4/1/2003
Medford	OR	International - Medford	MFR	N	\$4.50	\$28,869,233	22y5m	4/1/2003	9/1/2025
North Bend	OR	Southwest Oregon Regional	ОТН	N	\$3.00	\$520,605	7y6m	2/1/1994	8/1/2001
North Bend	OR	Southwest Oregon Regional	ОТН	N	\$4.50	**	4y6m	8/1/2001	2/1/2006
North Bend	OR	Southwest Oregon Regional	ОТН	N	\$4.50	\$2,557,363	15y	2/1/2006	2/1/2021
		Eastern Oregon							
Pendleton	OR OR	Regional at Pendleton  Eastern Oregon Regional at Pendleton	PDT	CS	\$3.00 \$4.50	\$486,540	13y10m 5y5m	12/1/1995	3/1/2015
Pendleton Portland	OR	Portland International	PDX	M	\$3.00	\$613,687,685	9y3m	7/1/1992	10/1/2001
Portland	OR	Portland International	PDX	M		\$613,687,685 **			
					\$4.50		14y7m	10/1/2001	5/1/2016
Portland	OR OR	Portland International	PDX	M	\$4.50	\$68,207,251	1y10m	5/1/2016	3/1/2018
Redmond	OR	Roberts Field	RDM	N	\$3.00	\$3,517,536	8y1m	10/1/1993	11/1/2001

Redmond	OR	Roberts Field	RDM	N	\$4.50	**	2y1m	11/1/2001	12/1/2003
Redmond	OR	Roberts Field	RDM	N	\$4.50	\$2,083,546	Зу	12/1/2003	12/1/2006
Redmond	OR	Roberts Field Lehigh Valley	RDM	N	\$4.50	\$27,930,168	33y4m	3/1/2007	7/1/2040
Allentown	PA	International Lehigh Valley	ABE	S	\$3.00	\$11,092,349	8y3m	11/1/1992	2/1/2001
Allentown	PA	International	ABE	S	\$3.00	\$2,807,572	5m	6/1/2001	11/1/2001
Allentown	PA	Lehigh Valley International Lehigh Valley	ABE	S	\$4.50	**	1y2m	11/1/2001	1/1/2003
Allentown	PA	International	ABE	S	\$4.50	\$31,075,601	14y11m	9/1/2003	8/1/2018
Altoona	PA	Altoona-Blair County	AOO	Ν	\$3.00	\$110,500	2y9m	5/1/1993	2/1/1996
Altoona	PA	Altoona-Blair County	AOO	Ν	\$3.00	\$116,620	2y9m	1/1/1997	10/1/1999
Altoona	PA	Altoona-Blair County	AOO	N	\$3.00	\$298,660	8y5m	7/1/2000	12/1/2008
Altoona	PA	Altoona-Blair County	AOO	N	\$4.50	**	Зу	12/1/2008	12/1/2011
Altoona	PA	Altoona-Blair County	AOO	N	\$4.50	\$139,918	Зу	12/1/2011	12/1/2014
Bradford	PA	Bradford Regional	BFD	cs	\$3.00	\$206,793	7y9m	8/1/1995	5/1/2003
Bradford	PA	Bradford Regional	BFD	CS	\$4.50	\$434,883	14y6m	5/1/2003	11/1/2017
Du Bois	PA	Dubois Regional	DUJ	cs	\$3.00	\$386,636	5y10m	6/1/1995	4/1/2001
Du Bois	PA	Dubois Regional	DUJ	CS	\$4.50	**	2y7m	4/1/2001	11/1/2003
Du Bois	PA	Dubois Regional	DUJ	CS	\$4.50	\$325,413	9y6m	4/1/2004	10/1/2013
Erie	PA	Erie International/Tom Ridge Field Erie International/Tom	ERI	N	\$3.00	\$2,022,109	4y8m	10/1/1992	6/1/1997
Erie	PA	Ridge Field	ERI	N	\$3.00	\$1,216,914	3y5m	12/1/1997	5/1/2001
Erie	PA	Erie International/Tom Ridge Field Erie International/Tom	ERI	N	\$4.50	\$597,596	1y5m	8/1/2003	1/1/2005
Erie	PA	Ridge Field	ERI	N	\$4.50	\$12,091,829	19y7m	7/1/2005	2/1/2025
Harrisburg	PA	Harrisburg International Harrisburg	MDT	S	\$3.00	\$6,904,614	5y11m	2/1/1997	1/1/2003
Harrisburg	PA	International	MDT	S	\$4.50	\$129,212,500	31y6m	1/1/2003	7/1/2034
Johnstown	PA	John Murtha Johnstown-Cambria County John Murtha	JST	cs	\$3.00	\$148,269	3y1m	11/1/1993	12/1/1996
Johnstown	PA	Johnstown-Cambria County	JST	cs	\$3.00	\$510,227	5y4m	12/1/1997	5/1/2001
Johnstown	PA	John Murtha Johnstown-Cambria County John Murtha Johnstown-Cambria	JST	cs	\$4.50	**	5y8m	5/1/2001	1/1/2007
Johnstown	PA	County	JST	CS	\$4.50	\$132,000	2y9m	7/1/2007	4/1/2010
Lancaster	PA	Lancaster	LNS		\$3.00	\$1,483,000	14y	2/1/1995	2/1/2009
Latrobe	PA	Arnold Palmer Regional	LBE	N	\$3.00	\$1,397,687	17y2m	3/1/1996	5/1/2013
Philadelphia	PA	Philadelphia International	PHL	L	\$3.00	\$1,141,562,798	8y7m	9/1/1992	4/1/2001
Philadelphia	PA	Philadelphia International	PHL	L	\$4.50	**	11y10m	4/1/2001	2/1/2013
Dhiladalahia	PA	Philadelphia International	PHL	L	\$3.00	¢24 400 000	Em	2/1/2013	
Philadelphia	FA	Philadelphia Philadelphia	FIL		φ3.00	\$24,400,000	5m	2/1/2013	7/1/2013
Philadelphia	PA	International Pittsburgh	PHL	L	\$4.50	\$238,950,000	4y9m	7/1/2013	4/1/2018
Pittsburgh	PA	International Pittsburgh	PIT	M	\$3.00	\$100,098,648	3y2m	10/1/2001	12/1/2004
Pittsburgh	PA	International Pittsburgh	PIT	M	\$4.50	**	1y9m	12/1/2004	9/1/2006
Pittsburgh	PA	Pittsburgh International	PIT	М	\$4.50	\$426,674,028	18y3m	9/1/2006	12/1/2024
Reading	PA	Reading Regional/Carl A Spaatz Field	RDG		\$3.00	\$1,692,031	13y7m	12/1/1994	7/1/2008
State College	PA	University Park	UNV/SCE	N	\$3.00	\$3,742,876	11y	11/1/1992	11/1/2003
State College	PA	University Park	UNV/SCE	N	\$4.50	**	2y8m	11/1/2003	7/1/2006
State College	PA	University Park	UNV/SCE	N	\$4.50	\$5,758,552	8y5m	7/1/2006	12/1/2014
Wilkes-Barre	PA	Wilkes- Barre/Scranton International	AVP	N	\$3.00	\$4,588,122	3y6m	12/1/1993	6/1/1997
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Wilkes-Barre	PA	Wilkes- Barre/Scranton International Wilkes-	AVP	N	\$3.00	*	3y5m	12/1/1997	5/1/2001
William Down	DΛ	Barre/Scranton	AVP	N	¢4.50	¢45 242 506	47. Om	E/1/2001	0/4/2040
Wilkes-Barre	PA PA	International Williamsport Regional	IPT	N N	\$4.50 \$3.00	\$15,343,506 \$132,488	17y3m	5/1/2001 5/1/1997	8/1/2018 11/1/1998
Williamsport	PR	Rafael Hernandez	BQN	N	\$3.00 \$3.00	\$132,466 \$0	1y6m 3y2m	3/1/1997	5/1/1996
Aguadilla  Aguadilla	PR	Rafael Hernandez	BQN	N	\$4.50	\$9,828,476	16y	12/1/2005	12/1/2021
Ponce	PR	Mercedita	PSE	N	\$3.00	\$866,000	5y5m	3/1/1993	9/1/1998
		Luis Munoz Marin					•		
San Juan	PR	International Luis Munoz Marin	SJU	M	\$3.00	\$222,901,971	12y9m	3/1/1993	12/1/2005
San Juan	PR	International	SJU	M	\$4.50	**	2y6m	12/1/2005	6/1/2008
San Juan	PR	Luis Munoz Marin International	SJU	M	\$4.50	\$348,203,216	21y2m	6/1/2008	8/1/2029
Providence	RI	Theodore Francis Green State	PVD	М	\$3.00	\$104,029,700	12y7m	2/1/1994	9/1/2006
		Theodore Francis				++			
Providence	RI	Green State Theodore Francis	PVD	M	\$4.50		1y11m	9/1/2006	8/1/2008
Providence	RI	Green State Columbia	PVD	M	\$4.50	\$79,529,011	8y3m	8/1/2008	11/1/2016
Columbia	sc	Metropolitan	CAE	S	\$3.00	\$70,528,884	8y1m	11/1/1993	12/1/2001
Columbia	sc	Columbia Metropolitan	CAE	S	\$4.50	**	9y	12/1/2001	12/1/2010
Florence	sc	Florence Regional	FLO	N	\$3.00	\$669,334	3y11m	12/1/1995	11/1/1999
Florence	SC	Florence Regional	FLO	N	\$3.00	*	2m	12/1/1999	2/1/2000
Hilton Head Island	SC	Hilton Head	HXD/HHH	N	\$3.00	\$1,542,300	6y4m	2/1/1994	6/1/2000
Hilton Head Island	SC	Hilton Head	HXD/HHH	N	\$3.00	\$2,076,657	6y10m	12/1/2000	10/1/2007
Myrtle Beach	SC	Myrtle Beach International	MYR	S	\$3.00	\$27,941,134	5y10m	10/1/1996	8/1/2001
		Myrtle Beach				**			
Myrtle Beach	SC	International	MYR	S	\$4.50		6y	8/1/2001	8/1/2007
Aberdeen	SD	Aberdeen Regional	ABR	N	\$3.00	\$677,809 **	2y	1/1/2000	1/1/2002
Aberdeen	SD	Aberdeen Regional	ABR	_ N _	\$4.50		5y5m	1/1/2002	6/1/2007
Aberdeen	SD SD	Aberdeen Regional	ABR	N N	\$4.50	\$533,588	2y9m	6/1/2007	3/1/2010
Pierre	SD	Pierre Regional	PIR PIR	N N	\$4.50	\$366,239	6y5m	2/1/2003	7/1/2009
Pierre		Pierre Regional			\$4.50	\$422,107	7y	9/1/2009	9/1/2016
Rapid City	SD SD	Rapid City Regional Rapid City Regional	RAP RAP	N N	\$3.00 \$3.00	\$1,087,206 \$4,146,262	2y5m	8/1/1997 6/1/2000	1/1/2000 6/1/2006
Rapid City				N		**	6y	6/1/2006	
Rapid City Rapid City	SD SD	Rapid City Regional  Rapid City Regional	RAP RAP	N N	\$4.50 \$4.50	\$4,725,628	9m 4y6m	5/1/2006	5/1/2007 11/1/2011
		Tri-Cities Regional							
Bristol	TN	TN/VA Tri-Cities Regional	TRI	N	\$3.00	\$10,521,507	10y5m	2/1/1997	7/1/2007
Bristol	TN	TN/VA	TRI	N	\$4.50	**	4y8m	7/1/2007	3/1/2012
Bristol	TN	Tri-Cities Regional TN/VA	TRI	N	\$4.50	\$668,500	1y4m	3/1/2012	7/1/2013
Chattanooga	TN	Lovell Field	CHA	N	\$3.00	\$15,091,446	6y9m	7/1/1994	4/1/2001
Chattanooga	TN	Lovell Field	СНА	N	\$4.50	**	3y7m	4/1/2001	11/1/2004
Chattanooga	TN	Lovell Field	CHA	N	\$3.00	**	3m	11/1/2004	2/1/2005
Chattanooga	TN	Lovell Field	СНА	N	\$4.50	**	5y6m	2/1/2005	8/1/2010
Chattanooga	TN	Lovell Field	СНА	N	\$4.50	\$2,413,001	2y2m	8/1/2010	10/1/2012
Jackson	TN	McKellar-Sipes Regional	MKL		\$4.50	\$332,248	7y8m	10/1/2002	6/1/2010
Knoxville	TN	Mc Ghee Tyson	TYS	s	\$3.00	\$99,080,294	9y9m	1/1/1994	10/1/2003
Knoxville	TN	Mc Ghee Tyson	TYS	S	\$4.50	**	18y9m	10/1/2003	7/1/2022
Knoxville	TN	Mc Ghee Tyson	TYS	S	\$4.50	\$4,691,627	1y2m	7/1/2022	9/1/2023
Memphis	TN	Memphis International	MEM	М	\$3.00	\$53,700,000	4y5m	8/1/1992	1/1/1997
Nashville	TN	Nashville International	BNA	М	\$3.00	\$228,396,826	22y8m	1/1/1993	12/1/2009
Nashville	TN	Nashville International	BNA	М	\$4.50	**	10m	12/1/2009	10/1/2010
Nashville	TN	Nashville International	BNA	М	\$3.00	\$91,948,976	4y11m	10/1/2010	9/1/2015
Nashville	TN	Nashville International	BNA	M	\$4.50	\$11,287,500	1y	9/1/2015	9/1/2016

Abilene	TX	Abilene Regional	ABI	N	\$3.00	\$2,008,611	4y8m	1/1/1998	9/1/2002
Abilene	TX	Abilene Regional	ABI	N	\$4.50	**	5y10m	9/1/2002	7/1/2008
Abilene	TX	Abilene Regional	ABI	N	\$4.50	\$2,519,008	7y1m	7/1/2008	8/1/2015
Amarillo	TX	Rick Husband Amarillo International	AMA	S	\$4.50	\$19,200,000	9y7m	12/1/2008	7/1/2018
Austin	TX	Robert Mueller	AUS	М	\$2.00	\$6,189,459	2m	11/1/1993	2/1/1994
Austin	1.	Municipal Robert Mueller	AUS	IVI	\$2.00	\$6,169,459	3m	11/1/1993	2/1/1994
Austin	TX	Municipal Austin-Bergstrom	AUS	М	\$3.00	**	1y	2/1/1994	2/1/1995
Austin	TX	International	AUS	М	\$3.00	\$343,074,546	8y9m	7/1/1995	4/1/2004
Austin	TX	Austin-Bergstrom International	AUS	М	\$4.50	**	15y9m	4/1/2004	1/1/2020
		Austin-Bergstrom				<b>0.4.405.000</b>	·		
Austin Beaumont/Port	TX	International Southeast Texas	AUS	M	\$4.50	\$4,125,000	4m	1/1/2020	5/1/2020
Arthur  Beaumont/Port	TX	Regional Southeast Texas	BPT	N	\$3.00	\$2,784,768	7y6m	9/1/1994	3/1/2002
Arthur	TX	Regional	BPT	N	\$4.50	**	3y1m	3/1/2002	4/1/2005
Beaumont/Port Arthur	TX	Southeast Texas Regional	BPT	N	\$4.50	\$931,584	6y11m	4/1/2005	3/1/2012
7111101	170	Brownsville/South	טו ו	•	ψ1.00	φοσ1,001	Oy i iiii	17 17 2000	0/1/2012
Brownsville	TX	Padre Island International	BRO	N	\$3.00	\$1,099,404	5y7m	10/1/1997	5/1/2003
		Brownsville/South					Í		
Brownsville	TX	Padre Island International	BRO	N	\$4.50	\$5,182,363	15y2m	5/1/2003	7/1/2018
College Station	TX	Easterwood Field	CLL	N	\$3.00	\$2,063,797	4y9m	7/1/1996	4/1/2001
College Station	TX	Easterwood Field	CLL	N	\$4.50	**	2y9m	4/1/2001	1/1/2004
College Station	TX	Easterwood Field	CLL	N	\$4.50	\$3,491,666	9y	1/1/2004	1/1/2013
Corpus Christi	TX	Corpus Christi International	CRP	s	\$3.00	\$49,700,114	9y1m	3/1/1994	3/1/2003
		Corpus Christi				**	·		
Corpus Christi	TX	International	CRP	S	\$4.50		2y	3/1/2003	2/1/2010
Dallas	TX	Dallas Love Field	DAL	M	\$3.00	\$345,323,728	12y1m	2/1/2010	3/1/2022
Dallas	TX	Dallas Love Field Dallas/Ft Worth	DAL	M	\$3.00	**	3y8m	2/1/2008	10/1/2011
Dallas-Ft Worth	TX	International	DFW	L	\$3.00	\$182,438,761	2y1m	5/1/1994	6/1/1996
Dallas-Ft Worth	TX	Dallas/Ft Worth International	DFW	L	\$3.00	\$2,306,174,080	5y5m	2/1/1997	7/1/2002
Dallas-Ft Worth	TX	Dallas/Ft Worth International	DFW	L	\$4.50	**	14y8m	7/1/2002	3/1/2017
		Dallas/Ft Worth							
Dallas-Ft Worth	TX	International  Dallas/Ft Worth	DFW	L	\$3.00	\$51,900,495	2m	3/1/2017	5/1/2017
Dallas-Ft Worth	TX	International	DFW	L	\$4.50	\$2,988,412,952	17y4m	5/1/2017	9/1/2034
Del Rio	TX	Del Rio International	DRT	N	\$4.50	\$403,739	5y10m	2/1/2010	12/1/2015
El Paso	TX	El Paso International	ELP	S	\$3.00	\$76,826,242	15y5m	1/1/1997	6/1/2012
Harlingen	TX	Valley International	HRL	S	\$3.00	\$9,144,355	9y1m	11/1/1998	12/1/2007
Harlingen	TX	Valley International	HRL	S	\$4.50	\$3,590,824	1y7m	12/1/2007	7/1/2009
Harlingen	TX	Valley International	HRL	S	\$4.50	\$13,044,000	6y9m	8/1/2009	5/1/2016
Houston	TX	William P. Hobby George Bush	HOU	М	\$3.00	\$163,517,150	12y	11/1/2006	11/1/2017
		Intercontinental/							
Houston	TX	Houston	IAH	L	\$3.00	\$1,372,445,143	18y11m	12/1/2008	11/1/2027
Killeen	TX	Killeen Municipal	ILE	N	\$3.00	\$242,051	1y10m	1/1/1993	11/1/1994
Killeen	TX	Killeen Municipal	ILE	N	\$3.00	\$3,579,834	6y1m	4/1/1995	5/1/2001
Killeen	TX	Killeen Municipal	ILE	N	\$4.50	**	2y3m	5/1/2001	8/1/2003
Killeen	TX	Robert Gray AAF	ILE/GRK	N	\$4.50	*	2y1m	12/1/2003	1/1/2006
Killeen	TX	Robert Gray AAF	GRK	N	\$4.50	\$5,080,476	6y6m	6/1/2006	12/1/2012
Laredo	TX	Laredo International	LRD	N	\$3.00	\$6,303,839	15y8m	10/1/1993	6/1/2009
Laredo	TX	Laredo International	LRD	N	\$4.50	**	3y2m	6/1/2009	1/1/2013
Laredo	TX	Laredo International	LRD	N	\$4.50	\$7,852,765	9y5m	1/1/2013	6/1/2022
Longview	TX	East Texas Regional	GGG	N	\$3.00	\$472,571	5y7m	9/1/1996	4/1/2002
Longview	TX	East Texas Regional	GGG	N	\$3.00	\$699,232	8y8m	9/1/2002	5/1/2011
Lubbock	TX	Lubbock Preston Smith International	LBB	S	\$3.00	\$16,178,722	11y4m	10/1/1993	2/1/2005
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Lubbock	TX	Lubbock Preston Smith International	LBB	S	\$2.00	\$4,189,571	2у	2/1/2005	2/1/2007
Lubbock	TX	Lubbock Preston Smith International	LBB	S	\$3.00	\$14,974,087	1y4m	2/1/2007	6/1/2008
Lubbock	TX	Lubbock Preston Smith International	LBB	S	\$4.50	**	5y6m	6/1/2008	12/1/2013
McAllen	TX	McAllen Miller International	MFE	S	\$3.00	\$15,544,825	15y6m	4/1/1998	10/1/2013
Midland	TX	Midland International	MAF	S	\$3.00	\$35,873,495	11y9m	1/1/1993	9/1/2004
Midland	TX	Midland International	MAF	S	\$4.50	**	9y4m	9/1/2004	1/1/2014
Midland	TX	Midland International	MAF	S	\$3.00	\$1,395,921	10m	1/1/2014	11/1/2014
Midland	TX	Midland International	MAF	S	\$4.50	\$1,544,032	9m	11/1/2014	8/1/2015
San Angelo	TX	San Angelo Regional/Mathis Field	SJT	N	\$3.00	\$1,266,877	8y11m	5/1/1993	4/1/2002
San Angelo	TX	San Angelo Regional/Mathis Field San Angelo	SJT	N	\$4.50	**	2y4m	4/1/2002	8/1/2004
San Angelo	TX	Regional/Mathis Field	SJT	N	\$4.50	\$2,942,045	10y	8/1/2004	8/1/2014
San Antonio	TX	San Antonio International	SAT	М	\$3.00	\$238,029,391	5y11m	11/1/2001	10/1/2007
San Antonio	TX	San Antonio International	SAT	M	\$4.50	**	5y3m	10/1/2007	1/1/2013
San Antonio	TX	San Antonio International	SAT	М	\$4.50	\$142,929,158	6y2m	1/1/2013	3/1/2019
Tyler	TX	Tyler Pounds Regional	TYR	N	\$3.00	\$2,901,212	9y6m	3/1/1994	9/1/2003
Tyler	TX	Tyler Pounds Regional Tyler Pounds	TYR	N	\$4.50	**	4y11m	9/1/2003	8/1/2008
Tyler	TX	Regional	TYR	N	\$4.50	\$1,437,855	3y2m	8/1/2008	10/1/2011
Victoria	TX	Victoria Regional	VCT	CS	\$3.00	\$195,960	Зу	12/1/1994	8/1/1998
Victoria	TX	Victoria Regional	VCT	CS	\$3.00	\$188,872	Зу	1/1/1999	1/1/2002
Victoria	TX	Victoria Regional	VCT	CS	\$4.50	\$444,905	10y	1/1/2002	1/1/2012
Waco	TX	Waco Regional	ACT	N	\$3.00	\$2,438,451	5y11m	11/1/1995	10/1/2001
Waco	TX	Waco Regional	ACT	N	\$4.50	**	6y3m	10/1/2001	1/1/2008
Waco	TX	Waco Regional Sheppard AFB/Wichita Falls	ACT	N _	\$4.50	\$1,458,418	4y3m	1/1/2008	4/1/2012
Wichita Falls	TX	Municipal	SPS	N	\$4.50	\$1,646,268	9y2m	10/1/2008	12/1/2017
Cedar City	UT	Cedar City Regional	CDC	CS	\$4.50	\$229,900	4y8m	2/1/2007	10/1/2011
Salt Lake City	UT	Salt Lake City International	SLC	L	\$3.00	\$166,057,268	6y4m	12/1/1994	4/1/2001
Salt Lake City	UT	Salt Lake City International Salt Lake City	SLC	L	\$4.50	**	3m	4/1/2001	7/1/2001
Salt Lake City	UT	International	SLC	L	\$4.50	\$367,392,459	11y6m	7/1/2001	1/1/2012
St George	UT	St George Municipal	SGU	N	\$3.00	\$23,568	4y4m	5/1/1998	9/1/2002
St George	UT	St George Municipal	SGU	N	\$4.50	\$3,515,402	12y7m	6/1/2003	1/1/2016
Wendover	UT	Wendover Burlington	ENV	N	\$3.00	\$142,300	3y2m	8/1/1996	10/1/1999
Burlington	VT	International	BTV	S	\$3.00	\$25,408,285	6y5m	4/1/1997	9/1/2003
Burlington	VT	Burlington International Burlington	BTV	S	\$4.50	**	6y1m	9/1/2003	10/1/2009
Burlington	VT	International	BTV	S	\$4.50	\$17,298,103	4y3m	12/1/2009	3/1/2014
Charlotte Amalie	VI	Cyril E. King	STT	S	\$3.00	\$3,808,574	2y5m	3/1/1993	8/1/1995
Charlotte Amalie	VI	Cyril E. King	STT	S	\$3.00	\$7,792,000	7у	12/1/1995	12/1/2002
Charlotte Amalie	VI	Cyril E. King	STT	S	\$3.00	\$13,500,000	7y9m	8/1/2004	4/1/2012
Christiansted	VI	Henry E. Rohlsen	STX	N	\$3.00	\$2,158,095	3y1m	3/1/1993	4/1/1996
Christiansted	VI	Henry E. Rohlsen Ronald Reagan	STX	N	\$3.00	\$4,408,000	6y7m	12/1/1996	7/1/2003
Arlington	VA	Washington National Ronald Reagan	DCA	L	\$3.00	\$297,807,356	7y6m	11/1/1993	5/1/2001
Arlington	VA	Washington National Ronald Reagan	DCA	L _	\$4.50	**	4y1m	5/1/2001	6/1/2005
Arlington	VA	Washington National	DCA	L	\$4.50	\$305,413,857	9y9m	6/1/2005	3/1/2015
Chantilly	VA	Washington Dulles International	IAD	L	\$3.00	\$269,427,498	7y6m	1/1/1994	5/1/2001

		Washington Dulles							
Chantilly	VA	International Washington Dulles	IAD	L	\$4.50	**	4y3m	5/1/2001	8/1/2005
Chantilly	VA	International Charlottesville-	IAD	L	\$4.50	\$2,173,226,652	33y4m	8/1/2005	12/1/2038
Charlottesville	VA	Albemarle	CHO	N	\$2.00	\$305,992	1y1m	9/1/1992	10/1/1993
Charlottesville	VA	Charlottesville- Albemarle	СНО	N	\$3.00	\$5,114,437	9y9m	4/1/1995	1/1/2005
Charlottesville	VA	Charlottesville- Albemarle	СНО	N	\$4.50	**	1y1m	1/1/2005	2/1/2006
Charlottesville	VA	Charlottesville- Albemarle	СНО	N	\$4.50	\$3,368,434	3y11m	2/1/2006	1/1/2010
Lynchburg	VA	Lynchburg Regional/Preston Glenn Field Lynchburg	LYH	N	\$3.00	\$185,940	1y	7/1/1995	7/1/1996
Lynchburg	VA	Regional/Preston Glenn Field	LYH	N	\$3.00	\$827,616	1y9m	9/1/2000	6/1/2002
		Lynchburg Regional/Preston							
Lynchburg	VA	Glenn Field Newport	LYH	N	\$4.50	\$2,309,770	13y	6/1/2002	6/1/2015
Newport News	VA	News/Williamsburg International	PHF	s	\$3.00	\$552,500	9m	10/1/2006	7/1/2007
Norfolk	VA	Norfolk International	ORF	S	\$3.00	\$64,005,536	12y7m	5/1/1997	1/1/2010
Richmond	VA	Richmond International	RIC	S	\$3.00	\$137,014,261	10y7m	5/1/1994	1/1/2005
Richmond	VA	Richmond International	RIC	S	\$4.50	**	14y10m	1/1/2005	10/1/2019
Roanoke	VA	Roanoke Regional/Woodrum Field	ROA	N	\$3.00	\$6,463,183	3y3m	9/1/1998	12/1/2001
		Roanoke Regional/Woodrum							
Roanoke	VA	Field Roanoke	ROA	N	\$4.50	**	3y2m	12/1/2001	2/1/2005
Roanoke	VA	Regional/Woodrum Field	ROA	N	\$3.00	\$8,506,010	9m	2/1/2005	11/1/2005
Roanoke	VA	Roanoke Regional/Woodrum Field	ROA	N	\$4.50	**	6y	11/1/2005	11/1/2011
Staunton	VA	Shenandoah Valley Regional	SHD	cs	\$3.00	\$207,875	5y	12/1/2001	12/1/2006
Staunton	VA	Shenandoah Valley Regional	SHD	CS	\$4.50	\$244,810	10y9m	6/1/2007	3/1/2018
	WA	Bellingham International	BLI	N	\$3.00	\$1,594,527	_	7/1/1993	8/1/1998
Bellingham		Bellingham				φ1,594,52 <i>1</i> *	5y1m		
Bellingham	WA	International Bellingham	BLI	N	\$3.00	*	10m	3/1/1999	1/1/2000
Bellingham	WA	International Bellingham	BLI	N	\$3.00	\$1,400,000	2y6m	1/1/2000	7/1/2002
Bellingham	WA	International Bellingham	BLI	_ N _	\$4.50	** **	2y11m	7/1/2002	6/1/2005
Bellingham Friday Harbor	WA WA	Friday Harbor	BLI FRD/FHR	N N	\$4.50 \$3.00	\$5,241,957 \$517,077	9y3m 15y5m	6/1/2005 2/1/2001	9/1/2014 7/1/2016
•	WA	Grant County International	MWH		\$3.00		•	3/1/1999	
Moses Lake		Grant County				\$470,000 **	6y8m		11/1/2005
Moses Lake Pasco	WA WA	International  Tri-Cities	MWH PSC	N	\$4.50 \$3.00	\$3,657,898	10y2m 7y11m	11/1/2005 11/1/1993	1/1/2016 10/1/2001
Pasco	WA	Tri-Cities	PSC	N	\$4.50	**	1y6m	10/1/2001	4/1/2003
Pasco	WA	Tri-Cities	PSC	N	\$4.50	\$13,289,313	18y6m	4/1/2003	10/1/2021
Port Angeles	WA	William R. Fairchild International	CLM	N	\$3.00	\$117,556	1y9m	8/1/1993	5/1/1995
Port Angeles	WA	William R. Fairchild International	CLM	N	\$3.00	\$877,100	15y1m	9/1/1996	10/1/2011
Pullman	WA	Pullman/Moscow Regional	PUW	N	\$3.00	\$169,288	2y8m	6/1/1994	2/1/1996
Pullman	WA	Pullman/Moscow Regional	PUW	N	\$3.00	\$706,727	1y11m	2/1/2000	1/1/2002
Pullman	WA	Pullman/Moscow Regional	PUW	N	\$4.50	**	3y9m	1/1/2002	10/1/2002
Pullman	WA	Pullman/Moscow Regional	PUW	N	\$4.50	\$678,185	7y3m	10/1/2005	1/1/2013
Seattle	WA	Seattle-Tacoma International	SEA	L	\$3.00	\$76,701,322	8y11m	11/1/1992	10/1/2001
		Seattle-Tacoma							
Seattle	WA	International	SEA	L	\$4.50	**	1y5m	10/1/2001	1/1/2003

Seattle	WA	Seattle-Tacoma International	SEA	L	\$4.50	\$1,256,860,903	15y8m	1/1/2003	9/1/2018
Spokane	WA	Spokane International	GEG	s	\$3.00	\$52,372,419	9y10m	6/1/1993	4/1/2003
Spokane	WA	Spokane International	GEG	S	\$4.50	**	2y1m	4/1/2003	5/1/2005
Spokane	WA	Spokane International	GEG	S	\$4.50	\$42,648,429	6y3m	5/1/2005	8/1/2011
Walla Walla	WA	Walla Walla Regional	ALW	N	\$3.00	\$3,745,775	7y11m	11/1/1993	10/1/2001
Walla Walla	WA	Walla Walla Regional	ALW	N	\$4.50	**	18y	10/1/2001	10/1/2019
Wenatchee	WA	Pangborn Memorial	EAT	N	\$3.00	\$622,488	2y2m	8/1/1993	10/1/1995
Wenatchee	WA	Pangborn Memorial	EAT	N	\$3.00	\$660,570	4y1m	6/1/1998	7/1/2002
Wenatchee	WA	Pangborn Memorial	EAT	N	\$4.50	**	7m	7/1/2002	2/1/2003
Wenatchee	WA	Pangborn Memorial Yakima Air Terminal/McAllister	EAT	N	\$4.50	\$1,257,589	6y11m	5/1/2003	4/1/2010
Yakima	WA	Field Yakima Air Terminal/McAllister	YKM	N	\$3.00	\$1,565,797 *	6у	2/1/1993	2/1/1999
Yakima	WA	Field Yakima Air Terminal/McAllister	YKM	N	\$3.00		1y1m	5/1/1999	6/1/2000
Yakima	WA	Field	YKM	N	\$3.00	\$1,976,471	10y10m	6/1/2000	4/1/2011
Charleston	WV	Yeager	CRW	N	\$3.00	\$6,006,037	8y3m	8/1/1993	11/1/2001
Charleston	WV	Yeager	CRW	N	\$4.50	**	1y5m	11/1/2001	4/1/2003
Charleston	WV	Yeager	CRW	N	\$4.50	\$19,632,586	15y2m	4/1/2003	6/1/2018
Clarksburg	WV	North Central West Virginia	CKB	N	\$3.00	\$79,103	2y1m	3/1/1994	10/1/1995
Clarksburg	WV	North Central West Virginia North Central West	СКВ	N	\$4.50	\$101,489	1y10m	4/1/2001	8/1/2002
Clarksburg	WV	Virginia	CKB	N	\$4.50	\$2,920,641	50y	5/1/2004	5/1/2054
Huntington	WV	Tri-State/Milton J. Ferguson Field Tri-State/Milton J.	HTS	N	\$3.00	\$1,853,497	13y	12/1/1995	12/1/2008
Huntington	WV	Ferguson Field Morgantown	HTS	N	\$3.00	\$1,122,712	4y4m	5/1/2009	9/1/2013
Morgantown	WV	Municipal-Walter L. Bill Hart Field Morgantown	MGW	N	\$2.00	\$54,012	1y1m	12/1/1992	1/1/1994
Morgantown	WV	Municipal-Walter L. Bill Hart Field	MGW	N	\$2.00	\$211,390	7y1m	12/1/1994	1/1/2002
Morgantown	WV	Morgantown Municipal-Walter L. Bill Hart Field Morgantown	MGW	N	\$4.50	**	2y5m	1/1/2002	6/1/2004
Morgantown	WV	Municipal-Walter L. Bill Hart Field Morgantown	MGW	N	\$4.50	\$227,618	3y9m	6/1/2004	3/1/2008
Morgantown	WV	Municipal-Walter L. Bill Hart Field Mid-Ohio Valley	MGW	N	\$4.50	\$663,774	16y7m	6/1/2009	1/1/2026
Parkersburg	WV	Regional	PKB	CS	\$3.00	\$305,491	3y3m	5/1/1999	8/1/2002
Parkersburg	WV	Mid-Ohio Valley Regional	PKB	cs	\$4.50	\$286,543	13y5m	8/1/2003	1/1/2016
Appleton	WI	Outagamie County Regional	ATW	N	\$3.00	\$10,466,940	11y11m	7/1/1994	6/1/2006
		Outagamie County				**			
Appleton Appleton	WI WI	Regional Outagamie County Regional	ATW ATW	N N	\$4.50 \$3.00	\$318,410	1y10m 5m	6/1/2006 4/1/2008	4/1/2008 9/1/2008
Appleton	WI	Outagamie County Regional	ATW	N	\$4.50	\$4,717,500	4y4m	9/1/2008	1/1/2013
Eau Claire	WI	Chippewa Valley Regional	EAU	N	\$3.00	\$708,253	5y10m	2/1/1996	12/1/2001
Eau Claire	WI	Chippewa Valley Regional Chippewa Valley	EAU	N	\$4.50	** _	4y1m	12/1/2001	1/1/2006
Eau Claire	WI	Regional	EAU	N	\$4.50	\$662,411	7y9m	8/1/2006	5/1/2014
Green Bay	WI	Austin Straubel International	GRB	S	\$3.00	\$7,530,958	9у	3/1/1993	3/1/2002
Green Bay	WI	Austin Straubel International	GRB	S	\$4.50	\$38,768,829	18y7m	3/1/2002	10/1/2020
La Crosse	WI	La Crosse Municipal	LSE	N	\$3.00	\$1,964,469	6y9m	7/1/1994	4/1/2001
La Crosse	WI	La Crosse Municipal	LSE	N	\$4.50	**	6m	4/1/2001	10/1/2001
La Crosse	WI	La Crosse Municipal	LSE	N	\$4.50	\$5,709,707	14y1m	10/1/2001	11/1/2015

Madison	WI	Dane County Regional - Truax Field	MSN	S	\$3.00	\$12,308,713	8y2m	9/1/1993	11/1/2001
Madison	WI	Dane County Regional - Truax Field	MSN	S	\$4.50	\$79,902,856	21y11m	11/1/2001	10/1/2023
Milwaukee	WI	General Mitchell International	MKE	М	\$3.00	\$309,431,013	25y3m	5/1/1995	8/1/2020
Mosinee	WI	Central Wisconsin	CWA	N	\$3.00	\$7,725,600	13y10m	11/1/1993	9/1/2007
Mosinee	WI	Central Wisconsin	CWA	N	\$4.50	**	2y10m	9/1/2007	7/1/2010
Mosinee	WI	Central Wisconsin	CWA	N	\$4.50	\$3,529,500	5y9m	7/1/2010	4/1/2016
Rhinelander	WI	Rhinelander-Oneida County	RHI	N	\$3.00	\$204,771	2y2m	1/1/1994	4/1/1996
Rhinelander	WI	Rhinelander-Oneida County	RHI	N	\$3.00	\$457,484	5y3m	6/1/1996	9/1/2001
Rhinelander	WI	Rhinelander-Oneida County	RHI	N	\$4.50	**	2y4m	9/1/2001	1/1/2004
Rhinelander	WI	Rhinelander-Oneida County	RHI	N	\$4.50	\$1,397,617	6y11m	1/1/2004	12/1/2011
Casper	WY	Casper/ Natrona County International	CPR	N	\$3.00	\$1,629,582	7y7m	9/1/1993	4/1/2001
Casper	WY	Casper/ Natrona County International	CPR	N	\$4.50	**	2y2m	4/1/2001	6/1/2003
Casper	WY	Casper/ Natrona County International Cheyenne	CPR	N	\$4.50	\$2,590,000	8y5m	6/1/2003	11/1/2011
Cheyenne	WY	Regional/Jerry Olson Field	CYS	N	\$3.00	\$957,013	7y5m	11/1/1993	4/1/2001
Cheyenne	WY	Cheyenne Regional/Jerry Olson Field Cheyenne Regional/Jerry Olson	CYS	N	\$4.50	**	5y8m	4/1/2001	1/1/2007
Cheyenne	WY	Field	CYS	N	\$4.50	\$407,728	5y6m	1/1/2007	7/1/2012
Cody	WY	Yellowstone Regional	COD	N	\$3.00	\$413,037	3y11m	8/1/1997	7/1/2001
Cody	WY	Yellowstone Regional	COD	N	\$4.50	**	8m	7/1/2001	3/1/2002
Cody	WY	Yellowstone Regional	COD	N	\$4.50	\$76,373	3y1m	3/1/2002	4/1/2005
Cody	WY	Yellowstone Regional	COD	N	\$4.50	\$697,934	7y4m	9/1/2005	1/1/2013
Gillette	WY	Gillette-Campbell County	GCC	N	\$3.00	\$369,132	8y3m	9/1/1993	12/1/2001
Gillette	WY	Gillette-Campbell County Gillette-Campbell	GCC	N	\$4.50	\$162,537	2y6m	12/1/2001	6/1/2004
Gillette	WY	County Gillette-Campbell	GCC	N	\$4.50	*	6m	1/1/2005	7/1/2005
Gillette	WY	County	GCC	N	\$4.50	\$770,410	6y4m	7/1/2005	11/1/2011
Jackson	WY	Jackson Hole	JAC	N	\$3.00	\$3,799,325	7y8m	8/1/1993	4/1/2001
Jackson	WY	Jackson Hole	JAC	N	\$4.50	**	1y4m	4/1/2001	8/1/2002
Jackson	WY	Jackson Hole	JAC	N	\$4.50	\$21,146,288	23y10m	8/1/2002	6/1/2026
Laramie	WY	Laramie Regional	LAR	N	\$3.00	\$126,457	4y2m	8/1/1996	10/1/2000
Laramie	WY	Laramie Regional	LAR	N	\$3.00	* *	9m	12/1/2000	8/1/2001
Laramie	WY	Laramie Regional	LAR	N	\$4.50	\$252,009 \$4,055,040	6y4m	12/1/2006	4/1/2013
Riverton  Riverton	WY WY	Riverton Regional  Riverton Regional	RIW RIW	N N	\$3.00 \$4.50	\$1,055,040 **	5y11m 22y6m	5/1/1995 4/1/2001	4/1/2001
Rock Springs	WY	Rock Springs- Sweetwater County	RKS	N	\$3.00	\$382,300	11y	4/1/1995	4/1/2006
Rock Springs	WY	Rock Springs- Sweetwater County	RKS	N	\$4.50	\$476,907	6y5m	4/1/2006	9/1/2012
Sheridan	WY	Sheridan County	SHR	N	\$3.00	\$218,988	5y10m	3/1/1996	12/1/2001
Sheridan	WY	Sheridan County	SHR	N	\$4.50	\$433,610	6y9m	12/1/2001	9/1/2008
Sheridan	WY	Sheridan County	SHR	N	\$4.50	\$736,114	6y8m	10/1/2008	6/1/2015
Worland	WY	Worland Municipal	WRL	cs	\$4.50	\$70,500	5y2m	1/1/2003	3/1/2008
Worland	WY	Worland Municipal	WRL	cs	\$4.50	\$193,038	13y11m	8/1/2008	7/1/2022

NOTES:

Collections at locations noted by  $^{\star}$  in the amount column were prematurely stopped due to FAA processing errors.

 $<sup>^{\</sup>star\star}$  Amount shown on line imediately above the double asterisk is the total approved collections at this location at both the \$3 and \$4.50 levels.

#### Letter of Intent (LOI) Commitments By Fiscal Year

State	City	Airport Name	Discretionary 2010	Entitlement 2010
AK	Anchorage	Ted Stevens Anchorage International	4,000,000.00	13,972,854.00
CA	Sacramento	Sacramento International	7,500,000.00	2,182,000.00
CO	Denver	Denver International	7,000,000.00	0
FL	Miami	Miami International	8,540,000.00	0
GA	Atlanta	Hartsfield - Jackson Atlanta International	12,500,000.00	0
IA	Cedar Rapids	The Eastern Iowa	3,500,000.00	3,000,000.00
IL	Chicago	Chicago O'Hare International	20,000,000.00	6,500,000.00
IN	Gary	Gary/Chicago International	5,000,000.00	1,000,000.00
IN	Indianapolis	Indianapolis International	3,000,000.00	5,000,000.00
KY	Covington	Cincinnati/Northern Kentucky International	2,000,000.00	0
LA	Baton Rouge	Baton Rouge Metropolitan, Ryan Field	3,500,000.00	3,400,000.00
MA	Boston	General Edward Lawrence Logan International	5,900,000.00	3,780,000.00
MD	Hagerstown	Hagerstown Regional-Richard A Henson Field	850,000.00	150,000.00
MN	Minneapolis	Minneapolis-St Paul Inter./Wold-Chamberlain	5,000,000.00	0
MO	St. Louis	Lambert-St Louis International	8,500,000.00	4,249,717.00
NC	Charlotte	Charlotte/Douglas International	12,000,000.00	8,500,000.00
NC	Greensboro	Piedmont Triad International	6,000,000.00	5,200,000.00
NY	New York	John F Kennedy International	14,800,000.00	0
ОН	Cleveland	Cleveland-Hopkins International	13,170,000.00	3,099,000.00
ОН	Columbus	Port Columbus International	10,000,000.00	1,919,000.00
TN	Memphis	Memphis International	4,823,000.00	0
TX	Dallas-Fort Worth	Dallas/Fort Worth International	6,000,000.00	0
TX	Houston	George Bush Intercontinental/Houston	13,050,000.00	10,024,000.00
UT	St. George	New	10,000,000.00	1,000,000.00
VA	Washington	Washington Dulles International	4,000,000.00	6,662,414.00
WA	Seattle	Seattle-Tacoma International	20,075,000.00	335,205.00

#### Letter of Intent (LOI) Commitments By Fiscal Year

State	City	Airport Name	Discretionary 2011	Entitlement 2011
AK	Anchorage	Ted Stevens Anchorage International	8,200,000.00	3,947,800.00
CA	Sacramento	Sacramento International	7,000,000.00	2,124,000.00
CO	Denver	Denver International	7,000,000.00	0
FL	Miami	Miami International	0	0
GA	Atlanta	Hartsfield - Jackson Atlanta International	10,000,000.00	0
IA	Cedar Rapids	The Eastern Iowa	2,500,000.00	0
IL	Chicago	Chicago O'Hare International	20,000,000.00	0
IN	Gary	Gary/Chicago International	5,000,000.00	1,000,000.00
IN	Indianapolis	Indianapolis International	5,000,000.00	5,000,000.00
KY	Covington	Cincinnati/Northern Kentucky International	6,000,000.00	0
LA	Baton Rouge	Baton Rouge Metropolitan, Ryan Field	2,500,000.00	3,400,000.00
MA	Boston	General Edward Lawrence Logan International	5,900,000.00	3,830,000.00
MD	Hagerstown	Hagerstown Regional-Richard A Henson Field	850,000.00	150,000.00
MN	Minneapolis	Minneapolis-St Paul Inter./Wold-Chamberlain	0	0
MO	St. Louis	Lambert-St Louis International	0	0
NC	Charlotte	Charlotte/Douglas International	12,000,000.00	8,500,000.00
NC	Greensboro	Piedmont Triad International	0	5,200,000.00
NY	New York	John F Kennedy International	10,900,000.00	0
OH	Cleveland	Cleveland-Hopkins International	0	3,165,000.00
OH	Columbus	Port Columbus International	10,000,000.00	1,954,000.00
TN	Memphis	Memphis International	0	0
TX	Dallas-Fort Worth	Dallas/Fort Worth International	0	0
TX	Houston	George Bush Intercontinental/Houston	0	0
UT	St. George	New	15,000,000.00	1,000,000.00
VA	Washington	Washington Dulles International	0	6,662,414.00
WA	Seattle	Seattle-Tacoma International	8,200,000.00	5,400,000.00

State	City	Airport Name	Discretionary 2012	Entitlement 2012	
AK	Anchorage	Ted Stevens Anchorage International	7,280,000.00	3,487,800.00	
CA	Sacramento	Sacramento International	6,000,000.00	2,171,000.00	
CO	Denver	Denver International	6,000,000.00	0	
FL	Miami	Miami International	0	0	
GA	Atlanta	Hartsfield - Jackson Atlanta International	0	0	
IA	Cedar Rapids	The Eastern Iowa	1,500,000.00	0	
IL	Chicago	Chicago O'Hare International	20,000,000.00	0	
IN	Gary	Gary/Chicago International	5,000,000.00	1,000,000.00	
IN	Indianapolis	Indianapolis International	0	0	
KY	Covington	Cincinnati/Northern Kentucky International	0	0	
LA	Baton Rouge	Baton Rouge Metropolitan, Ryan Field	3,000,000.00	3,400,000.00	
MA	Boston	General Edward Lawrence Logan International	5,800,000.00	3,870,000.00	
MD	Hagerstown	Hagerstown Regional-Richard A Henson Field	850,000.00	150,000.00	
MN	Minneapolis	Minneapolis-St Paul Inter./Wold-Chamberlain	0	0	
MO	St. Louis	Lambert-St Louis International	0	0	
NC	Charlotte	Charlotte/Douglas International	12,000,000.00	8,500,000.00	
NC	Greensboro	Piedmont Triad International	0	5,200,000.00	
NY	New York	John F Kennedy International	14,800,000.00	0	
ОН	Cleveland	Cleveland-Hopkins International	0	3,233,000.00	
ОН	Columbus	Port Columbus International	10,000,000	1,989,000.00	
TN	Memphis	Memphis International	0	0	
TX	Dallas-Fort Worth	Dallas/Fort Worth International	0	0	
TX	Houston	George Bush Intercontinental/Houston	0	0	
UT	St. George	New	10,000,000.00	1,000,000.00	
VA	Washington	Washington Dulles International	20,000,000.00	0	
WA	Seattle	Seattle-Tacoma International	0	5,500,000.00	

State	City	Airport Name	Discretionary 2013	Entitlement 2013	
AK	Anchorage	Ted Stevens Anchorage International	4,000,000.00	4,250,837.00	
CA	Sacramento	Sacramento International	6,000,000.00	2,220,000.00	
CO	Denver	Denver International	2,000,000.00	0	
FL	Miami	Miami International	0	0	
GA	Atlanta	Hartsfield - Jackson Atlanta International	0	0	
IA	Cedar Rapids	The Eastern Iowa	0	0	
IL	Chicago	Chicago O'Hare International	20,000,000.00	0	
IN	Gary	Gary/Chicago International	5,000,000.00	1,000,000.00	
IN	Indianapolis	Indianapolis International	0	0	
KY	Covington	Cincinnati/Northern Kentucky International	0	0	
LA	Baton Rouge	Baton Rouge Metropolitan, Ryan Field	0	0	
MA	Boston	General Edward Lawrence Logan International	0	0	
MD	Hagerstown	Hagerstown Regional-Richard A Henson Field	850,000.00	150,000.00	
MN	Minneapolis	Minneapolis-St Paul Inter./Wold-Chamberlain	0	0	
MO	St. Louis	Lambert-St Louis International	0	0	
NC	Charlotte	Charlotte/Douglas International	12,000,000.00	0	
NC	Greensboro	Piedmont Triad International	0	6,115,513.00	
NY	New York	John F Kennedy International	11,800,000.00	0	
OH	Cleveland	Cleveland-Hopkins International	0	3,304,000.00	
OH	Columbus	Port Columbus International	10,000,000	2,026,000.00	
TN	Memphis	Memphis International	0	0	
TX	Dallas-Fort Worth	Dallas/Fort Worth International	0	0	
TX	Houston	George Bush Intercontinental/Houston	0	0	
UT	St. George	New	10,000,000.00	1,000,000.00	
VA	Washington	Washington Dulles International	13,000,000.00	0	
WA	Seattle	Seattle-Tacoma International	0	5,600,000.00	

State	City	Airport Name	Discretionary 2014	Entitlement 2014
AK	Anchorage	Ted Stevens Anchorage International	4,000,000.00	1,911,930.00
CA	Sacramento	Sacramento International	6,000,000.00	2,271,000.00
CO	Denver	Denver International	0	0
FL	Miami	Miami International	0	0
GA	Atlanta	Hartsfield - Jackson Atlanta International	0	0
IA	Cedar Rapids	The Eastern Iowa	0	0
IL	Chicago	Chicago O'Hare International	20,000,000.00	0
IN	Gary	Gary/Chicago International	5,000,000.00	1,000,000.00
IN	Indianapolis	Indianapolis International	0	0
KY	Covington	Cincinnati/Northern Kentucky International	0	0
LA	Baton Rouge	Baton Rouge Metropolitan, Ryan Field	0	0
MA	Boston	General Edward Lawrence Logan International	0	0
MD	Hagerstown	Hagerstown Regional-Richard A Henson Field	0	0
MN	Minneapolis	Minneapolis-St Paul Inter./Wold-Chamberlain	0	0
MO	St. Louis	Lambert-St Louis International	0	0
NC	Charlotte	Charlotte/Douglas International	6,000,000.00	0
NC	Greensboro	Piedmont Triad International	0	0
NY	New York	John F Kennedy International	10,900,000.00	0
ОН	Cleveland	Cleveland-Hopkins International	0	3,378,000.00
ОН	Columbus	Port Columbus International	10,000,000	2,064,000.00
TN	Memphis	Memphis International	0	0
TX	Dallas-Fort Worth	Dallas/Fort Worth International	0	0
TX	Houston	George Bush Intercontinental/Houston	0	0
UT	St. George	New	10,000,000.00	1,000,000.00
VA	Washington	Washington Dulles International	13,000,000.00	0
WA	Seattle	Seattle-Tacoma International	0	5,700,000.00

State	City	Airport Name	Discretionary 2015	Entitlement 2015
AK	Anchorage	Ted Stevens Anchorage International	4,000,000.00	0
CA	Sacramento	Sacramento International	5,131,512.00	2,328,884.00
CO	Denver	Denver International	0	0
FL	Miami	Miami International	0	0
GA	Atlanta	Hartsfield - Jackson Atlanta International	0	0
IA	Cedar Rapids	The Eastern Iowa	0	0
IL	Chicago	Chicago O'Hare International	20,000,000.00	0
IN	Gary	Gary/Chicago International	2,844,597.00	1,000,000.00
IN	Indianapolis	Indianapolis International	0	0
KY	Covington	Cincinnati/Northern Kentucky International	0	0
LA	Baton Rouge	Baton Rouge Metropolitan, Ryan Field	0	0
MA	Boston	General Edward Lawrence Logan International	0	0
MD	Hagerstown	Hagerstown Regional-Richard A Henson Field	0	0
MN	Minneapolis	Minneapolis-St Paul Inter./Wold-Chamberlain	0	0
MO	St. Louis	Lambert-St Louis International	0	0
NC	Charlotte	Charlotte/Douglas International	0	0
NC	Greensboro	Piedmont Triad International	0	0
NY	New York	John F Kennedy International	7,000,000.00	0
OH	Cleveland	Cleveland-Hopkins International	0	3,455,000.00
ОН	Columbus	Port Columbus International	10,000,000	2,104,000.00
TN	Memphis	Memphis International	0	0
TX	Dallas-Fort Worth	Dallas/Fort Worth International	0	0
TX	Houston	George Bush Intercontinental/Houston	0	0
UT	St. George	New	9,000,000.00	1,000,000.00
VA	Washington	Washington Dulles International	14,000,000.00	0
WA	Seattle	Seattle-Tacoma International	0	6,231,753.00

State	City	Airport Name	Discretionary 2016	Entitlement 2016
AK	Anchorage	Ted Stevens Anchorage International	1,000,000.00	0
CA	Sacramento	Sacramento International	0	0
CO	Denver	Denver International	0	0
FL	Miami	Miami International	0	0
GA	Atlanta	Hartsfield - Jackson Atlanta International	0	0
IA	Cedar Rapids	The Eastern Iowa	0	0
IL	Chicago	Chicago O'Hare International	20,000,000.00	0
IN	Gary	Gary/Chicago International	0	0
IN	Indianapolis	Indianapolis International	0	0
KY	Covington	Cincinnati/Northern Kentucky International	0	0
LA	Baton Rouge	Baton Rouge Metropolitan, Ryan Field	0	0
MA	Boston	General Edward Lawrence Logan International	0	0
MD	Hagerstown	Hagerstown Regional-Richard A Henson Field	0	0
MN	Minneapolis	Minneapolis-St Paul Inter./Wold-Chamberlain	0	0
MO	St. Louis	Lambert-St Louis International	0	0
NC	Charlotte	Charlotte/Douglas International	0	0
NC	Greensboro	Piedmont Triad International	0	0
NY	New York	John F Kennedy International	7,000,000.00	0
ОН	Cleveland	Cleveland-Hopkins International	0	3,535,000.00
ОН	Columbus	Port Columbus International	10,000,000.00	2,144,000.00
TN	Memphis	Memphis International	0	0
TX	Dallas-Fort Worth	Dallas/Fort Worth International	0	0
TX	Houston	George Bush Intercontinental/Houston	0	0
UT	St. George	New	0	0
VA	Washington	Washington Dulles International	9,000,000.00	0
WA	Seattle	Seattle-Tacoma International	0	0

State	City	Airport Name	Discretionary 2017	Entitlement 2017
AK	Anchorage	Ted Stevens Anchorage International	0	0
CA	Sacramento	Sacramento International	0	0
CO	Denver	Denver International	0	0
FL	Miami	Miami International	0	0
GA	Atlanta	Hartsfield - Jackson Atlanta International	0	0
IA	Cedar Rapids	The Eastern Iowa	0	0
IL	Chicago	Chicago O'Hare International	20,000,000.00	0
IN	Gary	Gary/Chicago International	0	0
IN	Indianapolis	Indianapolis International	0	0
KY	Covington	Cincinnati/Northern Kentucky International	0	0
LA	Baton Rouge	Baton Rouge Metropolitan, Ryan Field	0	0
MA	Boston	General Edward Lawrence Logan International	0	0
MD	Hagerstown	Hagerstown Regional-Richard A Henson Field	0	0
MN	Minneapolis	Minneapolis-St Paul Inter./Wold-Chamberlain	0	0
MO	St. Louis	Lambert-St Louis International	0	0
NC	Charlotte	Charlotte/Douglas International	0	0
NC	Greensboro	Piedmont Triad International	0	0
NY	New York	John F Kennedy International	0	0
ОН	Cleveland	Cleveland-Hopkins International	0	658,991.00
ОН	Columbus	Port Columbus International	4,109,000.00	2,186,000.00
TN	Memphis	Memphis International	0	0
TX	Dallas-Fort Worth	Dallas/Fort Worth International	0	0
TX	Houston	George Bush Intercontinental/Houston	0	0
UT	St. George	New	0	0
VA	Washington	Washington Dulles International	0	0
WA	Seattle	Seattle-Tacoma International	0	0

State	City	Airport Name	Discretionary 2018	Entitlement 2018
AK	Anchorage	Ted Stevens Anchorage International	0	0
CA	Sacramento	Sacramento International	0	0
CO	Denver	Denver International	0	0
FL	Miami	Miami International	0	0
GA	Atlanta	Hartsfield - Jackson Atlanta International	0	0
IA	Cedar Rapids	The Eastern Iowa	0	0
IL	Chicago	Chicago O'Hare International	20,000,000.00	0
IN	Gary	Gary/Chicago International	0	0
IN	Indianapolis	Indianapolis International	0	0
KY	Covington	Cincinnati/Northern Kentucky International	0	0
LA	Baton Rouge	Baton Rouge Metropolitan, Ryan Field	0	0
MA	Boston	General Edward Lawrence Logan International	0	0
MD	Hagerstown	Hagerstown Regional-Richard A Henson Field	0	0
MN	Minneapolis	Minneapolis-St Paul Inter./Wold-Chamberlain	0	0
MO	St. Louis	Lambert-St Louis International	0	0
NC	Charlotte	Charlotte/Douglas International	0	0
NC	Greensboro	Piedmont Triad International	0	0
NY	New York	John F Kennedy International	0	0
ОН	Cleveland	Cleveland-Hopkins International	0	0
ОН	Columbus	Port Columbus International	0	0
TN	Memphis	Memphis International	0	0
TX	Dallas-Fort Worth	Dallas/Fort Worth International	0	0
TX	Houston	George Bush Intercontinental/Houston	0	0
UT	St. George	New	0	0
VA	Washington	Washington Dulles International	0	0
WA	Seattle	Seattle-Tacoma International	0	0

State	City	Airport Name	Discretionary Beyond	Entitlement Beyond
AK	Anchorage	Ted Stevens Anchorage International	0	0
CA	Sacramento	Sacramento International	0	0
CO	Denver	Denver International	0	0
FL	Miami	Miami International	0	0
GA	Atlanta	Hartsfield - Jackson Atlanta International	0	0
IA	Cedar Rapids	The Eastern Iowa	0	0
IL	Chicago	Chicago O'Hare International	40,000,000.00	0
IN	Gary	Gary/Chicago International	0	0
IN	Indianapolis	Indianapolis International	0	0
KY	Covington	Cincinnati/Northern Kentucky International	0	0
LA	Baton Rouge	Baton Rouge Metropolitan, Ryan Field	0	0
MA	Boston	General Edward Lawrence Logan International	0	0
MD	Hagerstown	Hagerstown Regional-Richard A Henson Field	0	0
MN	Minneapolis	Minneapolis-St Paul Inter./Wold-Chamberlain	0	0
MO	St. Louis	Lambert-St Louis International	0	0
NC	Charlotte	Charlotte/Douglas International	0	0
NC	Greensboro	Piedmont Triad International	0	0
NY	New York	John F Kennedy International	0	0
ОН	Cleveland	Cleveland-Hopkins International	0	0
OH	Columbus	Port Columbus International	0	0
TN	Memphis	Memphis International	0	0
TX	Dallas-Fort Worth	Dallas/Fort Worth International	0	0
TX	Houston	George Bush Intercontinental/Houston	0	0
UT	St. George	New	0	0
VA	Washington	Washington Dulles International	0	0
WA	Seattle	Seattle-Tacoma International	0	0

State	City	Airport Name	Discretionary Total	Entitlement Total	
AK	Anchorage	Ted Stevens Anchorage International	32,480,000.00	27,571,221.00	
CA	Sacramento	Sacramento International	37,631,512.00	13,296,884.00	
CO	Denver	Denver International	22,000,000.00	0	
FL	Miami	Miami International	8,540,000.00	0	
GA	Atlanta	Hartsfield - Jackson Atlanta International	22,500,000.00	0	
IA	Cedar Rapids	The Eastern Iowa	7,500,000.00	3,000,000.00	
IL	Chicago	Chicago O'Hare International	220,000,000.00	6,500,000.00	
IN	Gary	Gary/Chicago International	27,844,597.00	6,000,000.00	
IN	Indianapolis	Indianapolis International	8,000,000.00	10,000,000.00	
KY	Covington	Cincinnati/Northern Kentucky International	8,000,000.00	0	
LA	Baton Rouge	Baton Rouge Metropolitan, Ryan Field	9,000,000.00	10,200,000.00	
MA	Boston	General Edward Lawrence Logan International	17,600,000.00	11,480,000.00	
MD	Hagerstown	Hagerstown Regional-Richard A Henson Field	3,400,000.00	600,000.00	
MN	Minneapolis	Minneapolis-St Paul Inter./Wold-Chamberlain	5,000,000.00	0	
MO	St. Louis	Lambert-St Louis International	8,500,000.00	4,249,717.00	
NC	Charlotte	Charlotte/Douglas International	54,000,000.00	25,500,000.00	
NC	Greensboro	Piedmont Triad International	6,000,000.00	21,715,513.00	
NY	New York	John F Kennedy International	77,200,000.00	0	
ОН	Cleveland	Cleveland-Hopkins International	13,170,000.00	23,827,991.00	
OH	Columbus	Port Columbus International	74,109,000.00	16,386,000.00	
TN	Memphis	Memphis International	4,823,000.00	0	
TX	Dallas-Fort Worth	Dallas/Fort Worth International	6,000,000.00	0	
TX	Houston	George Bush Intercontinental/Houston	13,050,000.00	10,024,000.00	
UT	St. George	New	64,000,000.00	6,000,000.00	
VA	Washington	Washington Dulles International	73,000,000.00	13,324,828.00	
WA	Seattle	Seattle-Tacoma International	28,275,000.00	28,766,958.00	

## TRUST FUND SHARE OF FAA Activities (AIRPORT AND AIRWAY TRUST FUND)

## **Program and Financing**

(in millions of dollars)

Identific	ation code: 69-8104-0-7-402	FY 2009 Actual	FY 2010 Enacted	FY 2011 Estimate
	Obligations by program activity:			
00.01	Payment to operations	5,238	4,000	6,064
10.00	Total new obligations	5,238	4,000	6,064
	Budgetary resources available for obligation:			
22.00	New budget authority (gross)	5,238	4,000	6,064
23.95	Total new obligations	-5,238	-4,000	-6,064
	New budget authority (gross), detail:			
	Discretionary:			
40.26	Appropriation (Trust Fund)	5,238	4,000	6,064
	Change in obligated balances:			
73.10	Total new obligations	5,238	4,000	6,064
73.20	Total outlays (gross)	-,5238	-4,000	-6,064
74.40	Obligated balance, start of year			
	Outlays (gross), detail:			
86.90	Outlays from new discretionary authority	5,238	4,000	6,064
	Net budget authority and outlays:			
89.00	Budget authority	5,238	4,000	6,064
90.00	Outlays	5,238	4,000	6,064

For 2011, the Budget proposes \$9,793 million for FAA Operations, of which \$6,064 million would be provided from the Airport and Airway Trust Fund.

### **Object Classification**

(in millions of dollars)

		FY 2009	FY 2010	FY 2011
Identific	ation code: 69-8104-0-7-40	Actual	Enacted	Estimate
	Direct obligations:			_
19.40	Financial Transfers	5,238	4,000	6,064

#### **AIRPORT AND AIRWAY TRUST FUND**

#### Program and Financing (in millions of dollars)

·		FY2009	FY 2010	FY 2011
Identific	ation code: 20-8103-0-7-402	Actual	Enacted	Estimate
	Memorandum (non-add) entries:			
92.01	Total investments, start of year: Federal securities:	7,674	7,829	9,249
	Par value			
92.02	Total investments, end of year: Federal securities:	7,829	9,249	9,257
	Par value			

Section 9502 of Title 26, U.S. Code, provides for amounts equivalent to the funds received in the Treasury for the passenger ticket tax and certain other taxes paid by airport and airway users to be transferred to the Airport and Airway Trust Fund. In turn, appropriations are authorized from this fund to meet obligations for airport improvement grants, FAA facilities and equipment, research, operations, payment to air carriers, and for the Bureau of Transportation Statistics Office of Airline Information.

The status of the fund is as follows:

## Status of Funds (in millions of dollars)

Idoptific	FY 2010 Enacted	FY 2011 Estimate		
ruentinc	ation code: 20-8103-0-7-402 Unexpended balance, start of year:	Actual	Enacted	Estimate
01.00	Balance, start of year	9,705	8,780	10,358
01.00	Adjustments:	7,703	0,700	10,550
01.91	Kerosene tax adjustment			
01.99	Total balance, start of year	9,705	8,780	10,358
01.77	Cash Income during the year:	7,703	0,700	10,330
	Current law:			
	Receipts			
12.00	Excise Taxes, Airport and Airway Trust Fund [021-00-	10,569	11,798	12,493
12.00	810310-0]	10,007	11,770	12,170
	Offsetting receipts (intragovernmental):			
12.40	Interest, Airport and Airway Trust Fund [021-00-810320-0].			
12.10	morest, rimport and rim way mast rand [621 66 616626 6].	308	216	246
12.41	Interest, Airport and Airway Trust Fund [021-00-810320-0]			
	Offsetting collections:			
12.80	Grants-in-aid for Airports (Airport and Airway Trust Fund)		1	1
	[021-12-8106-0]		•	
12.81	Facilities and Equipment (Airport and Airway and Airport	6	47	47
	Trust Fund [021-12-8107-0]			
12.82	Facilities and Equipment (Airport and Airway and Airport	75	93	93
	Trust Fund [021-12-8107-0]			
12.83	Research, engineering and development (Airport and Airway	1	16	16
	Trust Fund) [021-12-8108]			
12.99	Income under present law	10,959	12,171	12,896
32.99	Total cash income	10,959	12,171	12,896
	Cash outgo during year:			
	Current law:			
45.00	Payments to Air Carriers [021-12-8304-0]	-85	-119	-139
45.01	Grants-in-aid for Airports [021-12-8106-0]	-3,876	-3,389	-3,387
45.02	Facilities and Equipment (Airport and Airway Trust Fund)	-2,541	-2,881	-3,071
	[021-12-8107-0]			
45.03	Research, Engineering and Development (Airport and Airway	-144	-204	-225
	Trust Fund) [021-12-8108-0]			
45.04	Trust Fund Share of FAA Activities (Airport and Airway Trust			
	Fund) [021-12-8104-0]	-5,238	-4,000	-6,064
45.99	Outgo under current law (-)	-11,884	-10,593	-12,886
65.99	Total Cash outgo (-)	-11,884	-10,593	-12,886
	Unexpended balance, end of year:			
87.00	Uninvested balance (net), end of year	951	1,109	1,111
87.01	Airport and Airway Trust Fund	7,829	9,249	9,257
87.99	Total balance, end of year	8,780	10,358	10,368
	Commitments against unexpended balance, end of year:			
98.99	Total commitments (-)	-8,481	-8,927	-9,068
99.00	Uncommitted balance, end of year	299	1,431	1,300

#### **AVIATION USER FEES**

#### **Special and Trust Fund Receipts**

(in millions of dollars)

		FY 2009	FY 2010	FY 2011
Identific	ation code: 69-5422-0-2-402	Actual	Enacted	Estimate
	Balance, start of year:			
01.00	Balance, start of year		30	32
01.99	Balance, start of year		30	32
	Receipts:			
02.00	Aviation User Fee, Overflight Fee[69-542240-0-000-R0000-01]	57	52	54
02.99	Total receipts and collections	57	52	54
04.00	Total Balances and collections	57	82	86
	Appropriations:			
05.00	Aviation user fees[69-5422-0-402-P-6020-01]	-27	-50	-50
05.99	Total Appropriations	-27	-50	-50
07.99	Balance, end of year	30	32	36

#### **Program and Financing**

(in millions of dollars)

	FY 2009	FY 2010	FY 2011
Identification code: 69-5422-0-2-402	Actual	Enacted	Estimate
Budget resources available for obligation:			
21.40 Unobligated balance carried forward, start of year	23		
22.21 Unobligated balance transferred to other accounts (69-5423)	-23		
23.90 Total budgetary resources available for obligation			
24.40 Unobligated balance carried forward, end of year			
New budget authority (gross), detail:			
Mandatory:			
60.20 Appropriations (special fund) [69-5422-0-402-N-0500-01]	27	50	50
61.00 Transferred to other accounts [69-5423]	27	-50	-50
62.50 Appropriation (total mandatory)			
Net budget authority and outlays:			
89.00 Budget authority			
90.00 Outlays			

The Federal Aviation Reauthorization Act of 1996 (P.L. 104-264) authorized the collection of user fees for air traffic control and related services provided by the FAA to aircraft that neither take off nor land in the United States, commonly known as over-flight fees. The Budget estimates that \$54 million in over flight fees will be collected in 2011.

#### **AVIATION INSURANCE REVOLVING FUND**

## **Program and Financing**

(in millions of dollars)

Identification code: 69-4120-0-3-402  FY 2009 FY 2010 FY 2 Actual Enacted Estir					
Tabilitio	Obligations by program activity:	notadi	Eriadioa	Estimate	
09.01	Program administration	7	6	6	
10.00	Total new obligations	7	6	6	
	Budget resources available for obligation:				
21.40	Unobligated balance carried forward, start of year	1,137	1,311	1,498	
22.00	New budget authority (gross)		193	197	
23.90	Total budgetary resources available for obligation	1,318	1,504	1,695	
23.95	Total new obligations		-6	-6	
24.40	Unobligated balance carried forward, end of year	1,311	1,498	1,689	
	New budget authority (gross), detail:				
	Mandatory:				
69.00	Offsetting collections (cash)	181	193	197	
	Change in obligated balances:				
72.40	Obligated balance, start of year	6	7	7	
73.10	Total new obligations	7	6	6	
73.20	Total outlays (gross)		-6	-6	
74.40	Obligated balance, end of year	7	7	7	
	Outlays (gross), detail:				
86.97	Outlays from new mandatory authority	5	6	6	
86.98	Outlays from mandatory balances	1			
87.00	Total outlays (gross)	6	6	6	
	Offsets:				
	Against gross budget authority and outlays:				
	Offsetting collections (cash) from:				
88.20	Interest on Federal securities	38	35	45	
88.40	Non-Federal sources		158	152	
88.90	Total, offsetting collections (cash)	181	193	197	
	Net budget authority and outlays:				
89.00	Budget authority				
90.00	Outlays	-175	-187	-191	
00.01	Memorandum (non-add) entries:	4.070	4.071	4 407	
92.01	Total investments, start of year: Federal securities: Par value	1,078	1,271	1,497	
92.02	Total investments, end of year: Federal securities: Par value	1,271	1,497	1,637	

The fund provides direct support for the aviation insurance program (chapter 443 of title 49, U.S. Code). Income to the fund is derived from premium collections for premium insurance coverage issued, income from authorized investments, and binder fees for nonpremium coverage issued. The binders provide aviation insurance coverage for U.S. air carrier aircraft used in connection with certain Government contract operations by the Department of Defense and the Department of State.

The Homeland Security Act of 2002 (P.L. 107-296) required the Secretary to provide additional war risk insurance coverage (Hull Loss and Passenger and Crew Liability) to air carriers insured for Third-Party War Risk Liability as of June 19, 2002, as authorized under existing law. Continuation of this coverage was subsequently directed by several appropriations and authorization acts, the last being the FY 2010 Federal Aviation Administration Extension Act Part II, which extends the requirement to provide insurance coverage through March 31, 2010. The Budget contains no policy recommendation for the aviation insurance program and displays baseline funding for the program in 2011.

The Secretary is authorized to limit an air carrier's third party liability to \$100 million, when the Secretary certifies that the loss was from an act of terrorism. The FAA insurance policy covers: (i) hull losses at agreed value; (ii) death, injury, or property loss to passengers or crew, the limit being the same as that of the air carrier's commercial coverage before September 11, 2001; and (iii) third party liability, the limit generally being twice that of such coverage.

#### **Object Classification**

(in millions of dollars)

		FY 2009	FY 2010	FY 2011
Identification code: 69-4120-0-3-402		Actual	Enacted	Estimate
	Reimbursable obligations:			
21.11	Personnel Compensation: Full time permanent	1	1	1
24.40	Refunds	6	5	5
29.90	Subtotal, obligations, reimbursable obligations	7	6	6
99.99	Total new obligations	7	6	6

#### **Employment Summary**

		FY 2009	FY 2010	FY 2011
Identification	code: 69-4120-0-3-402	Actual	Enacted	Estimate
	Reimbursable:			
20.01	Civilian full-time equivalent employment	5	5	5

#### ADMINISTRATIVE SERVICES FRANCHISE FUND

# Program and Financing (in millions of dollars)

Identific	ation code: 69-4562-0-4-402	FY 2009 Actual	FY 2010 Enacted	FY 2011 Estimate
	Obligations by program activity:	•	·	
09.01	Accounting Services	68	50	52
09.04	Information Services	101	93	96
09.05	Duplicating Services	6	5	5
09.06	Multi Media	2	2	2
09.07	CMEL/Training	11	13	13
09.08	International Training	3	3	3
09.10	Logistics	223	235	235
09.11	Aircraft Maintenance	60	57	58
09.12	Acquisition	00	9	10
09.99	Total reimbursable program	474	467	474
10.00	Total new obligations			
10.00		474	467	474
21.40	Budget resources available for obligation:	102	174	150
	Unobligated balance carried forward, start of year	193	174	158
22.00	New budget authority (gross)	435	451	449
22.10	Resources available from recoveries of prior year Obligations	20		
23.90	Total budgetary resources available for obligation	648	625	607
23.95	Total new obligations		-467	-474
24.40	Unobligated balance carried forward, end of year	174	158	133
	New budget authority (gross), detail:			
	Discretionary:			
	Spending authority from offsetting collections:			
58:00	Offsetting collections (cash)	494	451	449
58.10	Change in uncollected customer payments from federal			
	sources (unexpired)			
58:90	Spending authority from offsetting collections (total	435	451	449
	discretionary)			
70.40	Change in obligated balances:		1.10	
72.40	Obligated balance, start of year	63	149	44
73.10	Total new obligations	474	467	474
73.20	Total outlays (gross)	-427	-572	-453
73.45	Recoveries of prior year obligations	-20		
74.00	Change in uncollected customer payments from federal			
	sources (unexpired)	59		
74.40	Obligated balance, end of year	149	44	65
	Outlays (gross), detail:			
86.90	Outlays from new discretionary authority	325	307	305
86.93	Outlays from Discretionary balances		265	148
87.00	Total Outlays (gross)	427	572	453
07.00	Offsets:	127	372	100
	Against gross budget authority and outlays:			
88.00	Offsetting collections (cash) from: Federal Sources	494	451	449
00.00	Against gross budget authority only:	171	101	117
88.95	Change in uncollected customer payments from Federal			
00.70	Sources (unexpired)	-59		
	Net budget authority and outlays:	-57	*******	********
89.00	Budget authority			
90.00	Outlays	-67	121	4
70.00	Outlays	-07	121	4

In 1997, the Federal Aviation Administration established a franchise fund to finance operations where the costs for goods and services provided are charged to the users on a reimbursable basis. The fund improves organizational efficiency and provides better support to FAA's internal and external customers. The activities included in this franchise fund are: training, accounting, payroll, travel, duplicating services, multimedia services, information technology, material management (logistics), and aircraft maintenance.

#### **Object Classification**

(in millions of dollars)

		FY 2009	FY 2010	FY 2011
Identific	ation code: 69-4562-0-4-402	Actual	Enacted	Estimate
	Reimbursable obligations:			
21.11	Personnel compensation: Full-time permanent	111	125	129
21.21	Civilian personnel benefits	29	33	35
22.10	Travel and transportation of persons	5	6	6
22.20	Transportation of things	5	4	5
22.33	Communications, utilities, and miscellaneous charges	18	16	16
22.40	Printing and reproduction	2	1	1
22.52	Other services	200	170	174
22.60	Supplies and materials	86	91	94
23.10	Equipment	18	21	14
29.90	Subtotal, Obligations, Reimbursable obligations	474	467	474
99.99	Total new obligations	474	467	474

#### **Employment Summary**

		FY 2009	FY 2010	FY 2011
Identificatio	n code: 69-4562-0-4-402	Actual	Estimate	Estimate
	Reimbursable:			
2001	Civilian full-time equivalent employment	1,453	1,452	1,467

#### FACILITIES AND EQUIPMENT, RECOVERY ACT

## **Program and Financing**

(in millions of dollars)

Identifi	cation code: 69-1304-0	FY 2009	FY 2010	FY 2011
		Actual	Estimate	Estimate
	Obligations by program activity:			
	Direct program:			
00.01	Power systems	30	20	
00.02	Modernize aging en route air traffic control centers	42	8	
00.03	Replace air traffic control towers (ATCT/TRACONS)		80	
00.04	Install airport lighting, navigation and landing equipment	18	<u>2</u>	
10.00	Total new obligations	90	110	
	Budgetary resources available for obligation:			
21.40	Unobligated balance carried forward, start of year		110	
22.00	New budget authority (gross)	200		
23.90	Total budgetary resources available for obligation	200	110	
23.95	Total new obligations	-90	-110	
24.40	Unobligated balance carried forward, end of year	110		
	New budget authority (gross), detail:			
	Discretionary:			
40.00	Appropriation (Recovery Act)	200		
	Change in obligated balances:			
72.40	Obligated balance, start of year:		88	110
73.10	Total new obligations	90	110	
73.20	Total outlays (gross)	-2	-88	-110
74.40	Obligated balance, end of year	88	110	
	Outlays (gross), detail:			
86.90	Outlays from new discretionary authority	2		
86.93	Outlays from discretionary balances		88	110
87.00	Total outlays (gross)	2	88	110
	Net budget authority and outlays			
89.00	Budget authority	200		
90.00	Outlays	2	88	110
95.02	Unpaid obligations, end of year	88		

The American Recovery and Reinvestment Act of 2009 provided \$200 million to FAA's Facilities & Equipment (F&E) account, which finances major capital investments related to modernizing and improving air traffic control and airway facilities, equipment, and systems. Funds were appropriated from the General Fund of the U.S. Treasury and available for obligation through FY 2010. The funding is being used to upgrade, modernize, and improve FAA power systems, air route traffic control centers, air traffic control towers, terminal radar approach control facilities, and navigation and landing equipment.

## Object Classification (in millions of dollars)

		FY 2009	FY 2010	FY 2011
Identification code: 69-1304-0		Actual	Estimate	Estimate
	Direct obligations:			_
12.52	Other services	27	33	
12.60	Supplies and materials	2	3	
13.10	Equipment	10	12	
13.20	Land and structures	51	62	
99.99	Total new obligations	90	110	

#### **GRANTS-IN-AID FOR AIRPORTS, RECOVERY ACT**

#### **Program and Financing**

(in millions of dollars)

		FY 2009	FY 2010	FY 2011
Identifi	cation code: 69-1306-0	Actual	Estimate	Estimate
	Obligations by program activity:			
	Direct Program:			
00.01	Grants-in-aid for airports	1,078	20	
00.02	Administrative Oversight	1	1	
10.00	Total new obligations	1,079	21	
	Budgetary resources available for obligation:			
22.00	New budget authority (gross)	1,100	21	
23.95	Total new obligations	-1,079	-21	
	New budget authority (gross), detail:			
	Discretionary:			
40.01	Appropriation (Recovery Act)	1,100		
	Change in obligated balances:	_		
72.40	Obligated balance, start of year		900	330
73.10	Total new obligations	1,079	21	
73.20	Total outlays (gross)	-179	-591	-220
74.40	Obligated balance, end of year	900	330	110
	Outlays (gross), detail:	_	_	
86.90	Outlays from new discretionary authority	179		
86.93	Outlays from discretionary balances		591	220
87.00	Total outlays (gross)	179	591	220
	Net budget authority and outlays:			
89.00	Budget authority	1,100		
90.00	Outlays	179	591	220

The American Recovery and Reinvestment Act of 2009 provided \$1.1 billion for Grants-in-Aid for Airports (AIP). Funds are appropriated from the General Fund of the U.S. Treasury and are available for obligation through FY 2010. These funds are being allocated to qualified airports as discretionary grants, and will be distributed based on a project priority system that addresses airport safety and security, infrastructure, runway safety, increased capacity, and mitigation of environmental impacts.

#### **Object Classification**

(in millions of dollars)

		FY 2009	FY 2010	FY 2011
Identifi	cation code: 69-1306-0	Actual	Estimate	Estimate
	Direct obligations:			
	Personnel compensation			
11.5	Other personnel compensation	1	1	
14.10	Grants, subsidies, and contributions	1,078	20	
99.9	Total new obligations	1,079	21	

## FAA Administrative Provisions in FY 2011 President's Budget

Proposed Language	Justification
Sec. 110. The Administrator of the Federal Aviation Administration may reimburse amounts made available to satisfy 49 U.S.C. 41742(a)(1) from fees credited under 49 U.S.C. 45303: Provided, That during fiscal year 2011, 49 U.S.C. 41742(b) shall not apply, and any amount remaining in such account at the close of that fiscal year may be made available to satisfy section 41742(a)(1) for the subsequent fiscal year.	In order to satisfy 49 U.S.C. 41742(a)(1), at the beginning of each fiscal year FAA makes available to the Essential Air Services (EAS) program \$50 million from the Facilities & Equipment (F&E) account. This provision allows FAA to reimburse F&E from the overflight fees collected and is needed in order to continue the practice in FY 2011.
Sec. 111. Amounts collected under section 40113(e) of title 49, United States Code, shall be credited to the appropriation current at the time of collection, to be merged with and available for the same purposes of such appropriation.	As authorized under 49 USC 40113(e), the FAA may provide safety-related training and operational services to foreign aviation authorities with or without reimbursement. While FAA generally enforces a prepayment policy for reimbursable goods and services provided to foreign countries or international organizations, many have laws or regulations similar to the U.S. that prohibit advance payments. In those instances, FAA often receives payments for services provided during a fiscal year after that year has ended. This provision allows FAA to use the funds for additional technical assistance work that cannot be prepaid, instead of returning the funds to a lapsed appropriation.
Sec. 112. None of the funds limited by this Act for grants under the Airport Improvement Program shall be made available to the sponsor of a commercial service airport if such sponsor fails to agree to a request from the Secretary of Transportation for cost-free space in a non-revenue producing, public use area of the airport terminal or other airport facilities for the purpose of carrying out a public service air passenger rights and consumer outreach campaign.	This provision requires airports to make space available, at the request of the Secretary, in the public use areas of a terminal (both non-revenue and revenue-producing areas) for an air passenger rights and consumer outreach campaign. The space includes areas that are currently leased to airline tenants.
Sec. 113. None of the funds in this Act shall be available for paying premium pay under 5 U.S.C. 5546(a) to any Federal Aviation Administration employee unless such employee actually performed work during the time corresponding to such premium pay.	This provision has historically been included in the appropriations language under the Operations account heading. The provision stems from past legal action taken by air traffic controllers to receive premium pay for a full shift, even if only part of the shift was eligible for premium pay. The FAA recommends including this provision as a GP that would apply to all FAA accounts. FAA also recommends keeping this provision for FY 2011 in order to minimize potential payroll liability.
Sec. 114. None of the funds in this Act may be obligated or expended for an employee of the Federal Aviation Administration to purchase a store gift card or gift certificate through use of a Government-issued credit card.	This provision prohibits FAA employees from using a government-issued credit card to purchase a store gift card or gift certificate. This provision has historically been included in the appropriations language under the Operations account heading. FAA recommends including this provision as a GP that would apply to all FAA accounts.

#### FEDERAL AVIATION ADMINISTRATION

#### **OPERATIONS**

#### **ESTIMATES**

#### **APPROPRIATIONS**

2001	<sup>1</sup> 6,592,235,000		<sup>2</sup> <sup>3</sup> 6,515,837,683
		2001	<sup>4</sup> 123,000,000
2002	<sup>5</sup> 6,886,000,000	2002	<sup>6</sup> 6,886,000,000
		2002	<sup>7</sup> 200,000,000
			<sup>8</sup> -5,681,000
2003	<sup>9 10</sup> 7,481,970,000	2003	11 12 137,019,170,377
2004	<sup>14</sup> 7,590,648,000	2004	<sup>15</sup> <sup>16</sup> 7,479,206,153
2005	<sup>17</sup> 7,849,000,000	2005	
2006	<sup>20</sup> 218,201,000,000	2006	<sup>23</sup> <sup>24</sup> 8,104,140,000
2007	<sup>22</sup> 8,366,000,000	2007	<sup>25</sup> 8,374,374,217
2008	<sup>26</sup> 8,725,783,000	2008	<sup>30</sup> 8,740,000,000
	<sup>27</sup> 8,998,461,700	2009	<sup>31</sup> 9,046,167,000
2010	<sup>28</sup> 9,335,798,000	2010	<sup>32</sup> 9,350,028,000
2011	<sup>29</sup> 0 702 000 000		

#### FEDERAL AVIATION ADMINISTRATION

<sup>&</sup>lt;sup>1</sup> Administration proposed 100 percent funding from the Airport and Airway Trust Fund.

<sup>&</sup>lt;sup>2</sup> Reflects administrative rescission of .22 percent per P.L. 106-554 and \$14,000,000 transfer to the Essential Air Service.

<sup>&</sup>lt;sup>3</sup> Includes \$4,405,156,288 from the Airport and Airway Trust Fund.

<sup>&</sup>lt;sup>4</sup> P.L. 107-38, Emergency Supplemental Appropriations Act for Recovery from and Response to Terrorist Attacks on the U.S., FY 2001.

<sup>&</sup>lt;sup>5</sup> Includes \$5,777,219,000 from the Airport and Airway Trust Fund.

<sup>&</sup>lt;sup>6</sup> Includes \$5,773,519,000 from the Airport and Airway Trust Fund.

Emergency Supplemental Funding included in P.L. 107-117, FY 2002 Department of Defense Appropriations Bill.

<sup>&</sup>lt;sup>8</sup> Reflects Administrative and Travel Rescission per P.L. 107-206;\$5,542,000 from General Fund and \$139,000 from Trust.

<sup>&</sup>lt;sup>9</sup> FY 2003 includes \$404,768,000 for CSRS/Health benefit accruals proposed by the Administration.

<sup>&</sup>lt;sup>10</sup> Includes 3,799,278,000 from Airport and Airway Trust Fund.

Includes \$3,774,582,693 from Airport and Airway Trust Fund and \$3,248,064,934 from General Fund.

 $<sup>^{12}</sup>$  Reflects 0.65 percent across-the-board rescission per P.L. 108-7 and Working Capital Fund cut of \$3.9M.

<sup>13</sup> Excludes Midway Island Airfield earmark for \$3,500,000—reduced to \$3,477,250 by 0.65 rescission.

<sup>&</sup>lt;sup>14</sup> Administration proposes \$6,000,000,000 from Airport and Airway Trust Fund.

Reflects 0.59 percent across-the-board rescission per P.L. 108-199; Working Capital Fund cut by \$7.3M.

<sup>&</sup>lt;sup>16</sup> Includes \$4,469,000,000 from Airport Airway Trust Fund.

<sup>&</sup>lt;sup>17</sup> Includes \$6,002,000,000 from Airport and Airway Trust Fund with \$2M for Bureau of Transportation Statistics.

Reflects 0.80 percent across-the-board rescission per P.L. 108-447 and Working Capital Fund cut of \$6.3M.

<sup>&</sup>lt;sup>19</sup> Includes \$\$4,878,728,416 from Airport and Airway Trust Fund.

<sup>&</sup>lt;sup>20</sup> Includes \$6,500,000,000 from the Airport and Airway Trust Fund.

<sup>&</sup>lt;sup>21</sup> Includes \$150,000,000 for Flight Service Station A-76 Competition.

<sup>&</sup>lt;sup>22</sup> Includes \$5,445,000,000 from Airport and Airway Trust Fund. <sup>23</sup> Reflects 1.0 percent across-the-board rescission per P.L. 109-148.

<sup>&</sup>lt;sup>24</sup> Includes \$5,541,000,000 from Airport and Airway Trust Fund.

<sup>&</sup>lt;sup>25</sup> Includes \$5,627,900,000 from Airport and Airway Trust Fund

<sup>&</sup>lt;sup>26</sup> Includes \$6,243,027,000 from Airport and Airway Trust Fund. FAA did not request funding for this account in FY 2008. Funding was requested in

the proposed Safety and Operations and Air Traffic Organization accounts. The Operations amount is shown here for comparative purposes.

Includes \$6,280,973,000 from Airport and Airway Trust Fund. FAA did not request funding for this account in FY 2009. Funding was requested in the proposed Safety and Operations and Air Traffic Organization accounts. The Operations amount is shown here for comparative purposes.

28 Includes \$6,207,798,000 from Airport and Airway Trust Fund.

<sup>&</sup>lt;sup>29</sup> Includes \$6,064,000,000 from Airport and Airway Trust Fund.

<sup>30</sup> Includes \$6,397,061,000 from Airport and Airway Trust Fund.

<sup>31</sup> Includes \$5,238,005,000 from Airport and Airway Trust Fund. Also includes \$3.7 million transfer from the U.S. Department of State.

<sup>&</sup>lt;sup>32</sup> Includes \$4,000,000,000 from Airport and Airway Trust Fund.

FACILITIES AND EQUIPMENT (AIRPORT AND AIRWAY TRUST FUND)

ESTIMATES	APPROPRIATIONS
20012,495,000,000	2001 <sup>33</sup> 2,650,920,117
20022,914,000,000	20022,914,000,000
	2002 <sup>34</sup> -15,000,000
	2002 <sup>35</sup> 108,500,000
27	2002 Rescission <sup>36</sup> -1,726,000
2003 <sup>37</sup> 2,981,022,000	2003 <sup>38</sup> 2,961,645,357
	2003 Rescission <sup>39</sup> -20,000,000
20042,916,000,000	2004 <sup>40</sup> 2,892,831,000
	2004 Rescission
20052,500,000,000	2005
	2005 Supplemental (P.L.108-
2007	324) <sup>43</sup> 5,100,000
20062,448,000,000	2006
2007	2006
20072,503,000,000 2008 <sup>46</sup> 2,461,566,000	2007
2009	2009 <sup>2,</sup> 742,095,000
20102,925,202,000	2009 Supplemental (P.L.111- 5) <sup>48</sup> 200,000,000
20112,970,000,000	2010 <sup>2,</sup> 936,203,000
20112,770,000,000	2010 930,203,000

<sup>&</sup>lt;sup>33</sup> Includes administrative rescission of .22 percent per P.L. 106-554.

<sup>&</sup>lt;sup>34</sup> Rescission of unobligated balances per P.L. 107-87.

Emergency Supplemental Funding included in P.L. 107-117, FY 2002 Department of Defense Appropriations Bill.

<sup>&</sup>lt;sup>36</sup> Administrative and Travel rescission per P.L. 107-206.

<sup>&</sup>lt;sup>37</sup> FY 2003 request excludes \$18,551,000 for CSRS/Health benefit accruals proposed by the Administration.

Reflects 0.65 percent across-the-board rescission of per P.L. 108-7.

<sup>&</sup>lt;sup>39</sup> Rescission of unobligated balances.

<sup>&</sup>lt;sup>40</sup> Reflects 0.59 percent across-the-board rescission per P.L. 108-199.

<sup>&</sup>lt;sup>41</sup> Rescission of unobligated balances.

<sup>&</sup>lt;sup>42</sup> Reflects 0.80 percent across-the-board rescission per P.L. 108-447.

Reflects 0.80 percent across-the-board rescission per P.L. 108-447.
 American Recovery and Reinvestment Act Supplemental per P.L. 111-5, from the General Fund.
 Reflects 1.0 percent across-the-board rescission, per P. L. 109-148.
 Hurricane Supplemental fund per P.L. 109-148
 FAA did not request funding for this account in FY 2008. Funding was requested in the proposed Safety and Operations and Air Traffic Organization accounts. The Facilities and Equipment amount is shown here for comparative purposes.
 FAA did not request funding for this account in FY 2009. Funding was requested in the proposed Safety and Operations and Air Traffic Organization request funding for this account in FY 2009. Funding was requested in the proposed Safety and Operations and Air Traffic Organization request funding for this account in FY 2009.

accounts. The Facilities amount is shown here for comparative purposes.

48 American Recovery and Reinvestment Act Supplemental per P.L. 111-5, from the General Fund.

#### FEDERAL AVIATION ADMINISTRATION

RESEARCH, ENGINEERING, AND DEVELOPMENT

ESTIMAT	ES	APPROPR	IATIONS
2001		2001	<sup>49</sup> 186,588,600
2002	187,781,000	2002	
		2002	<sup>50</sup> 50,000,000
		2002 Rescission	<sup>51</sup> -161,000
2003	126,744,000	2003	<sup>52</sup> 147,485,075
2004	100,000,000	2004	<sup>53</sup> 118,734,310
2005		2005	<sup>54</sup> 129,879,584
2006	130,000,000	2006	<sup>55</sup> 136,620,000
2007		2007	
2008		2008	
2009	<sup>57</sup> 171,028,000	2009	171,000,000
2010		2010	190,500,000
2011	190,000,000		

Includes rescission of .22 percent per P.L. 106-554.
 Emergency Supplemental Funding included in P.L. 107-117, FY 2002 Department of Defense Appropriations Bill.
 Administrative and Travel rescission per P.L. 107-206.
 Reflects a 0.65 percent across-the-board rescission per P.L. 108-7.
 Reflects a 0.59 percent across-the-board rescission per P.L. 108-199.
 Reflects a 0.80 percent across-the-board rescission per P.L. 108-447.
 Reflects a 1.0 percent across-the-board rescission of 1.0 percent per P.L. 109-148.
 Includes \$122,867,000 from the Airport and Airway Trust Fund.
 Includes \$156,003,000 from the Airport and Airway Trust Fund.

#### FEDERAL AVIATION ADMINISTRATION

GRANTS-IN-AID FOR AIRPORTS (LIQUIDATION OF CONTRACT AUTHORIZATION) (AIRPORT AND AIRWAY TRUST FUND)

	ESTIMATES	APPROPRIATIONS	
2001	1,960,000,000	2001	3,200,000,000
		2001 Rescission	579,000,000
2002	1,800,000,000	2002	1,800,000,000
2002 Rescission	331,000,000	2002 Rescission	
		2002	<sup>59</sup> 175,000,000
2003	3,100,000,000	2003	
2004	3,400,000,000	2004	3,400,000,000
2005	2,800,000,000	2005	2,800,000,000
2006	3,300,000,000	2006	3,399,000,000
2007	4,000,000,000	2007	4,399,000,000
2008	4,300,000,000	2008	4,399,000,000
2009	3,600,000,000	2009	3,600,000,000
2010	3,000,000,000	2009 Supplemental (P.L. 111-5)	<sup>60</sup> 1,100,000,000
2011	3.550.000.000	2010	3.000.000.000

 <sup>&</sup>lt;sup>58</sup> Rescission of Contract Authority per P.L. 107-87.
 <sup>59</sup> Emergency Supplemental Funding included in P.L. 107-117, FY 2002 Department of Defense Appropriations Bill.
 <sup>60</sup> American Recovery and Reinvestment Act Supplemental, per P.L. 111-5, from the General Fund.

#### FEDERAL AVIATION ADMINISTRATION

GRANTS-IN-AID FOR AIRPORTS LIMITATION ON OBLIGATIONS (AIRPORT AND AIRWAY TRUST FUND)

ESTIMATES		APPROPRIATIONS
2001	. (1,950,000,000)	2001
2001 (Proposed Supp.)	(-50,000,000)	
2002	(3,300,000,000)	2002 <sup>63</sup> (3,474,944,000)
2003	. (3,400,000,000)	2003
2004	. (3,400,000,000)	2004
		2004 <sup>66</sup> (1,988,200)
2005		2005 <sup>67</sup> (3,497,000,000)
2006	. (3,000,000,000)	2006(3,514,500,000)
2007	. (2,750,000,000)	2007(3,514,500,000)
2008		2008(3,514,500,000)
2009	. (2,750,000,000)	2009(3,514,500,000)
2010	. (3,515,000,000)	2010(3,515,000,000)
2011	. (3,515,000,000)	

Reflects administrative rescission of .22 percent per P.L. 106-554.
 Includes direct appropriation of \$2,494,500 for Huntsville, Alabama, and reflect a .22 percent rescission pursuant to P.L. 106-554.
 Includes direct appropriation, DOD supplemental of \$175,000,000 per P.L. 107-117 and reflects admin. rescission of \$-56,000 per P.L. 107-206.
 Reflects 0.65 percent across-the-board rescission per P.L. 108-7.
 Reflects 0.59 percent across-the-board rescission per P.L. 108-199.
 Direct appropriation from General Fund for Ft. Worth Alliance Airport, pursuant to Division H, Section 167, P.L. 108-199.
 Includes 0.80 percent across-the-board rescission per P.L. 108-447 and includes a \$25,000,000 Hurricane supplemental per P.L. 108-324.

## **PERFORMANCE BUDGET**

# EXHIBIT IV-1 BUDGET REQUEST BY STRATEGIC GOAL

The performance sections of the FY 2011 budget submission align with the current FY 2006 – 2011 DOT Strategic Plan. DOT will release a new strategic plan in FY 2010 that will detail the Department's new priorities and areas of emphasis. DOT expects the performance sections of the FY 2012 budget submission will be aligned to this new strategic plan.

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# EXHIBIT IV-1 FY 2011 BUDGET REQUEST BY STRATEGIC GOAL AND PERFORMANCE GOAL Appropriations, Obligation Limitations, & Exempt Obligations (\$000)

STRATEGIC & PERFORMANCE GOALS BY PERFORMANCE MEASURE	FY 2009 ACTUAL <sup>1</sup>	FY 2010 ENACTED	FY 2011 REQUEST <sup>5</sup>
1. SAFETY STRATEGIC GOAL			
A. <u>Aviation Safety</u>			
a. Reduce the Commercial Air Carrier Fatality Rate	8,654,532	4,646,774 2	6,396,396
<ul><li>b. Reduce the General Aviation Fatal Accident Rate</li><li>e. Other (Maintain Zero Commercial Space Transportation</li></ul>	1,520,800	2,339,061 <sup>2</sup>	2,216,863
Accidents - FAA Flight Plan measure)	15,007	16,245	10,233
Subtotal Aviation Safety	10,190,339	7,002,081	8,623,491
B. <u>Hazardous Materials Safety</u>			
a. Reduce Serious Hazardous Materials Incidents	23,700	24,509	63,767
Subtotal Hazardous Materials Safety	23,700	24,509	63,767
Total – Safety Strategic Goal	10,214,040	7,026,590	8,687,258
2. REDUCED CONGESTION STRATEGIC GOAL			
A. Meet Air Transportation Demand			
a. Increase NAS On-Time Arrival Rate at the 35 OEP			
Airports	462,689	1,762,246	2,463,125
b. Increase Average Daily Airport Capacity for the 35 OEP	4 004 4E0	4,895,650	4,647,336
Airports Subtotal Meet Air Transportation Demand	4,884,459 <b>5,347,148</b>	6,657,896 <sup>2</sup>	7,110,461
Subtotal Meet All Transportation Demand	3,347,140	0,037,070	7,110,401
Total – Reduced Congestion Strategic Goal	5,347,148	6,657,896	7,110,461
3. GLOBAL CONNECTIVITY STRATEGIC GOAL			
A. Sustained International Leadership			
a. Secure a Yearly Increase in External Funding for Global			
Safety Initiatives (FY 2009 only)	18,505		
<ul> <li>a. Promote International Aviation Development Projects</li> <li>(FY 2010 &amp; FY 2011)</li> </ul>		18,962	65,928
Subtotal Sustained International Leadership	18,505	18,962	65,928
B. <u>Harmonized Regulatory and Facilitation</u>			
Requirements <sup>3</sup>			
a. Conclude Bilateral Aviation Safety Agreements			
and			
b. Expand the Use of NextGen Performance-Based			
Systems or Concepts in Priority Countries	43,838	48,896	9,631
Subtotal Regulatory and Facilitation		45 4	
Requirements	43,838	48,896 <sup>4</sup>	9,631

# EXHIBIT IV-1 FY 2011 BUDGET REQUEST BY STRATEGIC GOAL AND PERFORMANCE GOAL Appropriations, Obligation Limitations, & Exempt Obligations (\$000)

STRATEGIC & PERFORMANCE GOALS BY PERFORMANCE MEASURE C. Expand Business Opportunities	FY 2009 ACTUAL <sup>1</sup>	FY 2010 ENACTED	FY 2011 REQUEST <sup>5</sup>
<ul> <li>a. Other (Meet FAA's Procurement Goals for Women- Owned and Small Disadvantaged Businesses)</li> <li>Subtotal Expand Business Opportunities</li> </ul>	725 <b>725</b>	840 <b>840</b>	0 <b>0</b>
Total - Global Connectivity Strategic Goal	63,068	68,697	75,559
4. ENVIROMENTAL STEWARDSHIP STRATEGIC GOAL A. Reduction in Pollution			
<ul> <li>a. Increase Percentage of DOT Facilities Categorized as No Further Remedial Action Planned</li> </ul>	38,798	102,377 <sup>2</sup>	862
<ul> <li>b. Other (Reduce Exposure to Significant Aircraft Noise - FAA Flight Plan measure)</li> </ul>	339,087	352,801	213,996
Subtotal Reduction in Pollution	377,885	455,177	214,859
B. <u>Streamlined Environmental Reviews</u> a. Reduce Median Completion Time for all Environmental			
Impact Statements	46,406	46,551	2,045
Subtotal Streamlined Environmental Reviews	46,406	46,551	2,045
Total – Environmental Stewardship Strategic Goal	424,291	501,728	216,904
5. SECURITY, PREPAREDNESS AND RESPONSE STRATEGIC GOAL	236,523	249,712	104,608
<ul> <li>6. ORGANIZATIONAL EXCELLENCE STRATEGIC GOAL</li> <li>A. <u>DOT's Organizational Excellence Initiatives</u></li> <li>a. Other (FAA Activities Supporting the Achievement of DOT's Organizational Excellence</li> </ul>			
goals)	416,214	1,434,250	273,211
Subtotal President's Management Agenda	416,214	1,434,250 <sup>2</sup>	273,211
B. Financial Stewardship			
<ul> <li>a. Percentage of Major Federally Funded Transportation Infrastructure Projects with less than 2 percent Annual Growth in the Project Completion Milestone as Reported in the Finance Plan</li> </ul>	2,000	2.002	0
b. Percentage of Financial Plan Cost Estimates for Major Federally Funded Transportation Infrastructure Projects	2,000	2,092	0
with Less than 2 percent Annual Growth	2,000	2,092	0
Subtotal Financial Stewardship	4,000	4,184	0

# EXHIBIT IV-1 FY 2011 BUDGET REQUEST BY STRATEGIC GOAL AND PERFORMANCE GOAL Appropriations, Obligation Limitations, & Exempt Obligations (\$000)

STRATEGIC & PERFORMANCE GOALS BY PERFORMANCE MEASURE	FY 2009 <u>ACTUAL</u> 1	FY 2010 ENACTED	FY 2011 <u>REQUEST</u> ⁵
C. Acquisition Management			
<ul> <li>For Major DOT Systems, the Percentage of Scheduled Milestones Established in the Acquisition Project Baselines that are Met</li> </ul>	32,390	24,337	0
<ul> <li>For Major DOT Systems, the Percentage of Cost Goals</li> <li>Established in the Acquisition Project Baselines that are</li> </ul>			
Met	32,390	24,337	0
Subtotal Acquisition Management	64,779	48,673	0
Total – Organizational Excellence Strategic Goal	484,993	1,487,107	273,211
GRAND TOTAL	16,770,062	15,991,731	16,468,000

<sup>&</sup>lt;sup>1</sup> Includes funding provided by the American Recovery and Reinvestment Act of 2009. This Act provided supplemental funding of \$200 million to Facilities & Equipment and \$1.1 billion to Grants-in-Aid for Airports. The funding is allocated to the Average Daily Airport Capacity performance measure under Reduced Congestion.

<sup>&</sup>lt;sup>2</sup> Changes for FY 2010 from FY 2009 levels are due to revisions in the ATO zero-based budget resulting from efforts to align business planning and budget goal allocation methods.

<sup>&</sup>lt;sup>3</sup> For FY 2009, funding for the BASA and NextGen measures was combined. The BASA measure was discontinued in FY 2010, but funding for BASA-related activities remains combined with NextGen.

<sup>&</sup>lt;sup>4</sup> Changes for FY 2010 from FY 2009 levels are due to the increased allocation of ATO operations funding to support the international NextGen program and performance measure.

<sup>&</sup>lt;sup>5</sup> Discrepancies in goal allocations between FY 2010 and FY 2011 levels are due to changes in the methodology for identifying, calculating and distributing indirect costs in the new Performance Planning Logic Model.

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#### PERFORMANCE BUDGET

## **EXHIBIT IV-2**

#### PERFORMANCE OVERVIEW

The performance sections of the FY 2011 budget submission align with the current FY 2006 - 2011 DOT Strategic Plan. DOT will release a new strategic plan in FY 2010 that will detail the Department's new priorities and areas of emphasis. DOT expects the performance sections of the FY 2012 budget submission will be aligned to this new strategic plan.

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## EXHIBIT IV-2 PERFORMANCE OVERVIEW

The Federal Aviation Administration (FAA) integrates performance results into its budget request to ensure alignment with the Department of Transportation's Strategic Plan. The FAA tracks the following DOT level performance measures to demonstrate program results:

Strategic Goal: Safety

Reducing Commercial Air Carrier Fatalities <sup>1</sup> : U.S. Fatalities per 100 Million Persons On Board								
	2006	2007	2008	2009	2010	2011		
Target	N/A	N/A	8.7	8.4	8.2	7.9		
Actual	N/A	N/A	0.4 <sup>2</sup>	6.8 <sup>3</sup>	N/A	N/A		
<b>Previous Measure:</b> U.S. commercial air carrier fatal aviation accidents per 100,000 departures (last 3 years' average)								
	2006	2007	2008	2009	2010	2011		
Target	0.018	0.010	≤0.010	≤0.010	N/A	N/A		
Actual	0.020	0.023 <sup>4</sup>	0.023 <sup>2</sup>	0.18 <sup>3</sup>	N/A	N/A		

<sup>&</sup>lt;sup>1</sup> In FY 2008 new metric replaced Fatal Accident Rate. Through the FY 2011 submission, targets and results for both measures will be reported.

- <sup>2</sup> Preliminary estimate. Final data expected March 2010.
- <sup>3</sup> Preliminary estimate. Final data expected March 2011.

<sup>&</sup>lt;sup>4</sup> Actual result revised from preliminary estimate of 0.022 in FY 2009.

General Aviation Fatal Accident Rate <sup>1</sup> : Reduce the rate of fatal general aviation accidents							
	2006	2007	2008	2009	2010	2011	
Target	N/A	N/A	N/A	1.11	1.09	1.08	
Actual	N/A	N/A	N/A	1.17 <sup>2</sup>	N/A	N/A	
Previous Measure: Reduce the number of fatal general aviation accidents							
	2006	2007	2008	2009	2010	2011	
Target	337	331	325	319	N/A	N/A	

<sup>&</sup>lt;sup>1</sup> In FY 2009, metric changed from General Aviation Fatal Accidents to General Aviation Fatal Accident Rate. Through the FY 2012 submission, targets and results for both measures will be reported.

<sup>&</sup>lt;sup>3</sup> Preliminary estimate. Final data expected March 2010.

Serious Hazardous Materials Incidents <sup>1</sup> : Number of serious hazardous materials transportation incidents (CY)							
2006 2007 2008 2009 2010 2011							
Target	460	466	462	458	458	446	
Actual	495	490 <sup>2</sup>	427 <sup>3</sup>	427 <sup>4</sup>	N/A	N/A	

<sup>&</sup>lt;sup>1</sup> Targets and results are for DOT as a whole; FAA contributes.

Overview 1

<sup>&</sup>lt;sup>2</sup> Preliminary estimate. Final data expected March 2011.

<sup>&</sup>lt;sup>2</sup> Actual result of 473 revised in FY 2009.

<sup>&</sup>lt;sup>3</sup> Revised from preliminary estimate of 451.

<sup>&</sup>lt;sup>1</sup> Preliminary estimate.

Commercial Space Launch Accidents¹: Number of accidents resulting in fatalities, injuries, or significant property damage to uninvolved public

2006 2007 2008 2009 2010 2011

	2006	2007	2008	2009	2010	2011
Target	0	0	0	0	0	0
Actual	0	0	0	0	N/A	N/A

FAA *Flight Plan* target. Although not designated a DOT-level measure, Commercial Space Launch Accidents is included to emphasize FAA's commitment to promoting safety in the rapidly developing commercial space industry.

#### Strategic Goal: Reduced Congestion

NAS On-Time Arrivals: Percent of all flights arriving within 15 minutes of schedule at the 35 Operational Evolution Plan airports due to National Air Space (NAS) related delays 2007 2006 2008 2009 2010 2011 **Target** 87.40% 87.67% 88.00% 88.00% 88.00% 88.00% 88.36% 86.96% 87.29% 88.98% Actual N/A N/A

Average Daily Airport Capacity: Average daily arrival and departure rates							
2006 2007 2008 2009 2010 2011							
Target	101,191	101,562	101,868	100,707	102,648	103,068	
Actual	101,932	102,545	103,222	101,691	N/A	N/A	

#### Strategic Goal: Global Connectivity

International Aviation Development Projects<sup>1</sup>: The number of projects for which funding is arranged from the U.S. and international governmental organizations, multilateral banks, and industry

	2006	2007	2008	2009	2010	2011
Target	N/A	N/A	N/A	7	7	7
Actual	N/A	N/A	N/A	8	N/A	N/A

**Previous Measure:** Yearly increase in international aviation development funding from the U.S. and international governmental organizations, multilateral banks, and industry

	2006	2007	2008	2009	2010	2011
Target	\$23.41M	\$12.00M	\$15.00M	\$18.00M	\$21.00M	N/A
Actual	\$33.04M	\$13.36M	\$16.70M	\$13.79M	N/A	N/A

Measure redefined in FY 2009 to show total projects per year for which funding is arranged. Through the FY 2012 submission, targets and results for both measures will be reported.

2 Overview

**NextGen Technologies:** Total number of countries taking a significant step, as a result of FAA assistance and collaboration, to implement the operational use of NextGen technologies, procedures, or concepts

	2006	2007	2008	2009	2010	2011
Target	1	1	1	1	1	1
Actual	1	1	1	2	1	N/A

#### Strategic Goal: Environmental Stewardship

**Noise Exposure:** Percent reduction in the number of people in the U.S. who are exposed to significant aircraft noise levels  $^{\rm 1}$ 

	2006	<b>2007</b> <sup>2</sup>	2008	2009	2010	2011
Target	- 4%	- 8%	- 12%	- 16%	-20%	-24%
Actual	-36% <sup>3</sup>	-37% <sup>3</sup>	-42% <sup>4</sup>	-48% <sup>5</sup>	N/A	N/A

<sup>&</sup>lt;sup>1</sup> FAA *Flight Plan* target - not designated a DOT-level measure.

<sup>&</sup>lt;sup>5</sup> Projection from trends. Final data expected May 2010.

Streamline Environmental Impact Statements <sup>1</sup> : Median time in months to complete	
Environmental Impact Statements (EIS) for DOT-funded infrastructure projects	

	2006	2007	2008	2009	2010	2011
Target	N/A	N/A	60	54	48	48
Actual	57	67	63.5	79.3	N/A	N/A

<sup>&</sup>lt;sup>1</sup> Targets and results are for DOT as a whole; FAA contributes.

**DOT Facility Cleanup**<sup>1</sup>: Percent of DOT facilities characterized as 'No Further Remedial Action Planned' under the Superfund Amendments Reauthorization Act

	2006	2007	2008	2009	2010	2011		
Target	93%	93%	93%	93%	93%	93%		
Actual	92%	93%	94%	94%	N/A	N/A		

<sup>&</sup>lt;sup>1</sup> Targets and results are for DOT as a whole; FAA contributes.

Overview 3

<sup>&</sup>lt;sup>2</sup> The target was revised in FY 2007 from a 1% annual decrease from the baseline to a 4% decrease, lowering the cumulative target for FY 2007 from 5% to 8%.

<sup>&</sup>lt;sup>3</sup> Revised from original result due to improvement in noise exposure model in FY 2008.

<sup>&</sup>lt;sup>4</sup> Revised from projection of -38%.

#### Strategic Goal: Organizational Excellence

**Actual** 

**Acquisition Schedule**<sup>1</sup>: For major DOT aviation systems, percent of scheduled milestones established in the acquisition project baselines that are met

1 1 7										
	2006	2007	2008	2009	2010	2011				
Target	85.00%	87.50%	90.00%	90.00%	90.00%	90.00%				
Actual	97.44%	97.00%	93.88%	93.75%	N/A	N/A				

<sup>&</sup>lt;sup>1</sup> This is designated as a DOT-level target, but only FAA results are measured.

Acquisition Cost¹: For major DOT aviation systems, percent of cost goals established in the acquisition project baselines that are met200620072008200920102011Target85.00%87.50%90.00%90.00%90.00%90.00%

100%

96.08%

97.06%

N/A

N/A

100%

**Infrastructure Projects Schedule**<sup>1</sup>: Percent of major federally funded transportation infrastructure projects with less than 2 percent annual growth in the project completion milestone as reported in the finance plan

	2006	2007	2008	2009	2010	2011
Target	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Actual	89.0%	89.0%	79.0%	78.37%	N/A	N/A

<sup>&</sup>lt;sup>1</sup> Targets and results are for DOT as a whole; FAA contributes.

Infrastructure Projects Cost <sup>1</sup>: Percent of finance plan cost estimates for federally funded transportation infrastructure projects with less than 2 percent annual growth in project completion cost

	2006	2007	2008	2009	2010	2011
Target	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Actual	84.0%	83.0%	82.0%	83.78%	N/A	N/A

<sup>&</sup>lt;sup>1</sup> Targets and results are for DOT as a whole; FAA contributes.

4 Overview

<sup>&</sup>lt;sup>1</sup> This is designated as a DOT-level target, but only FAA results are measured.

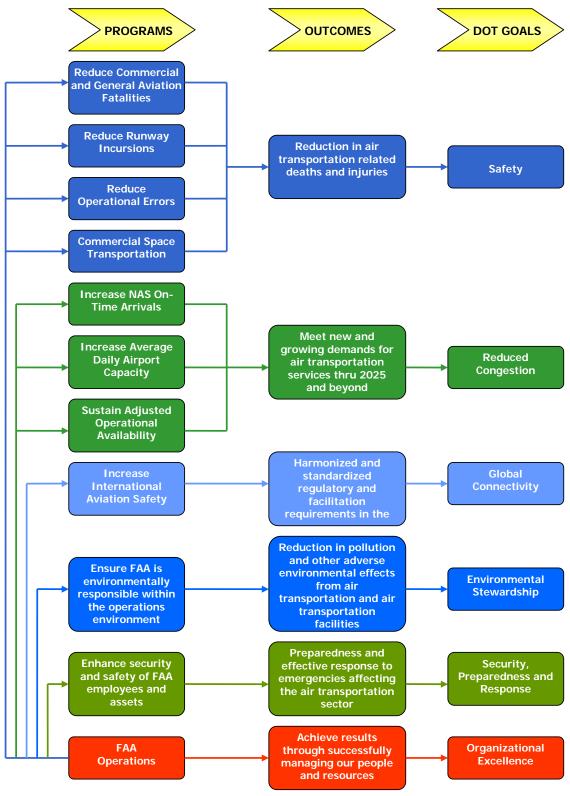
### **EXHIBIT IV-3**

# FISCAL YEAR 2011 PERFORMANCE PLANNING LOGIC MODEL

The performance sections of the FY 2011 budget submission align with the current FY 2006 – 2011 DOT Strategic Plan. DOT will release a new strategic plan in FY 2010 that will detail the Department's new priorities and areas of emphasis. DOT expects the performance sections of the FY 2012 budget submission will be aligned to this new strategic plan.



## Federal Aviation Administration



#### SAFETY

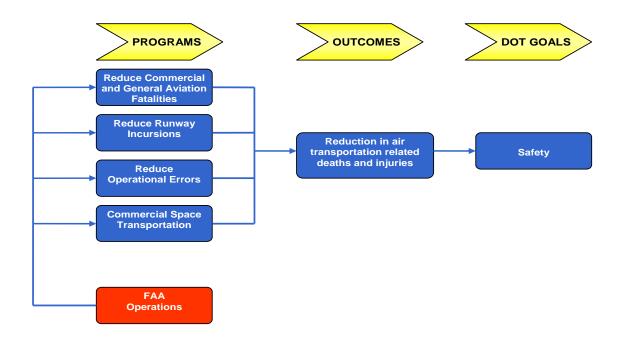
#### **OVERVIEW**

The safety of American aviation is unparalleled. Since 2001 there have been over 68 million successful flights on U.S. commercial aircraft. This represents over 4.1 billion passengers who have flown safely. By 2025, there will be added demands on the capacity of the system and FAA must steadily progress its plans and activities to be ready for the additional safety challenges.

As part of Vision 100, Congress chartered the Next Generation Air Transportation System (NextGen) Joint Planning and Development Office (JPDO) to jump-start the aviation system of tomorrow. This office uses the brainpower and resources of six cabinet-level offices to develop a blueprint for the aviation system in 2025 and, more importantly, a plan to get there. The plan for NextGen states that the demands on the system may triple from what they are today. It anticipates the need to handle new types of aircraft, such as very light jets being used as air taxis, and the integration of suborbital reusable launch vehicles into the NAS. Also, unmanned pilotless civil aircraft will fly cargo and one day, passengers.

The 2011 FAA budget request for nearly \$8.7 billion and over 29,000 FTE supports Increased Safety – the most important strategic objective of DOT and FAA. The FAA estimates that 53 percent of the agency's FY 2011 budget will be required to maintain and improve safety programs. The agency's efforts to continually improve operations have contributed to a safer aviation environment. In 2011, FAA programs will:

- Work with stakeholders to establish their own safety management systems to identify potential risk areas to engender their cooperation for the open reporting of safety concerns. (Reduce Commercial and General Aviation Fatalities)
- Continue to implement initiatives to reduce runway incursions such as enhanced runway and taxiway markings, improved lighting such as runway status lights, reduction of frangible equipment on the airports surface, and improved driver training. (High Priority Performance Goal Reduce Runway Incursions)
- Implement a voluntary reporting system of safety related events from controllers and other air traffic services employees. (Reduce Commercial and General Aviation Fatalities)
- Promote safety in the rapidly developing commercial space industry, to include licensing of up to 12 commercial launches from SpaceX and up to 8 launches from Orbital Sciences, test flight human space flight with crew onboard. (Commercial Space Launch and Reentry Safety)
- Develop policies, procedures, and approval processes to enable safe operation of unmanned aircraft systems.
   (Reduce Commercial and General Aviation Fatalities)



		SAFETY			
	Reduce Commercial and \$4.16 billion; 10,968 F		lities		
Program Purpose and Customers/ Beneficiaries The Reduce	FY 2011 Activities	FY 2011 Achievements - Modernize and	FY 2011 Outputs	FY 2011 Outcomes	Contributions to DOT Goal
Commercial and General Aviation Fatalities program reduces risk for the flying public through implementation of new technology, increased information, and improved systems, products and services.	aintain the Notices to Airmen System (NOTAMS)  - Develop approval process to enable operation of unmanned aircraft systems.  - Certification services to operators, agencies and air carriers  - Operate air traffic control facilities (towers, TRACONs, and centers)	standardize and standardize systems that track safety data and provide safety information and analysis about the NAS to all stakeholders  - Implement voluntary reporting system of safety related events  - Implement Safety Management System	Automatic Dependent Surveillance – Broadcast (ADS-B) Air Traffic Control Critical Surveillance Services to 130 service volumes  - Commission weather and communications at 25 airports in Alaska  - Provide WAAS service at 300 runway ends currently not served by Instrument Landing Systems (ILS)	commercial air carrier rate will not exceed 7.9 fatalities per 100 million people on board  - Limit the general aviation fatal accident rate to no more than 1.08 fatal accidents per 100,000 flight hours	Gual. Salety

#### Reduce Commercial and General Aviation Fatalities

#### Program Purpose and Customers/Beneficiaries

The *Reduce Commercial and General Aviation Fatalities* program reduces risk for the flying public through implementation of new technology, increased information, and improved systems, products, and services. Customers and beneficiaries include pilots, controllers, air carriers, and flying public.

#### 2011 Program Inputs

The total request for the *Reduce Commercial and General Aviation Fatalities* program is \$4.16 billion, to include 10,968 FTE.

#### 2011 Program Activities

The FAA ensures safety by continuously operating more than 500 air traffic control towers and Terminal Radar Approach Control facilities (TRACONs), 21 Air Traffic En Route Control Centers and two Combined En Route/Approach Control facilities. To support the operation of these operational facilities, FAA systematically develops and implements improved training, procedures and technology to improve safety across the NAS. An important component of this program is to ensure that certificate holders and certificated airports meet minimum safety requirements, standards, and regulations. The FAA also improves the safety of transporting hazardous materials by air through development of procedures, and inspections and certification. The FAA conducts aircraft investigations, oversees approved designees, and certificates people, equipment, and organizations. The agency issues airmen certificates and certificates verifying aircraft and parts have been found to meet applicable minimum safety standards. FAA will provide certification services and support to operators, agencies and air carriers.

#### 2011 Program Achievements

Investments in new technologies and procedures will result in increased situational awareness for pilots through satellite-based Global Positioning System (GPS) surveillance, broadcast services and improved avionics. Modernized and standardized systems that track safety data and provide safety information and analysis about the NAS will enable safer operations at all operational facilities. FAA will implement a voluntary reporting system of safety related events from controllers and others employees providing air traffic services. FAA will continue to mature the Safety Management System in FY 2011, ensuring interoperability among all lines of business. Through the Safety

Management System, FAA identifies and reduces any factors contributing to unintended losses of standard separation.

#### 2011 Program Outputs

During FY 2011, FAA will roll-out Automatic Dependent Surveillance- Broadcast (ADS-B) Air Traffic Control Critical Surveillance Services to 130 service volumes. FAA will commission weather and communications at 25 airports in Alaska during FY 2011. 500 WAAS Localizer Performance with Vertical Guidance (LPV) procedures will be implemented throughout the NAS. FAA will provide WAAS service at 300 runway ends currently not served by Instrument Landing Systems.

#### 2011 Program Outcomes

In FY 2011, the commercial air carrier rate will not exceed 7.9 fatalities per 100 million people on board. In FY 2011, FAA will ensure that the general aviation fatal accident rate is limited to no more than 1.08 fatal accidents per 100,000 flight hours.

#### Contribution to DOT Goal

The Reduce Commercial and General Aviation Fatalities program supports the DOT Safety goal.

		SAFETY						
Program Name: Reduce Runway Incursions (High Priority Performance Goal)								
FY 2011 Inputs: \$143			EV 0011	FV 0011	0 1 1 11			
Program Purpose	FY 2011	FY 2011 Achievements	FY 2011	FY 2011	Contributions			
and Customers/ Beneficiaries	Activities		Outputs	Outcomes	to DOT Goal			
Reduce aircraft passengers' exposure	- Train pilots, controllers	- Implement Runway Status Lights (RWSL) that will provide	Evaluate up to eight	- Additional Two percent	Goal: Reduction in transportation			
to risk and increase	and airfield	pilots with a set of visual	serious	reduction in	related deaths			
runway safety	operators	indicators for safety progressing	and/or	total number	and injuries			
systematically.		around the airport	significant	of runway				
Customers and	- Create		runway	incursions				
beneficiaries include	improved	- Implement 100% of Airport	incursion	from the FY				
controllers, pilots,	procedures	Surface Detection Equipment,	events and report	2008 baseline of 1009				
airfield operators, and flying public.	- Implement	Model X (ASDE-X), providing controllers with visual indicators	results and	runway				
nying public.	new	of traffic movement on the	recommends	incursions				
	technologies	airport surface and alert them	to Runway	(Total				
		to possible conflicts	Safety	reduction to				
			Council.	date - five				
				percent)				
			One of 23					
			RWSLs					
			35 of 35					
			ASDE-X					

#### Reduce Runway Incursions (High Priority Performance Goal)

#### Program Purpose and Customers/Beneficiaries

The unauthorized presence of an aircraft, vehicle or pedestrian on a runway increases the likelihood of incidents that could evolve into fatalities, serious injuries, and significant property damage. The runway environment remains one of the highest risk areas in our national airspace system. Improving runway safety requires a collection of initiatives, with each providing incremental benefit. The FAA systematically reduces aircraft passengers' exposure to risk and increases runway safety. Customers and beneficiaries include controllers, pilots, airfield operators, and flying public.

#### 2011 Program Inputs

The Reduce Runway Incursions high priority performance goal FY2011 reguest includes \$143.08 million and 512 FTE.

#### 2011 Program Activities

The FAA systematically invests in advancements to reduce runway incursions through technology, infrastructure, tools, and training/safety promotion to improve runway safety. This includes:

- Operational procedures, such as pilot readbacks of controller clearances.
- Airport infrastructure, such as airfield signs, pavement markings, surface surveillance systems, and other safety technologies.
- Air traffic management, such as the coordination between ground and local control.
- Training and awareness for the safe conduct of airport movement operations

#### 2011 Program Achievements

During FY 2011, FAA will implement Runway Status Lights (RWSL) as well as emerging NEXTGEN technology that can assist in the reduction of runway incursions such as Airport Surface Detection Equipment, Model X (ASDE-X). The first key site will be deployed (first of 23, 4%) for RWSL and last three of 35 ASDE-X will be deployed.

#### 2011 Program Outputs

The FAA's Runway Safety Root Causal Analysis Team will evaluate up to eight serious and/or significant events and report results and recommendations to the Runway Safety Council – senior level safety officials under the direction of the Director of Runway Safety and including representative from industry.

#### 2011 Program Outcomes

The outcome of the *Reduce Runway Incursion* program can be quantified by an additional two percent reduction in the total number of runway incursions (total reduction of five percent thru FY 2011) from the FY 2008 baseline of 1009 runway incursions.

#### Contribution to DOT Goal

The *Reduce Runway Incursions* program supports the DOT Safety goal.

		SAFETY			
•	iction of Operational Erro 38 billion; 17,446 FTE	ors			
Program Purpose and Customers/ Beneficiaries	FY 2011 Activities	FY 2011 Achievements	FY 2011 Outputs	FY 2011 Outcomes	Contributions to DOT Goal
The purpose of the reducing operational errors program is to improve situational awareness for pilots and controllers operating in the National Airspace System (NAS) by providing them with additional information concerning potential conflicts and offering possible resolutions	- Operate more than 500 air traffic control towers and TRACONs, 21 Air Traffic En Route Control Centers and two Combined En Route/ Approach Control facilities  - Develop and implement improved training, procedures and technology  - Identify and reduce factors contributing to unintended losses of	- Install Terminal Doppler Weather Radar Elevation Drive Enhancement Modification at six sites  - Report by the end of the fiscal year on the effectiveness of ATO mitigations of the causal factors for ten Risk Analysis events	- Complete assessment for achieving year- end performance goal to satisfy the annual safety performance targets for Category A&B (most serious) Operational Errors of no more than 2.00 per million operations	- Limit Category A and B (most serious) operational errors to a rate of no more than 2.00 per million activities	Goal: Safety

#### Reduction of Operational Errors

#### Program Purpose and Customers/Beneficiaries

The *Reduction of Operational Errors* Program improves situational awareness for pilots and controllers operating in the National Airspace System (NAS) by providing them with additional information concerning potential conflicts and offering possible resolutions. Customers and beneficiaries include pilots and flying public.

### 2011 Program Inputs

The FAA FY2011 budget request program inputs include \$4.38 billion and 17,446 FTE.

#### 2011 Program Activities

The FAA's effort to reduce operational errors is one measure of moving air traffic safely and efficiently. We provide air traffic control to the NAS through operation of more than 500 air traffic control towers and TRACONs, 21 Air Traffic En Route Control Centers and two Combined En Route/ Approach Control facilities. Additionally, we will implement automated systems for detecting, recording, and reporting all losses of standard separation between radar controlled operations by FY 2012. This activity is to identify and reduce factors contributing to unintended Losses of Standard Separation (LOSS).

#### 2011 Program Achievements

The FAA will invest in capital acquisitions aimed at increasing safety. Investments for FY 2011 include extended use of Terminal Doppler Weather System (TDWR) and Wide Area Augmentation System (WAAS). The FAA will install Terminal Doppler Weather Radar Elevation Drive Enhancement Modification at six sites for the fiscal year. In FY 2011, we will establish risk analysis processes to ensure factors contributing to significant safety events are identified, reported, and mitigated by the end of FY 2011.

#### 2011 Program Outputs

Complete assessment for achieving year-end performance goal to satisfy the annual safety performance targets for Category A&B (most serious) Operational Errors of no more than 2.00 per million operations.

#### 2011 Program Outcomes

The *Reduction of Operational Errors* Program will limit Category A and B (most serious) operational errors to a rate of no more than 2.00 per million activities.

#### Contribution to DOT Goal

The *Reduction of Operational Errors* program supports the DOT Safety goal.

		SAFETY							
	Program Name: Increase Commercial Space Launch and Reentry Safety. FY 2011 Inputs: \$15.96 million; 75 FTE								
Program Purpose and Customers/ Beneficiaries	FY 2011 Activities	FY 2011 Achievements	FY 2011 Outputs	FY 2011 Outcomes	Contributions to DOT Goal				
The purpose of increasing commercial space launch and reentry safety is to ensure the full and safe integration of commercial space transportation launch and reentry vehicles into civil aviation.	- Identify operational issues impacting the safe and efficient launch, flight and re-entry of manned and unmanned commercial space transportation operations  - Provide support for safe, routine space vehicle operations within the National Airspace (NAS)	- Draft baseline operational requirements for spaceports and commercial space transportation vehicles performing sustained suborbital operations in the NAS to ensure compatibility with NextGen operational system.  - Develop a strategic roadmap for 2012 and beyond that addresses FAA planning for commercial human space flight.	License up to 12 commercial launches from SpaceX and up to eight launches from Orbital Sciences.	- No fatalities, serious injuries, or significant property damage to the uninvolved public during licensed or permitted space launch and reentry activities	Goal: Safety				

#### Increase Commercial Space Launch and Reentry Safety

#### Program Purpose and Customers/Beneficiaries

The purpose of the *Increase Commercial Space Launch and Reentry Safety* program is to ensure the full and safe integration of commercial space transportation launch and reentry vehicles into civil aviation. Customer and beneficiaries include commercial space transportation industry, NASA, DoD, the flying public and public at large.

### 2011 Program Inputs

In order to increase commercial space launch and reentry safety in FY 2011 this budget requests \$15.96 million and 75 FTE.

#### 2011 Program Activities

FY 2011 recurring activities for this program include licensing, safety inspections, and experimental permit determinations for all commercial space launches and launch sites. FAA will continue to identify operational issues impacting the safe and efficient launch, flight and re-entry of manned and unmanned commercial space transportation operations.

#### 2011 Program Achievements

In FY 2011, FAA will draft baseline operational requirements for spaceports and commercial space transportation vehicles performing sustained suborbital operations in the NAS to ensure compatibility with NextGen operational system. FAA will also develop a strategic roadmap for 2012 and beyond that identifies topics, issues and activities in the area of commercial human space flight.

#### 2011 Program Outputs

FAA will license up to 12 commercial launches from SpaceX and up to eight launches from Orbital Sciences.

#### 2011 Program Outcomes

The outcome of the *Increase Commercial Space Launch and Reentry Safety* program is no fatalities, serious injuries, or significant property damage to the uninvolved public during licensed or permitted space launch and reentry activities.

#### Contribution to DOT Goal

The Increase Commercial Space Launch and Reentry Safety program supports achieving the DOT Safety goal.

#### **REDUCED CONGESTION**

#### **OVERVIEW**

One of FAA's most significant challenges is meeting current and future capacity needs. The Next Generation Air Transportation System (NextGen) technologies and procedures will enable us to meet this need long-term. Today, however, airfield construction remains one of the most effective methods of increasing arrival and departure rates.

This funding request of over \$7.6 billion and more than 16,200 FTE contributes to the DOT Reduced Congestion strategic goal. These strategic investments enable transition to the Next Generation Air Transportation System (NextGen) capabilities as well as other capacity and efficiency improvements focused on the efficient spacing of aircraft on final approach, the use of weather information to improve predictability and operational efficiency, and the availability of equipment to support terminal ATC services.

This request supports efforts to meet projected demand and improve on-time reliability and performance of air carriers. NextGen will continue to address today's constraints and comprehensively modernize and transform the air transportation system. The NextGen portfolio of investments focuses on the implementation and integration of key NextGen transformational technologies. The capabilities these technologies provide begin a shift of decision-making from the ground to the cockpit. In fiscal year 2011, the Surveillance and Broadcast Services (SBS) program office will use analytical models to study and assess the application of ADS-B for 3 nautical mile separation standards. To demonstrate ADS-B applications, the SBS program office will develop an implementation plan for deploying ground-based merging and spacing for improved pilot situational awareness. For oceanic airspace, simulation and modeling will be performed to improve fuel efficiency while an analysis program will be initiated to assess the feasibility of separation in the oceanic environment below the 30/30 nautical mile standard. Complementary to the strategic Oceanic Initiatives, En Route is initiating operational trials of Automatic Dependent Surveillance -- Contract (ADS-C) In Trail procedures, which would allow more aircraft to reach fuel efficient altitudes.

The FY 2011 budget request supports airspace redesign in key metropolitan areas, such as New York and Philadelphia. Redesign efforts in southern Nevada will provide short-term operational efficiencies and accommodate a potential future new airport.

### REDUCED CONGESTION

Program Name: American Recovery and Reinvestment Act (ARRA)

Airport Grants and Facilities & Equipment

FY 2011 Inputs: \$0

FY 2011 Inputs: \$0					
Program Purpose and Customers/ Beneficiaries	FY 2011 Activities	FY 2011 Achievements	FY 2011 Outputs	FY 2011 Outcomes	Contributions to DOT Goal
FAA uses ARRA funds to increase capacity through airfield construction and maintenance and modernization of air traffic control and airway facilities, equipment, and systems.	Manage and monitor ongoing grants-in-aid for airports and contracts awarded directly by the Federal Government for ARRA-related infrastructure investments and airport maintenance and improvement	Continued program management and oversight of the 2009 and 2010 grants and contract awards	Major construction projects that include maintenance and modernization of airport runways, taxiways, terminals, road construction, air route traffic control centers, air traffic control towers and terminal radar approach control facilities, power systems, and navigation and landing facilities	Increased airfield and aircraft operation efficiencies, enhanced airfield and peak-hour capacity with reduced costs associated with daily operation and maintenance of replaced/upgraded facilities and equipment	Goal: Reduced Congestion

## ARRA Airport Grants and Facilities & Equipment

### Program Purpose and Customers/Beneficiaries

FAA ARRA funds are used to increase capacity through airfield construction and maintenance and modernization of air traffic control and airway facilities, equipment, and systems. Grants and contracts are awarded in support of achieving increased National Airspace Space (NAS) capacity, efficiencies, and operational performance. This provides much-needed power systems, facility and runway construction refurbishments that will improve the function and condition of airport infrastructure. In addition, new jobs and the preservation of existing jobs will occur from the construction work that will be undertaken to accomplish the planned facility projects.

#### 2011 Program Inputs

FAA will maintain current staffing levels associated with ARRA in FY 2011.

#### 2011 Program Activities

The over 600 projects being completed under FAA's ARRA programs support capital improvements at qualified airports to improve airfield and airspace capacity, including increased aircraft operations, larger aircraft, and improved peak-hour capacity. Other capacity-related grant projects include new and expanded aprons to support aircraft parking in terminal areas. Maintenance and construction contracts support 18 aging FAA facility projects, to include exterior wall replacements, elevator replacements, roof replacement, parking lot expansion, and refurbishment of mechanical systems. Additional contracts provide for uninterruptible power systems, power cable and breaker replacements, installation and upgrades for lightening protection, grounding and bonding, battery replacements, fuel storage tank replacement for engine generators, and installation and upgrade of engine generators. Grantees and contractors are required to submit monthly progress reports to their respective program managers and management within the FAA to ensure they are meeting their project milestones.

#### 2011 Program Achievements

This program achieves management and oversight of the 2009 and 2010 grants and contract awards.

#### 2011 Program Outputs

Major construction projects that include maintenance and modernization of airport runways, taxiways, terminals, road construction, air route traffic control centers, air traffic control towers and terminal radar approach control facilities, power systems, and navigation and landing facilities.

#### 2011 Program Outcomes

Increased airfield and aircraft operation efficiencies, enhanced airfield and peak-hour capacity with reduced costs associated with daily operation and maintenance of replaced/upgraded facilities and equipment.

#### Contribution to DOT Goal

ARRA Airport Grants and Facilities & Equipment support the achievement of the DOT Reduced Congestion goal. This includes decreased system outages and increased system availability reducing delays and increasing airfield and operational capacity at the nation's airports.

	REDUCED CONGESTION								
	Program Name: Increase NAS On-Time Arrivals FY 2011 Inputs: \$1.49 billion; 5,148 FTE								
Program Purpose and Customers/ Beneficiaries	FY 2011 Activities	FY 2011 Achievements	FY 2011 Outputs	FY 2011 Outcomes	Contributions to DOT Goal				
The purpose of increasing NAS On-Time Arrivals is to maintain NAS services for all users by strategically investing in the current infrastructure.	<ul> <li>Maintain existing Terminal and En Route automation, surveillance, and weather systems</li> <li>Commission new runways and runway extensions</li> <li>Conduct regional planning studies to identify potential delay reductions measures</li> <li>Fund airport activities that will provide greater access to 86 regional airports in the seven metro areas</li> </ul>	- Redesign terminal airspace in New York and Philadelphia (affects seven airports)  - Achieve last site operational readiness for En Route Automation Modernization.	- Install two upgraded software versions for terminal automation systems  - Deploy 200 weather ceilometers for Automated Surface Observing Systems  - Continue production and installation of new integrated display system for 52 terminal facilities	- Achieve a NAS on- time arrival rate of 88.0% at the 35 Operational Evolution Partnership (OEP) airports	Goal: Reduced Congestion				

#### NAS On-Time Arrivals

#### Program Purpose and Customers/Beneficiaries

The FAA is increasing NAS on-time arrivals by maintaining NAS services for all users by strategically investing in the current infrastructure. Customer and Beneficiaries include airports, pilots and the flying public.

#### 2011 Program Inputs

This funding request of \$1.49 billion and 5,148 FTE is to increase NAS on-time arrivals.

#### 2011 Program Activities

Program activities include maintaining existing Terminal and En Route automation, surveillance, and weather systems. In addition, activities are modernizing En Route facilities and identifing poor physical plant conditions for En Route facilities. The FAA will commission new runways and runway extensions and conduct regional planning studies to identify potential delay reduction measures. Through airport grants, FAA will fund airport activities that will provide greater access to 86 regional airports in the seven metro areas.

#### 2011 Program Achievements

During FY 2011, FAA will redesign airspace serving New York and Philadelphia metropolitan areas, supporting seven key airports. During FY 2011, FAA will achieve ERAM last site Operational Readiness Decision (ORD).

#### 2011 Program Outputs

During FY 2011, FAA will upgrade terminal staffed facilities by:

- Installing two upgraded software versions for terminal automation systems
- Replacing 200 weather ceilometers for Automated Surface Observing Systems
- Continue production and installation of new integrated display system for 52 terminal facilities

#### 2011 Program Outcomes

In FY 2011, FAA will achieve a NAS on-time arrival rate of 88.0% at the 35 Operational Evolution Partnership (OEP) airports.

#### Contribution to DOT Goal

The Increase NAS On-Time Arrivals supports the achievement of the DOT Reduced Congestion goal.

		REDUCED CONC	SESTION						
	Program Name: Increase Average Daily Airport Capacity FY 2011 Inputs: \$3.13 billion; 3,270 FTE								
Program Purpose and Customers/ Beneficiaries	FY 2011 Activities	FY 2011 Achievements	FY 2011 Outputs	FY 2011 Outcomes	Contributions to DOT Goal				
The purpose of Increase Average Daily Airport Capacity is to make changes in procedures and/or technology, increasing average daily airport capacity for all users of the NAS.	- Maintain and update the systems that move air traffic safely and efficiently through the NAS  - Commission planned runways  - Maintain a level of investment for airport infrastructure projects that benefits the NAS	Implement and expand Traffic Flow Management System (TFMS)     Evaluate and expand the use of Converging Runway Display Aids at airports with intersecting runways.	- Maintain 93% of airport runway pavement in good or better condition	- Achieve an average daily airport capacity for the 35 Operational Evolution Partnership (OEP) airports of 103,068 arrivals and departures per day  - Achieve an average daily airport capacity for the seven major metropolitan areas of 39,484 arrivals and departures per day	Goal: Reduced Congestion				

#### Increase Average Daily Airport Capacity

#### Program Purpose and Customers/Beneficiaries

This program results in increased capacity for all users of the NAS through changes in procedures and/or technology and investments in airport infrastructure that benefit the NAS. FAA is initiating operational trials of Automatic Dependent Surveillance -- Contract (ADS-C) In Trail procedures, which would allow more aircraft to reach fuel efficient altitudes. Customers and beneficiaries include airports, pilots, controllers and flying public.

#### 2011 Program Inputs

The Increase Average Daily Airport Capacity program inputs include a budgetary request of \$3.13 billion and 3,270 FTE.

#### 2011 Program Activities

In FY 2011, FAA will maintain and update the systems that move air traffic safely and efficiently through the NAS. FAA will work with airports to commission planned runways and maintain a level of investment for airport infrastructure projects that benefits the NAS.

### 2011 Program Achievements

In FY 2011, FAA will implement and expand Traffic Flow Management System (TFMS) and develop and implement an integrated procedures concept for Performance-Based Navigation (PBN) with the goal of moving towards NextGen capabilities. FAA will evaluate and expand the use of Converging Runway Display Aids at airports with intersecting runways.

#### 2011 Program Outputs

Efforts from the Increase Average Daily Airport Capacity program will result in maintaining 93% of airport runway pavement in good or better condition.

#### 2011 Program Outcomes

Achieve an average daily airport capacity for the 35 Operational Evolution Partnership (OEP) airports of 103,068 arrivals and departures per day. Achieve an average daily airport capacity for the seven major metropolitan areas of 39,484 arrivals and departures per day.

#### Contribution to DOT Goal

The Increase Average Daily Airport Capacity program supports the DOT goal of Reduced Congestion.

FY 2011 Input	REDUCED CONGESTION  Program Name: Sustain Adjusted Operational Availability FY 2011 Inputs: \$2.48 billion; 7,832 FTE								
Program Purpose and Customers/ Beneficiaries	FY 2011 Activities	FY 2011 Achievements	FY 2011 Outputs	FY 2011 Outcomes	Contributions to DOT Goal				
The purpose of Sustaining Adjusting Operational Availability is to maintain NAS services for all users by strategically investing in current infrastructure	- Monitor, control, maintain, and restore NAS equipment  - Maintain Federal Telecommunications Infrastructure (FTI)	Remote maintenance monitoring will be enhanced through replacement of the Maintenance Processor Subsystem (MPS) and the maintenance automation system software (MASS) providing greater reliability of the core system monitoring the NAS.	- Replace five obsolescent Uninterruptible Power System units  - Install ten cost efficient direct current power distribution systems  - Deliver and install 85 voice recorders  - Procure 1,996 and install 2,026 multimode digital radios	- Sustain adjusted operational availability at 99.70% for the reportable facilities that support the 35 Operational Evolution Partnership (OEP) airports	Goal: Reduced Congestion				

#### Sustain Adjusted Operational Availability

#### Program Purpose and Customers/Beneficiaries

The purpose of sustaining adjusted operational availability is to maintain NAS services for all users so that services are available when needed. Customers and beneficiaries include pilots, controllers, and the flying public.

#### 2011 Program Inputs

Sustain Adjusted Operational Availability requests \$2.48 billion and 7,832 FTE to address the DOT goal of Reduced Congestion.

#### 2011 Program Activities

The FAA's ongoing activities for Sustaining Adjusted Operational Availability include monitoring, controlling, maintaining, and restoring NAS equipment, to include the Federal Telecommunications Infrastructure (FTI).

#### 2011 Program Achievements

During FY 2011, remote maintenance monitoring will be enhanced through replacement of the Maintenance Processor Subsystem (MPS) and the maintenance automation system software (MASS), providing greater reliability of the core system monitoring the NAS.

#### 2011 Program Outputs

During FY 2011, FAA's outputs for this program will be:

- Replace five obsolescent Uninterruptible Power System units
- Install ten cost efficient direct current power distribution systems
- Deliver and install 85 voice recorders
- Procure 1,996 and install 2,026 multimode digital radios

#### 2011 Program Outcomes

Sustain adjusted operational availability at 99.70% for the reportable facilities that support the 35 Operational Evolution Partnership (OEP) airports.

#### Contribution to DOT Goal

The FAA supports the DOT Reduced Congestion goal through the Sustain Adjusted Operational Availability program.

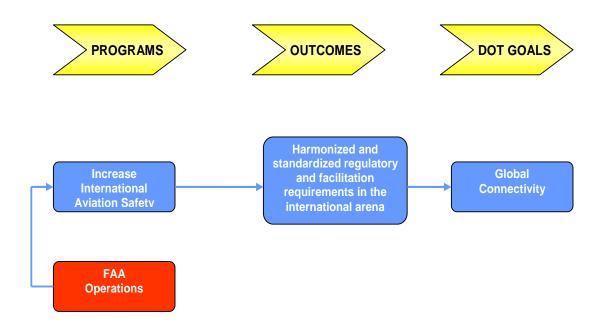
#### **GLOBAL CONNECTIVITY**

#### **OVERVIEW**

The FAA provides direct or indirect assistance to over 100 countries around the world to help improve aviation systems. The United States is the largest contributor of technical and financial support to the International Civil Aviation Organization (ICAO), which represents 189 of the world's civil aviation authorities. While the air accident rate continues to decrease worldwide, in areas where major growth is forecast there is a greater risk for air accidents to occur over the next century. In this environment, FAA will take a leadership role, collaborating with our international partners to ensure that the flying public travels safely and efficiently both domestically and abroad.

The FY 2011 budget requests about \$74.99 million and approximately 340 FTE to support expanded global presence, training, and technical assistance to foreign aviation authorities and maintenance of aircraft certification work. Specifically, FAA is committed to supporting Presidential safety programs and building mutually beneficial partnerships with civil aviation organizations in the Middle East, China, India and Latin America. We will increase our effort to create and expand government-industry partnerships and strengthen the capabilities of regional aviation authorities and organizations through technical assistance and training.

The agency will also continue to build and maintain bilateral and multilateral relationships, support FAA senior leadership in achieving U.S. objectives, and negotiate agreements that improve safety and efficiency worldwide.



Program Purpose and Customers/ Beneficiaries	FY 2011 Activities	FY 2011 Achievements	FY 2011 Outputs	FY 2011 Outcomes	Contributions to DOT Goal
Through the Increase International Aviation Safety program, FAA supports increased safety and capacity of the global civil aerospace system in an environmentally sound manner. Customers and beneficiaries are the international aviation community.	- Establish coordinated safety agendas throughout the world  - Participate in public-private partnerships and ICAO international venues  - Support reconstitution of civil aviation in Afghanistan, Iraq and other countries.	- Deliver international air transportation hazardous shipping regulation courses - Define international steps to limit or reduce the impact of greenhouse gas emissions from international civil aviation on the global climate	- Work with the Chinese aviation authorities and industry to adopt three proven Commercial Aviation Safety Team (CAST) safety enhancements by FY 2011  - Arrange commitments for external funding for at least seven international aviation development projects  - Expanded use of NextGen performance-based systems and concepts to one priority country	- Direct or indirect assistance to over 100 countries around the world to help them improve their aviation systems	Goal: Global Connectivity

#### Increase International Aviation Safety

#### Program Purpose and Customers/Beneficiaries

The purpose of this program is to increase the safety and capacity of the global civil aerospace system in an environmentally sound manner. Customers and beneficiaries are the international aviation community.

#### 2011 Program Inputs

The requested amount of \$74.99 million and 338 FTE provide the recourses for the Increase International Aviation Safety program to improve aviation systems around the world.

#### 2011 Program Activities

Ongoing FY 2011 program efforts include the establishment of a coordinated safety agenda throughout the world through participation in public-private partnerships and ICAO international venues. Specifically, FAA will continue to support reconstitution of civil aviation in Afghanistan and Iraq and other countries.

#### 2011 Program Achievements

By FY 2011, FAA will work with Chinese aviation authorities and industry to adopt a total of 27 proven Commercial Aviation Safety Team (CAST) safety enhancements. A total of three will be adopted in FY 2011. Additionally, FAA will deliver international air transportation hazardous shipping regulation courses and define international steps to limit or reduce the impact of greenhouse gas emissions from international civil aviation on the global climate.

#### 2011 Program Outputs

The FAA will work with the Chinese aviation authorities and industry to adopt three proven Commercial Aviation Safety Team (CAST) safety enhancements by FY 2011. Arrange commitments for external funding for at least seven aviation development projects. The FY 2011 target is seven projects. Expand the use of NextGen performance-based systems and concepts to one priority country.

#### 2011 Program Outcomes

The FAA will provide direct or indirect assistance to over 100 countries around the world to help them improve their aviation systems.

#### Contribution to DOT Goal

Increase International Aviation Safety supports the Global Connectivity DOT goal.

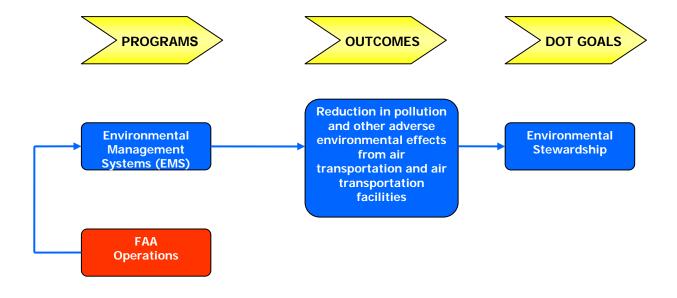
#### **ENVIRONMENTAL STEWARDSHIP**

#### **OVERVIEW**

To ensure continued United States air transportation vitality and global leadership, the FAA has committed to improving environmental protection and addressing the energy challenge. Environmental protection that allows sustained aviation growth is the overarching environmental goal for NextGen. Despite the downturn in aviation activity experienced from 2008 – 2009, environmental and energy pressures on the national and international aviation system remain and will continue to increase as growth in aviation activity returns. The primary environmental and energy issues that will significantly influence the future capacity and flexibility of the national airspace system (NAS) are aircraft noise, air quality, global climate effects, energy availability and efficiency, and water quality.

The FY 2011 budget request for \$214.86 million and over 110 FTE supports FAA contributions to DOT Environmental Stewardship strategic goal, facilities clean-up, streamlined environmental reviews and reducing aircraft noise and improving aviation fuel efficiency. FAA programs which address environmental stewardship are included below:

- FAA will develop and mature clean and quiet technologies and advance alternative fuels.
- Qualify and approve new aviation alternative fuels for operational use. A number of key tests to support approval of these new fuels will occur in 2011.
- Develop improved metrics, measurement techniques, and modeling to quantify and predict impacts and to understand inter-relationships of aviation environmental factors.



ENVIRONMENTAL STEWARDSHIP							
Program Name: Ensure FAA is Environmentally Responsible within the Operations Environment							
FY 2011 Inputs: \$214.86 million; 113 FTE							
Program Purpose and	FY 2011	FY 2011	FY 2011	FY 2011	Contributions		
Customers/	Activities	Achievements	Outputs	Outcomes	to		
Beneficiaries				5	DOT Goal		
The purpose of environmental stewardship is to ensure FAA operations protect the environment. Customers and beneficiaries include aviation industry, community groups, and the general public.	- Implement Environmental Management Systems to ensure FAA operations protect the environment, meet statutory and regulatory environmental requirements, and improve reliability and cost effectiveness  - Develop and mature cleaner, quieter and more energy efficient technologies  - Identify and explore advances in communications, navigation and surveillance technology to enable environmentally friendly gate-to- gate NextGen operational procedures	- Demonstrate promising environmental technologies, including alternative fuels  - Complete a NAS-wide benefits assessment of aircraft environmental technologies and aviation alternative fuels  - Assess aviations climate impacts, including life cycle effects of renewable alternative fuels  - Refine and update the NextGen environmental goals, targets and metrics	- Complete annual assessment of fuel burn Assess aviation-related emission concentration s that effect local air quality	- Reduce the number of people exposed to significant noise by four percent per year through FY 2014, as measures by a three-year (2000-2002) moving average. FY 2011 target is -24%  - Improve aviation fuel efficiency by one percent each year through FY 2014 to 12 percent, as measures by a three-year moving average of the fuel burned per revenue mile flow, from the three-year average for calendar years 2000-2002. FY 2011 target is -9%	Goal: Environmental Stewardship		

#### Ensure FAA Operations Protect the Environment

#### Program Purpose and Customers/Beneficiaries

The purpose of this program is to ensure FAA operations protect the environment and promote environmental stewardship. Customers and beneficiaries include aviation industry, community groups, and general public.

#### 2011 Program Inputs

To Ensure the FAA is Environmentally Responsible within the Operations Environment, \$214.86 million and 113 FTE are requested.

### 2011 Program Activities

FY 2011 FAA activities include implementation of Environmental Management Systems (EMS) to ensure FAA operations minimize environmental impact, meet statutory and regulatory environmental requirements, and improve efficiency, reliability and cost benefit. The FAA will continue to develop and mature cleaner, quieter and more energy efficient technologies and advance alternative aviation fuels. We will identify and explore advances in communications, navigation and surveillance technology to enable environmentally friendly gate-to-gate NextGen operational procedures.

#### 2011 Program Achievements

During FY 2011, FAA will demonstrate advanced environmental technologies, including alternative fuels. We will complete a NAS-wide benefits assessment of aircraft environmental technologies and aviation alternative fuels and contribute toward NextGen environmental goals. Identifying and exploring advances in communication, navigation

and surveillance technology to advance aircraft arrival and departure, surface movements, and en route/ oceanic procedures will result in reduced noise, fuel burn, and engine emissions. We will assess aviation's climate impacts, including life cycle effects of renewable alternative fuels. FAA will refine and update the NextGen environmental goals, targets and metrics and conduct a major demonstration of a NextGen EMS.

### 2011 Program Outputs

Through research and development and using analytical tools, FAA will better understand the relationship between noise and emissions and different types of emissions. During FY 2011, FAA will complete an annual assessment of fuel burn. In the area of emissions mitigations, FAA will release guidance material related to dispersion modeling (i.e., assessment of aviation-related emission concentrations that affect local air quality).

#### 2011 Program Outcomes

Reduce the number of people exposed to significant noise by four percent per year through FY 2014, as measured by a three-year (2000-2002) moving average. FY 2011 target is -24 percent. Improve aviation fuel efficiency by one percent each year through FY 2014 to 12 percent, as measured by a three year moving average of the fuel burned per revenue mile flown, from the three year average for calendar years 2000-2002. The FY 2011 target is -9 percent.

#### Contribution to DOT Goal

FAA's program to *Ensure FAA is Environmentally Responsible within the Operations Environment* supports the DOT Environmental Stewardship goal.

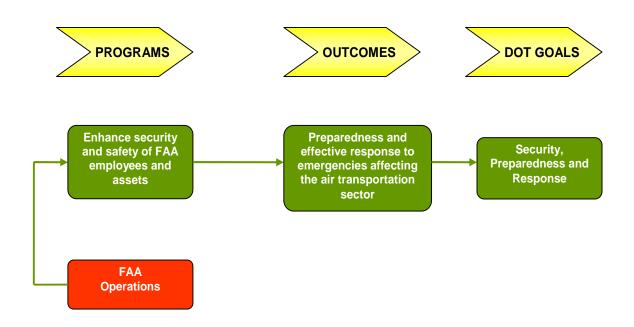
#### **SECURITY**

#### **OVERVIEW**

While FAA does not contribute directly to DOT's Security performance goal, the agency is responsible for the safe transportation of hazardous materials in air commerce. The FAA develops and implements national policy on hazardous materials through inspections, training, and outreach to those involved in the production and air transport of hazardous materials worldwide. The agency is responsible for ensuring that FAA employees and facilities are protected from terrorist and other criminal acts, classified and sensitive unclassified information are protected, and communications secured. In addition, FAA ensures FAA's critical information systems, networks, and administrative systems are protected from cyber-terrorism and malicious activities by hackers and other unauthorized personnel.

This funding request supports the DOT Security, Preparedness, and Response strategic goal. The FAA requests nearly \$104.61 million and about 440 FTE for programs contributing to this strategic goal. The FY 2011 budget request provides resources for critical infrastructure protection, emergency operations, contingency planning, and the safe transportation of hazardous materials in air commerce. Specifically, this budget request allows for:

- Activities to remediate moderate vulnerabilities identified for FAA information systems that support Human Resources, Finance, Security/Safety, and Air Traffic services. The request will cover contracts that will conduct information system assessments, certifications, recertifications, and risk mitigation activities. The funding will allow FAA to handle risks to its information systems sooner, which will save out-year dollars and prevent higher and more costly system vulnerabilities and remediations.
- Continuation of ability to respond to Privacy Act requests. Increase the training and awareness of all employees
  and contractors, and update policies and procedures in response to OMB mandates, such as the requirement to
  eliminate all unnecessary uses of Social Security Numbers in FAA systems and support the continuation of
  reengineering efforts to improve how the agency manages the collection, storage, transmission, and destruction
  of Personally Identifiable Information throughout the entire agency.
- Enhancement of safety inspections and emergency operations. Aviation operations occur domestically and overseas 24 hours a day, and FAA must be able to respond to events in the air domain around the clock. This request will support FAA in providing on-site, immediate, decision-quality intelligence information to the FAA Administrator and Lines of Business outside of normal duty hours and, most notably, during a crisis or developing aviation security incident. In addition, FAA will be better positioned to support the 154 percent growth in Federal hiring by providing personnel security specialist resources to process, track, and adjudicate national security and suitability investigations required for each employment candidate. The hiring surge and reinvestigation of on board employees for higher security clearance require a boost to the Personnel Security System (PSS) workforce.



Program Name: Enhance Security and Safety of FAA Employees and Assets FY 2011 Inputs: \$104.61 million; 444 FTE						
Program Purpose and Customers/ Beneficiaries	FY 2011 Activities	FY 2011 Achievements	FY 2011 Outputs	FY 2011 Outcomes	Contributions to DOT Goal	
The purpose of enhancing the security and safety of FAA employees and assets is to protect the air-traveling public.	- Conduct annual assessments, contingency plan tests, and information system security technology evaluations - Identify, implement and oversee facility security measures commensurate with privacy information risks - Provide operational support to sensitive national defense and sensitive law enforcement operations from relevant counterintelligence sources - Provide operations support in response to emergency or crisis situations.	- Complete 92 information system certifications and accreditations  - Conduct 176 annual assessments  - Vulnerability test 20% of FAA's inventory  - Complete 100% of Privacy Threshold Analysis and Privacy Impact Assessments and the Certification and Accreditation anniversary  - Review 99% of all Sensitive Compartmented Information (SCI) request packages for suitability determination within seven days	Send 99% of SCI request packages meeting suitability determinations to the relevant security authority within five business days.	- Zero cyber security events that significantly disable or degrade FAA services - Exceed Federal Emergency Management Agency (FEMA) continuity readiness levels by five percent	Goal: Security, Preparedness and Response	

### Enhance Security and Safety of FAA Employees and Assets

#### Program Purpose and Customers/Beneficiaries

The FAA's security program enhances and protects the security and safety of FAA employees and assets, and by extension, the air-traveling public. Customers and beneficiaries are FAA employees, flying public and users of the NAS.

#### 2011 Program Inputs

In order for the *Enhance Security and Safety of FAA Employees and Assets* program to be most effective, the FAA has requested \$104.61 million and 444 FTE as program inputs.

#### 2011 Program Activities

FAA's FY 2011 recurring activities include conducting annual security assessments, contingency plan testing, and information system security technology evaluations. FAA will also continue to provide operational support to sensitive national defense and sensitive law enforcement operations from relevant counterintelligence sources, as well as in response to emergency or crisis situations.

#### 2011 Program Achievements

During FY 2011, FAA will complete 92 information system certifications and accreditations, conduct 176 annual assessments, vulnerability test 20% of FAA's inventory and complete 100 percent of Privacy Threshold Analysis and Privacy Impact Assessments and the Certification and Accreditation anniversary. The FAA will also review 99 percent of all Sensitive Compartmented Information (SCI) request packages for suitability determination within seven days.

#### 2011 Program Outputs

FAA employees are provided with a secure environment where information and assets are protected and safe.

## 2011 Program Outcomes

Program outcomes include aero cyber security events that significantly disable or degrade FAA services and exceeding Federal Emergency Management Agency (FEMA) continuity readiness levels by five percent.

### Contribution to DOT Goal

The FAA's program to *Enhance Security and Safety of FAA Employees and Assets* contributes to the DOT goal of Security, Preparedness and Response.

#### ORGANIZATIONAL EXCELLENCE

#### **OVERVIEW**

As the aviation community continues to move forward during a tough economic environment, FAA faces many difficult management challenges. FAA's central management strategy contained within the FAA Flight Plan, for achieving organizational excellence is to ensure mission success through strong leadership, better-trained and safer workforce, enhanced cost-control, and data - risk informed decision making. Key to attaining excellence is our ability to refine our focus on the strategic management of agency human capital.

This funding request for \$273.21 million and about 540 FTE supports the DOT Organizational Excellence strategic goal, also supporting FAA's capability to put the right people, information, financial resources, and administrative support in the right place at the right time. FAA's organizational excellence programs contribute to operational program effectiveness and national objectives for:

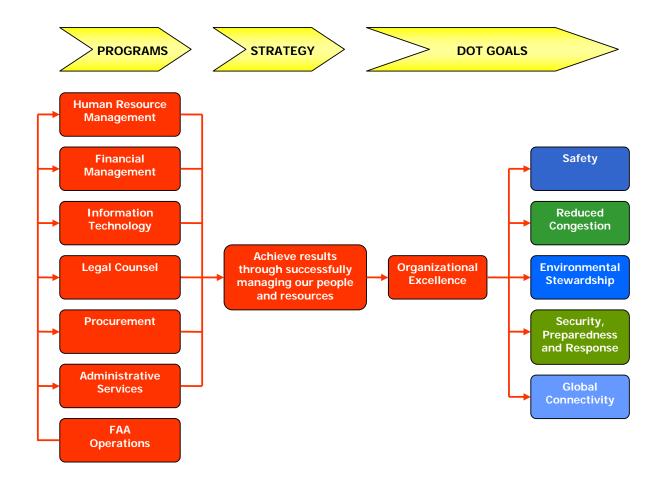
- Increased safety,
- Reduced congestion,
- Global connectivity,
- Environmental stewardship, and
- Security, preparedness and response

The FAA is taking steps to place the right number of aviation professionals including controllers and safety personnel in identified positions to maximize the safety and efficiency of the NAS. In the next decade, FAA will continue to hire and train sufficient numbers to ensure a viable NAS and meet programmed levels. The FY 2011 budget request supports the hiring, training, staffing analysis, and management recommendations of the Air Traffic Controller and Safety Workforce Plans, enhanced cost control as evidenced by an unqualified annual audit report, and a better trained and safer workforce through reductions in workforce injury/illness.

The request will support FAA in reducing on-the-job-training time necessary for the certification of developmental controllers from Stage I to IV (not including Certified Professional Controllers IT) ensuring that 90 percent of new controllers meet or come in under their budgeted time for certification. FAA will also acquire and develop necessary skills by achieving the target for months-to-certification of developmentals from Stage I to IV (not including the Certified Professional Controllers (CPC) in-training (IT).

The FAA will coordinate and report on the initiative efforts to maintain the ATC Workforce Plan annual hiring within two percent of the ATC Workforce Plan hiring targets.

This request also supports the *Aviation Safety Workforce Plan*, ensuring a highly trained and proficient workforce to successfully transition to a Safety Management System. The FAA will maintain safety staff within 1 percent of projected annual requirements, as well as undertaking initiatives to reduce injury or illness to a rate of no more than 2.44 per 100 employees.



	ORC	GANIZATIONAL	EXCELLENCE		
Program Name: FAA	Workforce and Suppor	t Programs			
FY 2011 Inputs: \$27	3.21 million; 537 FTE				
Program Purpose	FY 2011	FY 2011	FY 2011	FY 2011	Contributions
and Customers/	Activities	Achievements	Outputs	Outcomes	to
Beneficiaries			·		DOT Goal
The FAA Workforce	- Manage the hiring,	- 90 percent of	- Obtain	- Maintain air traffic	Goal:
and Support	training, development		unqualified	control workforce	Organizational
Programs' purpose is	and utilization of	and Terminal	audit opinion	within two percent	Excellence
to ensure the efficient	controllers and	controllers meet	with no	above or below the	
delivery of NAS	Aviation Safety	or come in	material	projected annual	
services by effectively	Workforce	under their	weakness	totals in the Air	
managing the FAA		budgeted time		Traffic Controller	
workforce and	- Analyze and	for certification	- Reduce the	Workforce Plan.	
associated support	determine staffing		total		
programs. Customers	and hiring targets		workplace	- Maintain the	
and beneficiaries			injury and	aviation safety	
include employees and	- Manage personnel		illness case	workforce within 1	
ultimately the flying	hiring and selections		rate to no	percent of the	
public.			more than	projected annual	
	<ul> <li>Provide support for</li> </ul>		2.44 per 100	totals in the Aviation	
	all operating		employees	Safety Workforce	
	programs		by the end of	Plan. FY 2011 Target:	
			FY 2011	1% of annual target	

#### FAA Workforce and Support Programs

#### Program Purpose and Customers/Beneficiaries

This program's purpose is to ensure the efficient delivery of NAS services by effectively managing the FAA workforce. Customers and beneficiaries include employees, and ultimately the flying public.

#### 2011 Program Inputs

The requested program inputs include \$273.21 million and 537 FTE.

#### 2011 Program Activities

In FY 2011, FAA will continue to manage the hiring, training, development and utilization of controllers and Aviation Safety Workforce. We will analyze and determine staffing and hiring targets and then manage personnel hiring and selections. Financial management program objectives for FY 2011 include receiving an unqualified audit opinion with no material weakness for FAA's presentation of 2010 annual audited financial statement.

#### 2011 Program Achievements

In FY 2011, 90 percent of new controllers will meet or come in under their budgeted time for certification.

#### 2011 Program Outputs

As a result of maintaining the Air Traffic Controller and Aviation Safety workforce, FAA will have sufficient resources to support its safety mission as well as meet external stakeholder requirements. Other outputs include FAA employee support, financial management support and IT service and system support. Employee support outputs include training, employee recognition, workforce development, employee recruitment, and properly managed resources. For financial management, outputs for the fiscal year include financial management reports, financial statements, and financial operating plans. For IT, continued compliance with Section 508 and Privacy Act, development and implementation of systems, Internet and Intranet support, and support of Continuity of Operations Plan (COOP) sites.

#### 2011 Program Outcomes

Maintain air traffic control workforce within two percent above or below the projected annual totals in the Air Traffic Controller Workforce Plan. The FY 2011 funding request contributes to all FAA goals and ensures FAA is able to put the right people, information, financial resources, and administrative support in the right place at the right time.

#### Contribution to DOT Goal

The DOT Organizational Excellence goal is supported by all of FAA's workforce and support programs.

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## EXHIBIT IV-4 KEY PROGRAM REVIEWS, ASSESSMENTS OR EVALUATIONS

### A. Recent Reviews, Assessments and Evaluations

Name/Title	Туре	Result
Operational Error Program	Review	Recommendations included establishing: (1) Follow-up mechanism to ensure Flight Standards inspectors comply with new guidance for investigating pilot deviations; (2) Process to rate the severity of pilot deviations and a corresponding goal to reduce the most severe incidents; (3) Milestones for fully implementing TARP; and (4) Internal audit of the planned changes to the ATO safety oversight.
Independent Assessment of FAA's Acquisition Management System	Assessment	Recommendations from the assessment were grouped into five major themes: (1) Restructure governance process; (2) Adopt a portfolio management view to oversee investments; (3) Streamline investment selection process based on type of investment; (4) Implement improvements to support full range of purchasing activities; and (5) Enable a high performing acquisition organization.  Within these major themes were three recommendations with a potential for high impact that were singled out for further analysis and recommendations: institute acquisition categories defining a specific path and review authorities based on specific program criteria, assess the investment selection review processes and identify an approach to streamline the process, and establish processes to support development of Acquisition Management System process schedules for capital investments.
Comprehensive Review of FAA's Federally Funding Research and Development – Center for Advance Aviation System Development	Review	This evaluation was completed with a signed report being delivered to ATO NextGen & Operations Planning on August 14, 2009. The review was conducted under the FAA National Acquisition Evaluation Program. It is a review of data collected on a regular basis during the life of the contract and sponsoring agreement between the FAA and the MITRE Corporation. The evaluation was included in the Comprehensive Review of the FAA's Federally Funded Research and Development Center.

#### Operational Error Program

Name of Org requiring examination: ATO

Name of org conducting examination: DOT OIG

Start date: November 2007End date: December 2008

Independent Assessment of FAA Acquisition Management System (AMS)

Name of Org requiring examination: DOT/FAA/ATO

Name of org conducting examination: PriceWaterhouseCoopers LLP

Start date: October 2007End date: January 2009

Program Reviews 1

Review of FAA's Federally Funding Research and Development Center – Center for Advance Aviation System Development (CAASD)

• Name of Org requiring the examination: DOT/FAA/ATO/NextGen & Operations Planning

Name of org conducting the examination: FAA/ATO/Acquisition & Business

Start date: May 2009End date: August 14, 2009

### B. Planned Reviews, Assessments and Evaluations

Name/Title	Туре	Intended Result
Streamlined Environmental Impact Statement Process	Evaluation	Examine efforts of the Airports Program to streamline the NEPA EIS process. Provide lessons learned and initiatives where streamlining might be improved.
Runway Safety Program	Evaluation	This evaluation will be a management study and will examine management systems, processes and practices, communications and industry involvement. This evaluation is directly related to our performance goal of improving aviation safety.

#### Streamlined Environmental Impact Statement Process

Name of Org requiring examination: FAA/ARP

Name of org conducting examination: ARP with contractor support

Start date: October 1, 2010End date: September 30, 2011

#### Runway Safety Program

• Name of Org requiring examination: FAA/ATO

• Name of org conducting examination: ATO with contractor support

Start date: Start of FY 2011

• End date: 2011

2 Program Reviews

# Attachment A Summary of High Priority Performance Goals

## **Reducing Runway Incursions**

Mode: Federal Aviation Administration

#### Problem being addressed

<u>Problem statement:</u> The unauthorized presence of an aircraft, vehicle or pedestrian on a runway increases the likelihood of incidents that could evolve into fatalities, serious injuries, and significant property damage.

#### Importance:

The runway environment remains one of the highest risk areas in our national airspace system. Therefore, the FAA must systematically reduce aircraft passengers' exposure to risk and increase runway safety.

#### 2. Contributing programs within the agency/outside the agency

<u>Lead Program:</u> Director of the Runway Safety Office, Regional Runway Safety Program Managers, located in each of the FAA Regions – Conduct Runway Safety Action Team meetings, educate pilot, airport and ATC communities within the regional boundaries.

#### Supporting Programs:

- Director, Flight Standards Service Improve the Nation's aviation safety record by conveying safety principles and practices through training, outreach, and education. Conduct investigations into alleged pilot deviations.
- Office of the Associate Administrator of Airports Provide guidance and assistance on Airport signage and marking, compliance with FAR Part 139.
- Vice President, Terminal Operations Provide guidance and assistance on Air Traffic Control operations and procedures
- Team Lead, Field prototyping and demonstration team Deploy field prototypes and gather data to support proof of concept

#### **Contributing Non-Federal Partners:**

- State and Local Airport Authorities
- American Association of Airport Executives Participates on the Runway Safety Council and supports Runway Safety Root Causal Analysis Team in an effort to reduce both the severity and likelihood of runway incursions.
- Airports Council International North America Participates on the Runway Safety Council
  and supports Runway Safety Root Causal Analysis Team in an effort to reduce both the
  severity and likelihood of runway incursions.
- Airline Pilots Association Participates on the Runway Safety Council and supports Runway Safety Root Causal Analysis Team in an effort to reduce both the severity and likelihood of runway incursions.
- Air Transport Association Participates on the Runway Safety Council and supports Runway Safety Root Causal Analysis Team in an effort to reduce both the severity and likelihood of runway incursions.
- Aircraft Owners and Pilots Association Participates on the Runway Safety Council and supports Runway Safety Root Causal Analysis Team in an effort to reduce both the severity and likelihood of runway incursions.

- MITRE Participates on the Runway Safety Council and supports Runway Safety Root Causal Analysis Team in an effort to reduce both the severity and likelihood of runway incursions.
- National Air Traffic Controllers Association Participates on the Runway Safety Council and supports Runway Safety Root Causal Analysis Team in an effort to reduce both the severity and likelihood of runway incursions.
- National Association of Flight Instructors Participates on the Runway Safety Council and supports Runway Safety Root Causal Analysis Team in an effort to reduce both the severity and likelihood of runway incursions.
- National Business Aviation Association Participates on the Runway Safety Council and supports Runway Safety Root Causal Analysis Team in an effort to reduce both the severity and likelihood of runway incursions.
- Regional Airline Association Participates on the Runway Safety Council and supports Runway Safety Root Causal Analysis Team in an effort to reduce both the severity and likelihood of runway incursions.

#### 3. Implementation strategy overview

<u>Approach:</u> The FAA systematically invests in advances through technology, infrastructure, tools, and training/safety promotion to improve runway safety. This includes:

- Operational procedures, such as pilot read-backs of controller clearances.
- Airport infrastructure, such as airfield signs, pavement markings, surface surveillance systems, and other safety technology.
- Air traffic management, such as the coordination between ground and local control.
- Training and awareness for the safe conduct of airport movement operations, such as focused outreach, Flight Instructor Refresher Clinics, Pilot Seminars, and working with industry to maintain focus on Runway Safety through special campaigns, such as our Summer Initiative that targeted specific airports based on our data analysis.
- Runway Safety Council and Root Cause Analysis Team integration of incursion investigation with human performance data to enhance the development of safety recommendations.
- Partnerships with industry groups, such as the Airline Owners and Pilots Association (AOPA) and the National Association of Flight Instructors (NAFI) to provide the General Aviation community with Runway Safety focused programs through outreach, such as DVD and promotional material mailings.
- Runway Safety technologies, such as Runway Status Lights at 23 airports by 2015, Low Cost Ground Surveillance at four airports by 2011, and ASDE-X implementation at 35 airports by 2011. The first key site for RWSL and the final three sites for ASDE-X will be deployed in 2011.
- Partnering with industry on testing of Airport Moving Map Display Technology in the cockpit.

#### **Tracking Success**

<u>The Runway Safety Program's quarterly</u> seasonally adjusted runway incursions targets for FY 2010 and FY 2011 are:

	FY2010	FY2011
	979	959
1Q	228	223
2Q	218	211
3Q	263	256
4Q	270	269
	979	959

### 4. Resources Required

### Funding:

Consolidated requirement for this entire program is \$143.08 million, 512 full time equivalent employees. For detailed information to include FY 2011 activities and achievements, please see Logic Model – *Reduce Runway Incursions*, page 6.

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## FEDERAL AVIATION ADMINISTRATION RESEARCH, DEVELOPMENT, AND TECHNOLOGY

The FAA's R,E&D program, in partnership with the aviation community, provides world leadership by conducting high-priority research and the development of innovative technologies to support a safe, efficient, and environmentally acceptable global aviation system. The program undertakes research and coordinates its research with both domestic and international partners. It is responsible for establishing and overseeing the FAA's R&D policy and plans, developing its R&D investment portfolio, and serving as the agency's R&D spokesperson. Its diverse scientific, engineering and technical work force supports all aspects of aviation from research on materials to development of new products and procedures.

Under the management of the Office of Research and Technology Development, the R&D program develops and tests specific technologies, tools, and procedures critical to enhancing the FAA's unique mission to regulate and certify airmen and aircraft and to enhance the safety and efficiency of the National Aviation System. The program also enables the FAA to keep pace with new technologies that affect the FAA's ability to regulate and manage the National Airspace System. The FAA publishes the annual National Aviation Research Plan which documents each R&D program area, provides intended outcomes, outputs, programmatic structure, partnerships, and a long-range outlook for the program.

One way, the FAA ensures its research meets the President's criteria for research and development is through the Research, Engineering, and Development Advisory Committee (REDAC), established by Congress in 1989. This group reports to the FAA Administrator on RE&D issues and provides a link between the FAA's program and similar efforts in industry, academia, and government. The REDAC specifically looks at the FAA research programs in terms of the relevance and appropriateness of programs to the National Airspace System and works to ensure that FAA's program goals and priorities properly link to national needs. The Committee also examines the quality and performance of the Research and Development program and provides FAA with advice on how best to allocate funds to ensure a high quality R&D program. The REDAC considers aviation research needs in six key areas: air traffic services, airport technology, aircraft safety, human factors, and the environment. Representing corporations, universities, associations, consumers, and other agencies, up to 30 REDAC members hold two-year terms. The REDAC meets with FAA senior managers two times a year and annually reviews the Agency's R&D budget submission.

### Department of Transportation Budget Authority (in thousands of dollars)

		FY 2009 Enacted	FY 2010 Enacted	FY 2011 Request
FEDER#	AL AVIATION ADMINISTRATION			
A. Research, Engineering and Development		171,000	190,500	190,000
A11	Improve Aviation Safety	90,763	93,572	93,702
a.	Fire Research and Safety	6,650	7,799	7,231
b.	Propulsion and Fuel System	3,669	3,105	2,332
C.	Advanced Structural/Structural Safety	2,920	4,935	2,566
d.	Atmospheric Hazards-Aircraft Icing/Digital System Safety	4,838	4,482	6,635
e.	Continued Airworthiness	14,589	10,944	10,801
f.	Aircraft Catastrophic Failure Prevention Research	436	1,545	1,165
g.	Flightdeck/Maintenance/System Integration Human Factors	7,465	7,128	7,174
h.	System Safety Management	12,488	12,698	11,907
I.	Air Traffic ControTechnical Operations Human Factors	10,469	10,302	10,475
j.	Aeromedical Research	8,395	10,378	11,217
k.	Weather Program	16,968	16,789	16,505
l.	Unmanned Aircraft System	1,876	3,467	3,694
m.	NextGen Alternative Fuels for General Aviation	-	-	2,000
A12	Improve Efficiency	43,226	48,543	54,874
a.	JPDO	14,466	14,407	14,292
b.	Wake Turbulence	10,132	10,631	10,685
C.	NextGen: Air Ground Integration	2,554	5,688	10,614
d.	NextGen: Self-Separation	8,025	8,247	9,971
e.	NextGen Weather in the Cockpit	8,049	9,570	, 9,312
A13	Reduce Environmental Impact	31,658	42,031	35,974
a.	Environment and Energy	15,608	15,522	15,374
b.	NextGen Environmental Research Aircraft Technologies Fuels and I	16,050	26,509	20,600
A14	Mission Support	5,353	6,354	5,450
a.	System Planning and Resource Management	1,817	1,766	1,733
b.	William J. Hughes Technical Center Laboratory Facility	3,536	4,588	3,717
B. Facili	ities & Equipment	145,732	170,418	155,164
a.	Advanced Technology Development and Prototype	35,000	28,100	15,100
b.	Plant	18,400	18,500	21,500
C.	CAASD	22,932	23,944	23,564
d.	NextGen Demonstrations and Infrastructure Development	28,000	33,774	-
f.	NextGen System Development	41,400	66,100	95,000
C. Airpo	ort Improvement Program, Airport Technology (T)	34,348	37,472	42,217
a.	Airport Technology Research	19,348	22,472	27,217
b.	Airport Cooperative Research	15,000	15,000	15,000
D. Ope	rations	14,295	13,563	13,021
E. Com	mercial Space Transportation	145	145	165
	Subtotal, Research and Development	312,772	356,126	336,850
	Subtotal, Technology Investment (T)	34,348	37,472	42,217
	Subtotal , Facilities (F)	18,400	18,500	21,500
	TOTAL FAA	365,520	412,098	400,567

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