U.S. Department of Transportation

BUDGET ESTIMATES

FISCAL YEAR 2020

FEDERAL AVIATION ADMINISTRATION

SUBMITTED FOR USE OF THE COMMITTEE ON APPROPRIATIONS

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OVERVIEW

The Federal Aviation Administration (FAA) has overseen all aspects of civil aviation in the United States for sixty years. We operate the largest, safest and most complex aerospace system in the world. Safety is our top priority, and the FAA delivers on this priority every day by guiding the 5,000 aircraft that fly in our nation's airspace at any given time.

For FY 2020, a total funding level of $17.1 billion will enable the FAA to achieve its mission while making critical investments that support innovation, protect aviation safety, and make investments in our nation's infrastructure.

The FAA needs to keep pace with innovation in the aerospace industry. The budget therefore proposes to create a new Office of Innovation, with an initial investment of $1.6 million, in order to provide strong leadership that will engage with industry and facilitate collaboration among the agency's lines of business to introduce more rapidly new entrants and technology into the nation's airspace.

This budget request also supports the FAA's continuing efforts to safely integrate new entrants such as unmanned aircraft systems (UAS) and commercial space transportation into our nation's busy airspace. Selectees for the FAA's UAS Integration Pilot Program will collect two and half years of drone data on night operations, flights over people and beyond the pilot's line of sight, and detect-and-avoid technology. The FAA is also automating how UAS operators get permission to fly in controlled airspace – a crucial first step for UAS traffic management. The FAA is actively implementing this tool at hundreds of airports and air traffic facilities. For commercial space, the FAA is automating launch and reentry operations, a process that has been manual and time consuming, requiring the closure of large portions of the national airspace.

It has been eleven years since the FAA undertook the responsibility for modernizing air traffic control while maintaining an aging legacy infrastructure. While the majority of the NextGen technology has been deployed, our FY 2020 budget supports NextGen and the FAA's ongoing effort to bring NextGen benefits to industry stakeholders, while maintaining the agency's existing infrastructure at its current condition level.

Our FY 2020 budget request reflects our commitment to achieving the next level of safety. Additional funding is requested to address vulnerabilities to cybersecurity threats, and the budget request also includes funding to support the data and information systems that the FAA relies on to protect the safety of our civil aviation.

The budget also provides funding to improve infrastructure at our nation's airports through federal grants. Our grant funding supports our continued focus on safety-related development projects at our airports, including projects that reduce the potential for runway incursions.

Operations

The FY 2020 request includes $10.3 billion for Operations. This level provides targeted investments to improve the FAA's ability to respond to industry innovation and improve the safety of our national airspace, while providing enough resources to cover uncontrollable cost increases.

The budget request includes almost $21 million for targeted investments that will improve the FAA's ability to respond to industry innovation. This total includes $1.6 million for a new Office of Innovation that will quickly bring new viable innovations from the aviation industry into full operation in our national airspace system. The office will examine the impact of new technologies developed by industry on our national airspace, assess their likely benefits, and develop methods for safely integrating these technologies into existing operations. The Office of Innovation will also provide leadership to engage with industry and to facilitate collaboration among FAA lines of business.

The total request for innovative investments also includes an increase of $12 million for activities across the agency to safely integrate UAS into our national airspace, as well as an increase of $2 million for efforts to speed the processing of licenses and approvals, streamline regulatory requirements for commercial space activities, and keep pace with industry demands for products and services.

Finally, an increase of $5.1 million will improve the safety of our national airspace by supporting the FAA's cybersecurity efforts. The additional funding will be used to conduct annual risk assessments of cybersecurity risks, and to begin a multi-year plan for reducing the backlog of known cyber vulnerabilities in the national airspace.

The Operations budget request also includes $108 million to cover uncontrollable cost increases anticipated in FY 2020. Most of this additional funding is necessary to cover the cost of an additional compensable day in FY 2020 ($28 million) and to pay for costs that are transitional from the Facilities and Equipment account ($47 million). The FAA spends over $2 billion a year on new air traffic control and safety related systems in the Facilities and Equipment account, including NextGen capabilities. After new systems are installed in the national airspace, the costs of their operation and maintenance is paid from the Operations account.

Facilities & Equipment (F&E)

The FY 2020 request includes $3.3 billion for Facilities and Equipment. Of this total, $1.22 billion supports bringing NextGen benefits, including near-term priorities identified by the NextGen Advisory Committee. The FAA will engage with the Congress and aviation industry stakeholders to explore the potential for better integrated NextGen automation solutions with a focus on whether fewer providers would result in the improved effectiveness and efficiency of various NextGen capabilities.

<u>Innovation</u>

The Facilities and Equipment budget request includes nearly $1.22 billion for NextGen capital investments. This funding fully supports ongoing programs such as Data Communications, which enables controllers to send digital instructions and clearances to pilots. This funding level also supports key NextGen programs such as NextGen Weather Processor, which will help reduce weather delays by delivering improved weather information to all users of the national airspace; enhancements to Automated Dependent Surveillance-Broadcast (ADS-B), which is the FAA's satellite-based successor to radar technology; and Space Based ADS-B work in the Caribbean, which will allow users of the national airspace to take advantage of satellite-based surveillance in places that do not have ADS-B ground infrastructure.

The budget also funds several programs that have great potential in reducing congestion and strengthening economic competitiveness in the United States. Great efficiencies can be gained by connecting airport surface information to the en route airspace and by exchanging more information with stakeholders. The request therefore includes $136 million for the Terminal Flight Data Manager program, which will collect, distribute, and update flight information in the airspace around an airport. This program is a key ground infrastructure program for NextGen operations in the areas of flight planning; push back, taxi and departure; descent and approach; and landing, taxi and arrival. The program is supported by the NextGen Advisory Committee and will help to reduce congestion along the Northeast Corridor of the United States. In addition, $30.7 million is included in the budget request for Time Based Flow Management, which enables the performance-based navigation program to maximize traffic flow into and out of the busy metropolitan airspaces and corresponding airports.

The integration of both UAS and commercial space into the national airspace is also reflected in the F&E budget request. For UAS, $126.8 million is included to help develop a UAS Traffic Management system, a separate but complementary system to the Air Traffic Management system. This investment will include the evaluation of technology to track both cooperative and non-cooperative targets, the evaluation of technology that will support smart collection and dissemination of data to Unmanned Traffic System service providers, and cyber security and data integrity work for UAS networks. For commercial space, $33.0 million is requested to allow the FAA to automate launch and reentry operations that are currently manual in nature, time consuming, and require vast sections of commercial airspace to be closed off. An automated system will safely reduce the amount of airspace that must be closed to other users, and build the foundation for integrating commercial space operations into the national airspace.

<u>Safety</u>

The F&E budget request includes $155 million in FY 2020 to continue programs that protect aviation safety. This total provides ongoing funding for the Airborne Collision Avoidance System to replace the existing warning system that alerts pilots and controllers when aircraft are too close to each other. This funding level also provides funding for the Aviation Safety Analysis System, Aerospace Medicine Safety Information Systems, Aviation Safety Information Analysis and Sharing, and System Approach for Safety Oversight programs, which allow the FAA's safety inspection and certification workforce to access current safety data while they are conducting investigations and audits of airlines, manufactures, and pilots.

The budget also includes $33.3 million for the Information Security Program to protect national airspace assets from cybersecurity threats. This program limits the amount of security control investment required by each individual airspace system. The program will monitor the computing environment to detect and respond to anomalous events and data flows, and will remediate any system vulnerability.

Research, Engineering & Development

The FY 2020 budget request includes $120 million for Research, Engineering and Development. The FAA's budget proposal supports the Administration's commitment to maximize the impact of taxpayer dollars and improve the efficiency of federal research programs for the benefit of the American public.

The budget request includes a total of $86.8 million for research in essential safety areas, including $6 million to investigate improvements for the safe integration of commercial space operations into the national airspace, and another $7.5 million for safety research related to UAS. The UAS funding will be used to study the safety implications of new UAS operational concepts and technologies, and to support the new regulatory standards. The UAS research will focus on the areas of control and communications, training devices, and detection and avoidance technologies. Other safety-related research areas include advanced materials, aircraft icing, continued airworthiness, and information security.

Grants-in-Aid for Airports

The FY 2020 budget request includes $3.35 billion for the regular airport grants program. This request level provides the funding needed to preserve and improve critical airfield infrastructure at more than 3,300 public-use airports nationwide. This request supports our continued focus on safety-related development projects, including projects to help reduce runway incursions.

This request includes $112 million for personnel & related expenses for the FAA's Office of Airports. This level includes funding for two additional safety positions that will help the FAA ensure airport compliance with safety regulations and support the integration of UAS into airports through policy development and outreach.

The budget request includes $33.2 million for the Airport Technology Research program to support the safe and efficient integration of new and innovative technologies into the airport environment. Examples of research areas include new airfield lighting using LED technology, ways to reduce or eliminate harmful chemicals in firefighting agents, safe UAS operations at airports, runway condition monitoring using radar, new pavement materials to make airport pavements last longer, and wireless sensors to monitor pavement health.

The budget also includes $15 million for the Airport Cooperative Research program. The FAA provides oversight and expertise for projects in areas such as commercial space noise measurements, UAS operation at airports, safe construction practices, and emergency communications models.

Conclusion

Every day, tens of thousands of commercial flights, operating from a vast network of airports spanning 3.8 million square miles in the United States alone, will take off and land safely. The vast majority of flights will leave their gates on time and arrive on time. They will operate throughout their journeys under the watchful eyes of professional air traffic controllers in an air transportation system that is second to none.

America relies on civil aviation. A cornerstone of our nation's economy, civil aviation contributes approximately $1.6 trillion annually to the national economy, provides 11 million jobs, and constitutes 5.1 percent of the gross domestic product.[1]

The FY 2020 budget request will make critical investments in innovation that will allow the FAA to continue protecting this vital economic engine, while operating the safest and most complex aerospace system in the world.

[1] *Economic Impact of Civil Aviation on the U.S. Economy*, U.S. Department of Transportation, September 2017

Exhibit I-A
ORGANIZATION CHART
FY 2019

- **Office of the Administrator and Deputy Administrator (AOA)**
  17 FTE/ 22 Positions
  Total FAA
  43,609 FTE / 44,485 Positions
  - **Director for Audit & Evaluation (AAE)**
    20 FTE/ 20 Positions
  - **Air Traffic Organization (ATO)**
    31,333 FTE / 32,058 Positions
  - **Associate Administrator for Aviation Safety (AVS)**
    7,408 FTE / 7,442 Positions
  - **Associate Administrator for Commercial Space Transportation (AST)**
    104 FTE / 109 Positions
  - **Associate Administrator for Airports (ARP)**
    599 FTE / 599 Positions
  - **Associate Administrator for Security & Hazardous Material Safety (ASH)**
    495 FTE / 531 Positions
  - **Assistant Administrator for Policy, International Affairs & Environment (APL)**
    139 FTE / 144 Positions
  - **Assistant Administrator for Finance and Management (AFN)**
    1,775 FTE / 1,819 Positions
  - **Assistant Administrator for Next Generation Air Transportation System (ANG)**
    874 FTE / 877 Positions
  - **Assistant Administrator for Civil Rights (ACR)**
    72 FTE / 74 Positions
  - **Assistant Administrator for Human Resource Management (AHR)**
    505 FTE / 513 Positions
  - **Assistant Administrator for Government & Industry Affairs (AGI)**
    9 FTE / 9 Positions
  - **Office of Chief Counsel (AGC)**
    229 FTE / 238 Positions
  - **Assistant Administrator for Communications (AOC)**
    30 FTE / 30 Positions

Exhibit I-B
ORGANIZATION CHART
FY 2020

- **Office of the Administrator and Deputy Administrator (AOA)**
  17 FTE/ 22 Positions
  Total FAA
  43,750 FTE / 44,589 Positions
  - **Director for Audit & Evaluation (AAE)**
    20 FTE/ 20 Positions
  - **Air Traffic Organization (ATO)**
    31,413 FTE / 32,112 Positions
  - **Associate Administrator for Security & Hazardous Material Safety (ASH)**
    494 FTE / 530 Positions
  - **Assistant Administrator for Civil Rights (ACR)**
    72 FTE / 74 Positions
  - **Assistant Administrator for Communications (AOC)**
    31 FTE / 31 Positions
  - **Associate Administrator for Aviation Safety (AVS)**
    7,425 FTE / 7,460 Positions
  - **Assistant Administrator for Policy, International Affairs & Environment (APL)**
    303 FTE / 308 Positions
  - **Assistant Administrator for Human Resource Management (AHR)**
    505 FTE / 513 Positions
  - **Associate Administrator for Commercial Space Transportation (AST)**
    117 FTE / 122 Positions
  - **Assistant Administrator for Finance and Management (AFN)**
    1,622 FTE / 1,665 Positions
  - **Assistant Administrator for Government & Industry Affairs (AGI)**
    9 FTE / 9 Positions
  - **Associate Administrator for Airports (ARP)**
    600 FTE / 591 Positions
  - **Assistant Administrator for Next Generation Air Transportation System (ANG)**
    886 FTE / 887 Positions
  - **Office of Chief Counsel (AGC)**
    229 FTE / 238 Positions
  - **Office of Innovation**
    7 FTE/ 7 Positions

Section 2. Budget
Summary Tables

EXHIBIT II-1

FY 2020 COMPARATIVE STATEMENT OF NEW BUDGET AUTHORITY
FEDERAL AVIATION ADMINISTRATION
($000)

ACCOUNT NAME	FY 2018 ACTUAL*	FY 2019 ANNUALIZED CR	FY 2019 ENACTED**	FY 2020 REQUEST
Operations	$10,211,754	$10,211,754	$10,410,758	$10,340,000
Emergency Supplemental	$35,000			
Rescission				
Subtotal	**$10,246,754**	**$10,211,754**	**$10,410,758**	**$10,340,000**
Facilities and Equipment	$3,250,000	$3,250,000	$3,000,000	$3,295,000
Emergency Supplemental	$79,589			
Rescission				
Cancellation				
Subtotal	**$3,329,589**	**$3,250,000**	**$3,000,000**	**$3,295,000**
Research, Engineering and Development	$188,926	$188,926	$191,100	$120,000
Rescission				
Subtotal	**$188,926**	**$188,926**	**$191,100**	**$120,000**
Grants-in-Aid for Airports				
Contract Authority (AATF)	$3,350,000	$3,350,000	$3,350,000	$3,350,000
General Fund Appropriation	$1,000,000	$1,000,000	$500,000	
Rescission				
Subtotal	**$4,350,000**	**$4,350,000**	**$3,850,000**	**$3,350,000**
Obligation Limitation [Non-Add]	[3,350,000]	[3,350,000]	[3,350,000]	[3,350,000]
Overflight Fees	$152,898	$155,000	$155,000	$151,000
Overflight Fees (Transfer to EAS)	($142,769)	($155,000)	($155,000)	($151,000)
	---------------	---------------	---------------	---------------
TOTAL	**$18,125,398**	**$18,000,680**	**$17,451,858**	**$17,105,000**
Appropriations	$18,125,398	$18,000,680	$17,451,858	$17,105,000
Rescissions	$0	$0	$0	$0
Cancellations	$0	$0	$0	$0

*Does include $114.6 million supplemental funding from the Further Additional Supplemental Appropriations for Disaster Relief Requirements Act, 2018 (P.L. 115-123) of which $35 million is in Operations and $79.6 million is in Facilities & Equipment.

** Enacted levels for FY 2019 are provided for informational purposes. The FY 2020 budget request was developed before a final appropriations act was enacted for FY 2019, and the request assumes a year-long continuing resolution for FY 2019.

EXHIBIT II-2

FY 2020 TOTAL BUDGETARY RESOURCES BY APPROPRIATION ACCOUNT
FEDERAL AVIATION ADMINISTRATION
Appropriations, Obligation Limitations, and Exempt Obligations
($000)

	FY 2018 ACTUAL*	FY 2019 ANNUALIZED CR	FY 2019 ENACTED**	FY 2020 REQUEST
Operations	**10,211,754**	**10,211,754**	**10,410,758**	**10,340,000**
Air Traffic Organization (ATO)	7,692,786	7,692,786	7,841,720	7,777,357
Aviation Safety (AVS)	1,310,000	1,310,000	1,336,969	1,327,779
Commercial Space Transportation (AST)	22,587	22,587	24,949	25,598
Finance & Management (AFN)	801,506	801,506	816,398	784,832
NextGen (ANG)	60,000	60,000	61,258	60,145
Security and Hazardous Materials Safety (ASH)	112,622	112,622	114,165	117,694
Staff Offices	212,253	212,253	215,299	246,595
Facilities & Equipment	**3,250,000**	**3,250,000**	**3,000,000**	**3,295,000**
Engineering, Development, Test and Evaluation	165,600	210,300	194,300	277,800
Air Traffic Control Facilities and Equipment	2,148,100	2,087,200	1,849,777	2,051,370
Non-Air Traffic Control Facilities and Equipment	193,000	214,100	204,700	203,400
Facilities and Equipment Mission Support	245,300	240,400	238,400	237,700
Personnel and Related Expenses	498,000	498,000	512,823	524,730
Research, Engineering & Development	**188,926**	**188,926**	**191,100**	**120,000**
Improve Aviation Safety	117,960	117,960	117,708	86,821
Improve Efficiency	18,232	18,232	19,499	0
Reduce Environmental Impacts	47,187	47,187	47,187	27,603
Mission Support	5,547	5,547	6,706	5,576
Grants-in-Aid for Airports	**4,350,000**	**4,350,000**	**3,850,000**	**3,350,000**
Grants-in-Aid for Airports	4,174,927	4,174,927	3,679,190	3,189,423
Personnel & Related Expenses	116,863	116,863	112,600	112,353
Airport Technology Research	33,210	33,210	33,210	33,224
Small Community Air Service	10,000	10,000	10,000	0
Airport Cooperative Research Program	15,000	15,000	15,000	15,000
TOTAL:	**18,000,680**	**18,000,680**	**17,451,858**	**17,105,000**

*Does not include $114.6 million supplemental funding from the Further Additional Supplemental Appropriations for Disaster Relief Requirements Act, 2018 (P.L. 115-123) of which $35 million is in Operations and $79.6 million is in Facilities & Equipment.

** Enacted levels for FY 2019 are provided for informational purposes. The FY 2020 budget request was developed before a final appropriations act was enacted for FY 2019, and the request assumes a year-long continuing resolution for FY 2019.

EXHIBIT II-3

FY2020 BUDGET REQUEST BY DOT STRATEGIC AND ORGANIZATIONAL GOALS
FEDERAL AVIATION ADMINISTRATION
Appropriations, Obligation Limitations, and Exempt Obligations
($000)

	Safety	Infrastructure	Innovation	Accountability	Total
Operations	**5,693,356**	**2,954,074**	**143,523**	**1,549,046**	**10,340,000**
Air Traffic Organization (ATO)	4,368,196	2,893,929	85,570	429,662	**7,777,357**
Aviation Safety (AVS)	1,210,024	-	31,639	86,116	**1,327,779**
Commercial Space Transportation (AST)		-	21,889	3,709	**25,598**
Finance & Management (AFN)	-	-	-	784,832	**784,832**
NextGen (ANG)	-	60,145	-	-	**60,145**
Security and Hazardous Materials Safety (ASH)	115,136	-	2,558	-	**117,694**
Staff Offices	-	-	1,868	244,727	**246,595**
Facilities & Equipment	**155,100**	**1,783,577**	**1,274,848**	**81,475**	**3,295,000**
Engineering, Development, Test and Evaluation	-	75,900	191,900	-	**267,800**
Air Traffic Control Facilities and Equipment	26,700	1,026,472	967,798	40,400	**2,061,370**
Non-Air Traffic Control Facilities and Equipment	103,700	52,100	19,500	28,100	**203,400**
Facilities and Equipment Mission Support	-	232,400	5,300	-	**237,700**
Personnel and Related Expenses	24,700	396,705	90,350	12,975	**524,730**
Research, Engineering & Development	**73,304**	**27,603**	**13,517**	**5,576**	**120,000**
Improve Aviation Safety	73,304		13,517		**86,821**
Reduce Environmental Impacts		27,603			**27,603**
Mission Support				5,576	**5,576**
Grants-in-Aid for Airports	**1,001,245**	**2,179,849**	**127,009**	**41,897**	**3,350,000**
Grants-in-Aid for Airports	922,314	2,116,337	109,506	41,266	**3,189,423**
Personnel & Related Expenses	57,311	44,108	10,303	631	**112,353**
Airport Technology Research	16,620	14,404	2,200	-	**33,224**
Small Community Air Service	-	-	-	-	**-**
Airport Cooperative Research Program	5,000	5,000	5,000	-	**15,000**
TOTAL:	**6,923,004**	**6,945,103**	**1,558,898**	**1,677,994**	**17,105,000**

EXHIBIT II-4

FY 2020 BUDGET AUTHORITY
FEDERAL AVIATION ADMINISTRATION
($000)

ACCOUNT NAME	Mandatory / Discretionary	FY 2018 ACTUAL*	FY 2019 ANNUALIZED CR	FY 2019 ENACTED**	FY 2020 REQUEST
Operations	**D**	**$10,246,754**	**$10,211,754**	**$10,410,758**	**$10,340,000**
General		$1,360,754	$1,360,754	$577,358	$975,915
AATF		$8,886,000	$8,851,000	$9,833,400	$9,364,085
Facilities & Equipment (AATF)	**D**	**$3,329,589**	**$3,250,000**	**$3,000,000**	**$3,295,000**
Research, Engineering & Development (AATF)	**D**	**$188,926**	**$188,926**	**$191,100**	**$120,000**
Grants in Aid for Airports (AATF)		**$4,350,000**	**$4,350,000**	**$3,850,000**	**$3,350,000**
Contract Authority (AATF)	**M**	$3,350,000	$3,350,000	$3,350,000	$3,350,000
General Fund	**D**	$1,000,000	$1,000,000	$500,000	
Aviation User Fees	**M**	**$152,898**	**$155,000**	**$155,000**	**$151,000**
Aviation User Fees (transfer to EAS)	**M**	**($142,769)**	**($155,000)**	**($155,000)**	**($151,000)**
		---------------	---------------	---------------	---------------
TOTAL:		**$18,125,398**	**$18,000,680**	**$17,451,858**	**$17,105,000**
[Mandatory]		$3,360,129	$3,350,000	$3,350,000	$3,350,000
[Discretionary]		$14,765,269	$14,650,680	$14,101,858	$13,755,000
		---------------	---------------	---------------	---------------
[General]		$2,360,754	$2,360,754	$1,077,358	$975,915
[AATF]		$15,754,515	$15,639,926	$16,374,500	$16,129,085

Note: Totals may not add due to rounding.

*Does include $114.6 million supplemental funding from the Further Additional Supplemental Appropriations for Disaster Relief Requirements Act, 2018 (P.L. 115-123) of which $35 million is in Operations and $79.6 million is in Facilities & Equipment.

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EXHIBIT II-5

FY 2020 OUTLAYS
FEDERAL AVIATION ADMINISTRATION
($000)

ACCOUNT NAME	FY 2018 ACTUAL	FY 2019 ANNUALIZED CR	FY 2019 ENACTED*	FY 2020 REQUEST
Operations	**$10,077,136**	**$10,825,380**	**$11,000,504**	**$10,324,820**
General	$948,141	$1,939,380	$1,132,104	$960,820
AATF	$9,128,995	$8,886,000	$9,868,400	$9,364,000
Facilities & Equipment	**$2,563,764**	**$3,547,898**	**$3,467,898**	**$3,522,348**
AATF				
- Discretionary	$2,560,369	$3,542,898	$3,462,898	$3,522,348
- Mandatory	$3,395	$5,000	$5,000	$0
Aviation Insurance Revolving Account (M)	**($28,452)**	**($68,000)**	**($68,000)**	**($77,000)**
Research, Engineering & Development	**$150,908**	**$213,190**	**$214,147**	**$185,190**
Grants-in-Aid for Airports	**$3,188,614**	**$4,146,364**	**$4,091,364**	**$4,293,114**
Aviation User Fees (Overflight) (M)	**$1,607**	**$0**	**$0**	**$0**
Franchise Fund	**$45,388**	**($17,000)**	**($17,000)**	**$16,000**
TOTAL:	**$15,998,965**	**$18,647,832**	**$18,688,912**	**$18,264,472**
[Mandatory]	($23,450)	($68,000)	($68,000)	($77,000)
[Discretionary]	$16,022,415	$18,715,832	$18,756,912	$18,341,472

** Enacted levels for FY 2019 are provided for informational purposes. The FY 2020 budget request was developed before a final appropriations act was enacted for FY 2019, and the request assumes a year-long continuing resolution for FY 2019.

EXHIBIT II-6
SUMMARY OF REQUESTED FUNDING CHANGES FROM BASE
Federal Aviation Administration
Appropriations, Obligation Limitations, and Exempt Obligations
($000)

Operations	FY 2018 Actual	FY 2019 Annualized CR	Baseline Changes						FY 2020 Baseline Estimate	Program Increases/ Decreases	FY 2020 Request
			FY 2020 FERS Increase	Annualization of FY 2019 FTE	One more Compensable Day (262 days)	GSA Rent	WCF Increase/ Decrease [1]	Other FY 2020 Base Adjustments [2]			
PERSONNEL RESOURCES (FTE)											
Direct FTE	39,598	40,080		6				18	40,104	15	40,119
FINANCIAL RESOURCES											
ADMINISTRATIVE EXPENSES											
Salaries and Benefits	$7,186,121	$7,198,867	$17,385	$900	$27,544			$3,730	$7,248,426	$4,225	$7,252,651
Travel	$161,433	$156,438						$1,827	$158,265	$30	$158,295
Transportation	$23,524	$23,550							$23,550	$0	$23,550
GSA Rent	$116,296	$108,898				$3,400			$112,298	$0	$112,298
Rental Payments to Other	$53,564	$53,796						$13	$53,809	$0	$53,809
Communications, & Utilities	$318,644	$339,420						$9,715	$349,135	$0	$349,135
Printing	$6,818	$3,917							$3,917	$0	$3,917
Other Services	$2,149,400	$2,124,948					($2,094)	$38,031	$2,160,885	$16,471	$2,177,356
Supplies	$140,034	$130,835							$130,835	$5	$130,840
Equipment	$51,249	$68,981						$94	$69,075	$15	$69,090
Land and Strructure	$462	$905						$6,955	$7,860	$0	$7,860
Grants, Claims and Subsidies	$2,640	$0							$0	$0	$0
Insurance Claims and Indemnities	$1,569	$1,199							$1,199	$0	$1,199
Admin Subtotal	**$10,211,754**	**$10,211,754**	**$17,385**	**$900**	**$27,544**	**$3,400**	**($2,094)**	**$60,365**	**$10,319,254**	**$20,746**	**$10,340,000**
PROGRAMS											
Air Traffic Organization (ATO)	$7,692,786	$7,692,786	$13,450		$20,984		($881)	$43,544	$7,769,883	$7,474	$7,777,357
Aviation Safety (AVS)	$1,310,000	$1,310,000	$2,666		$4,363		$86	$6,514	$1,323,629	$4,150	$1,327,779
Commercial Space Transportation (AST)	$22,587	$22,587	$43	$900	$68				$23,598	$2,000	$25,598
Finance and Management (AFN)	$801,506	$801,506	$608		$1,074	$3,400	$1,227	$9,578	$817,393	($32,561)	$784,832
NextGen (ANG)	$60,000	$60,000	$65		$117		($37)		$60,145	$0	$60,145
Security and Hazardous Materials Safety (ASH)	$112,622	$112,622	$187		$312		$1,072	$729	$114,922	$2,772	$117,694
Staff Offices	$212,253	$212,253	$366		$626		($3,561)		$209,684	$36,911	$246,595
Programs Subtotal	**$10,211,754**	**$10,211,754**	**$17,385**	**$900**	**$27,544**	**$3,400**	**($2,094)**	**$60,365**	**$10,319,254**	**$20,746**	**$10,340,000**
TOTAL	**$10,211,754**	**$10,211,754**	**$17,385**	**$900**	**$27,544**	**$3,400**	**($2,094)**	**$60,365**	**$10,319,254**	**$20,746**	**$10,340,000**

Footnotes:
1. The CIO WCF Services amount of $11,755,490 is referenced in Exhibit II – 6, Exhibit II – 7 and the Information Technology Tab 5 sections of the narrative.

2. This table reflects the transfer of funding and staff to cover accident investigations conducted by the Civil Aerospace Medical Institute from the RE&D account to the Operations account. For FY 2020 this transfer entails $3,730,000 and 18 FTP/FTE. Operations funds investigation and aeromedical work, which differs from the applied research funded in the RE&D account.

EXHIBIT II-6
SUMMARY OF REQUESTED FUNDING CHANGES FROM BASE
Federal Aviation Administration

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

Facilities & Equipment	FY 2018 Actual	FY 2019 Annualized CR	Baseline Changes: FY 2020 FERS Increase	Annualization of FY 2019 FTE	One more Compensable Day (262 days)	GSA Rent	WCF Increase/ Decrease	Human Factors Transfer from RE&D	FY 2020 Baseline Estimate	Program Increases/ Decreases	FY 2020 Request
PERSONNEL RESOURCES (FTE)											
Direct FTE	2,626	2,685		59				10	2,754	32	2,786
FINANCIAL RESOURCES											
ADMINISTRATIVE EXPENSES											
Salaries and Benefits	$435,335	$441,830	$1,000	$8,850	$1,688			$1,800	$455,168	4,800	$459,968
Travel	$50,121	$42,777							$42,777	5,502	$48,279
Transportation	$2,353	$2,293							$2,293	364	$2,657
GSA Rent	$22	$0							$0	-	$0
Rental Payments to Others	$34,653	$44,135							$44,135	(495)	$43,640
Communications, & Utilities	$45,304	$50,551							$50,551	(820)	$49,731
Printing	$15	$13							$13	-	$13
Other Services:	$2,334,750	2,254,708							$2,254,708	27,483	$2,282,191
-WCF	$48	$50					-2		$48	-	$48
Supplies	$23,948	$34,761							$34,761	(296)	$34,465
Equipment	$203,474	$218,849							$218,849	(4,432)	$214,417
Lands and Struc tures	$119,928	$152,728							$152,728	(892)	$151,836
Grants, Claims, Subsidies and Interest	$49	$7,305							$7,305	450	$7,755
Admin Subtotal	**$3,250,000**	**$3,250,000**	**$1,000**	**$8,850**	**$1,688**	**$0**	**($2)**	**$1,800**	**$3,263,336**	**$31,664**	**$3,295,000**
PROGRAMS											
Engineering, Development, Test and Evaluation	165,600	210,300							210,300	67,500	277,800
Air Traffic Control Facilities and Equipment	2,148,100	2,087,200							2,087,200	(35,830)	2,051,370
Non-Air Traffic Control Facilities and Equipment	193,000	214,100							214,100	(10,700)	203,400
Facilities and Equipment Mission Support	245,300	240,400							240,400	(2,700)	237,700
Personnel & Related Expenses	498,000	498,000	1,000	8,850	1,688		(2)	1,800	511,336	13,394	524,730
Programs Subtotal	**3,250,000**	**3,250,000**	**$1,000**	**$8,850**	**$1,688**	**$0**	**($2)**	**$1,800**	**3,263,336**	**31,664**	**3,295,000**
TOTAL	**3,250,000**	**3,250,000**	**$1,000**	**$8,850**	**$1,688**	**$0**	**($2)**	**$1,800**	**3,263,336**	**31,664**	**3,295,000**

This table reflects the transfer of funding and staff related to certain human factors work from the R,E&D account to the F&E account. For FY 2020, this transfer entails $1,800,000 and 10 FTP/FTE. This transfer affects staff who work on human factors prototyping and development activities already funded in F&E Activity 1, which differs from the applied research funded in the R,E&D account.

EXHIBIT II-6
SUMMARY OF REQUESTED FUNDING CHANGES FROM BASE
FEDERAL AVIATION ADMINISTRATION
Appropriations, Obligation Limitations, and Exempt Obligations
($000)

Research, Engineering & Development	FY 2018 Actual	FY 2019 Annualized CR	Baseline Changes: Realignments	Baseline Changes: One More Compensable Day (262 days)	Baseline Changes: GSA Rent	Baseline Changes: WCF Increase/ Decrease	Baseline Changes: Inflation/Deflation	FY 2020 Baseline Estimate	Program Increases/ Decreases	FY 2020 Request
PERSONNEL RESOURCES (FTE)	**223.0**	**245.0**						**245.0**		**245.0**
Direct FTE*	**223.0**	**245.0**						**245.0**		**245.0**
Reimbursable FTE	0.0	0.0						0.0		0.0
FINANCIAL RESOURCES										
ADMINISTRATIVE EXPENSES										
Salaries and Benefits	$39,021	$39,021		$80				$39,101	$3,922	$43,023
Travel	$1,756	$1,756						$1,756	($868)	$888
Transportation	$53	$53						$53		$53
GSA Rent										$0
Communications & Utilities	$21	$21						$21		$21
Printing	$28	$28						$28		$28
Other Services:	$112,468	$112,468								$0
- Other								$112,468	($72,060)	$40,408
- WCF										$0
- WCF IT*	**$0**	**$0**						**$0**		$0
Supplies	$2,068	$2,068						$2,068		$2,068
Equipment	$1,954	$1,954						$1,954		$1,954
Grants, Claims & Subsidies	$31,557	$31,557						$31,557		$31,557
Administrative Subtotal	**$188,926**	**$188,926**	**$0**	**$80**	**$0**	**$0**	**$0**	**$189,006**	**($69,006)**	**$120,000**
PROGRAMS										
Improve Aviation Safety	**$117,960**	**$117,960**		**$62**				**$118,022**	**($31,202)**	**$86,821**
WCF IT*	**$0**	**$0**						**$0**		
Improve Aviation Safety	$117,960	$117,960						$118,022	($31,202)	$86,822
Improve Efficiency	**$18,232**	**$18,232**		**$5**				**$18,236**	**($18,236)**	**$0**
WCF IT*	**$0**	**$0**						**$0**		
Improve Efficiency	$18,232	$18,232						$18,236	($18,236)	$0
Environmental Sustainability	**$47,187**	**$47,187**		**$6**				**$47,193**	**($19,590)**	**$27,603**
WCF IT*	**$0**	**$0**						**$0**		
Environmental Sustainability	$47,187	$47,187						$47,193	($19,590)	$27,603
Mission Support	**$5,547**	**$5,547**		**$7**				**$5,554**	**$22**	**$5,576**
WCF IT*	**$0**	**$0**						**$0**		
Mission Support	$5,547	$5,547						$5,554	$22	$5,576
Programs Subtotal	**$188,926**	**$188,926**	**$0**	**$80**	**$0**	**$0**	**$0**	**$189,006**	**($69,006)**	**$120,000**
TOTAL	**$188,926**	**$188,926**	**$0**	**$80**	**$0**	**$0**	**$0**	**$189,006**	**($69,006)**	**$120,000**

EXHIBIT II-6
SUMMARY OF REQUESTED FUNDING CHANGES FROM BASE
Federal Aviation Administration
Appropriations, Obligation Limitations, and Exempt Obligations
($000)

Grants-in-Aid for Airports	FY 2018 Actual	FY 2019 Annualized CR	Baseline Changes: Annualization of 2019 Pay Raises	Annualization of 2019 FTE	2020 Pay Raises	One More Compensable Day (262 days)	GSA Rent	WCF Increase/ Decrease	Inflation/ Deflation	FY 2020 Baseline Estimate	Program Increases/ Decreases	FY 2020 Request
PERSONNEL RESOURCES (FTE)												
Direct FTE	564	599								599	1	600
FINANCIAL RESOURCES												
ADMINISTRATIVE EXPENSES												
Salaries and Benefits	101,725	101,725				350				102,075	-5,000	97,075
Travel	3,156	3,156								3,156		3,156
Transportation	124	124								124		124
GSA Rent	104	104								104		104
Rental Payments to Others	789	789								789		789
Communications, Rent & Utilities	265	265								265		265
Printing	27	27								27		27
Other Services:										0		0
-WCF	133	133								133		133
-Advisory and Assistance Services	27,390	27,390								27,390		27,390
-Other	29,078	29,078								29,078	-1	29,077
Supplies	1,122	1,122								1,122		1,122
Equipment	1,236	1,236								1,236		1,236
Lands and Structures	496	496								496		496
Grants, Claims & Subsidies	4,174,335	4,174,335								4,174,335	-985,349	3,188,986
Insurance Claims and Indemnities	1	1								1		1
Interest and Dividends	19	19								19		19
Financial transfers	10,000	10,000								10,000	-10,000	0
Admin Subtotal	**4,350,000**	**4,350,000**	**0**	**0**	**0**	**350**	**0**	**0**	**0**	**4,350,350**	**-1,000,350**	**3,350,000**
PROGRAMS												
Grants	4,174,927	4,174,927								4,174,927	-985,504	3,189,423
Personnel and Related Expenses	116,863	116,863				335				117,198	-4,845	112,353
Airport Technology Research	33,210	33,210				14				33,224	0	33,224
Airport Cooperative Research	15,000	15,000				1				15,001	-1	15,000
Small Community Air Service	10,000	10,000								10,000	-10,000	0
Programs Subtotal	**4,350,000**	**4,350,000**	**0**	**0**	**0**	**350**	**0**	**0**	**0**	**4,350,350**	**-1,000,350**	**3,350,000**
TOTAL	**4,350,000**	**4,350,000**	**0**	**0**	**0**	**350**	**0**	**0**	**0**	**4,350,350**	**-1,000,350**	**3,350,000**

EXHIBIT II-7
WORKING CAPITAL FUND
FEDERAL AVIATION ADMINISTRATION
($000)

	FY 2018 ACTUAL	FY 2019 ANNUALIZED CR	FY 2019 ENACTED	FY 2020 REQUEST	CHANGE
DIRECT:					
Facilities & Equipment	49	50	50	48	(2)
Grants-in-Aid for Airports	134	128	128	107	(21)
Operations	54,572	55,110	55,110	53,016	(2,094)
TOTAL	**$ 54,755**	**$ 55,288**	**$ 55,288**	**$ 53,171**	**$ (2,117)**

Footnotes:

1) F&E and Grants-in-Aid for Airports funding only support E-gov Initiatives

2) The CIO WCF Services amount of $11,755,490 is referenced in Exhibit II – 6, Exhibit II – 7 and the Information Technology Tab 5 sections of the narrative.

3) Enacted levels for FY 2019 are provided for informational purposes. The FY 2020 budget request was developed before a final appropriations act was enacted for FY 2019, and the request assumes a year-long continuing resolution for FY 2019.

EXHIBIT II-8
FEDERAL AVIATION ADMINISTRATION
PERSONNEL RESOURCE -- SUMMARY
TOTAL FULL-TIME EQUIVALENTS

	FY 2018 ACTUAL	FY 2019 ANNUALIZED CR	FY 2019 ENACTED*	FY 2020 REQUEST
DIRECT FUNDED BY APPROPRIATION				
Operations	39,598	40,080	40,080	40,119
Facilities & Equipment	2,626	2,685	2,685	2,786
Research, Engineering & Development	223	245	245	245
Grants-in-Aid for Airports	564	599	599	600
SUBTOTAL, DIRECT FUNDED	**43,011**	**43,609**	**43,609**	**43,750**
REIMBURSEMENTS / ALLOCATIONS / OTHER				
Reimbursements and 'Other'				
Operations	228	228	228	230
Aviation Insurance Revolving Fund	3	4	4	4
Facilities & Equipment	58	55	55	54
Grants-in-Aid for Airports	1	1	1	2
Administrative Services Franchise Fund	1,550	1,594	1,594	1,607
Allocations from other Organizations				
SUBTOTAL, REIMBURSE./ALLOC./OTH.	**1,840**	**1,882**	**1,882**	**1,897**
TOTAL FTEs	**44,851**	**45,491**	**45,491**	**45,647**

This table reflects a transfer in FY 2020: Funding and staff to cover accident investigations conducted by the Civil Aerospace Medical Institute are transferred from the R,E&D account to the Operations account. For FY 2020 this transfer entails $3,730,000 and 18 FTP/FTE. Operations funds investigation and aeromedical work, which differs from the applied research funded in the R,E&D account.

* Enacted levels for FY 2019 are provided for informational purposes. The FY 2020 budget request was developed before a final appropriations act was enacted for FY 2019, and the request assumes a year-long continuing resolution for FY 2019.

EXHIBIT II-9
FEDERAL AVIATION ADMINISTRATION
RESOURCE SUMMARY – STAFFING
TOTAL POSITIONS

	FY 2018 ACTUAL	FY 2019 ANNUALIZED CR	FY 2019 ENACTED*	FY 2020 REQUEST
DIRECT FUNDED BY APPROPRIATION				
Operations	39,968	40,889	40,889	40,928
Facilities & Equipment	2,674	2,748	2,748	2,821
Research, Engineering & Development	216	249	249	249
Grants-in-Aid for Airports	567	599	599	591
SUBTOTAL, DIRECT FUNDED	**43,425**	**44,485**	**44,485**	**44,589**
REIMBURSEMENTS / ALLOCATIONS / OTHER				
Reimbursements and 'Other'				
Operations	122	236	236	236
Aviation Insurance Revolving Fund	2	4	4	4
Facilities & Equipment	-	4	4	4
Grants-in-Aid for Airports	2	2	2	2
Administrative Services Franchise Fund	1,516	1,560	1,560	1,536
Allocations from other Organizations				
SUBTOTAL, REIMBURSE./ALLOC./OTH.	**1,642**	**1,806**	**1,806**	**1,782**
TOTAL POSITIONS	**45,067**	**46,291**	**46,291**	**46,371**

This table reflects a transfer in FY 2020: Funding and staff to cover accident investigations conducted by the Civil Aerospace Medical Institute are transferred from the R,E&D account to the Operations account. For FY 2020 this transfer entails $3,730,000 and 18 FTP/FTE. Operations funds investigation and aeromedical work, which differs from the applied research funded in the R,E&D account.

* Enacted levels for FY 2019 are provided for informational purposes. The FY 2020 budget request was developed before a final appropriations act was enacted for FY 2019, and the request assumes a year-long continuing resolution for FY 2019.

EXHIBIT II-10
FEDERAL AVIATION ADMINISTRATION
USER FEES
($000)

	FY 2018 ACTUAL	FY 2019 ESTIMATE	FY 2020 ESTIMATE
USER FEE			
Civil Aviation Registry Fees	1,348	1,300	1,300
Foreign Repair Station/Certification Fees	11,823	12,000	12,000
Aeronautical Charting Fees	63	46	46
Overflight Fees	133,742	145,437	150,513
Unmanned Aircraft Systems Registry Fees	1,343	1,000	1,000
Total User Fees	**148,319**	**159,783**	**164,859**

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OPERATIONS

(AIRPORT AND AIRWAY TRUST FUND)

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 112–95, $10,340,000,000 to remain available until September 30, 2021, of which $9,364,085,000 shall be derived from the Airport and Airway Trust Fund: Provided, That not later than 60 days after the submission of the President's budget request, the Administrator of the Federal Aviation Administration shall transmit to Congress an annual update to the report submitted to Congress in December 2004 pursuant to section 221 of Public Law 108–176: Provided further, That not later than 60 days after the submission of the President's budget request, the Administrator shall transmit to Congress a companion report that describes a comprehensive strategy for staffing, hiring, and training flight standards and aircraft certification staff in a format similar to the one utilized for the controller staffing plan, including stated attrition estimates and numerical hiring goals by fiscal year: 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 pro-gram: 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 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.

Note.—A full-year 2019 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2019 (Division C of P.L. 115–245, as amended). The amounts included for 2019 reflect the annualized level provided by the continuing resolution.

Program and Financing (in millions of dollars)

Identification code: 69-1301-0-1-402		FY 2018 Actual	FY 2019 Estimate	FY 2020 Estimate
	Obligations by program activity:			
0001	Air Traffic Organization (ATO)	7,702	7,718	7,775
0002	NextGen	60	61	60
0003	Finance & Management	788	826	789
0004	Regulation & Certification	1,311	1,333	1,339
0005	Commercial Space Transportation	22	25	26
0006	Security & Hazardous Materials Safety	110	120	118
0007	Staff Offices	214	213	246
0008	2017 Hurricanes / 2018 Supplemental	1	5	5
0100	Direct Program Activities Subtotal	10,208	10,301	10,358
0799	Total Direct Obligations	10,208	10,301	10,358
0801	Operations (Reimbursable)	144	145	145
0900	Total new obligations, unexpired accounts	10,352	10,446	10,503
	Budget resources:			
1000	Unobligated balance brought forward, Oct. 1	86	180	154
1021	Recoveries of prior year unpaid obligations	47	....	....
1033	Recoveries of prior year paid obligations	1	....	....
1050	Unobligated balance (total)	134	180	154
	Budget authority:			
	Appropriations, discretionary:			
1100	Appropriation	1,361	1,361	976
	Spending authority from offsetting collections, discretionary,			
1700	Collected	9,262	9,059	9,568
1701	Change in uncollected payments, Federal sources	-215	....	....
1750	Spending auth from offsetting collections, disc (total)	9,047	9,059	9,568
1900	Budget authority (total)	10,408	10,420	10,544
1930	Total budgetary resources available	10,542	10,600	10,698
	Memorandum (non-add) entries:			
1940	Unobligated balance expiring	-10	....	....
	Memorandum (non add) entries:			
1941	Unexpired unobligated balance, end of year	180	154	195
	Change in obligated balance:			
	Unpaid obligations:			
3000	Unpaid obligations, brought forward, Oct. 1	1,585	1,622	1,070
3001	Adjustments to unpaid obligations, brought forward, Oct 1...	-1	....	....
3010	New Obligations, unexpired accounts	10,352	10,446	10,503
3011	Obligations ("upward adjustments"), expired accounts	11	....	....
3020	Outlays (gross)	-10,237	-10,998	-10,528
3040	Recoveries of prior year unpaid obligations, unexpired	-47	....	....
3041	Recoveries of prior year unpaid obligations, expired	-41	....	....
3050	Unpaid obligations, end of year	1,622	1,070	1,045
	Uncollected payments:			
3060	Uncollected pymts, Fed sources, brought forward, Oct 1	-408	-170	-170
3070	Change in uncollected pymts, Fed sources, unexpired	215	....	....
3071	Change in uncollected pymts, Fed sources, expired	23	....	....
3090	Uncollected pymts, Fed sources, end of year	-170	-170	-170
	Memorandum (non-add) entries:			
3100	Obligated balance, start of year	1,176	1,452	900
3200	Obligated balance, end of year	1,452	900	875
	Budget authority and outlays, net:			
	Discretionary:			
4000	Budget authority, gross	10,408	10,420	10,544
	Outlays, gross:			

Identification code: 69-1301-0-1-402		FY 2018 Actual	FY 2019 Estimate	FY 2020 Estimate
4010	Outlays from new discretionary authority	8,880	9,195	9,303
4011	Outlays from discretionary balances	1,357	1,803	1,225
4020	Outlays, gross (total)	10,237	10,998	10,528
	Offsets against gross budget authority and outlays:			
	Offsetting collections (collected) from:			
4030	Federal sources..	-9,252	-9,028	-9,537
4033	Non-Federal sources	-35	-29	-29
4034	Offsetting governmental collections..................................	-1	-2	-2
4040	Offsets against gross budget authority and outlays (total) ...	-9,288	-9,059	-9,568
	Additional offsets against gross budget authority only:			
4050	Change in uncollected pymts, Federal sources, unexpired ...	215	....	....
4052	Offsetting collections credited to expired accounts	25	....	....
4053	Recoveries of prior year paid obligations, unexpired accout...	1	....	....
4060	Additional offsets against budget authority only (total)	241	....	....
4070	Budget authority, net (discretionary)	1,361	1,361	976
4080	Outlays, net (discretionary)	949	1,939	960
4180	Budget authority, net (total)	1,361	1,361	976
4190	Outlays, net (total)	949	1,939	960
	Memorandum (non add) entries:			
5093	Unavailable balance, SOF: Offsetting collections	1	....	....
5094	Cancelling unavailable balance: Offsetting collections...........	-1	....	....

The FY 2020 Budget requests $10.340 billion for Federal Aviation Administration (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 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)

Identification code: 69-1301-0-1-402		FY 2018 Actual	FY 2019 Estimate	FY 2020 Estimate
	Direct obligations:			
	Personnel compensation:			
11.1	Full-time permanent	4,615	4,665	4,694
11.3	Other than full-time permanent	32	32	32
11.5	Other personnel compensation	451	458	457
11.9	Total personnel compensation	5,098	5,115	5,183
12.1	Civilian personnel benefits	2,028	2,052	2,066
13.0	Benefits for former personnel	4	4	4
21.0	Travel and transportation of persons	164	157	158
22.0	Transportation of things	24	24	24
23.1	Rental payments to GSA	102	109	112
23.2	Rental payments to others	54	54	54
23.3	Communications, utilities, and miscellaneous charges	341	338	349
24.0	Printing and reproduction	4	5	5
25.1	Advisory and assistance services	594	581	609
25.2	Other services from non-Federal sources	1,587	1,619	1,585
26.0	Supplies and materials	133	131	130
31.0	Equipment	72	70	70
41.0	Grants, subsidies, and contributions	1	1	8
42.0	Insurance claims and indemnities	2	1	1
99.0	Direct obligations	10,208	10,301	10,358
99.0	Reimbursable obligations	144	145	145
99.9	Total new obligations	10,352	10,446	10,503

Employment Summary

Identification code: 69-1301-0-1-402		FY 2018 Actual	FY 2019 Estimate	FY 2020 Estimate
1001	Direct civilian full-time equivalent employment	35,598	40,080	40,119
2001	Reimbursable civilian full-time equivalent employment	228	228	230

EXHIBIT III-1
OPERATIONS
Summary by Program Activity
Appropriations, Obligation Limitations, and Exempt Obligations
($000)

	FY 2018 ACTUAL	FY 2019 ANNUALIZED CR	FY 2019 ENACTED*	FY 2020 REQUEST	CHANGE FY 2019-2020
Air Traffic Organization (ATO)	$ 7,692,786	$ 7,692,786	$ 7,841,720	$ 7,777,357	$ (64,363)
Aviation Safety (AVS)	$ 1,310,000	$ 1,310,000	$ 1,336,969	$ 1,327,779	$ (9,190)
Commercial Space (AST)	$ 22,587	$ 22,587	$ 24,949	$ 25,598	$ 649
Finance & Management (AFN)	$ 801,506	$ 801,506	$ 816,398	$ 784,832	$ (31,566)
NextGen (ANG)	$ 60,000	$ 60,000	$ 61,258	$ 60,145	$ (1,113)
Security and Hazardous Materials Safety (ASH)	$ 112,622	$ 112,622	$ 114,165	$ 117,694	$ 3,529
Staff Offices	$ 212,253	$ 212,253	$ 215,299	$ 246,595	$ 31,296
TOTAL	**$ 10,211,754**	**$ 10,211,754**	**$ 10,410,758**	**$ 10,340,000**	**$ (70,758)**
FTEs					
Direct Funded	39,598	40,080	40,080	40,119	39
Reimbursable, allocated, other	228	228	228	230	2

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 surveillance 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.

* Enacted levels for FY 2019 are provided for informational purposes. The FY 2020 budget request was developed before a final appropriations act was enacted for FY 2019, and the request assumes a year-long continuing resolution for FY 2019.

Operations Summary
($000)

	Dollars	FTP	OTFTP	FTE
FY 2019 Annualized CR	**$10,211,754**	**40,124**	**765**	**40,080**
Adjustments to FY 2020 Base	**$107,500**	**18**	**-**	**24**
FERS Increase	17,385	-	-	6
Extra Compensable Day (262)	27,544	-	-	-
GSA Rent	3,400	-	-	-
Working Capital Fund	-2,094	-	-	-
Transition from F&E to Ops	47,355	-	-	-
Great Lakes Regional Offices	8,727	-	-	-
Financial Accounting Services	553	-	-	-
Annualization of FY 2019 FTE	0	-	-	-
CAMI Accident Investigation Transfer from RE&D to Ops	3,730	18	-	18
Discretionary Adjustments	**$20,746**	**21**	**-**	**15**
UAS Requirements	12,000	1	-	1
Commercial Space Regulatory Reform	2,000	13	-	7
Innovation Office	1,600	7	-	7
Cybersecurity	5,146	-	-	-
Base Transfers	**-**	**-**	**-**	**-**
Staffing Reassignment	-	-	-	-
Regional Administrators Office Realignment	-	-	-	-
FY 2020 Request	**$10,340,000**	**40,163**	**765**	**40,119**

Base Transfer Summary
($000)

	LOB/SO	FTE	FTP	Funding	LOB/SO	FTE	FTP	Funding
Operations								
Staffing Reassignment	ASH	-1	-1	-$228	ATO	1	1	$228
Regional Administrators Office Realignment	AFN	-164	-164	-$33,311	APL	164	164	$33,311
Total		-165	-165	-$33,539		165	165	$33,539
Transfer between Appropriations								
Civil Aerospace Medical Institute	R,E&D	-18	-18	-$3,730	ASH	18	18	$3,730
Total - All Transfers		**-183**	**-183**	**-$37,269**		**183**	**183**	**$37,269**

Staffing Summary -- FY 2018 - FY 2020

			Type	FY 2018 Actual	FY 2019 Annualized CR	FY 2020 Request
Air Traffic Organization		ATO	FTP	28,915	29,374	29,375
			OTFTP	619	689	689
			FTE	29,170	29,400	29,401
Associate Administrator for Aviation Safety		AVS	FTP	7,093	7,266	7,284
			OTFTP	34	31	31
			FTE	7,126	7,266	7,284
Associate Administrator for Commercial Space Transportation		AST	FTP	95	108	121
			OTFTP	1	1	1
			FTE	97	104	117
Assistant Administrator for Finance and Management		AFN	FTP	1,549	1,648	1,484
			OTFTP	15	17	17
			FTE	1,574	1,624	1,460
Assistant Administrator for Next Generation Air Transportation System		ANG	FTP	178	186	186
			OTFTP	4	4	4
			FTE	182	186	186
Associate Administrator for Security and Hazardous Materials Safety		ASH	FTP	492	530	529
			OTFTP	3	1	1
			FTE	476	495	494
Staff Offices	Assistant Administrator for Human Resource Management	AHR	FTP	486	510	510
			OTFTP	3	3	3
			FTE	493	505	505
	Office of the Administrator and Deputy	AOA	FTP	14	18	18
			OTFTP	1	4	4
			FTE	15	17	17
	Assistant Administrator for Audit and Evaluation	AAE	FTP	17	19	19
			OTFTP	2	1	1
			FTE	19	20	20
	Assistant Administrator for Civil Rights	ACR	FTP	66	73	73
			OTFTP	4	1	1
			FTE	68	72	72
	Asst. Administrator for Government and Industry Affairs	AGI	FTP	8	8	8
			OTFTP	1	1	1
			FTE	9	9	9
	Assistant Administrator for Communications	AOC	FTP	29	29	30
			OTFTP	1	1	1
			FTE	30	30	31
	Office of Chief Counsel	AGC	FTP	214	230	230
			OTFTP	7	8	8
			FTE	221	229	229
	Asst. Administrator for Policy, International Affairs and Environment	APL	FTP	116	125	289
			OTFTP	1	3	3
			FTE	118	123	287
	Innovation Office (TBD)	TBD	FTP	-	-	7
			OTFTP	-	-	-
			FTE	-	-	7
Total			FTP	39,272	40,124	40,163
			OTFTP	696	765	765
			FTE	39,598	40,080	40,119

Resource Summary -- FY 2018 - FY 2020 ($000)

			FY 2018 Actual	FY 2019 Annualized CR	FY 2020 Request
	Air Traffic Organization (ATO)	pcb	$ 5,509,906	$ 5,555,811	$ 5,590,473
		o/o	$ 2,182,880	$ 2,136,975	$ 2,186,884
	ATO Total		**$ 7,692,786**	**$ 7,692,786**	**$ 7,777,357**
	Associate Administrator for Aviation Safety (AVS)	pcb	$ 1,091,551	$ 1,100,878	$ 1,111,637
		o/o	$ 218,449	$ 209,122	$ 216,142
	AVS Total		**$ 1,310,000**	**$ 1,310,000**	**$ 1,327,779**
	Associate Administrator for Commercial Space Transportation (AST)	pcb	$ 16,861	$ 17,002	$ 19,113
		o/o	$ 5,726	$ 5,585	$ 6,485
	AST Total		**$ 22,587**	**$ 22,587**	**$ 25,598**
	Assistant Administrator for Finance and Management (AFN)	pcb	$ 256,859	$ 259,133	$ 234,901
		o/o	$ 544,647	$ 542,373	$ 549,931
	AFN Total		**$ 801,506**	**$ 801,506**	**$ 784,832**
	Assistant Administrator for NextGen Air Transportation System (ANG)	pcb	$ 28,464	$ 28,712	$ 28,894
		o/o	$ 31,536	$ 31,288	$ 31,251
	ANG Total		**$ 60,000**	**$ 60,000**	**$ 60,145**
	Associate Administrator for Security and Hazardous Materials Safety (ASH)	pcb	$ 74,700	$ 75,350	$ 75,621
		o/o	$ 37,922	$ 37,272	$ 42,073
	ASH Total		**$ 112,622**	**$ 112,622**	**$ 117,694**
Staff Offices	Assistant Administrator for Human Resource Management (AHR)	pcb	$ 72,721	$ 73,335	$ 73,782
		o/o	$ 31,836	$ 31,222	$ 28,098
	AHR Total		**$ 104,557**	**$ 104,557**	**$ 101,880**
	Office of the Administrator and Deputy (AOA)	pcb	$ 2,513	$ 2,536	$ 2,552
		o/o	$ 1,577	$ 1,554	$ 1,554
	AOA Total		**$ 4,090**	**$ 4,090**	**$ 4,106**
	Assistant Administrator for Audit and Evaluation (AAE)	pcb	$ 3,241	$ 3,267	$ 3,288
		o/o	$ 102	$ 76	$ 76
	AAE Total		**$ 3,343**	**$ 3,343**	**$ 3,364**
	Assistant Administrator for Civil Rights (ACR)	pcb	$ 10,057	$ 10,145	$ 10,210
		o/o	$ 2,265	$ 2,177	$ 2,177
	ACR Total		**$ 12,322**	**$ 12,322**	**$ 12,387**
	Assistant Administrator for Government and Industry Affairs (AGI)	pcb	$ 1,426	$ 1,437	$ 1,445
		o/o	$ 138	$ 127	$ 127
	AGI Total		**$ 1,564**	**$ 1,564**	**$ 1,572**
	Assistant Administrator for Communications (AOC)	pcb	$ 6,125	$ 6,179	$ 6,595
		o/o	$ 425	$ 371	$ 746
	AOC Total		**$ 6,550**	**$ 6,550**	**$ 7,341**
	Office of the Chief Council (AGC)	pcb	$ 39,629	$ 39,957	$ 40,700
		o/o	$ 5,852	$ 5,524	$ 5,053
	AGC Total		**$ 45,481**	**$ 45,481**	**$ 45,753**
	Assistant Administrator for Policy, International Affairs and Environment (APL)	pcb	$ 24,906	$ 25,125	$ 51,940
		o/o	$ 9,440	$ 9,221	$ 16,652
	APL Total		**$ 34,346**	**$ 34,346**	**$ 68,592**
	Innovation Office (TBD)	pcb	$ -	$ -	$ 1,500
		o/o	$ -	$ -	$ 100
	TBD Total		**$ -**	**$ -**	**$ 1,600**
Grand Total			**$ 10,211,754**	**$ 10,211,754**	**$ 10,340,000**

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Detailed Justification for the Air Traffic Organization (ATO)

FY 2020 - Air Traffic Organization Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	*FY 2019 Enacted	FY 2020 Request
Salaries and Expenses	5,509,905	5,555,811	5,634,327	5,590,473
Program Costs	2,182,880	2,136,975	2,207,393	2,186,884
Total	**$7,692,786**	**$7,692,786**	**$7,841,720**	**$7,777,357**
FTE	**29,170**	**29,400**	**29,400**	**29,401**

*Enacted levels for FY 2019 are provided for informational purposes. The FY 2020 budget request was developed before a final appropriations act was enacted for FY 2019, and the request assumes a year-long continuing resolution for FY 2019.

Funding details for ATO's eight service units:

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Air Traffic Services (AJT)	4,067,786	4,087,314	TBD	4,102,009
Technical Operations (AJW)	1,627,988	1,621,922	TBD	1,637,295
System Operations (AJR)	270,236	269,323	TBD	263,360
Safety and Technical Training (AJI)	195,853	193,320	TBD	194,351
Mission Support Services (AJV)	287,156	279,592	TBD	285,248
Management Services (AJG)	229,642	228,163	TBD	252,370
Program Management (AJM)	911,705	905,555	TBD	937,390
Flight Programs (AJF)	102,420	107,596	TBD	105,334
Total	**$7,692,786**	**$7,692,786**	**$7,841,720**	**$7,777,357**

What is this program and what does this funding level support?

The Air Traffic Organization (ATO) operates the most complex and technically advanced air traffic control system in the world. In FY 2020, ATO is required to sustain and improve effective and efficient air traffic control throughout U.S. airspace. The funding requested will enable ATO to train FAA's highly-skilled workforce, provide information and updates to the flying public to ensure safe air travel, maintain critical infrastructure necessary to operate the National Airspace System (NAS), review and update navigational information to promote more efficient air transportation, and effectively control air traffic, which is a major contributor to the national economy.

While the system is already exceedingly safe, ATO is making it safer by moving to a proactive safety culture in which every individual in ATO is committed to assessing and mitigating risks. While safety is paramount, ATO is also taking steps to enable growth and changes in aviation.

ATO is a Performance-Based Organization providing safe, secure, and cost-effective air traffic control services to commercial, private aviation and the military. ATO is comprised of more than 29,000 Operations-funded professional employees committed to providing safe and efficient air traffic control services. Many ATO employees, including approximately 14,500 air traffic controllers, 5,000 air traffic supervisors and air traffic managers, 1,800 engineers, and 6,000 maintenance technicians, directly serve FAA's customers. The remaining employees work in a wide variety of professions to sustain the smooth operations of ATO. They research, plan, and build air traffic control equipment and programs; manage payroll and benefits programs; maintain productive relationships with the aviation industry and the general public; and ensure that the environment and ATO employees are protected.

ATO provides air traffic services for the Nation and is fully committed to the agency's mission. ATO handles over 27,000 scheduled passenger flights per day at US airports and helps transport over 743 million passengers per year, a vital part of the Nation's economy. In total, the ATO handles over 43,000 IFR (Instrument Flight Rules) flights per day, and manages over 137,000 operations (including departures, arrivals and over-flights) per day at FAA and contract towers. FAA data shows that civil aviation accounted for over $1.6 trillion in total economic activity, supporting 5.1 percent of U.S. Gross Domestic Product. Approximately 10.6 million people are employed in aviation- related fields, and earn over $446.8 billion a year.

ATO's eight service organizations include:

Air Traffic Services (AJT): Air Traffic Services provides air traffic control operations from en route, terminal, and combined control facilities in the United States, Puerto Rico, and Guam. Air Traffic Services also controls more than 29 million square miles of airspace. This represents more than 17 percent of world's airspace, and includes all of the United States and large portions of the Atlantic and Pacific Oceans and Gulf of Mexico. Every day FAA ensures thousands of positively-controlled aircraft, are directed to the safest, most efficient pathway to their destinations.

The en route domain provides air traffic control services at 21 air route traffic control centers (ARTCCs) and two combined control facilities, which interface with more than 18 air navigation service providers (ANSPs). Terminal air traffic control (ATC) services include both airport surface operations and terminal area operations. Airport surface operations are conducted by controllers at 268 federal and 254 contract towers located at the Nation's airports. Terminal area operations are conducted by controllers at 157 terminal radar approach control (TRACON) facilities, which routinely handle aircraft within 40 miles of an airport.

Air Traffic Services is divided into three geographical service areas (Eastern, Central, and Western) to better manage the delivery of 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.

Technical Operations (AJW): The NAS is composed of a mix of hardware and software systems that enable controllers to monitor and communicate with pilots and other ATC facilities. NAS system capabilities include automation, communications, surveillance and navigation. Failure at any point in the system can cause capacity reductions and potentially compromise safety. Reductions in capacity cause delays with costs to users and the flying public. Technical Operations ensures that terminal and en route controllers have all critical parts of the NAS infrastructure available for the safe and efficient delivery of air traffic services.

The mission of the Technical Operations Service Unit is to:

- Ensure efficient delivery of all NAS services for all stakeholders;
- Increase NAS capacity for all users through changes in technology;
- Maintain optimal NAS services for all users by strategically investing in the current infrastructure and providing operational oversight of leased NAS services;
- Improve situational awareness for pilots, controllers and airfield operators by providing them with real-time information concerning potential conflicts and offering possible resolutions; and
- Provide a safe and healthful workplace for all FAA employees through an active Occupational Safety and Health Administration program.

Technical Operations supports the delivery of safe and efficient flight services to customers through responsive and cost effective maintenance of NAS facilities, systems, and equipment, and by providing operational oversight of leased services. The work consists of:

- NAS system design, development, acquisition, installation, maintenance, restoration, modification, certification and oversight of vendor-supplied NAS services and vendor maintenance programs;
- Facilities maintenance; and
- Engineering and assignment of aeronautical frequency spectrum.

Core work is performed by personnel at System Support and Technical Operations Control Centers. The Centers focus on optimizing NAS performance through prioritization of response based on multiple factors, including the importance of the airport or ATC facility that is directly or indirectly affected by the equipment or service outage. Technical Operations leads the day-to-day defense and protection of the NAS by providing governance and requirements to enhance cybersecurity. Technical Operations coordinates threat information sharing and inter-agency collaboration and tailors cybersecurity business and acquisition strategies to support the rapid delivery of tools, applications, and other capabilities to defend the critical infrastructure from the evolving threat.

System Operations (AJR): All national air traffic flow management initiatives are provided by AJR, along with policy and concept development for new airport surface flow management programs. AJR is working to provide gate-to-gate strategic traffic management. System Operations is the focal point for stakeholder interaction through formal Collaborative Decision Making venues, and serves as FAA's Customer Advocate. AJR provides all national Flight Service functions and operational oversight to all NAS security issues. As overall NAS management requires exacting data exchange, AJR manages FAA data policy and orders. With data management, AJR provides ATO with system performance analysis, trending and forecasting. Finally, in promoting FAA's sophisticated approach to air traffic system management AJR enables the global outreach to the international community on behalf of ATO, providing subject matter experts and operational insight to FAA's global partners.

The System Operations Service Unit consists of several directorates that perform essential functions in the daily operation of the NAS. These functions affect all aspects of FAA ATC operations and AJR's engagement with other Government agencies, airlines, and foreign air navigation service providers.

Safety and Technical Training (AJI): Provides safety, technical training, policy and performance, and standardization expertise necessary to help enable air traffic controllers, technicians, engineers and support personnel's daily efforts to keep aircraft safe, separated, and on time.

AJI safety programs are responsible for ensuring the safety of the NAS through reporting, mitigating, and monitoring risks. This strategy includes gathering input from front line employees, deploying technology to gather data, improving analysis to identify risk and implementing corrective actions to mitigate identified hazards. AJI ensures that national safety management policies are clearly defined, communicated, and adhered to; conducts audits, operational assessments of NAS changes and new technologies; and provides safety analysis and data management capability. AJI manages safety policy development, reduce fatigue risks through a comprehensive fatigue risk management system, facilitate an ongoing ATO safety culture transformation that leads to improved safety performance, and are the focal point for reducing the risk of runway collisions and excursions in the NAS.

AJI is the organization within ATO that provides technical training to controllers, technicians, and engineers. We provide a national training program to ensure the technical competency (knowledge and skills) of the workforce, and ensure AJI certifies enough of the right workers to meet operational needs. AJI develops and deliver technical training programs for a workforce of approximately 14,500 air traffic controllers, 6,000 Airway Transportation Systems Specialists (ATSS), and 1,800 engineers. This includes developing the design standards, acquiring services and products for delivering technical training at over 500 facilities nationwide, maintaining the technical training curricula, and adopting innovative technology that improves knowledge and skill transfer.

Mission Support Services (AJV): The Mission Support Services mission is to provide policy, technical expertise and analyses, critical support services and regulatory guidance across a broad range of activities directly related to the safe and efficient operation of the NAS. Core work includes:

- Oversight and support for NAS procedures and changes, which affect operations and special activities with the NAS.
- Development and dissemination of digital aeronautical charts, instrument flight procedures, aeronautical data, and related aeronautical navigation products.

- Aeronautical chart and data revisions, and development and maintenance of Radar Video Maps (RVMs) in response to increasing requirements of Unmanned Aircraft Systems (UAS) Integration.
- Updating of UAS Facility Maps, National Security maps, FAA Extension, Safety, and Security Act of 2016 maps, and all related data in support of Low Altitude Authorization and Notification Capability and changing UAS requirements.
- Support to Terminal Automation Modernization Replacement (TAMR) deployment by creating and maintaining ATC RVMs, Minimum Safe Altitude (MSA) ATC facility RVMs, MSA Warning system data files, and Minimum Vectoring Altitude maps.
- Inspections, evaluations, safety risk management, accident and incident information gathering and reporting services, and support for NAS procedures and changes, which affect operations and special activities with the NAS.
- Standardized administrative support services.
- Financial, material, procurement, and logistical support services.
- Integrated planning, requirements management and program implementation management support services.
- Facilitate the development of enterprise solutions and implement changes necessary to integrate new entrants into the NAS, covering a wide array of technical challenges with a focus on UAS and Commercial Space integration across the ATO.
- Development, validation, integration, and prioritization of new Air Traffic Management concepts and requirements across the enterprise, ensuring future changes to the NAS are operationally sound.
- Confirms and prioritizes operational needs. Also develops, confirms, and integrates, new Air Traffic Management concepts and requirements across the enterprise, ensuring future changes to the NAS are operationally sound and well timed.
- Coordination with international organizations and working groups to achieve ATO global strategies for air traffic management harmonization, standardization, advocacy, and technical and operation support; and
- Responsibility for obtaining electronic country clearances to notify the State Department for all international travel of ATO and ANG federal employees and contractors.

Management Services (AJG): The Management Services organization provides leadership and guidance in the areas of financial management, people services, business planning, technical labor relations and employee engagement, and leadership development for the ATO. This shared services model was designed to decrease the administrative burden on ATO's operating service units and improve the overall efficiency and effectiveness of the ATO. Management Services strives to maximize economies of scale by promoting standardization of processes, providing budget formulation and execution, overseeing ATO administrative policy, providing personnel actions and technical labor advice and leading ATO-specific employee development and succession planning efforts on behalf of FAA's customers, who collectively operate and maintain the National Airspace System.

Management Services directly supports the workforce by providing technical requirements, forecasting, and onboarding, along with the personnel and organizational policies that meet the needs of ATO's highly skilled workforce. AJG ensures performance stays on track by providing the framework to integrate ATO's plans, programs, and activities. AJG serves as a centralized point of contact for other FAA partners to develop strategies for implementing solutions within ATO. To this end, in continued support of the shared services model, 63 positions have been realigned from Mission Support (24), Flight Program Operations (18), and Technical Operations (21) to improve and streamline the efficient provision of shared services throughout the ATO.

Program Management Organization (AJM): The Program Management Organization provides full life-cycle program management capability across all of ATO from initial definition, through design, development, and effective deployment of both NAS sustainment and NextGen modernization systems.

Flight Program Operations (AJF): Flight Program Operations is responsible for all aspects of flight program operations, training, maintenance, safety, administration, and policy. AJF is structured around four directorates: Aircraft Operations, Aircraft Maintenance, Flight Program Safety, and Flight Program Administration.

The service unit's core business is safe flight operations in support of four primary missions.

- Aviation Safety Training: Provide training and currency/proficiency services to Office of Aviation Safety personnel such as aviation safety inspectors and flight test personnel.
- Flight Inspection: Ensure the integrity of instrument approaches and airway procedures that constitute the NAS infrastructure and the agency's international commitments, including airborne inspection of all space- and ground- based instrument flight procedures and the validation of electronic signals in space

transmitted from ground navigation systems. Flight procedures and surveillance systems are evaluated for accuracy, aeronautical data, human factors flyability, and obstacle clearance. Flight Program Operations also performs inspections of Department of Defense navigational facilities.

- Research, Development, Test & Evaluation Support conduct flights directly related to research development, test, and evaluation of new electronic aids, air traffic procedures, and aircraft improvement, under established agency projects.
- Transportation: Provide transportation required to accomplish official FAA responsibilities in times of emergency or disaster such as hurricane response, as well as support the National Transportation Safety Board in carrying out its duties.

Flight Program Operations operates aircraft out of eight facilities across the country. Flight Program Operations also has implemented a single safety management system, established standards equivalent to industry and Title 14 of the Code of Federal Regulations, and integrated all missions under the same flight control system.

<u>Transition from Facilities and Equipment to Operations:</u>

Transition to Operations and Maintenance (TOM) funding covers the operational cost of new systems acquired under the FAA's Facilities and Equipment Capital budget. Once new systems are installed in the NAS or Non-NAS the ongoing operational costs are transferred to the Operations appropriation. If legacy systems are being replaced or undergoing upgrading ("tech refresh") the request is the net of current operating costs and the anticipated cost of the replacement system. New capabilities do not usually have offsetting costs.

The funding provides for the ongoing support of contractor provided hardware and software maintenance, licensing fees, telecommunications costs, logistics support, utilities, and the cost flight procedures and inspection for new systems.

This funding is for the following systems commissioned in FY 2017 and transitioning to Operations in FY 2019.

Transition from Facilities and Equipment to Operations: FY 2019	Amount ($000)
Aeronautical Information Management (AIM) Modernization Segment 2	4,819
System-Wide Information Management (SWIM) NAS Enterprise Messaging Services (NEMS)	3,507
Airport Surface Surveillance Capability (ASSC)	2,383
Integrated Display System Replacement (IDSR)	1,459
TAMR Phase 1, TAMR Phase 3 Segment 1, TAMR Phase 3 Segment 2	1,012
Facility Security Risk Management (FSRM)	808
Ground Based Interval Management Spacing (GIM-S)	589
Power Services Systems	134
Mobile Asset Management Program (MAMP)	16
Communication Total (ASTI, NVS, CFE, NVRP, IVSR, FOTS)	1,791
Navigation Total (WAAS, RWSL, DME, PAPI, ALSF-2, ILS, MALSR, RVR)	1,472
Automated Surface Weather Observation Network (ASWON: SWS, AWOS-C)	976
Automatic Dependent Surveillance Broadcast (ADS-B)	2,665
ATO TOTAL	**$21,631**

This funding is for the following systems commissioned in FY 2018 and transitioning to Operations in FY 2020.

Transition from F&E to Ops (TOM): FY 2020 Programs	Amount ($000)
Terminal Automation Modernization and Replacement (TAMR)	5,946
Aeronautical Information Management (AIM) Modernization	5,075
Trajectory Based Operations – Data Communication – Segment 1 Phase 2 Initial En Route Services	3,903
System Wide Information Management (SWIM)	1,749
Performance Based Navigation (PBN)/ NAVLean	1,221
Facility Security Risk Management (FSRM)	1,052
Power Services Systems – Sustainment Support (PS3)	489
Alaskan Satellite Telecommunications Infrastructure (ASTI)	476
Common Terminal Digitizer (CTD)	443
Instrument Landing System (ILS)	283
Wide Area Augmentation System (WAAS)	280
Distance Measuring Equipment (DME)	277
Data, Visualization, Analysis and Reporting System (DVARS)	234
Runway Status Light (RWSL) Program	126
Communication Facilities Enhancement (CFE)	123
ASWON Surface Weather System (SWS)	104
Airport Surface Surveillance Capability (ASSC)	92
Precision Approach Path Indicator (PAPI)	30
Approach Lighting System with Flashers (ALSF-2)	12
ATO TOTAL	**$21,913**

Program Increases:

Unmanned Aircraft Systems (UAS): ATO is requesting $2.1 million to ensure a safe and efficient entry of UAS into the National Air Space (NAS). ATO will continue to integrate UAS operations into the National Airspace System in a timely fashion and with the same level of safety and efficiency as other legacy operations. These activities include reviewing and approving applications for specific UAS operations, and streamlining this process as much as possible to ensure the FAA responds to requests as efficiently as possible, maintaining the IT systems and tools that support the application process, develop standards and procedures to protect safety, and training its workforce as new standards are implemented.

Cyber Security: The FY 2020 request of $5.1 million enables establishment of an ongoing multi-year effort to identify and combat threats to the National Airspace System (NAS). Threats to FAA's NAS continue to increase as technology changes (i.e., shared infrastructure and the move from point to point circuits to Internet Protocol (IP) services). Shared infrastructure and the use of IP services increase the entry points for potential enterprise-level cybersecurity attacks.

The FAA has a backlog of known cyber vulnerabilities in the NAS environment. Funding will allow the FAA to conduct independent risk assessments annually. FAA will implement a multi-year solution that will reduce the backlog of program assessment and mitigation efforts by 10 percent each year.

FY 2020 Anticipated Accomplishments:

Function / Office	FY 2020 Anticipated Accomplishments
Air Traffic Organization	• Maintain and sustain core infrastructure in support of NAS operations for key automation, decision support, surveillance, and communications systems at our nation's core airports. • Improves the safety management system to ensure the safe and efficient flow of air traffic across the NAS. • Continue to seek cost savings in Time Division Multiplexing – Internet Protocol implementation, FAA Enterprise Network Services, and Flight Services through competition and technological innovation. • Continue to implement NextGen technologies that drive industry benefits, including Data Communications, Terminal Flight Data Manager, Time-Based Flow Management, and SWIM. • Prepare the NAS for new entrants, including Unmanned Aircraft Systems (UAS) and Commercial Space. • Reduce runway incursions, excursions, and other airport surface safety events through use of the Surface Safety Risk Index. • Provide continuous NAS information to external aviation partners. • Provide Performance-Based Navigation flight procedures and guidance in support of the FAA's transition to initial Trajectory-based Operations. • Develop leadership, career development and succession programs and training for ATO career professionals.

What benefits will be provided to the American Public through this request and why is this program necessary?

The ATO is committed to the American public to provide the safest aviation system in the world by preventing collisions between aircraft operating in the NAS, by providing an organized and expeditious flow of air traffic, and by providing support for National Security and Homeland Defense. The ATO relies on numerous programs to maintain the safety and efficiency of the current system.

The ATO provides strategic and tactical NAS oversight, and regulates real-time air traffic when constraints such as weather, runway closures, equipment outages, security issues or other impacting conditions affect the NAS. By developing and coordinating FAA operational metrics, system operations develop recommendations for improving NAS capacity and system efficiency to reduce delays at specific airports and in high volume corridors. The flying public benefits directly by minimizing NAS delays and congestion, which delivers an efficient and safe mode of transportation to travelers. It will also lead to efficiencies that will save fuel and provide a better flying experience to the public.

The ATO's responsibilities also include environmental assessments and polices to manage effective airspace use, and complete regulatory development for UAS operations over urban areas. This will expand the use of unmanned aircraft while deliberation completes on the UAS rulemaking actions.

The ATO creates standardization and provides synergy and efficiencies across the operations missions. The organization supports various programs and projects and contributes to the user benefits of safety and flight efficiency to ensure the existing NAS infrastructure remains within established specifications.

The safety of American aviation is unparalleled. Since 2003, FAA has coordinated more than 135 million successful flights on commercial aircraft, transporting over 7 billion passengers safely to their destinations. This outstanding record is attributable to FAA's efforts at reducing fatal accident rates, deploying systems and procedures to reduce serious runway incursions, and conducting training programs aimed at reducing operational errors.

Controller Workforce FY 1992 through FY 2020
(Data from FY 2018 Controller Workforce Plan)

FY 1992 Actual	15,147	FY 2001 Actual	15,233	FY 2010 Actual	15,696	FY 2019 Forecast	14,290
FY 1993 Acutal	14,970	FY 2002 Actual	15,478	FY 2011 Actual	15,418	FY 2020 Forecast	14,152
FY 1994 Actual	14,953	FY 2003 Actual	15,691	FY 2012 Actual	15,211		
FY 1995 Actual	14,614	FY 2004 Actual	14,934	FY 2013 Actual	14,463		
FY 1996 Actual	14,360	FY 2005 Actual	14,540	FY 2014 Actual	14,330		
FY 1997 Actual	14,588	FY 2006 Actual	14,618	FY 2015 Actual	14,143		
FY 1998 Actual	14,966	FY 2007 Actual	14,874	FY 2016 Actual	14,449		
FY 1999 Actual	15,061	FY 2008 Actual	15,381	FY 2017 Actual	14,481		
FY 2000 Actual	15,153	FY 2009 Actual	15,770	FY 2018 Actual	14,695		

Air Traffic Organization (ATO)
($000)

	Dollars	FTP	OTFTP	FTE
*** FY 2019 Annualized CR**	**$7,692,786**	**29,374**	**689**	**29,400**
Adjustments to FY 2020 Base	**77,097**	**-**	**-**	**-**
FERS Increase	13,450			
Extra Compensable Day (262)	20,984			
GSA Rent				
Working Capital Fund	-881			
Transition from F&E to Ops	43,544			
Great Lakes Regional Offices				
Financial Accounting Services				
Annualization of FY 2019 FTE				
CAMI Accident Investigation Transfer from RE&D to Ops				
Discretionary Adjustments	**7,246**	**-**	**-**	**-**
UAS Requirements	2,100			
Commercial Space Regulatory Reform				
Innovation Office				
Cybersecurity	5,146			
Base Transfers	**228**	**1**	**-**	**1**
Staffing Reassignment	228	1		1
Regional Administrators Office Realignment				
FY 2020 Request	**7,777,357**	**29,375**	**689**	**29,401**

FERS Increase: OMB Circular A-11 has increased the agency's contribution rates to the FERS retirement system. This increase in cost to the FAA represents the increased rates for both Air Traffic Controllers and other agency employees.

Extra Compensable Day: There are 262 Compensable days in FY 2020 vs. 261 days in FY 2019.

Working Capital Fund: This cost adjustment is requested to support the Department of Transportation's Working Capital Fund estimates for the FAA.

Transition from Facilities and Equipment to Operations: Transition to Operations and Maintenance (TOM) funding covers the operational cost of new systems acquired under the FAA's Facilities and Equipment Capital budget. Once new systems are installed in the NAS or Non-NAS the ongoing operational costs are transferred to the Operations appropriation. Capital projects cover everything from surveillance systems such as radars and ground based Navigational Aids to major software systems that provide air traffic control capabilities. Costs may include in- service management for hardware maintenance, software maintenance, software licenses, telecommunications, logistics support, and training.

UAS Requirements: The increase will allow the FAA to expand efforts to engage with the many operational, security, regulatory, and communication issues raised by the development of the Unmanned Aircraft Systems.

Cybersecurity: The request supports enterprise initiatives that will enhance the cybersecurity posture of all systems that provide critical Air Traffic Control (ATC) services. The FAA will increase the number of NAS system risk assessments conducted annually, and improve the rapid detection of abnormalities and situational awareness required to respond to cyber events within the Air Traffic Control (ATC) critical infrastructure.

Staffing Reassignment (ASH to ATO): This request transfers funding and staff from the Office of Security and Hazardous Materials Safety to the ATO Technical Operations Services.

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Detailed Justification for the Aviation Safety Organization (AVS)

FY 2020 - Aviation Safety Organization Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	*FY 2019 Enacted	FY 2020 Request
Salaries and Expenses	1,091,551	1,100,878	1,116,433	1,111,637
Program Costs	218,449	209,122	220,536	216,142
Total	**$1,310,000**	**$1,310,000**	**$1,336,969**	**$1,327,779**
FTE	**7,126**	**7,266**	**7,266**	**7,284**

*Enacted levels for FY 2019 are provided for informational purposes. The FY 2020 budget request was developed before a final appropriations act was enacted for FY 2019, and the request assumes a year-long continuing resolution for FY 2019.

Funding details for AVS' eight services and offices:

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Flight Standards Service	863,714	863,714	TBD	868,660
Aircraft Certification Service	239,409	239,409	TBD	240,720
Office of Aerospace Medicine	64,012	64,012	TBD	69,034
Office of Rulemaking	7,600	7,600	TBD	7,639
Air Traffic Safety Oversight Service	24,627	24,627	TBD	24,753
Office of Accident Investigation and Prevention	27,815	27,815	TBD	29,372
Office of Unmanned Aircraft Systems Integration	25,371	25,371	TBD	29,593
Office of Quality, Integration and Executive Services	57,452	57,452	TBD	58,008
Total	**$1,310,000**	**$1,310,000**	**$1,336,969**	**$1,327,779**

What is this program and what does this funding level support?

The request allows Aviation Safety (AVS) to provide core services for certification, production approval, and continued airworthiness of aircraft as well as the certification of pilots, mechanics, and others in safety-related positions; continue unmanned aircraft system (UAS) integration into the National Airspace System (NAS); and maintain essential safety data reporting capabilities.

AVS is responsible for setting the safety standards for every product, person, and organization that manufactures and operates aircraft in the NAS. Through its approximately 7,200 employees, AVS provides the following services:

- Surveillance and oversight of existing certificate holders.
- Development and establishment of safety and certification standards for the civil aviation industry.
- Surveillance and oversight of air carriers, general aviation operators, repair stations, manufacturers and airmen.

- Issuance or denial of certifications.
- Ongoing and wide-ranging transformation of the NAS encompassed by NextGen.

AVS has eight services and offices:

Flight Standards (AFS): Flight Standards Service promotes safety in air transportation by setting the standards for certification and oversight of airmen, air operators, air agencies, and designees as well as safety of flight of civil aircraft in air commerce. AFS conducts inspections, surveillance, investigation, and enforcement activities and manages the system for registry of civil aircraft and all official airmen records.

This AFS request also provides for the System Approach for Safety Oversight (SASO) Program which will transform the FAA's flight standards and the aviation industry to a national standard of system safety based upon International Civil Aviation Organization Safety Management System (SMS) principles. SASO requirements include security, training and automation requirements.

Aircraft Certification (AIR): Aircraft Certification Service develops and administers safety standards and procedures governing the design, production and airworthiness of civil aeronautical products. Certification staff oversee design, production, and airworthiness certification programs to ensure compliance with prescribed safety standards.

In 2017, AIR began a comprehensive realignment to transform the service from a division/directorate organizational structure to functional divisions to proactively address industry growth, globalization of aviation, heightened expectations and rapid changes in technological advances and industry business models. Current funds cover 13 Aircraft Certification Offices, 19 Manufacturing Inspection District Offices, four Manufacturing Inspection Satellite Offices, a Certificate Management Office, a Certification Program Management Section, and two International Offices (Brussels, Belgium and Singapore).

Aerospace Medicine (AAM): Office of Aerospace Medicine oversees a broad range of medical programs and services for both the domestic and international aviation communities. AAM performs medical certification of airmen, inspects and oversees aviation industry drug and alcohol testing programs and performs aerospace medicine and human factors research.

Rulemaking (ARM): Office of Rulemaking manages FAA's rulemaking program, processes, and timelines; develops proposed and final rules; manages responses to petitions for rulemaking and for exemption from regulatory requirements; and oversees rulemaking advisory committees that provide advice and recommendations on aviation-related issues.

Accident Investigation and Prevention (AVP): Office of Accident Investigation and Prevention investigates aviation accidents and incidents to detect unsafe conditions and trends and to coordinate the corrective action process. AVP investigates major or significant accidents and addresses National Transportation Safety Board and internal FAA Safety Recommendations.

Air Traffic Safety Oversight (AOV): Air Traffic Safety Oversight Service conducts independent safety oversight of the ATO's air traffic services, using risk-based, data-supported surveillance methods. Surveillance approaches include audits, inspections, investigations, compliance, and approvals, acceptances, and concurrences. AOV staff monitors local air traffic services, processes, and procedures using safety risk standards, SMS principles, and certification/credentialing programs. AOV approves the Air Traffic Organization's SMS, monitors the ATO for compliance with its approved SMS, and reviews and approves the ATO's safety implementation actions and risk management strategies.

Unmanned Aircraft Systems Integration (AUS): Office of Unmanned Aircraft Systems Integration is responsible for facilitating the safe, efficient, and timely integration of UAS into the NAS. AUS manages and coordinates international activities for UAS within FAA, aligning UAS international activities with foreign civil aviation authorities. Its functions include:

- Facilitating development of operating concepts, policies, requirements, criteria and procedures for new system evaluations, integration and implementation of emerging UAS technologies
- Overseeing all FAA UAS research and development initiatives
- Managing special programs including UAS Pathfinder and Airport Detection initiatives, UAS exemption

program, UAS Test Site oversight and rulemaking efforts
- Facilitating the development and implementation of FAA's UAS Strategic Plan, and
- Advancing education and outreach to UAS stakeholders and the public to enhance operational safety and public awareness

In FY 2018, AUS stood up the Unmanned Aircraft System Integration Pilot Program creating an opportunity for state, local, and tribal governments to partner with private sector entities, such as UAS operators or manufacturers, to accelerate safe UAS integration. The program will help the DOT and FAA craft new enabling rules by:

- Identifying ways to balance local and national interests related to UAS integration
- Improving communication with local, state and tribal jurisdictions
- Addressing security and privacy risks
- Accelerating the approval of operations that currently require special authorizations

Quality, Integration, and Executive Services (AQS): The Office of Quality, Integration, and Executive Services provides executive oversight and direction of consolidated management support services for all of AVS. AQS manages all phases of planning, financial management, Information Technology (IT) liaison services, and administrative activities for the immediate office of the Associate Administrator.

Transition from Facilities and Equipment to Operations:

Funding totaling $2,784,000 is requested for Facilities and Equipment funded systems that were commissioned in FY 2017 and FY 2018. These costs must now transition to Operations.

FY 2019 TOM Requirements	**Amount ($000)**
Aviation Safety Information Analysis and Sharing (ASIAS)	500
Regulation and Certification Infrastructure for System Safety (RCISS)	199
Aerospace Medical Equipment Needs (AMEN)	78
AVS TOTAL	**$776**
FY 2020 TOM Requirements	**Amount ($000)**
Aviation Safety Information Analysis and Sharing (ASIAS)	980
Regulation and Certification Infrastructure for System Safety (RCISS)	295
Aerospace Medical Equipment Needs (AMEN)	733
AVS TOTAL	**$2,008**

CAMI Accident Investigation Transfer from RE&D to Operations:

In FY 2020, the request includes funding and staff to cover accident investigations conducted by the Civil Aerospace Medical Institute (CAMI) that had previously been included in the Research, Engineering & Development (RE&D) account. This transfer entails $3,730,000 and 18 Full-Time Positions/Full Time Equivalents. RE&D will continue to fund safety related applied research while Operations will fund accident investigation and aeromedical research.

Program Increase for Unmanned Aircraft Systems (UAS):

AVS is requesting $4.15 million to support the continued state, local and tribal projects through Integrated Pilot Program (IPP), and the projected increase in Partnerships for Integration Program (PIPs), formerly Partnerships for

Safety Plan (PSP) applicants. This increase will also support the rulemaking activities needed to enable UAS integration into the NAS, to assist in rulemaking, and to expedite the processing of requests from industry. This will ensure that the FAA is able to meet the demand in this rapidly growing and changing industry as new information is gained and new operations are authorized.

FY 2020 Anticipated Accomplishments:

Function/Office	FY 2020 Anticipated Accomplishments
Aviation Safety	• Develop policies, procedures, and approval processes to enable expanded UAS operations to include reducing the processing time of part 107 operational waivers. • Conduct targeted outreach and engagement activities that inform current and potential UAS operators about safety, operational readiness, and enabling pathways. • Leverage operational data from the UAS Integration Pilot Program to assist in the development of policy, procedures, and standards that enable more routine, complex UAS operations. • Continuing to develop policy, procedural guidance, and certificate management programs for the emerging technologies needed to transition and operate in the NextGen environment. • Facilitate government/industry safety teams to identify emerging system risk and to implement risk mitigation strategies utilizing the ASIAS and System Safety Management Transformation programs that provide data-driven safety analysis to reduce aviation risk in the NAS worldwide. • Champion the evolving rulemaking efforts to modernize regulations in order to incorporate safety management principles into design and manufacturing environments. • Implement the FAA and Industry Certification Process Guide in a consistent and sustainable manner to educate all stakeholders about needs/expectations in the certification process, reinforce that education through follow-up activities, and measure the effectiveness of application. • Establish an organization and process Innovation Center for early engagement to facilitate the development of new standards and guidance to promote the safe and efficient adoption of emerging technology and processes for aviation applicants. • Establish baseline and ongoing levels of confidence in foreign Civil Aviation Authorities based on equivalency/compatibility of standards, policies and procedures and technical competency of each authority.

What benefits will be provided to the American Public through this request and why is this program necessary?

AVS will provide the American public safety and economic benefits by maintaining oversight of the NAS through data analysis techniques used for audits, surveillance, and certification of aircraft operators and production manufacturers, pilots, mechanics, and, other safety related positions. AVS will provide certification and integration services for newly designed and manufactured aviation products associated with UAS. The engineer and inspector resources will provide manufacturing and operational approvals of UAS technologies while maintaining safety oversight services within the NAS.

Staffing Information

	FY 2018 Enacted	FY 2019 Annualized CR	FY 2020 Request
Direct Full Time Equivalents (FTE)	**7,242**	**7,266**	**7,284**
Flight Standards Service	5,187	5,202	5,125
Aircraft Certification Service	1,325	1,329	1,359
Office of Aerospace Medicine	380	381	409
Office of Rulemaking	37	37	40
Air Traffic Safety Oversight Service	129	130	130
Office of Accident Investigation and Prevention	69	70	80
Office of Unmanned Aircraft Systems Integration	56	57	75
Office of Quality, Integration and Executive Services	59	60	66
Full Time Permanent Employment (FTP)	**7,266**	**7,266**	**7,284**
Flight Standards Service	5,202	5,202	5,125
Aircraft Certification Service	1,329	1,329	1,359
Office of Aerospace Medicine	381	381	409
Office of Rulemaking	37	37	40
Air Traffic Safety Oversight Service	130	130	130
Office of Accident Investigation and Prevention	70	70	80
Office of Unmanned Aircraft Systems Integration	57	57	75
Office of Quality, Integration and Executive Services	60	60	66

As of May 2018

Aviation Safety Organization (AVS)
($000)

	Dollars	FTP	OTFTP	FTE
*** FY 2019 Annualized CR**	**$1,310,000**	**7,266**	**31**	**7,266**
Adjustments to FY 2020 Base	**13,629**	**18**	**-**	**18**
FERS Increase	2,666			
Extra Compensable Day (262)	4,363			
GSA Rent				
Working Capital Fund	86			
Transition from F&E to Ops	2,784			
Great Lakes Regional Offices				
Financial Accounting Services				
Annualization of FY 2019 FTE				
CAMI Accident Investigation Transfer from RE&D to Ops	3,730	18		18
Discretionary Adjustments	**4,150**	**-**	**-**	**-**
UAS Requirements	4,150			
Commercial Space Regulatory Reform				
Innovation Office				
Cybersecurity				
Base Transfers	**-**	**-**	**-**	**-**
Staffing Reassignment				
Regional Administrators Office Realignment				
FY 2020 Request	**1,327,779**	**7,284**	**31**	**7,284**

FERS Increase: OMB Circular A-11 has increased the agency's contribution rates to the FERS retirement system. This increase in cost to the FAA represents the increased rates for both Air Traffic Controllers and other agency employees.

Extra Compensable Day: There are 262 Compensable days in FY 2020 vs. 261 days in FY 2019.

Working Capital Fund: This cost adjustment is requested to support the Department of Transportation's Working Capital Fund estimates for the FAA.

Transition from Facilities and Equipment to Operations: Transition to Operations and Maintenance funding covers the operational cost of new systems acquired under the FAA's F&E Capital budget. Once new systems are installed in the NAS or Non-NAS the ongoing operational costs are transferred to the Operations appropriation. Capital projects cover everything from surveillance systems such as radars and ground based Navigational Aids to major software systems which provide air traffic control capabilities. Costs may include in- service management for hardware maintenance, software maintenance, software licenses, telecommunications, logistics support, and training.

CAMI Accident Investigation Transfer from RE&D to Operations: The request includes funding and staff to cover accident investigations conducted by CAMI that had previously been included in the RE&D account.

UAS Requirements: The increase will allow the FAA to expand efforts to engage with the many operational, security, regulatory, and communication issues raised by the development of the Unmanned Aircraft Systems.

Commercial Space
Transportation(AST)

Detailed Justification for the Office of Commercial Space Transportation (AST)

**FY 2020 – Office of Commercial Space Transportation – Budget Request
($000)**

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	*FY 2019 Enacted	FY 2020 Request
Salaries and Expenses	16,861	17,002	17,242	19,113
Program Costs	5,726	5,585	7,707	6,485
Total	**$22,587**	**$22,587**	**$24,949**	**$25,598**
FTE	**97**	**104**	**104**	**117**

* Enacted levels for FY 2019 are provided for informational purposes. The FY 2020 budget request was developed before a final appropriations act was enacted for FY 2019, and the request assumes a year-long continuing resolution for FY 2019.

What is this program and what does this funding level support?

The Commercial Space Launch Act authorized the Department of Transportation (DOT) to license and monitor the safety of commercial space launches and to promote the industry. Executive Order 12465 designated DOT as the lead Federal agency for enabling private-sector launch capability. The Office of Commercial Space Transportation (AST) was originally within the Office of the Secretary of Transportation. AST was transferred to the FAA in 1995.

AST's mission 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. Recent years have witnessed dramatic growth in both the number of commercial space transportation companies and operations. In addition, both the National Space Policy of 2010 and the National Space Transportation Policy of 2013 reflect a greater reliance by the Federal Government on the commercial space industry to accomplish national objectives. As a result, AST continues to see significant increases in the activities required to achieve its mission.

In FY 2018, AST developed a proposal for a "21st Century Licensing Process" that would fundamentally change how the FAA licenses launches and reentries in 14 CFR Chapter III by proposing a regulatory approach that relies on performance-based regulations rather than prescriptive regulations. This action would primarily consolidate and revise parts 415, 417, 431, and 435 into a single regulatory part that states safety objectives for the launch and reentry of vehicles, and will leave design or operational solutions up to the applicant.

This action will be accompanied by a body of Advisory Circulars or standards that collectively provide at least one acceptable means of compliance for all performance-based regulations in the new part. This action would also enable flexible timeframes, remove unnecessary ground safety regulations, redefine when launch begins to allow specified pre-flight operations prior to license approval, and allow applicants to seek a license to launch from multiple sites. This proposal would significantly streamline and simplify licensing of launch and reentry operations.

AST accomplishes its safety mission through the execution of its licensing, permitting, and safety inspection functions.

Key focus areas include:

- Pre-application Consultation. AST conducts pre-application consultation with every company or entity that approaches the FAA for a license or permit. This consultation process can last months or even years, as it serves to educate these proponents on the applicable regulations and assist them in identifying potential issues as they develop and shape their plans. Currently, there are eight launch sites in pre-application consultation with AST.

- License and Permits. AST has 180 days to evaluate a license application or 120 days to evaluate a permit application. These evaluations are complex in nature, and require an in-depth safety evaluation, which also includes a policy review, interagency review, and a computation of maximum probable loss for determining an applicant's financial responsibility.

- Spaceports. AST is responsible for licensing the operation of launch sites or "spaceports", identified below:
  - California Spaceport at Vandenberg Air Force Base
  - Spaceport Florida at Cape Canaveral Air Force Station
  - Mid-Atlantic Regional Spaceport at Wallops Flight Facility in Virginia
  - Mojave Air and Space Port, California
  - Kodiak Launch Complex on Kodiak Island, Alaska
  - Oklahoma Spaceport in Burns Flat, Oklahoma
  - Spaceport America near Las Cruces, New Mexico
  - Cecil Field in Jacksonville, Florida
  - Houston Airport System Spaceport, at Ellington Airport
  - Midland International Airport in Midland, Texas
  - Colorado Air and Spaceport, CO

- Safety oversight. AST primarily through on-site inspections ensures license and permit holders adhere to regulatory requirements. At least one inspection of launch operations is required at time of flight, but inspection also encompasses sending safety inspectors to launch and reentry operations to ensure an operator's compliance with regulations and the representations made in its application. Other key activities are inspected, including dress rehearsals and the testing and installation of flight termination systems. Additionally, each year, AST conducts inspections of all licensed launch sites.

The increasing pace of growth in commercial space transportation brings challenges beyond increasing launch rates. The threat of orbital debris continues to grow and jeopardizes the safety of operations entering and returning from orbit. In addition, new types of space vehicles, such as balloons and a variety of winged launch and reentry vehicles, increase the complexity of licensing and operations, as do new ventures like small-satellites, cube-satellites, and commercial orbital servicing and commercial space stations, as well as the dawn of commercial human spaceflight operations. Recognizing these growing needs, the FAA is developing and implementing a strategy to ensure the efficient integration of commercial space into the NAS. This work will be performed in partnership with the Air Traffic Organization, NextGen, and other FAA organizations.

<u>Program Increase: Commercial Space Regulatory Reform ($2,000,000; 13 FTP; 7 FTE):</u>

These program costs include improving and enhancing AST's regulatory framework in order to transform the Commercial Space launch and re-entry licensing process to a single license for all types of launch and re-entry vehicle operations, and transform the regulatory process from one of prescriptive requirements to a performance based licensing regime. These program costs will also allow for continued automation development in order to keep pace with the increasing complexity and diversity of suborbital and orbital operations.

FY 2020 Anticipated Accomplishments:

Function/Office	FY 2020 Anticipated Accomplishments
Commercial Space	• Completion of licensing and permitting evaluations within statutory time limits. • Environmental assessment completion for all launches/reentry sites • Completion of additional safety approval applications, which evaluate space-related components, processes or services. • Improving the integrated planning and execution of commercial space operations in the National Airspace System (NAS). • An enhanced and revised regulatory framework, including continual engagement with those developing new projects, in order to keep regulations flexible to address the increasing complexity and diversity of suborbital and orbital operations.

What benefits will be provided to the American Public through this request and why is this program necessary?

Since AST's transfer to the FAA in 1995, through 2018, the Office has licensed or permitted 366 commercial space launches and reentries. Commercial space transportation operates through such activities as launch of supplies for the International Space Station, deployment of communications satellites to ensure reliable cell phone operations, and the development of new transportation concepts and enabling technologies. This request will allow AST to keep pace with the increasing tempo of operations anticipated in the next few years and effectively evaluate the increasingly complex vehicles, systems, and operations.

AST has supported licensed commercial launches, and reentries. As the number of launches increases, the number of reviews, analyses, inspections, documents, studies, and regulations and operational integration will increase proportionally. AST has also seen an increase in the number of foreign space agencies seeking AST advice and guidance for activities in their own countries.

Commercial space transportation activities are expanding at the same time the National Aeronautics and Space Administration is increasingly relying on the commercial sector to provide cargo services for the International Space Station, and someday, astronauts, as well. There also continues to be a growing need to ensure the safe integration of space and air traffic, both domestically and internationally. The budget request allows AST to ensure protection of the public, property, and the national security and foreign policy interests of the United States during commercial space launch or reentry activities, as well as encourage, facilitate and promote United States commercial space transportation.

Commercial Space Transportation (AST)
($000)

	Dollars	FTP	OTFTP	FTE
*** FY 2019 Annualized CR**	**$22,587**	**108**	**1**	**104**
Adjustments to FY 2020 Base	**1,011**	**-**	**-**	**6**
FERS Increase	43			6
Extra Compensable Day (262)	68			
GSA Rent				
Working Capital Fund				
Transition from F&E to Ops				
Great Lakes Regional Offices				
Financial Accounting Services				
Annualization of FY 2019 FTE	900			
CAMI Accident Investigation Transfer from RE&D to Ops				
Discretionary Adjustments	**2,000**	**13**	**-**	**7**
UAS Requirements				
Commercial Space Regulatory Reform	2,000	**13**		**7**
Innovation Office				
Cybersecurity				
Base Transfers	**-**	**-**	**-**	**-**
Staffing Reassignment				
Regional Administrators Office Realignment				
FY 2020 Request	**25,598**	**121**	**1**	**117**

FERS Increase: OMB Circular A-11 has increased the agency's contribution rates to the FERS retirement system. This increase in cost to the FAA represents the increased rates for both Air Traffic Controllers and other agency employees.

Extra Compensable Day: There are 262 Compensable days in FY 2020 vs. 261 days in FY 2019.

Annualization of FY 2019 FTE: This funding is requested to provide for the annualized cost of 7 FTE associated with an FY 2019 increase for AST Regulatory Reform. This funding supports the AST divisions which conduct licensing, permitting, safety inspections, technical analyses, and regulations development. This funding will help us keep pace with industry demands for products and services, and advance regulatory streamlining efforts.

Commercial Space Regulatory Reform: The request supports the effort to transform the Commercial Space launch and re-entry licensing process to a single license for all types of launch and re-entry vehicle operations, and transform the regulatory process from one of prescriptive requirements to a performance based licensing regime.

Detailed Justification for the Office of Finance and Management (AFN)

FY 2020 – Office of Finance and Management – Budget Request
($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	*FY 2019 Enacted	FY 2020 Request
Salaries and Expenses	256,859	259,133	262,792	234,901
Program Costs	544,647	524,373	553,606	549,931
Total	**$801,506**	**$801,506**	**$816,398**	**$784,832**
FTE	**1,574**	**1,624**	**1,624**	**1,460**

* Enacted levels for FY 2019 are provided for informational purposes. The FY 2020 budget request was developed before a final appropriations act was enacted for FY 2019, and the request assumes a year-long continuing resolution for FY 2019.

What is this program and what does this funding level support?

The Office of Finance and Management (AFN) is the FAA's shared services operating entity responsible for providing and streamlining the agency's common business services through a consolidated, integrated approach. AFN oversees the delivery of financial operations, acquisition services, information technology, property management, logistics and technical training to internal and external customers across the agency.

AFN manages the FAA's enacted budget and plans future budget requirements, handles more than 27,000 contract actions for more than $4.5 billion in goods and services annually, and supports some 56,000-technology users. AFN leads the FAA's efforts to identify cost savings, leverage technology, and optimize resources in order to position the agency to achieve the aviation safety mission while maintaining the flexibility to accommodate changing requirements in the most effective and efficient manner.

Each year, AFN detects and averts approximately 21 million cyber-alerts for the National Airspace System (NAS) and non-NAS systems throughout the FAA and the DOT, and provides critical crisis response capability for all cyber incidents related to NAS continuity.

In addition, AFN manages leases and real property assets that house 21,600 personnel in approximately 7.4 million square feet of office space, and provides management and oversight for over $7 billion in personal property assets.

AFN's four service organizations include:

Financial Services (ABA)

The Office of Financial Services enables the FAA to meet its aviation safety mission by formulating, justifying, executing, and managing budgets for each of the agency's lines of business and staff offices. ABA ensures that funding is available to meet each organization's mission essential needs and that critical Aviation Safety, Air Traffic, and NextGen personnel, programs, and initiatives are priority in assuring the uninterrupted and improved efficiency and safety of the NAS. ABA serves as the agency's Chief Financial Officer, leads the FAA in identifying cost savings, provides responsible financial management of budget appropriations, and manages the agency's workforce planning.

ABA manages three core services:

Budget and Programming ensures the agency identifies and defines budgetary needs and uses funds, other resources effectively while incorporating performance, and budget plans to meet agency goals. This organization tracks the status of major projects while monitoring agency spending to ensure compliance with appropriations and federal laws. It also serves as the liaison to Congress for funding and appropriation matters.

Financial Management develops and maintains corporate FAA-wide management systems and manages the capitalization of FAA's NAS and other capital assets. Implements accounting and financial management policy for the agency and assures the adequacy of internal controls for compliance with laws, regulations and policies.

Financial Analysis facilitates the Agency's cost reductions effort and implements cost control initiatives; develops agency policy and oversees financial guidance and advisory services for agency contracts; ensures business decisions are sound by analyzing the financial impact of proposed agency labor contracts; and, develops agency policy for spending and authorization controls.

ABA FY 2020 Anticipated Accomplishments:

Function	FY 2020 Anticipated Accomplishments
Budget and Programming	▪ Ensure that required funding needs for agency programs are available through effective resource oversight. ▪ Implement and improve the centralized structure for oversight of well over $400 million in reimbursable work.
Financial Management	▪ Lead the Agency on all accounting operations and provide financial oversight and information to assist FAA organizations with making business decisions. ▪ Ensure an unmodified audit opinion on agency FY 2019 financial statements with no material weaknesses.
Financial Analysis	▪ As the Agency investment analysis process stewards, employ business case discipline to any cost/contract reviews for large investments.

Acquisitions and Business Services (ACQ)

ACQ provides contracting expertise, real, and personal property management that enables the FAA to achieve its aviation safety mission by procuring goods and services that leverage emerging technologies and industry best practices. Procurements are negotiated at best value providing significant cost savings. In FY 2018, ACQ contracted for more than $4.5 billion in goods and services and generated $33.7 million in cost savings through its SAVES program.

ACQ develops the FAA's Acquisition Workforce Strategy, which serves as the FAA's blueprint for building and sustaining a high-performing acquisition workforce consisting of critical positions, such as, Contracting Officers, Program Managers, Information Technology (IT) Specialists, Engineers, Financial Specialists, and four other specialized competencies. The models for these nine competencies and the tools necessary to implement them are aintained by ACQ.

Additionally, ACQ manages seven certification programs that provide acquisition professionals opportunities throughout the acquisition lifecycle to achieve and maintain professional development and certifications. Because of the commitment to maintaining a strong framework for the Agency's acquisition workforce, ACQ is consistently one of the top performers among its peer group and across the government.

Effective in FY 2020, the Aviation Property Management Organization (APM) transfers to ACQ. APM oversees and manages real and personal property for the Agency. Real property includes management of administrative space at FAA Headquarters and other facilities in the National Capital Region; and the space needs of more than 21,600 personnel from every FAA line of business and staff office housed in over 7.4 million square feet of leased FAA properties across the NAS.

ACQ manages five core services:

Procurements: ACQ advises FAA organizations, plans, negotiates and awards cost-effective, best value contracts, purchase orders, delivery orders, agreements, and aviation research grants for FAA headquarters, William J. Hughes Technical Center, Mike Monroney Aeronautical Center (MMAC), and the Service Areas.

Acquisition Professionals: ACQ annually updates the FAA's Acquisition Workforce Strategy and ongoing training and certification programs for acquisition personnel.

Acquisition Oversight: ACQ analyzes acquisition data to formulate trends and traceable metrics that identify areas for improvement to leverage government-leading practices and recommends improvements regarding agency policies and processes based on lessons learned, potential deficiencies, and best practices.

Real Property Management Services: ACQ maintains the Agency-wide inventory of real property and the data and performance measures associated with more than 58,300 buildings, structures, and land parcels which include administrative offices, structures, and land leases for National Airspace System operational sites. Additionally, ACQ oversees administrative space leases within each of the regions administered by the General Services Administration and field facilities for the Agency's Aviation Safety (AVS) and Security and Hazardous Materials Safety (ASH) organizations.

Personal Property Management and Oversight: ACQ provides support in leading and integrating logistics initiatives within the FAA and DOT. As part of ACQ's personal property responsibilities, ACQ establishes and oversees the agency's property management system for the management and physical control of over 150,000 assets valued at $7 billion in global agency assets throughout the NAS and international facilities. Types of agency assets include IT and NAS Equipment, Phones/Communications Radios, Test Equipment, and FAA Owned Vehicles.

ACQ Adjustments to Base:

Programs	Amount (000's)	FTP	FTE
GSA Rent	3,400	-	-
Great Lakes Regional Office Replacement Lease Project	8,727	-	-
Total	**$12,127**	**-**	**-**

General Services Administration (GSA) Rent: The $3.4 million requested will fund administrative lease costs above the rate of inflation for the National Capital Region, the other regional offices and field offices that support the NAS, and to pay rent costs above the FY 2019 requested level. Annual escalations in rent, utilities, and taxes continue to outpace base funding.

Regional Offices: Administrative Lease Costs requirements will increase by approximately 2 percent between FY 2019 and FY 2020. New or succeeding leases negotiated are subject to rising market rents. ACQ's primary avenue for mitigating rising budget costs is exiting or renegotiating unfavorable or underutilized leases and relocating staff into space at the appropriate size and rent. As part of the effort to reduce administrative space, the $8.727 million requested will cover the replacement lease for the Great Lakes Regional Office, tenant improvements, building specific amortized capital (BSAC), and architecture and engineering (A&E).

Regional Administrators Office Realignment Base Transfer ($-33.3 million, -164 FTE):

The Regional Administrators' function is being transferred to the Office of Policy, International Affairs, and Environment to better align the organizational structure with their responsibilities. The Regional Administrators conduct outreach, engagement, and horizontal integration to Congressional officials, Federal, state and local governments, airports, military, civic organizations, as well as to customers across the agency. In addition, Regional Administrators oversee regional emergency operations and integration services to ensure that appropriate communication and coordination occurs in critical crisis response incidents related to NAS continuity.

ACQ FY 2020 Anticipated Accomplishments:

Function	FY 2020 Anticipated Accomplishments
Procurement Actions	▪ Ensure contractor performance is in accordance with contract terms and conditions, issue contract modifications, and monitor contract deliverables. ▪ Develop and implement best practices in acquisition to deliver best value for the taxpayer and increase efficiency and effectiveness of procurement methods. ▪ Conduct internal and external small business outreach/training and target at least 25 percent of total direct procurement dollars as Small Business awards.
Acquisition Professionals Support	▪ Provide the annual update of the FAA's Acquisition Workforce Strategy. ▪ Manage training and certification programs for acquisition personnel, including program/project managers, contracting officers/specialists, contracting officer's representatives, systems engineers, test and evaluation specialists, and logistics specialists.
Acquisition Oversight	▪ Manage audits of cost reimbursable, time & material, and labor hour contracts with an estimated value of $100 million or more and perform audits for at least 15 percent of these contracts with estimated values below $100 million. ▪ Conduct Integrated Baseline Reviews on investment programs along with validations of contractor Earned Value Management Systems. ▪ Conduct investment program post-implementation reviews.
Real Estate Management	▪ Complete 95 percent of the annual real property inventory target and report to DOT. ▪ Achieve 69,000 square feet space reduction goal across FAA administrative space as part of OMB's "Reduce the Footprint" initiative.
Personal Property Management	▪ Enhance management performance targets that measure adequacy of property management policies and procedures, staffing and training, performance review and improvement program. ▪ Implement performance targets that measure the quality and appropriateness of property management activities, staff productivity, and adequacy of checks and balances. ▪ Optimize the Agency fleet size by reducing the number of FAA's underutilized administrative Fleet Vehicles. ▪ Improve and sustain personal property asset visibility, accountability, and management.

Information and Technology Services (AIT)

As the Agency's information and technology backbone, AIT enables the FAA to achieve its aviation safety mission by providing and overseeing all aspects of the Agency's IT enterprise, allowing all lines of business and staff offices, including Air Traffic Organization (ATO) and Aviation Safety Organization (AVS), to seamlessly connect, interact, and respond to customers, stakeholders, colleagues, and resources. AIT keeps the FAA's network safe from cyber threats, maintains a comprehensive cyber threat intelligence analysis capability, and supports innovative technology and tools to prevent attacks, while continuing the Agency on a path of increased efficiencies and innovation.

AIT is responsible for providing comprehensive IT services to 45,600 employees and 10,400 contractors across theFAA, for 56,000 technology users. AIT maintains a current inventory of nearly 300 Federal Information Security Management Act reportable systems, of which 72 are marked as mission critical (40 NAS and 32 Non-NAS systems). AIT supported systems serve over 500,000 registrants and designees using FAA aviation safety systems. Public facing systems such as *FAADroneZone, Low Level Authorization and Notification, and *FAA.Gov are developed and maintained by AIT to ensure ease of access and transparency for our public users. AIT's Federal Identity, Credential, and Access Management (FICAM) program continue to support millions of internal and public users to ensure content accuracy and security.

*Reference the following links: https://www.faa.gov/Dronezone/; https://www.faa.gov/

AIT manages three core services:

Shared Services and Modernization: AIT delivers effective customer-driven solutions to enhance and modernize core services that meet mandates and initiatives. AIT capitalizes on cloud capabilities by leveraging investments in application assets, and migrating or modernizing legacy systems to provide the risk management, security and financial benefits of the cloud. AIT supports all FAA devices, IT infrastructure components, and specialized software applications.

Cybersecurity: The FAA is committed to advancing its cybersecurity capabilities to maintain protection of FAA information, information systems, and mission from evolving cyber threats. This entails collecting intelligence in a timely manner to enable a more informed threat and defense capability, as well as strengthening the synergy between the three FAA operating domains: NAS, Research and Development, and Mission Support. The Department of Homeland Security Continuous Diagnostic Mitigation (CDM) program is a dynamic approach to fortifying the cybersecurity of FAA networks and systems. CDM provides the capabilities and tools that identify cybersecurity risks on an ongoing basis, prioritize these risks based upon potential impacts, and enable cybersecurity personnel to mitigate the most significant problems first. AIT's investment in such intelligence tools will safeguard the FAA's critical infrastructure by identifying, protecting, detecting, responding to, and recovering from malicious activities that could damage or disrupt services.

Enterprise Information Management (EIM): The EIM Capability is a modern cloud-based scalable enterprise platform that provides common information management capabilities and services across the FAA and eliminates the need to acquire and sustain dedicated and redundant information management capabilities for individual systems. Through the EIM, AIT supports programs such as the National Offload Program to improve public safety by providing NAS flight data to Safety Analytics and Controller Training applications.

Program Increase for Unmanned Aircraft Systems (UAS) Technical Support:

The $750K funding requested provides support for the delivery of IT tools and capabilities to support the FAA's UAS programs, including development of new solutions, improving and enhancing functionality, hosting, managing the lifecycle of the portfolio, and conducting security assessments.

Funding specifically supports enhancement and maintenance of three currently deployed UAS programs: 1. the nation-wide "UAS Registry", 2. the "B4UFly" (before You Fly) mobile app to provide model aircraft and drone operators with situational awareness using a real-time location-based evaluation to derive flight status indicators, and 3. The "Witness Input Portal" enabling the public to provide ground-based reports of observed UAS activities that may violate the law or present a security or physical risk.

AIT FY 2020 Anticipated Accomplishments:

Function	FY 2020 Anticipated Accomplishments
Shared Services and Modernization: *Optimize Information Access through Technology Innovation*	▪ Expand FAA Cloud Services core capabilities; incremental re-architecture to leverage new target states for agency applications. ▪ Provide EIM capability to analysts and business systems and applications, for efficient access across agency systems. ▪ Improve collection and analysis of IT data usage, portfolio management, and risk posture, to inform and streamline IT investment decisions. ▪ Modernize data management and analysis capabilities to include machine learning and visualization services. ▪ Provide application development, Web and Collaboration Services, Continuity of Operations and other related services in support of FAA mission critical requirements. ▪ Continued implementation of modern bandwidth technologies based on the associated governance.
Cybersecurity: *IT Risk Management & Information Systems Security*	▪ Update Notices, Policies, Orders, Directives, including System of Records Notices. ▪ Maintain solutions and services to prepare for and respond to cyber incidents and contingencies, in support of implementing CDM capabilities. ▪ Collaborate with AIT service offices to update the FAA's security architecture in accordance with FAA's and Federal's enterprise architecture framework. ▪ Conduct incident response exercises, tests, scans, simulation exercises, analysis and compliance reviews to ensure information security and privacy of all FAA information systems. ▪ Implement appropriate mitigation strategies to reduce cybersecurity risks across the aviation ecosystem.
Enterprise Information Management: *Enable FAA's Employees to Work Smarter, Resource Optimization*	▪ Identify and remediate operational and technical risk to improve the Application Enterprise Repository. ▪ Leverage application inventory analysis and cloud services, eliminate duplicative applications and modernize aging applications to improve the efficiency and reduce security vulnerabilities within FAA's application portfolio.

Mike Monroney Aeronautical Center (MMAC)

The Aeronautical Center, located in Oklahoma City, is home to the largest number of FAA employees located outside the Washington D.C. area. AMC's Office of Facilities Management (AMP) provides facility oversight, operations, architecture and engineering design, construction, space management and maintenance for the entire AMC campus to include the three core services AMC manages. The AMC campus is comprised of 133 buildings for a total of 3.39 million square feet of space located on 1,057 acres; 7,400 employees, students, and contractors; and 10,000 to 11, 000 annual visitors.

AMC also serves as the Franchise Fund Director and has oversight and responsibility for the FAA's Franchise Fund and its activities managing over 2,000 customer service agreements worth $400 million. The Franchise Fund includes the FAA Logistics Center and the Enterprise Service Center. AMC also supports the FAA Academy, which is the largest training facility within the DOT and the primary provider of technical training for the agency. The FAA academy performs 2,200 classes per year, training over 81,000 student completions annually and averaging 1,000 student participants per day.

Transition from Facilities and Equipment to Operations ($298,000):

These funds are for facilities that were renovated with funding from the Facilities and Equipment (F&E) account.

This request supports the Aeronautical Center Infrastructure Modernization program. Funding is for the costs of operations & maintenance, utilities, janitorial, environmental and occupational safety and health, and security of facilities at MMAC as a result of the renovation/construction of three facilities. These costs must now transition to Operations.

AMC FY 2020 Anticipated Accomplishments:

Function	FY 2020 Anticipated Accomplishments
FAA Academy and Air Traffic Control Training	▪ Ensure the FAA's workforce of the future is equipped with the technical skills necessary to maintain the NAS.
Facilities	▪ Reduce energy intensity by 2.5 percent annually through the end of FY 2025 to meet goals in Executive Order 13834 as compared to FY 2015 baseline.
Information Technology / Financial Services at AMC	▪ Maintain 99.5 percent availability for IT systems as defined in customer agreements detailing specific commitments; ▪ Improve service provision through timely mitigation of audit findings focusing on strengthening processes and closing process gaps.
Franchise Fund Director	▪ Manage over 2,000 active agreements worth ▪ $400 million of activity across FAA and other Federal agencies. These agreements are a part of the Franchise Fund activities, which include six franchise services lines.

What benefits will be provided to the American Public through this request and why is this program necessary?

AFN's shared services approach to delivering the Agency's common finance, acquisitions, information technology, property, logistics, technical training, and regional integration services promotes financial integrity, IT infrastructure security, continuous improvement, and streamlined products and services to support the FAA's vital aviation safety mission. AFN's integrated delivery model also focuses on reducing costs across the agency, saving taxpayer dollars while providing added value to all customers and stakeholders.

Each AFN service area works to move the agency forward by streamlining processes previously handled at the line of business or staff office level. IT support for systems, efficient, adequate space to house staff, a procurement group that can acquire needed materials and services, and a strong financial engine all substantially contribute to both ATO and AVS and is critical to support the daily air traffic control work in ATO and safety inspections in AVS. AFN continues to find new and innovative ways to lessen the administrative burden on the agency's employees, allowing them to more effectively meet their individual responsibilities to support the safety of the NAS.

The requested funding for FY 2020 will support all of FAA's 14 lines of businesses and staff offices and key initiatives that include:

- Overseeing the FAA's annual budget and operating financial, cost accounting, and procurement systems;
- Ensuring efficient operations of backup command, control, and communications centers for the NAS;
- Protecting and updating the agency's IT infrastructure;
- Competing, negotiating, awarding, and managing more than $4 billion in key contracts that support critical programs and projects including NextGen;
- Training more than 16,000 resident students in safety related occupations annually to keep the NAS operating at optimal capacity and efficiency at any given time;
- Maintaining 270,000 property and equipment assets.

Office of Finance and Management (AFN)
($000)

	Dollars	FTP	OTFTP	FTE
*** FY 2019 Annualized CR**	**$801,506**	**1,648**	**17**	**1,624**
Adjustments to FY 2020 Base	**15,887**	**-**	**-**	**-**
FERS Increase	608			
Extra Compensable Day (262)	1,074			
GSA Rent	3,400			
Working Capital Fund	1,227			
Transition from F&E to Ops	298			
Great Lakes Regional Offices	8,727			
Financial Accounting Services	553			
Annualization of FY 2019 FTE				
CAMI Accident Investigation Transfer from RE&D to Ops				
Discretionary Adjustments	**750**	**-**	**-**	**-**
UAS Requirements	750			
Commercial Space Regulatory Reform				
Innovation Office				
Cybersecurity				
Base Transfers	**-33,311**	**-164**	**-**	**-164**
Staffing Reassignment				
Regional Administrators Office Realignment	-33,311	-164		-164
FY 2020 Request	**$784,832**	**1,484**	**17**	**1,460**

FERS Increase: OMB Circular A-11 has increased the agency's contribution rates to the FERS retirement system. This increase in cost to the FAA represents the increased rates for both Air Traffic Controllers and other agency employees.

Extra Compensable Day: There are 262 Compensable days in FY 2020 vs. 261 days in FY 2019.

General Services Administration (GSA) Rent: GSA Direct Lease Portfolio increases required for annual escalations in rent, utilities, and taxes.

Working Capital Fund: This cost adjustment is requested to support the Department of Transportation's Working Capital Fund estimates for the FAA.

Transition from Facilities and Equipment to Operations: Transition to Operations and Maintenance funding covers the operational cost of new systems acquired under the FAA's Facilities and Equipment Capital budget. Once new systems are installed in the NAS or Non-NAS the ongoing operational costs are transferred to the Operations appropriation. Capital projects cover everything from surveillance systems such as radars and ground based Navigational Aids to major software systems that provide air traffic control capabilities. Costs may include in-service management for hardware maintenance, software maintenance, software licenses, telecommunications, logistics support, and training.

Regional Offices (Great Lakes): Cost to cover the replacement leases expiring by October 2020. The additional funding will cover tenant improvements, building specific amortized capital, and architecture and engineering.

Financial Accounting Services: This increase is required to provide for costs associated with the agency's financial systems. This request supports the increase associated with enhancements to the Agency's financial system, which includes increases to the number of licenses as new functions and users are added.

UAS Requirements: The increase will allow the FAA to expand efforts to engage with the many operational, security, regulatory, and communication issues raised by the development of the Unmanned Aircraft Systems.

Regional Administrators Office Realignment (AFN to APL): This request supports funding and staff for the realignment of the offices for the Regional Administrators from the Office of Finance and Management (AFN), Regions and Property Operations to the Office of Policy, International Affairs and Environment (APL).

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Detailed Justification for NextGen and Operations Planning (ANG)

FY 2020 – NextGen and Operations Planning – Budget Request
($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	*FY 2019 Enacted	FY 2020 Request
Salaries and Expenses	28,464	28,712	29,117	28,894
Program Costs	31,536	31,288	32,141	31,251
Total	**$60,000**	**$60,000**	**61,258**	**$60,145**
FTE	**182**	**186**	**186**	**186**

* Enacted levels for FY 2019 are provided for informational purposes. The FY 2020 budget request was developed before a final appropriations act was enacted for FY 2019, and the request assumes a year-long continuing resolution for FY 2019.

What is this program and what does this funding level support?

The William J. Hughes Technical Center (WJHTC) is FAA's national scientific test base for the research, development, test, and evaluation of air transportation systems. The research, testing and prototype development conducted by WJHTC staff helps shape the future of our Nation's air transportation system.

ANG maintains facilities and support services for all properties at WJHTC including land, buildings and infrastructure. The WJHTC owns and operates approximately 1.6 million square feet of test and evaluation facilities, National Airspace System (NAS) field support facilities, research and development facilities, administrative facilities and numerous project test sites.

The FAA's Federal Laboratory, WJHTC is the principal source for conducting Next Generation Air Transportation (NextGen) research, test, and evaluation. WJHTC specializes in sustaining and modernizing air traffic control automation, communications, surveillance, navigation, traffic flow management, and weather systems, and supports advancements in airport and aircraft safety, human factors, and separation standards. WJHTC also provides around the clock operational support to En Route, Terminal, and other Air Traffic Control facilities throughout the nation. Annual operations and maintenance costs for WJHTC are approximately 41 percent of ANG's operations budget.

FY 2020 Anticipated Accomplishments:

Function / Activity	FY 2020 Anticipated Accomplishments
Facility Related:	• Provide the technical platform for research in aircraft safety (fire, structural, unmanned aircraft systems, etc.), airport technologies (safety, capacity), human factors, and weather. • Provide laboratory systems for: o Conducting integrated concept evaluations, modeling and simulations, and test and evaluation for all NextGen technologies in the NAS. o 24 hours a day, seven days a week, 365 days a year field support for all operational systems within the NAS. • Provide facility operations and maintenance, environmental management and maintenance, and engineering support for all facilities located at the WJHTC. • Safeguard both employees and campus infrastructure by ensuring compliance with environmental laws, policies, directives, and initiatives.
NextGen and Operational Related:	• Prepare NextGen Program Performance measurement and benefits analyses. • Develop and coordinate the annual publication of the NextGen Implementation Plan. • Support separation reductions in U.S. sovereign airspace and international airspace where FAA has delegated authority to provide air traffic services. • Conduct the bi-annual review of the Performance of Reduced Vertical Separation Minimum Operations (RVSM) in North America (United States, Canada, and Mexico) compared to International Civil Aviation Organization. Recommended Requirements. • Conduct maintenance and operations of independent performance based monitoring for Altimetry System Error (ASE), a key component to the implementation of RVSM. • Provide improved advisories for Flight Operations Center Airline/Operations Center.

What benefits will be provided to the American public through this request and why is this program necessary?

Aviation enables the economic benefits of tourism, shipping and travel for business or pleasure. Airports provide economic impact to large and small communities across this country. Continued economic growth in the aviation industry is supported through the ongoing implementation of NextGen technologies, policies and procedures.

The WJHTC is a world class research institution that provides the American public with research, engineering, development, test, evaluation, and maintenance of air navigation, air traffic management, and future air transportation system capabilities. These capabilities directly affect the day-to day operation of the NAS, ensuring that safety critical operational systems are constantly maintained and improved. The technical expertise provided by the labs is also key to the implementation of future NextGen capabilities.

NextGen and Operations Planning (ANG)
($000)

	Dollars	FTP	OTFTP	FTE
*** FY 2019 Annualized CR**	**$60,000**	**186**	**4**	**186**
Adjustments to FY 2020 Base	**145**	**-**	**-**	**-**
FERS Increase	65			
Extra Compensable Day (262)	117			
GSA Rent				
Working Capital Fund	-37			
Transition from F&E to Ops				
Great Lakes Regional Offices				
Financial Accounting Services				
Annualization of FY 2019 FTE		-		-
CAMI Accident Investigation Transfer from RE&D to Ops				
Discretionary Adjustments	**0**	**-**	**-**	**-**
UAS Requirements				
Commercial Space Regulatory Reform				
Innovation Office				
Cybersecurity				
Base Transfers	**-**	**-**	**-**	**-**
Staffing Reassignment				
Regional Administrators Office Realignment				
FY 2020 Request	**60,145**	**186**	**4**	**186**

FERS Increase: OMB Circular A-11 has increased the agency's contribution rates to the FERS retirement system. This increase in cost to the FAA represents the increased rates for both Air Traffic Controllers and other agency employees.

Extra Compensable Day: There are 262 Compensable days in FY 2020 vs. 261 days in FY 2019.

Working Capital Fund: This cost adjustment is requested to support the Department of Transportation's Working Capital Fund estimates for the FAA.

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Detailed Justification for Security and Hazardous Materials Safety (ASH)

FY 2020 – Security and Hazardous Materials Safety – Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	*FY 2019 Enacted	FY 2020 Request
Salaries and Expenses	74,700	75,350	76,415	75,621
Program Costs	37,922	37,272	37,750	42,073
Total	**$112,622**	**$112,622**	**114,165**	**$117,694**
FTE	**476**	**495**	**495**	**494**

* Enacted levels for FY 2019 are provided for informational purposes. The FY 2020 budget request was developed before a final appropriations act was enacted for FY 2019, and the request assumes a year-long continuing resolution for FY 2019.

What Is This Program and What Does This Funding Level Support?

The Office of Security and Hazardous Materials Safety (ASH) ensures aviation safety, supports national and homeland security, and promotes an efficient airspace system through focused development and execution of its safety and security policies and programs. ASH programs protect the flying public, airmen, FAA employees, contractors, information, facilities and assets. ASH provides Agency crisis management coordination, manages continuity of operations/continuity of government plans, and executes and supports FAA and other government agencies' national security responsibilities.

ASH protects the flying public and U.S. certificated airmen through identification and analysis of security threats to FAA, the National Airspace System (NAS), and United States civil aviation operating worldwide; regulatory oversight of safe air transport of hazardous materials; and investigation of airmen and employee misconduct.

Transition from Facilities and Equipment to Operations:

These funds are for operational costs of assets commissioned in FY 2017 and FY 2018. This funding request covers microwave system maintenance, and Very High Frequency/Frequency Modulated (VHF/FM) radio network modernization efforts to comply with the National Telecommunications and Information Administration (NTIA) mandate to transition from 25 kHz to 12.5 kHz channel spacing. These costs must now transition to Operations.

Transition from Facilities and Equipment to Operations: FY 2019	Amount ($000)
National Airspace System Recovery Communications	200
ASH Total	**$200**

Transition from Facilities and Equipment to Operations: FY 2020	Amount ($000)
National Airspace System Recovery Communications	529
ASH Total	**$529**

Program Increase for Unmanned Aircraft Systems ($3.0 million):

ASH is requesting $3.0 million to build a robust security framework that supports full integration of UAS into the NAS and address the transportation of hazardous materials by UAS. This increase is required to coordinate and manage UAS intelligence and security activities, and activities necessary to integrate commercial delivery of hazardous materials and cargo by UASs into the NAS. This a new mission and will be focused on the security and safety challenges posed by the integration of UAS into the National Airspace System.

A staff will be established to support counter-UAS activities across the whole of government. These activities include new rulemaking within FAA; monitoring intelligence activities overseas; close coordination with Interagency partners to develop national policies and site-specific procedures for counter-UAS activities; development of standards for use of counter-UAS systems in the NAS; and numerous outreach and educational presentations across the nation. Estimates include office space and related costs and travel (conferences, military installations, UAS test activities, site visits to IPP locations etc.).

FY 2020 Anticipated Accomplishments:

Function / Activity	FY 2020 Anticipated Accomplishments
Office of Hazardous Materials Safety (AXH) is responsible for ensuring and promoting the safe air transportation of high-risk cargo, including hazardous materials through: ▪ Setting the standards for certification and oversight ▪ Investigating major incidents to identify safety deficiencies ▪ Evaluating the effectiveness of operators' risk mitigation strategies ▪ Coordinating the collaborative efforts of government and industry safety teams ▪ Overseeing and monitoring safe UAS integration into the NAS ▪ Evaluating and analyzing the effectiveness of existing AXH certification, regulatory, and compliance systems	▪ Improve industry compliance with aviation safety regulations and standards through inspections, data analyses, and risk management. ▪ Continue the full implementation of the Safety Assurance System (SAS) to improve AXH's ability to identify hazards and risks before they result in major incidents and accidents. ▪ Implement new programs and revised approaches directed by safety recommendations. ▪ Automate and standardize the safety oversight and inspection process. ▪ Manage and coordinate UAS activities for AXH and ensuring alignment with FAA and DOT initiatives. ▪ Develop new and innovative stakeholder engagement approaches to inform the aviation community and industry of trends and emerging risks. ▪ Evaluate and analyze the effectiveness of existing AXH certification, regulatory, and compliance systems.
Office of Personnel Security (AXP) provides Personnel Security program policy guidance, oversight, and evaluations, for: ▪ Personnel Security Program ▪ Identification Media and Credential Program	▪ Provide oversight to ensure FAA workforce is in compliance with federal personnel security requirements. ▪ Continue actions to complete recommendations from the Chicago ARTCC (ZAU) Security Review to enhance the Personnel Security, Identification Media, and Credential Programs that protect critical FAA personnel, infrastructure, and information in the NAS. ▪ Process background investigations and fingerprint checks for FAA employees and contractors to ensure only those who merit the public trust are hired and retained.

Function/Activity	FY 2020 Anticipated Accomplishments
Office of Infrastructure Protection (AXF) supervises nationwide Facility Security programs and provides program policy guidance, oversight, and evaluations for almost 1,100- staffed facilities, and supports the security needs of over 10,000 unstaffed facilities. ▪ Facility Security Management Program (FSMP) ▪ Information Security Program	▪ Ensure FAA facilities are compliant with facility and information security requirements that protect agency employees, visitors, information, systems, and facilities through robust oversight, inspection, and assessment program. ▪ Enhance the Facility Security Management Program that protects critical FAA infrastructure and personnel in the NAS. ▪ Increase the complexity of FAA facility inspections and assessments and continue to mature the risk management and resilience aspects of program oversight to improve the security posture of the National Airspace System's critical infrastructure and better inform future security investment decisions. ▪ Continue actions to complete recommendations from the ZAU Security Review to enhance the Information and Facility Security Programs that protect critical FAA personnel, infrastructure, and information in the NAS. ▪ Enhance standards, programmatic safeguards and controls for protecting classified national security and sensitive unclassified information from loss, compromise, or unauthorized disclosure.
Office of National Security Programs and Incident Response (AXE) ensures Agency-level emergency readiness, crisis management, threat identification and analysis, and national security support to promote and ensure national airspace and aviation safety and security. ▪ Washington Operations Center ▪ Current Intelligence and Threat Evaluation Watch Operations ▪ Special Operations and Law Enforcement Support ▪ Command, Control and Communications ▪ Emergency Preparedness and Response ▪ Regulatory Investigations ▪ Law Enforcement Assistance Program (LEAP)	▪ Manage the Washington Operations Center Complex (WOCC) and support the Air Traffic Security Coordinators (ATSCs), who manage the Domestic Events Network (DEN); provide leadership at FAA, DOT, and the White House with situational awareness of all incidents affecting civil aviation and the National Airspace System. ▪ Provide threat identification and analysis to support FAA decision-making regarding emerging threats to aviation safety, including from technologies, such as Unmanned Aircraft Systems (UAS). ▪ Support Agency efforts to progress safe integration of UAS into the NAS through liaison with national security partners to address UAS security risks and obtain and implement Counter-UAS authority. Ensure the safe integration of Counter-UAS technologies into the NAS. ▪ Maintain emergency operations network capability and ensure continued situational awareness of daily and emergency events. ▪ Support Continuity of Operations by maintaining the Primary Alternate Facility to enable FAA relocation in an emergency to ensure the Agency can perform its Mission Essential Functions at all times and maintains continuous monitoring of the National Airspace System. ▪ Obtain National Driver Registry information, review for DUI/DWI violations that have not been reported to the FAA, and take subsequent enforcement actions, as appropriate, to prevent airmen who present a safety risk to the NAS from

Function/Activity	FY 2020 Anticipated Accomplishments
	flying. ▪ Manage the FAA's Law Enforcement Assistance Program. Assist and support Federal, State, local, territorial, tribal, and international law enforcement agencies that investigate and interdict illicit use of aircraft in narcotics, weapons, and human trafficking. Support Agency investigation of non-compliant UAS operations. Draft and promulgate national policy to support regulatory investigations and LEAP activities, such as aircraft registration violations. Develop standards to enhance LEAP mission effectiveness.
Office of Investigations (AXI) conducts administrative and civil investigations involving FAA employees, contractors, and non-employees suspected of violating FAA orders, policy, and federal regulations. Additionally, AXI provides cyber analysis, insider threat detection and mitigation, and defensive counter intelligence services, including foreign travel briefings and debriefings. ▪ Internal Investigations ▪ Investigations Standards and Policy ▪ Technical Investigations: Insider Threat, Defensive Counter-Intelligence, Cyber Investigations	▪ Conduct internal investigations of FAA employees and contractors for misconduct. ▪ Conduct administrative, civil, and regulatory investigations that fall under the FAA's jurisdiction. ▪ Develop standards to enhance the efficiency and effectiveness of investigations. Draft and promulgate national policy to support and guide internal investigators in the consistent execution of their duties. ▪ Develop and execute FAA's Defensive Counterintelligence Program (DCIP), including cyber threat analysis, as well as the Insider Threat Detection and Mitigation Program (ITDMP). ▪ Execute Cyber Investigations in support of FAA's internal investigations, DCIP, and ITDMP.

What Benefits Will Be Provided to the American Public Through This Request and Why Is This Program Necessary?

We are responsible for the FAA's critical infrastructure protection, personnel security, emergency operations, threat identification and analysis, contingency planning and crisis response, investigations of employees, contractors, and airmen who may present a safety or security risk to the NAS, and the safe transportation of hazardous materials in air commerce. Protecting our critical infrastructure is a national and homeland security priority, which continues to demand a high level of attention and innovation.

In recognition of the criticality of the NAS in our country's transportation infrastructure and economic stability, ASH develops and executes policies and programs to protect FAA employees, contractors, facilities, and assets, as well as airmen, aircraft, and the flying public. We are committed to continuously improving the safety, security, and efficiency of flight, and continue to work with all of our partners and stakeholders to focus our experience, expertise, and new technology to ensure a safer and more secure global airspace.

Office of Security and Hazardous Materials Safety (ASH)
($000)

	Dollars	FTP	OTFTP	FTE
*** FY 2019 Annualized CR**	**$112,622**	**530**	**1**	**495**
Adjustments to FY 2020 Base	**2,300**	**-**	**-**	**-**
FERS Increase	187			
Extra Compensable Day (262)	312			
GSA Rent				
Working Capital Fund	1,072			
Transition from F&E to Ops	729			
Great Lakes Regional Offices				
Financial Accounting Services				
Annualization of FY 2019 FTE				
CAMI Accident Investigation Transfer from RE&D to Ops				
Discretionary Adjustments	**3,000**	**-**	**-**	**-**
UAS Requirements	3,000			
Commercial Space Regulatory Reform				
Innovation Office				
Cybersecurity				
Base Transfers	**-228**	**-1**	**-**	**-1**
Staffing Reassignment	-228	-1		-1
Regional Administrators Office Realignment				
FY 2020 Request	**$117,694**	**529**	**1**	**494**

FERS Increase: OMB Circular A-11 has increased the agency's contribution rates to the FERS retirement system. This increase in cost to the FAA represents the increased rates for both Air Traffic Controllers and other agency employees.

Extra Compensable Day: There are 262 Compensable days in FY 2020 vs. 261 days in FY 2019.

Working Capital Fund: This cost adjustment is requested to support the Department of Transportation's Working Capital Fund estimates for the FAA.

Transition from Facilities and Equipment to Operations: Transition to Operations and Maintenance funding covers the operational cost of new systems acquired under the FAA's Facilities and Equipment Capital budget. Once new systems are installed in the NAS or Non-NAS the ongoing operational costs are transferred to the Operations appropriation. Capital projects cover everything from surveillance systems such as radars and ground based Navigational Aids to major software systems that provide air traffic control capabilities. Costs may include in-service management for hardware maintenance, software maintenance, software licenses, telecommunications, logistics support, and training.

UAS Requirements: The increase will allow the FAA to expand efforts to safely and securely integrate UAS into the NAS as well as support development of a robust security framework to enable that integration.

Staffing Reassignment (ASH to ATO): This request transfers funding and staff from the Office of Security and Hazardous Materials Safety to the Air Traffic Organization, Technical Operations Services.

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Detailed Justification for - Staff Offices

FY 2020 - Staff Offices – Budget Request
($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	*FY 2019 Enacted	FY 2020 Request
Salaries and Expenses	160,618	161,981	164,269	192,012
Program Costs	51,635	52,272	51,030	54,583
Total	**$212,253**	**$212,253**	**$215,299**	**$246,595**
FTE	**973**	**1,005**	**1,005**	**1,177**

*Enacted levels for FY 2019 are provided for informational purposes. The FY 2020 budget request was developed before a final appropriations act was enacted for FY 2019, and the request assumes a year-long continuing resolution for FY 2019.

What is this program and what does this funding level support?

The Staff Offices of FAA include the Office of the Administrator, Chief Counsel and six assistant administrators who provide mission support services to the four lines of business, including legal counsel, economic trend analysis, diversity leadership, government and industry liaisons, communications, public relations and human resources management. A brief description of staff offices is outlined as follows:

- The **Office of Audit and Evaluation** (AAE) performs audit and investigative review functions primarily for internal safety disclosures and concerns, including the FAA Whistleblower Protection Program.
- The **Office of Civil Rights** (ACR) advises, represents, and assists the FAA Administrator on civil rights and equal opportunity matters.
- The **Office of Government and Industry Affairs** (AGI) serves as the Administrator's principal adviser and representative on matters concerning relationships with the Congress, aviation industry groups, and other governmental organizations, developing and reviewing plans and strategies involving these groups to enhance aviation safety.
- The **Office of Communications** (AOC) is responsible for the policy, direction, and management of the agency's communications programs for the news media and FAA's employees nationwide.
- The **Human Resources Management** (AHR) organization provides human resource services to all operating lines of business and staff offices (LOB/SOs) at the headquarters and to all the FAA regions including the two centers and overseas.
- The **Office of Policy, International Affairs, and Environment** (APL) serves as the principle advisor to the Administrator on international matters, and manages the FAA's Regional Offices.
- The **Office of Innovation** will examine new technologies' potential impact on the NAS, their likely benefits, and methods for safe integration into existing operations; as well as provide leadership with regard to industry engagement and internal collaboration

What benefits will be provided to the American public through this request and why is the program necessary?

Through the leadership of the Administrator, FAA successfully manages the most complex and safest aviation system in the world. By executing their mission responsibilities and providing management, leadership, and oversight, the FAA's Staff Offices have contributed to the overall success of the FAA.

Staff Offices provide services and resources necessary for the FAA's agency operations. Without these services, lines of business would not have the resources needed to meet their goals. From performing mission-critical services to receiving guidance and counsel on regulatory or legal issues, or managing annual appropriations, Staff Offices make a significant contribution to the mission of FAA.

Detailed Justification for – Office of the Administrator (AOA)

FY 2020 – Office of the Administrator – Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	*FY 2019 Enacted	FY 2020 Request
Salaries and Expenses	2,513	2,536	2,572	2,552
Program Costs	1,577	1,554	1,663	1,554
Total	**$4,090**	**$4,090**	**$4,235**	**$4,106**
FTE	**15**	**17**	**17**	**17**

*Enacted levels for FY 2019 are provided for informational purposes. The FY 2020 budget request was developed before a final appropriations act was enacted for FY 2019, and the request assumes a year-long continuing resolution for FY 2019.

What is this program and what does this funding level support?

The Office of the Administrator (AOA) leads the FAA in its mission to provide the safest, most efficient aerospace system in the world. This office is responsible for the overall planning, direction, coordination and control of FAA programs, and represents FAA in its work with the Department of Transportation and other agencies, the White House, Congress, the aviation community and the general public.

AOA directs and controls the operations of the FAA and acts as principal adviser to the Office of the Secretary (OST) on civil aviation matters and air transportation. Throughout FY 2020, AOA will continue to lead FAA toward achieving the agency's performance goals and targets.

In leading the FAA, the Administrator oversees the Agency's employees in maintaining, operating, and overseeing the largest and most complex aviation system in the world. The Agency determines the regulatory and operational standards for the United States, and effectively sets the benchmark for aviation safety around the world.

The funding level supports executive direction of the FAA and provides for the Administrator and Deputy Administrator's direct staff.

What benefits will be provided to the American public through this request and why is this program necessary?

AOA provides direction and executive oversight for the management and operation of the world's largest, safest, and most efficient airspace system. Aviation is a significant contributor to the U.S. economy and the FAA provides continuous operational Air Traffic Control services to airlines and general aviation; safety oversight of operators and manufacturers; management of airport improvement grants; and acquisition of the FAA's NextGen air traffic control system.

Detailed Justification for – Audit and Evaluation (AAE)

FY 2020 – Audit and Evaluation (AAE) – Budget Request
($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	*FY 2019 Enacted	FY 2020 Request
Salaries and Expenses	3,241	3,267	3,313	3,288
Program Costs	102	76	76	76
Total	**$3,343**	**$3,343**	**$3,389**	**$3,364**
FTE	**19**	**20**	**20**	**20**

*Enacted levels for FY 2019 are provided for informational purposes. The FY 2020 budget request was developed before a final appropriations act was enacted for FY 2019, and the request assumes a year-long continuing resolution for FY 2019.

What is this program and what does this funding level support?

The Office of Audit and Evaluation (AAE) has two primary functions: safety audit/investigation and hotline operations.

- **Safety audit and investigation analysis** staff perform audit and investigative review functions primarily for internal safety disclosures and concerns, including the FAA Whistleblower Protection Program. It also coordinates and evaluates FAA responses to Department of Transportation (DOT), Office of Inspector General, General Accounting Office and United States Office of Special Counsel generated audits, investigations and evaluations.

- **Hotline operations** is a reporting and data function that provides for analysis of hotline submissions, coordination of AAE investigations, and reviews for completeness investigations conducted by appropriate FAA organizations. The Office also operates and manages several administrative and safety hotlines.

The office primarily and directly supports the Departmental goal of increased safety, but also supports in a more generalized way the goal of building and enhancing FAA's high performance work place. The FY 2020 funding will support the operation and management of consolidated safety hotlines and provide a centralized focus for internally and externally generated safety-related complaints, critical audits, and investigations. Additionally, the Office provides an impartial agency venue for investigation and early resolution of safety disclosures.

What benefits will be provided to the American public through this request and why is this program necessary?

AAE has established itself as a viable forum for raising and addressing internal safety concerns and has developed standards to measure its successes. Currently, the success of the program can be gauged by its ability to timely process hotline matters, complete investigations, validate the completeness of agency responses to identified safety concerns, and ensure agency compliance with corrective actions.

AAE has become a vital and effective organization productively addressing and resolving safety-related whistleblower disclosures and employee workplace conflicts. Significantly, the visibility and accomplishments of the AAE Office have generated a critical awareness and recognition that employees can bring their safety sensitive disclosures to an internal organization and have them objectively reviewed by an unbiased entity.

AAE enhances agency accountability for internally identified safety concerns, whistle blower contributions, and employee workplace conflicts. The safety benefits of an effective internal reporting program are well accepted.

The direct beneficiaries of AAE's services are the agency and the flying public. AAE embodies FAA's commitment to a vibrant and evolving internal safety culture based on continuous review, evaluation, objective analysis and measured change. AAE provides agency employees and external stakeholders with an independent and highly visible forum to safely and constructively raise, address, and resolve safety complaints, concerns or whistleblower contributions.

Detailed Justification for – Civil Rights (ACR)

FY 2020 – Civil Rights (ACR) – Budget Request
($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	*FY 2019 Enacted	FY 2020 Request
Salaries and Expenses	10,057	10,145	10,288	10,212
Program Costs	2,265	2,177	2,243	2,177
Total	**$12,322**	**$12,322**	**$12,531**	**$12,387**
FTE	**68**	**72**	**72**	**72**

*Enacted levels for FY 2019 are provided for informational purposes. The FY 2020 budget request was developed before a final appropriations act was enacted for FY 2019, and the request assumes a year-long continuing resolution for FY 2019.

What is this Program and what does this funding level support?

Internally, the Office of Civil Rights (ACR) mission is to aid in the prevention of unlawful discrimination because of race, color, national origin, sex, age, religion, sexual orientation, and individuals with disabilities employed by the FAA. The Office of Civil Rights works in conjunction with FAA managers and the Administrator to ensure Equal Employment Opportunity (EEO) awareness and adherence to EEO policies and guidelines.

Externally, ACR's mission is to provide airport oversight with regard to civil rights laws and regulations. ACR works to ensure that all beneficiaries of federally assisted transportation programs are offered equal opportunity for participation and are free from discrimination. These efforts address airport compliance with the Americans with Disabilities Act (ADA), Rehabilitation Act, Disadvantaged Business Enterprise Program, Title VI, Limited English Proficiency (LEP), Environmental Justice (EJ), and other civil rights regulations.

FY 2020 Anticipated Accomplishments:

Function/Office	FY 2020 Anticipated Accomplishments
Internal Civil Rights Services ▪ EEO Complaint Services/Alternative Dispute Resolution Services ▪ Model EEO Program ▪ Diversity and Inclusion ▪ EEO Training	▪ Process 100 percent of the allegations and inquiries regarding EEO complaints by providing quality counseling, mediation and consulting services. ▪ Assist and provide resources for agency selecting officials to increase the hiring of People with Targeted Disabilities. ▪ Assist the Agency in building a Model EEO Workplace through outreach, consultations, collaboration, and educational partnerships. ▪ Increase FAA managers and employees conflict resolution skills through the Conflict Coaching Program and reduce the number of EEO complaints that are filed in the agency with early intervention techniques.

Function/Office	FY 2020 Anticipated Accomplishments
External Civil Rights Services ▪ Disability Airport Compliance ▪ Airport Non-discrimination Compliance (Title VI of the Civil Rights Act) ▪ Disadvantaged Business Enterprise (DBE)/Airport Concession Disadvantaged Business Enterprise (ACDBE) Compliance	▪ Conduct DBE compliance reviews and ensure that small and disadvantaged business enterprises are able to compete with larger companies for airport construction projects and concessions. ▪ Maintain an online FAA dbE-connect system to connect DBEs and relevant airport opportunities and allow airports to identify certified DBEs in areas of work needed to support their DBE goals. https://faa.dbesystem.com/ ▪ Deliver training, technical assistance and consultations in order to increase knowledge in the areas of DBE/ACDBE, ADA/ 504 and Title VI/LEP/EJ at the Nation's airports.

What benefits will be provided to the American public through this request and why is this program necessary?

ACR provides leadership and direction with regard to civil rights, diversity, and EEO matters. The ACR mission is to implement civil rights, EEO policies, and operational programs to ensure their full and successful development in support of FAA's mission to provide the safest, most efficient aerospace system in the world.

ACR works to foster diversity and inclusion activities that lead to a healthy work environment that promotes diversity in all its dimensions and harmony across the FAA.

ACR is committed to providing a workplace that promotes equal opportunity, is free of harassment, and is an environment where employees can focus on productivity, not conflict. The result of these efforts is a diverse and satisfied workforce that collaboratively helps to ensure the safety of the flying public.

Detailed Justification for – Government and Industry Affairs (AGI)

FY 2020 – Government and Industry Affairs (AGI) – Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	*FY 2019 Enacted	FY 2020 Request
Salaries and Expenses	1,426	1,437	1,457	1,445
Program Costs	138	127	147	127
Total	**$1,564**	**$1,564**	**$1,604**	**$1,572**
FTE	**9**	**9**	**9**	**9**

*Enacted levels for FY 2019 are provided for informational purposes. The FY 2020 budget request was developed before a final appropriations act was enacted for FY 2019, and the request assumes a year-long continuing resolution for FY 2019.

What is this Program and what does this funding level support?

The Office of Government and Industry Affairs (AGI) supports the Administrator and represents the FAA by being the principal linkage between the agency and Congress.

AGI works with FAA offices to coordinate, facilitate, and present FAA's legislative message. AGI consistently monitors and gauges the interest and needs of the United States Congress. This relationship also extends to coordinating FAA legislative initiatives and responses with the DOT. 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.

The following core activities represent the FY 2020 budget request:

- Communicate to Congress on behalf of the Administrator and Management Board.
- 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.
- Manage the coordination process between the FAA, the Office of the Secretary (OST), and the Office of Management and Budget, to encourage timely LOB and SO responses to targeted deadlines.
- Provide OST Governmental Affairs with factual, concise, and complete information from significant AGI congressional contacts and activities.
- Foster strong partnerships with key industry stakeholders.

What benefits will be provided to the American public through this request and why is this program necessary?

AGI continuously improves the quality, timeliness, and usefulness of FAA core business functions. AGI fosters productive relationships with key members of Congress and Congressional Oversight Committees. AGI solicits information from program offices within the Agency to better understand and communicate areas of interest or concerns to the United States Congress.

AGI's mission is to provide high quality timely communications to Congress. It is essential that public policy be debated on its merits so that the best outcomes can result. The work of AGI enables the Administrator, Deputy Administrator, and Associate Administrators to effectively interact and communicate the policies and positions of the FAA before the United States Congress. AGI's established congressional relations are vital to advancing the aviation priorities of the FAA, the Department of Transportation, and the Administration.

Detailed Justification for – Communications (AOC)

FY 2020 – Communications (AOC) – Budget Request
($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	*FY 2019 Enacted	FY 2020 Request
Salaries and Expenses	6,125	6,179	6,267	6,595
Program Costs	425	371	324	746
Total	**$6,550**	**$6,550**	**$6,591**	**$7,341**
FTE	**30**	**30**	**30**	**31**

*Enacted levels for FY 2019 are provided for informational purposes. The FY 2020 budget request was developed before a final appropriations act was enacted for FY 2019, and the request assumes a year-long continuing resolution for FY 2019.

What Is This Program and What Does This Funding Level Support?

The Office of Communications (AOC) delivers critical safety information to the news media, stakeholders, and FAA employees worldwide to support the FAA's operations, programs and mission. AOC helps the FAA achieve its mission by providing timely and accurate information and performing robust outreach to an increasingly diverse set of stakeholders. Using a variety of communications tools, AOC delivers its services through two major programs: Public Affairs and Corporate Communications.

Public Affairs

Public Affairs works closely with other FAA offices to provide timely and accurate information to the media, the aviation community and the public about FAA initiatives and activities. Public Affairs develops and implements communication strategies and public outreach to alert and inform the traveling public and aviation stakeholders about urgent safety issues.

Corporate Communications

Corporate Communications manages the FAA's digital communications, including FAA.gov, MyFAA and the agency's social media accounts, which generate more than 470 million impressions annually. Corporate Communications leads the FAA's creative and multimedia services, including video, audio and application development. The team coordinates with other FAA offices to provide more than 40,000 FAA employees with accurate and timely information on programs and activities.

Program Increase for Unmanned Aircraft Systems (UAS):

AOC is requesting $750,000 to provide dedicated resources for products and services for UAS. Resources will provide video production, script writing and editing, live broadcast of events and graphic designs, web support, and social media to encourage safe and proper use of UAS's.

FY 2020 Anticipated Accomplishments:

Function/Office	FY 2020 Anticipated Accomplishments
Public Affairs	▪ Increase awareness and understanding of FAA initiatives and other issues through press conferences, media briefings, press releases, social media, and other communication channels. ▪ Increase awareness of the FAA's role as a world leader on aviation issues. ▪ Support open government initiatives to make data available, improve online services, and increase collaboration with citizens, stakeholders, and other government agencies.
Corporate Communications	▪ Expand the use of social media platforms to educate new audiences. ▪ Use a variety of internal communication vehicles to educate employees about agency strategic goals, programs, and activities. Obtain feedback that helps the FAA meet those goals.

What benefits will be provided to the American public through this request and why is this program necessary?

With more than 119 million page views a year, www.faa.gov provides a wealth of resources to the American public. Pilots, mechanics, and other members of the flying public consistently read FAA's news, directives, hazardous materials information, and airworthiness information every second of every day of the year.

The FAA has seen a persistent increase in demand for secure access to critical aviation safety information. Users downloaded more than 9.5 million documents from FAA.gov related to pre-flight safety procedures and planning, airmen/aircraft certification, aircraft mechanical records, airport safety regulations, and accident/incident data. Information for air traffic operations, General Aviation safety, NextGen, and Unmanned Aircraft Systems is delivered via text, video, and graphical formats.

With more than 40,000 employees working in offices and in the field, around the country and abroad – the FAA intranet, employee news, daily broadcast, and audio/video production services are a vital part of ensuring employees are connected with the vision, mission and values of the agency. These vital communications vehicles ensure that employees are able to access information about everything from Human Resource benefits to changes in compensation programs that may directly affect them. Strong internal communications generate a more engaged, productive, and loyal workforce.

As the demand for safety information continues to grow from all stakeholders (employees, the public, the media, and the aviation community), these groups expect unfettered 24 hour day/7 days per week access to information the FAA provides, and interaction with that information through the Web, email, and social media. AOC will provide accurate critical information about FAA operations, safety oversight, efficiency initiatives and other programs to all of these groups as quickly as possible.

Detailed Justification for – Office of Chief Counsel (AGC)

FY 2020 – Office of Chief Counsel (AGC) – Budget Request
($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	*FY 2019 Enacted	FY 2020 Request
Salaries and Expenses	39,629	39,957	40,522	40,700
Program Costs	5,852	5,524	5,853	5,053
Total	**$45,481**	**$45,481**	**$46,375**	**$45,753**
FTE	**221**	**229**	**229**	**229**

*Enacted levels for FY 2019 are provided for informational purposes. The FY 2020 budget request was developed before a final appropriations act was enacted for FY 2019, and the request assumes a year-long continuing resolution for FY 2019.

What is this program and what does this funding level support?

Funding at the FY 2020 requested level would provide necessary legal services, including representation in support of significant FAA program responsibilities and functions.

The Office of the Chief Counsel (AGC) provides mission critical legal services for the FAA. Within the FAA, AGC is both a key partner to each line of business and staff office and an integral contributor to the success of every major agency program and function. Across every line of business and every agency program, AGC provides legal advice, reviews agency action for legal sufficiency and conformity, represents agency interests in various administrative and court forums, defends the agency's actions, and enhances risk management by proactively seeking to identify and mitigate risk. In addition, AGC is responsible for internal FAA adjudicative functions responsible for adjudicating bid protests and contract disputes, aviation civil penalties below a specified threshold, and challenges made to airport grant recipients compliance with their grants. This office also provides alternative dispute resolution services.

AGC's principal legal practice areas are:

1) Safety through its activity in enforcing aviation safety rules, rulemaking, acquisition and commercial law, aircraft and other tort litigation;

2) Innovation through its rulemaking activity, environmental legal services, airport legal services which support airport expansion and capacity, and acquisition of technologies that support increased capacity and efficiency; advancing global collaboration through international activity and harmonization of safety rules, enhancing Livable Communities and ensuring Environmental Sustainability through its rulemaking activity and environmental legal services; and

3) Accountability by enhancing FAA's high performing workforce, supporting numerous agency-wide strategic initiatives, and providing legal services in support of agency administrative functions including employment and labor law, ethics counsel, Freedom of Information Act and Privacy Act services and legislative services.

<u>Program Increase for Unmanned Aircraft Systems (UAS):</u>

AGC is requesting $500,000 for Unmanned Aircraft Systems (UAS) personnel expenses. This funding would allow the office to handle the additional influx of UAS administrative enforcement cases stemming from new authorities contained in the FAA's 2018 Reauthorization. Additional staff will enable FAA to coordinate with Department of Transportation Inspector General, Department of Justice, and local Assistant U.S. Attorney Offices on criminal enforcement cases. It will also allow better coordination with local and state agencies to address possible illegal operations and increase public and industry awareness of our Regulations and Enforcement Practices.

FY 2020 Anticipated Accomplishments:

Funding at the FY 2020 requested level would provide necessary legal services, including representation, in support of significant FAA program responsibilities and functions. Among the more significant are:

- Rulemaking, including critical safety rules and regulatory aspects of NextGen and the safe but also timely integration of new entrants into the National Airspace System (NAS). In particular, AGC has had to devote a steadily increasing amount of resources to aiding in the safe integration of UAS. For example, one UAS rulemaking project involved the substantial time of nine attorneys. More than 10 percent of the personnel of AGC are engaged in UAS matters and the workload is increasing.
- Enforcement of safety regulations.
- Acquisition of operational safety systems and equipment, including acquisition aspects of NextGen development, and compliance with commercial and fiscal requirements.
- Airports capacity enhancement and grants, environmental streamlining for airport projects, and environmental aspects of NextGen development.
- Personnel and labor matters.
- Key international agreements, harmonization of safety requirements and safety assessments.
- International technical assistance agreements and safety assessments.
- Dispute resolution services and/or administrative adjudication of acquisition related disputes, and administration of the Civil Penalty Program; representation of agency interests and choice of actions before United States federal courts and various administrative forums, including the National Transportation Safety Board (NTSB), the Merit Systems Protection Board, and the EEO Commission.

What benefits will be provided to the American public through this request and why is this program necessary?

AGC contributes to the overall success of FAA programs and functions that reside with the various lines of business and staff offices with programmatic responsibility. AGC's contribution cannot be assessed through a single measure. AGC contributes to many programs to ensure that overall FAA actions are consistent with legal requirements, risks are defined and managed to the extent practicable and the interests of the government and the flying public are strongly represented.

AGC acquisition attorneys provide key support in the development, acquisition, and deployment of NextGen air traffic control, and safety systems and technologies. The rulemaking attorneys play a critical role in establishing regulatory requirements and certification of new avionics equipment. The environmental attorneys are critical to ensuring environmental assessments are completed for new systems and airspace redesigns. The employment attorneys have a significant role in addressing the staffing and labor implications of a system where air traffic is managed rather than controlled.

The direct beneficiaries of AGC's services are the agency organizations that have operational and programmatic responsibility for carrying out FAA's mission, and by extension, the goals of the Department of Transportation. More significantly, the flying public is the overarching beneficiary of the increased safety and efficiency of a modern air transportation system. AGC is a key partner supporting the agency's success in all of FAA's various program areas.

Detailed Justification for – Policy, International Affairs, and Environment (APL)

FY 2020 – Policy, International Affairs, and Environment (APL) – Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	*FY 2019 Enacted	FY 2020 Request
Salaries and Expenses	25,145	23,812	25,479	52,127
Program Costs	9,201	9,275	9,540	15,533
Total	**$34,346**	**$33,087**	**$35,019**	**$67,660**
FTE	**118**	**123**	**123**	**287**

*Enacted levels for FY 2019 are provided for informational purposes. The FY 2020 budget request was developed before a final appropriations act was enacted for FY 2019, and the request assumes a year-long continuing resolution for FY 2019.

What is this program and what does this funding level support?

The Office of Policy, International Affairs, and Environment (APL) consists of the following offices:

Aviation Policy and Plans improves the FAA's effectiveness with corporate planning and performance management; makes coordinated and well-informed policy decisions for crosscutting and novel civil aerospace issues using independent economic, quantitative and qualitative analysis, information and tools; and positions the FAA for the future by coordinating FAA's reauthorization efforts, identifying, researching, and projecting emerging issues and trends.

International Affairs is responsible for formulating the FAA's international strategy and associated regional and global priorities, aligning FAA's international activities, programs and initiatives to most effectively accomplish the strategic goals and initiatives of the FAA, DOT, and the United States government, and leading collaborative engagement and cooperation with civil aviation authorities and aviation stakeholders across the world.

Environment and Energy is responsible for developing, recommending, coordinating, and implementing national and international standards, policy and guidance, research and technology goals, and analytical capabilities on aviation environmental and energy matters.

National Outreach and Regional Administration is responsible for conducting outreach, engagement, and horizontal integration to Congressional officials, federal, state and local governments, airports, military, civic organizations, as well as to customers across the agency. In addition, Regional Administrators oversee regional emergency operations and integration services to ensure that appropriate communication and coordination occurs in critical crisis response incidents related to NAS continuity.

To achieve the performance goals outlined in the FY 2020 budget APL will maximize outcomes through the leveraging of partnerships, technology, and expertise. APL will continue to achieve the goals of the Administration and the Department in connection with various domestic and international initiatives.

Program Increase for Unmanned Aircraft Systems (UAS):

APL is requesting $750,000 to meet the increased demand for new rulemaking, regulatory analysis and research, the completion of a full-scale production UAS survey, continued enhancement of UAS trend forecast through development of a UAS National forecast, and the implementation of the Presidential Memorandum regarding the Unmanned Aircraft Systems Integrated Pilot Program (IPP).

Anticipated FY 2020 Accomplishments:

Function / Activity	FY 2020 Anticipated Accomplishments
Aviation Policy and Plans	▪ Facilitate the implementation of a long-term FAA reauthorization bill, working across the agency, with the Administration, and with Congress and stakeholders. ▪ Provide timely economic analysis to enable the agency to send critical safety rules, cost-relieving regulation, and economically enabling rules such as UAS advanced operations, Commercial Space Launch and Re-entry, and supersonic aviation to the Office of the Secretary of Transportation and the Office of Management and Budget. ▪ Develop national and airport level activity forecasts, benefit-cost studies, issue analysis, economic impact studies, and stakeholder outreach, to facilitate NAS planning ▪ Improve FAA's effectiveness by leading streamlined and responsive corporate planning, performance, and risk management processes for the agency.
International Affairs	• Influence the International Civil Aviation Organization, member States, and appropriate regional aviation organizations and industry to align global standards and recommended practices with U.S. best practices in aviation safety oversight, operational efficiency and capacity, and integration of new and innovative technology. • Achieve a seamless global air transportation system through coordinated outreach on NextGen innovative systems, procedures, and concepts. • Manage international agreements and arrangements to support FAA and United States collaboration and technical assistance with States and key organizations to advance global aviation safety, efficiency, and capacity.
Environment and Energy	▪ Finalize updated noise exposure targets, policies and guidance pertaining to the mitigation of significant aircraft noise, taking into consideration research outcomes and emerging technologies. ▪ Refine the NAS-wide operational framework for assessing implications of proposed air traffic procedural changes on fuel burn and noise. ▪ Continue streamlining environmental review processes and revise the FAA National Environmental Policy Act implementation order 1050.1 and associated desk reference as necessary. ▪ Ensure global interoperability of NextGen technologies and procedures. ▪ Enable the next generation of supersonic aircraft and unmanned aircraft systems.
National Outreach and Regional Administration	▪ Enhance aviation safety by increasing awareness and outreach on the FAA high priority safety initiatives. ▪ Enhance community engagement techniques and proactively address noise concerns associated with aircraft and airspace procedures. ▪ Support emergency preparedness and continuity of operations. ▪ Provide program management assistance and coordination activities to support the prioritization and implementation of Northeast Corridor initiatives that reduce delays and improve schedule reliability.

What benefits will be provided to the American public through this request and why is this program necessary?

APL is the agency lead for Aviation Policy, International Aviation, and Environmental issues. Specifically, APL coordinates the agency's reauthorization before Congress, and is responsible for national aviation policies and strategies including aviation activity forecasts, economic analyses, aircraft noise and emissions analyses and mitigation, and environmental policy. In addition, the Regional Administrators serve as the corporate representatives for the FAA Administrator in communicating with local, state and Federal agencies, the aviation industry (from manufacturing to air carriers), and community organizations. APL works closely with other Federal agencies on national and international policy, environmental and energy issues, as well as with industry partners, other civil aviation authorities, academia, non-governmental organizations, and community representatives to ensure the United States will continue to be the gold standard for aviation.

As the global leader in aviation, the FAA must engage internationally to increase global safety standards and enhance aviation safety and efficiency. APL is responsible for improving environmental performance and addressing energy and sustainability needs, and for developing broad based approaches and coordinating agency responses to limit and reduce future aviation environmental impacts.

APL operates the Cornerstone Regional Operations Center that serves as 24 hours a day/7 days a week communication hubs that provide voice and data dissemination necessary to direct management of the NAS. Regional Administrators coordinate communication responses related to aircraft accidents, emergencies, missing aircrafts, hijacking, security threats, facility and system outages, airport closures, earthquakes and public information requests and complaints.

Detailed Justification for – Human Resource Management (AHR)

FY 2020 – Human Resource Management (AHR) – Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	*FY 2019 Enacted	FY 2020 Request
Salaries and Expenses	72,721	73,335	74,371	73,782
Program Costs	31,836	31,222	31,184	28,098
Total	**$104,557**	**$104,557**	**$105,555**	**$101,880**
FTE	**493**	**505**	**505**	**505**

What Is The Request And What Funds Are Currently Spent on the Program?

The FAA workforce is the backbone of the agency's success in providing the safest and most efficient aerospace system in the world. The Office of Human Resource Management (AHR) request covers daily work in providing human resource services to the nearly 46,000 FAA employees. AHR provides the strategic management of human capital that ensures the FAA has the skilled workforce needed to meet the changing demands of the industry we serve. In FY 2020, AHR will:

- Continue implementing agency-wide leadership development programs to build a solid pipeline of future leaders and provide existing leaders with the tools needed to provide transformational leadership in support of the FAA mission.
- Refine efforts to improve the engagement, commitment and satisfaction of FAA's workforce, which is a significant factor in enabling the Department of Transportation (DOT) to advance the multi- modal transportation system of the future.
- Employ a corporate strategy that fosters effective, positive, and collaborative labor management relations.

As the FAA builds the foundation for the aerospace system of the future through the implementation of NextGen, the agency's workforce will play an increasingly critical role. AHR focuses on the FAA's human capital by identifying, recruiting, and training FAA's workforce with the leadership, technical, and functional skills needed to meet the challenges of the future while maintaining the world's safest and most efficient aerospace sector. The cross-organizational workforce strategy supports the agency's transformation through the following four sub-initiatives:

- Leadership Development: Launching leadership development activities and tools grounded in FAA's strategic leadership capabilities, to support our current leaders while building a pipeline of future leaders.
- Skills Identification: Assessing the skills needed to maintain the strongest technical and functional talent for positions critical to meeting the FAA's mission.
- Skills Development: Proactively providing training to FAA's employees to develop their skills and close any skills gaps that exist in order to ensure the FAA has a strong workforce with the right technical and functional skills to meet the industry's needs.
- Attracting Talent: Attracting and retaining talented, high-performing professionals and positioning the FAA as a competitive employer of choice.

FY 2020 Anticipated Accomplishments:

By 2020, AHR will have assessed the skills requirements of priority mission critical occupations and will have implemented training and recruitment improvements to close technical and functional skills gaps.

The Office of Human Resource Services	
Critical Responsibilities:	Recruitment and hiring operations to recruit, assess, hire, and develop the FAA workforce. Processing personnel transactions, including payroll actions. Corporate recruitment and marketing; targeted outreach and agency branding.
Key Activities:	• Human Resources management consultation. • Workforce planning, position management, and classification. • Recruitment, applicant assessment, referral of qualified applicants, and job offers. • Personnel action processing and pay administration. • Employee onboarding. • Oversight and processing of personnel actions including the development of systems to support processing.
FY 2020 Anticipated Accomplishments	• Position FAA as an attractive employer for prospective employees through a streamlined and easy to use process for applying to FAA jobs. • Continue maturation of strategic HR services to forecast, recruit, and onboard the optimal number of FAA employees. • Implement an agency-wide strategic workforce planning framework.

The Office of Compensation, Benefits and Worklife	
Critical Responsibilities:	Manages the FAA's employee benefit, retirement programs, compensation, performance management, work-life and worker's compensation programs.
Key Activities:	• Provide pre and post retirement counseling including providing retirement estimates. • Process applications and providing counseling on survivor benefits, disability compensation, and changes to Federal Employees Health Benefits, Federal Employees Group Life Insurance, and the Thrift Savings Plan (TSP). • Administer two distinct performance management systems: Valuing Performance and the Performance Management System. • Manage the FAA and DOT's Office of Worker's Compensation Program.
FY 2020 Anticipated Accomplishments	• Continue achievement of workers' compensation cost avoidance through facilitating return to duty and ensuring careful adjudication of claims of questionable veracity. • Introduce new retirement, financial planning, and TSP seminars for FAA employees. • Expand Agency readiness and use of telework flexibilities and alternative work arrangements.

The Office of Labor and Employee Relations	
Critical Responsibilities	Manages the relationships between FAA and the unions that represent its employees.
FY 2020 Anticipated Accomplishments	• Provide day-to-day operational support and services to FAA managers on labor and employee relations. • Implement a labor and employee relations strategy. • Manage oversight and compliance of all bargaining with FAA unions.

The Office of Talent Development	
Critical Responsibilities:	Manages the development of talent and leadership bench strength.

Key Activities:	• Human Capital Planning • FAA Leadership & Learning Institute • FAA Learning Services (eLMS) • Executive Development • Organizational Effectiveness
FY 2020 Anticipated Accomplishments	• Identify and implement innovative approaches to the development of eight Strategic Leadership Capabilities with an emphasis on leaders developing leaders. • Provide learning services to all FAA employees through the eLMS. • Conduct the annual Federal Employee Viewpoint Survey.
The Office of Accountability and Strategic Business Management	
Critical Responsibilities:	Provides oversight, and ensures that management is held accountable for responding to allegations of sexual harassment, misconduct of a sexual nature, and other allegations of harassment and misconduct.
Key Activities:	• Develop and deliver anti-harassment training. • Monitor management's timeliness in addressing allegations. • Provide LOB/SO specific data to include: Accountability Board analytics, reports and training completion.
FY 2020 Anticipated Accomplishments	• Foster a workplace free of harassment and inappropriate behavior through investigation and adjudicating allegations of employee misconduct.

What benefits will be provided to the American public through this request and why is this program necessary?

Funding at the requested level is critical to continue providing personnel services to all FAA employees. The non-pay costs within AHR's budget include systems like CASTLE for time and attendance and other systems. AHR also supports the FAA's learning management system, the Employee Assistance Program, the FAA's Accountability Board, and the Agency's worker's and unemployment compensation program, all of which are necessary for FAA's lines of business to be successful.

Most of the FAA's hiring efforts are for FAA's safety organizations, with ATO and AVS being the most active. At the requested level, AHR will be able to support multiple recruiting events such as virtual career fairs. This will maintain the FAA's ability to reach qualified candidates, and support DOT and FAA's goals of maintaining a diverse workforce including veterans and persons with targeted disabilities. As more federal employees become eligible to retire in FY 2020 and beyond, the competition for talent will increase.

Detailed Justification for – Office of Innovation (AEI)

FY 2020 – Office of Innovation (AEI) – Budget Request
($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	*FY 2019 Enacted	FY 2020 Request
Salaries and Expenses	0	0	0	1,500
Program Costs	0	0	0	100
Total	**$0**	**$0**	**$0**	**$1,600**
FTE	**0**	**0**	**0**	**7**

What Is The Request And What Funds Are Currently Spent on the Program?

The FAA is establishing a new organization that is able to deal effectively and efficiently with the surge of new users and technologies – Office of Innovation, AEI. The U.S. aviation sector is experiencing a renaissance in new users and technologies. The FAA will face increasing challenges as the pace of change needed throughout the National Airspace System (NAS) and within the agency continues to accelerate. The ability of the FAA to establish oversight and foster the integration of these new users and technologies into the NAS will likely determine leadership in aviation innovation throughout the world.

The FAA must be more agile and efficient in handling the surge of new users and technologies into the NAS and must foster the creativity and collaboration necessary to ensure that taxpayers and the flying public enjoy the benefits of innovation. The Office of Innovation will examine the new technologies' potential impact on the NAS, their likely benefits, how work across the agency can ensure their safe integration into existing operations. It will provide leadership with regard to industry engagement and be the primary office for the facilitation of this engagement within the FAA.

What benefits will be provided to the American public through this request and why is this program necessary?

The FAA must be more effective and efficient in handling the surge of new users and technologies into the NAS and must foster the creativity and collaboration necessary to ensure that taxpayers and the flying public enjoy the benefits of innovation. The agency has launched an initiative to improve industry engagement, and increase internal collaboration in order to better examine how new technologies can benefit the NAS. The Office of Innovation will examine the new technologies' potential impact on the NAS, their likely benefits, and methods for safe integration into existing operations; as well as provide leadership with regard to industry engagement and internal collaboration.

Staff Offices
($000)

	Dollars	FTP	OTFTP	FTE
*** FY 2019 Annualized CR**	**$212,253**	**1,012**	**22**	**1,005**
Adjustments to FY 2020 Base	**-2,569**	**-**	**-**	**-**
FERS Increase	366	-	-	-
Extra Compensable Day (262)	626	-	-	-
GSA Rent	0	-	-	-
Working Capital Fund	-3,561	-	-	-
Transition from F&E to Ops	0	-	-	-
Great Lakes Regional Offices	0	-	-	-
Financial Accounting Services	0	-	-	-
Annualization of FY 2019 FTE	0	-	-	-
CAMI Accident Investigation Transfer from RE&D to Ops	0	-	-	-
Discretionary Adjustments	**3,600**	**8**	**-**	**8**
UAS Requirements	2,000	1	-	1
Commercial Space Regulatory Reform	0	-	-	-
Innovation Office	1,600	7	-	7
Cybersecurity	0	-	-	-
Base Transfers	**33,311**	**164**	**-**	**164**
Staffing Reassignment	0	-	-	-
Regional Administrators Office Realignment	33,311	164	-	164
FY 2020 Request	**$246,595**	**1,184**	**22**	**1,177**

FERS Increase: OMB Circular A-11 has increased the agency's contribution rates to the FERS retirement system. This increase in cost to the FAA represents the increased rates for both Air Traffic Controllers and other agency employees.

Extra Compensable Day: There are 262 Compensable days in FY 2020 vs. 261 days in FY 2019.

Working Capital Fund: This cost adjustment is requested to support the Department of Transportation's Working Capital Fund estimates for the FAA.

UAS Requirements: The increase will allow the FAA to expand efforts to engage with the many operational, security, regulatory, and communication issues raised by the development of the Unmanned Aircraft Systems.

Office of Innovation: This request establishes a new Office of Innovation to enable the FAA to be more effective and efficient in handling the surge of new users and technologies into the NAS. The Office will examine new technologies' potential impact on the NAS, likely benefits, and methods for safe operational integration.

Regional Administrators Office Realignment: This request supports funding and staff for the realignment of the offices for the Regional Administrators from the Office of Finance and Management, Regions and Property Operations to the Office of Policy, International Affairs and Environment.

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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 underpart 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,$3,295,000,000, of which $524,730,000 shall remain available until September 30, 2021 and $2,770,270,000 shall remain available until September 30, 2022: 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 no later than 60 days after the submission of the President's Budget request, the Secretary of Transportation shall transmit to the Congress an investment plan for the Federal Aviation Administration which includes funding for each budget line item for fiscal years 2021 through 2025, 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.

Note.—A full-year 2019 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2019 (Division C of P.L. 115–245, as amended). The amounts included for 2019 reflect the annualized level provided by the continuing resolution.

Program and Financing
(in millions of dollars)

Identification code: 69-8107-0-7-402		FY 2018 Actual	FY 2019 Estimate	FY 2020 Estimate
	Obligations by program activity:			
	Direct program:			
0001	Engineering, development, test and evaluation	148	243	228
0002	Procurement and modernization of (ATC) facilities and equipment	1,772	2,301	2,152
0003	Procurement and modernization of non-ATC facilities and equipment	179	223	209
0004	Mission support	242	274	256
0005	Personnel and related expenses	486	498	524
0006	Hurricane Sandy	.....	2	.....
0007	Spectrum Efficient National Surveillance Radar (SENSR)	7	4	.....
0008	2017 Hurricanes/2018 Supplemental	9	35	35
0100	Subtotal, direct program	2,843	3,580	3,404
0799	Total Direct obligations	2,843	3,580	3,404
0801	Facilities and Equipment (Airport and Airways Trust Fund)	122	122	122
0900	Total new obligations, unexpired accounts	2,965	3,702	3,526
	Budgetary resources: Unobligated balance:			
1000	Unobligated balance brought forward, Oct 1	1,468	2,013	1,665
1001	Discretionary unobligated balance brought fwd Oct 1	1,456	.....	.....
1021	Recoveries of prior year unpaid obligations	42	.....	.....
1033	Recoveries of prior year paid obligations	2	.....	.....
1050	Unobligated balance	1,512	2,013	1,665
	Budget authority: Appropriations, discretionary:			
	Appropriations discretionary:			
1101	Appropriation (special or trust fund)	3,330	3,250	3,295
	Spending authority from offsetting collections, discretionary:			
1160	Appropriation, discretionary (total)	3,330	3,250	3,295
1700	Collected	106	104	104
1701	Change in uncollected payment, Federal sources	36	.....	.....
1750	Spending authority from offsetting collections, disc (total)	142	104	104
1800	Collected	.....	.....	.....
1900	Budget authority (total)	3,472	3,354	3,399
1930	Total budgetary resources available	4,984	5,367	5,064
	Memorandum (non – add) entries:			
1940	Unobligated balance expiring	-6	.....	.....
	Special and non-revolving trust funds:			
1941	Unexpired Unobligated balance, end of year	2,013	1,665	1,538
1950	Other balances withdrawn and returned to unappropriated receipts	24	.....	.....
1951	Unobligated balance expiring	6	.....	.....
1952	Expired Unobligated balance, start of year	52	78	78
1953	Expired Unobligated balance, end of year	48	78	78
1954	Unobligated balance canceling	24	.....	.....
	Change in obligated balances:			
3000	Unpaid obligations, brought forward, Oct 1	1,815	2,036	2,086
3001	Adjustments to unpaid obligations, brought forward Oct 1	1	.....	.....
3010	Obligations incurred, unexpired accounts	2,965	3,702	3,526
3011	Obligations incurred, expired accounts	5	.....	.....
3020	Outlays (gross)	-2,683	-3,652	-3,626
3040	Recoveries of prior year unpaid obligations, unexpired	-42	.....	.....
3041	Recoveries of prior year unpaid obligations, expired	-25	.....	.....
3050	Unpaid obligations, end of year	2,036	2,086	1,988
	Uncollected payments:			
3060	Uncollected pymts, Fed sources, brought forward, Oct 1	-51	-76	-76

Identification code: 69-8107-0-7-402		FY 2018 Actual	FY 2019 Estimate	FY 2020 Estimate
3070	Change in uncollected pymts, Fed sources, unexpired	-36	.....	.....
3071	Change in uncollected pymts, Fed sources, expired	11	.....	.....
3090	Uncollected pymts, Fed sources, end of year	-76	-76	-76
	Memorandum (non-add) entries:			
3100	Obligated balance, start of year	1,765	1,960	2,010
3200	Obligated balance, end of year	1,960	2,010	1,910
	Budget Authority and outlays, net:			
4000	Budget authority, gross	3,472	3,354	3,399
4010	Outlays from new discretionary authority	937	1,423	1,452
4011	Outlays from discretionary balances	1,743	2,224	2,174
4020	Outlays, gross (total)	2,680	3,647	3,626
	Offsets:			
	Against gross budget authority and outlays:			
	Offsetting collections (collected) from:			
4030	Federal sources	-39	-52	-52
4033	Non-Federal sources	-81	-52	-52
4040	Offsets against gross budget authority and outlays (total)	-120	-104	-104
	Additional offsets against gross budget authority only:			
4050	Change in uncollected pymts, Fed sources, unexpired	-36	.....	.....
4052	Offsetting collections credited to expired accounts	12	.....	.....
4053	Recoveries of prior year paid obligations, unexpired accounts	2	.....	.....
4060	Additional offsets against budget authority only (total)	-22	.....	.....
4070	Budget authority, net (discretionary)	3,330	3,250	3,295
4080	Outlay, net (discretionary)	2,560	3,543	3,522
4101	Outlays from mandatory balances	3	5	.....
4120	Federal sources (Spectrum 011-X-5512000)	.....	.....	.....
4180	Budget authority, net (total)	3,330	3,250	3,295
4190	Outlay, net (total)	2,563	3,548	3,522

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 Department of Transportation, the National Aeronautics and Space Administration, and the Departments of Defense, Homeland Security, and Commerce to improve the safety, capacity, security, and environmental performance of the NAS. The funding request supports the Federal Aviation Administration's comprehensive plan for modernizing, maintaining, and improving air traffic control and airway facilities services.

Object Classification
(in millions of dollars)

Identification code: 69-8107-0-7-402		FY 2018 Actual	FY 2019 Estimate	FY 2020 Estimate
	Direct obligations:			
	Personnel compensation:			
11.1	Full-time permanent	317	328	341
11.3	Other than full-time permanent	2	2	2
11.5	Other personnel compensation	8	8	8
11.9	Total personnel compensation	327	338	351
12.1	Civilian personnel benefits	103	106	110
21.0	Travel and transportation of persons	44	43	48
22.0	Transportation of things	4	3	3
23.1	Rental payments to GSA	2	.....	.....
23.2	Rental payments to others	40	49	46
23.3	Communications, utilities, and miscellaneous charges	58	56	52
25.1	Advisory and assistance services	1,572	2,123	1,982
25.2	Other services from non-federal sources	167	154	148
25.3	Other goods and services from federal sources	24	53	49
25.4	Operation and maintenance of facilities	77	98	92
25.5	Research and development contracts	.....	1	1
25.6	Medical care	.....	.....	.....
25.7	Operation and maintenance of equipment	84	77	72
25.8	Subsistence and support of persons	.....	1	1
26.0	Supplies and materials	29	39	37
31.0	Equipment	185	248	233
32.0	Land and structures	125	187	175
41.0	Grants, subsidies, contributions	.....	4	4
44.0	Refunds	2	.....	.....
99.0	Subtotal, obligations, Direct obligations	2,843	3,580	3,404
99.0	Subtotal, obligations, Reimbursable obligations	122	122	122
99.9	Total new obligations, unexpired accounts	2,965	3,702	3,526

Employment Summary

Identification code: 69-8107-0-7-402	FY 2018 Actual	FY 2019 Estimate	FY 2020 Estimate
1001 Direct civilian full-time equivalent employment	2,626	2,685	2,786
2001 Reimbursable civilian full-time equivalent employment	58	55	54

EXHIBIT III-1

FACILITIES and EQUIPMENT
SUMMARY BY PROGRAM ACTIVITY
Appropriations, Obligations Limitations, and Exempt Obligations
($000)

	FY 2018 Actual	FY 2019 Annualized CR	*FY 2019 ENACTED	FY 2020 REQUEST	CHANGE FY 2019 Enacted-2020 Request
Engineering, Development, Test and Evaluation	165,600	210,300	194,300	277,800	83,500
Air Traffic Control Facilities and Equipment	2,148,100	2,087,200	1,849,777	2,051,370	201,593
Non-Air Traffic Control Facilities and Equipment	193,000	214,100	204,700	203,400	-1,300
Facilities and Equipment Mission Support	245,300	240,400	238,400	237,700	-700
Personnel and Related Expenses	498,000	498,000	512,823	524,730	11,907
TOTAL	3,250,000	3,250,000	3,000,000	3,295,000	295,000
FTEs					
Direct Funded	2,626	2,685	2685	2,786	101
Reimbursable	58	55	55	54	-1

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

Activity 3: Procurement and Modernization of Non-Air Traffic Control Facilities and Equipment

Activity 4: Facilities and Equipment Mission Support

Activity 5: Personnel and Related Expenses

*Enacted levels for FY 2019 are provided for informational purposes. The FY 2020 budget request was developed before a final appropriations act was enacted for FY 2019, and the request assumes a year-long continuing resolution for FY 2019.

Facilities and Equipment (F&E) Index

2B07	Integrated Display System (IDS)	$24,000,000	82
2B08	Remote Monitoring and Logging System (RMLS)	$14,400,000	84
2B09	Terminal Flight Data Manager (TFDM)	$135,450,000	86
2B10	Performance Based Navigation and Metroplex Portfolio	$5,000,000	89
2B11	Unmanned Aircraft System (UAS) Implementation	$58,400,000	90
2B12	Airport Ground Surveillance Portfolio	$19,000,000	92
2B13	Terminal and En Route Surveillance Portfolio	$68,500,000	94
2B14	Terminal and Enroute Voice Switch and Recorder Portfolio	$49,750,000	97
2B15	NextGen Implementation of FOXs and FIM Cloud	$35,000,000	99
	c. Flight Service Programs		
2C01	Automated Surface Observing System (ASOS)	$4,000,000	102
2C02	Future Flight Service Program (FFSP)	$19,200,000	103
2C03	Alaska Flight Service Facilities Modernization (AFSFM)	$2,650,000	105
2C04	Juneau Airport Wind System (JAWS) – Technology Refresh	$1,000,000	106
	d. Landing and Navigation Aids Programs		
2D01	VHF Omnidirectional Radio Range (VOR) Minimum Operation Network(MON)	$18,000,000	107
2D02	Wide Area Augmentation System (WAAS) for GPS	$90,000,000	109
2D03	Instrument Flight Procedures Automation (IFPA)	$1,100,000	112
2D04	Runway Safety Areas – Navigational Mitigation	$1,400,000	113
2D05	Landing and Lighting Portfolio	$48,245,000	114
	e. Other ATC Facilities Programs		
2E01	Fuel Storage Tank Replacement and Management	$26,400,000	118
2E02	Unstaffed Infrastructure Sustainment	$36,800,000	119
2E03	Aircraft Related Equipment Program (ARE)	$10,900,000	120
2E04	Airport Cable Loop Systems – Sustained Support	$10,000,000	121
2E05	Alaskan Satellite Telecommunications Infrastructure (ASTI)	$4,300,000	122
2E06	Facilities Decommissioning	$9,000,000	123
2E07	Electrical Power System – Sustain/Support	$150,000,000	124
2E08	Energy Management and Compliance (EMC)	$6,400,000	126
2E09	Child Care Center Sustainment	$1,500,000	127
2E10	FAA Telecommunications Infrastructure (FTI)	$48,500,000	128
2E11	Data Visualization, Analysis and Reporting System (DVARS)	$7,100,000	130
2E12	Time Division Multiplexing (TDM)-to-Internet Protocol (IP) Migration	$20,000,000	131
	Total, Activity 2	**$2,051,370,000**	

Activity 3, Procurement and Modernization of Non-Air Traffic Control Facilities and Equipment

	a. Support Programs		
3A01	Hazardous Materials Management	$20,000,000	133
3A02	Aviation Safety Analysis System (ASAS)	$19,700,000	135
3A03	National Air Space Recovery Communications (RCOM)	$12,000,000	137
3A04	Facility Security Risk Management	$15,100,000	139
3A05	Information Security	$33,300,000	141
3A06	System Approach for Safety Oversight (SASO)	$23,100,000	143
3A07	Aviation Safety Knowledge Management Environment (ASKME)	$5,300,000	145
3A08	Aerospace Medical Equipment Needs (AMEN)	$13,800,000	146
3A09	NextGen - System Safety Management Portfolio	$19,500,000	148
3A10	National Test Equipment Program (NTEP)	$3,000,000	150
3A11	Mobile Assets Management Program	$1,800,000	151
3A12	Aerospace Medicine Safety Information System (AMSIS)	$13,800,000	152
3A13	Logistics Support Systems and Facilities (LSSF)	$4,000,000	154

b. Training, Equipment and Facilities			
3B01	Aeronautical Center Infrastructure Modernization	$18,000,000	155
3B02	Distance Learning	$1,000,000	156
	Total, Activity 3	**$203,400,000**	
Activity 4, Facilities and Equipment Mission Support			
a. System Support and Support Services			
4A01	System Engineering and Development Support	$38,000,000	157
4A02	Program Support Leases	$48,000,000	159
4A03	Logistics Support Services (LSS)	$11,800,000	160
4A04	Mike Monroney Aeronautical Center Leases	$20,600,000	161
4A05	Transition Engineering Support	$21,000,000	163
4A06	Technical Support Services Contract (TSSC)	$28,000,000	165
4A07	Resource Tracking Program (RTP)	$8,000,000	166
4A08	Center for Advanced Aviation System Development (CAASD)	$57,000,000	167
4A09	Aeronautical Information Management Program	$5,300,000	169
	Total, Activity 4	**$237,700,000**	
Activity 5, Personnel Compensation, Benefits, and Travel			
5A01	Personnel and Related Expenses	$524,730,000	170
	Total, All Activities	**$3,295,000,000**	

Executive Summary – Facilities and Equipment (F&E) Budget Summary

What is this program and what does this funding level support?

The FY 2020 budget requests $3.295 billion to enable FAA to meet the challenge of both maintaining the capacity and safety of the current National Airspace System (NAS) while continuing its comprehensive system modernization. This request includes $1.220 billion for Next Generation Air Transportation System (NextGen) capital related investments. The remainder of the investment, $2.075 billion, will be in legacy areas to sustain current systems, including maintaining aging infrastructure, power systems, information technology, navigational aids, communications, surveillance, and weather systems.

The F&E budget is structured around five activities that group programs according to a common purpose. NextGen and Legacy Programs are found across all five activities and are specifically identified as such further in this overview.

Activity 1 - Engineering, Development, Test and Evaluation:

$277.8 million is requested for FY 2020 to develop unmanned aircraft systems (UAS), from initial research, to production, and facilities. Activity 1 programs are undertaken to validate operational concepts and proof-of-concept systems and equipment prior to making decisions about moving forward on capital investments that will be deployed across the NAS.

Activity 2 - Procurement and Modernization of Air Traffic Control Facilities and Equipment:

$2.051 billion is requested for FY 2020 to perform modernization of air traffic control facilities, systems, and equipment, and to support infrastructure upgrades, system replacements, and technology refresh at manned and unmanned facilities.

Activity 2 supports major systems acquisitions and facilities infrastructure programs in the implementation phase. These programs and initiatives fund the procurement and modernization of air traffic control facilities and equipment, including all funding related to the acquisition of air traffic control facilities, navigation and landing aids, surveillance equipment and facilities, automation systems, and communications systems and equipment. Activity 2 funding will support the following work:

- Upgrades to existing equipment
- Acquiring production systems to replace existing systems, extend serviceable life, or technology refresh system components
- Deploying systems for installation or transition to operational status
- Deploying new, satellite-based technologies such as Automatic Dependent Surveillance-Broadcast (ADS-B) and Wide Area Augmentation Systems (WAAS)
- Deploying communications infrastructure to provide surveillance and navigation services
- Replacing or modernizing manned and unmanned ATC facilities
- Replacing or modernizing automation, communications, navigation, surveillance/weather infrastructure, systems, and equipment
- Decommissioning and disposal of the systems and facilities that have been replaced

Activity 3 - Procurement and Modernization of Non-Air Traffic Control Facilities and Equipment:

$203.4 million is requested for FY 2020 to support modernization of non-air traffic control facilities, business systems, and equipment. The programs under Activity 3 support safety, regulation, security, information technology security, and regional and service center building infrastructure and support.

Activity 4 – Facilities and Equipment Mission:

$237.7 million is requested for FY 2020 to provide system wide integration, transition engineering, and technical contractual support in direct support of system acquisition or installation. This will provide for the following:

- Transition engineering, integration, and support
- NAS integrated logistics support
- Technical support services for implementation
- Program Support and Aeronautical Center Leases

Activity 5 - Personnel, Compensation, Benefits, and Travel (PCB&T):

$524.7 million is requested for FY 2020 to provide for the direct cost of federal salaries, benefits, travel, related personnel costs of FAA employees supporting all capital projects under the F&E account.

This budget request includes funding for critical system and facility infrastructure and takes into account the near term priorities identified by the NextGen Advisory Committee. As we work with our industry partners to take aviation into the future, it is critical that FAA carefully balance the need for sustaining the current infrastructure with the need to advance NextGen and to continue achieving ongoing benefits to users.

FY 2019 Partial Government Shutdown

The shutdown impacts within the Office of NextGen and other Facilities and Equipment acquisition programs continue to be assessed. FAA is conducting a thorough review of plans, timelines and commitments to determine schedule impacts, for our long-term goals and implementation of future planned capabilities. It is expected that all FAA Baselined Programs will experience some measure of cost and schedule growth as a direct result of the 35 day government shutdown. As of the FY 2020 President's Budget Submission, two major NextGen acquisition programs will experience a three to six month schedule delay.

NextGen

NextGen is not a single program but rather a portfolio of programs, systems, and procedures at different levels of maturity that will provide enhanced capabilities for the movement and management of Air Traffic. The work in the portfolio is being deployed in stages. Some enhancements are currently in deployment, some are nearing implementation, and some of the capabilities of NextGen are being defined and matured as the technology to support them becomes available (Pre-Implementation).

Pre-Implementation - $201.9 million is requested to continue multiple basic and applied research efforts in support of future NextGen technologies and concepts. FAA is focusing on Unmanned Aircraft Systems (UAS) for FY 2020 to support the development and integration of UAS products, systems, and implementation plans.

Implementation - $947.7 million is requested to continue the implementation of NextGen programs that have achieved or are near a Final Investment Decision (FID). As NextGen has progressed over the last several years, more programs have transitioned into the implementation phase.

- **En Route Automation Modernization Technology Refresh (ERAM)**: $106.0 million is requested to perform critical component replacements as necessary in order to ensure En Route's continued supportability and security.
- **System-Wide Information Management (SWIM)**: $101.0 million is requested to continue the implementation of an information management and data sharing system for FAA's internal and external stakeholders.
- **Automatic Dependent Surveillance Broadcast (ADS-B)**: $174.4 million is requested for the continued implementation of satellite-based surveillance capabilities that will provide a more complete picture of airspace conditions and more accurate position data of aircraft.
- **Air Traffic Management Implementation Portfolio**: $77.1 million is requested to continue software enhancements designed to deliver improvements on existing capabilities and new modeling functions for the Traffic Flow Management System (TFMS).
- **Time Based Flow Management (TBFM)**: $30.7 million is requested to maximize traffic flow and airport usage by improving flow management into and out of the busy metropolitan airspaces and corresponding airports.
- **Data Communications**: $136.2 million is requested for data communications, to deploy a text-based data communication system in the En Route domain.

- **NextGen Weather Processor (NWP)**: $31.3 million is requested to establish a common weather processing platform that will functionally replace the legacy FAA weather processor systems and host new capabilities in all FAA Towers, Terminal Radar Approach Control (TRACON) Facilities, and Air Route Traffic Control Centers.
- **Reduced Oceanic Separation (ROS)**: $32.3 million is requested to increase the use of current separation standards and potentially reduce separation in Oceanic Flight Information Regions
- **Terminal Flight Data Manager (TFDM)**: $135.5 million is requested to provide an integrated approach to maximize the efficient collection, distribution, and update of data supporting flight information in the terminal area (airspace around an airport and airport surface data).
- **Performance Based Navigation**: $5.0 million is requested to install distance measuring equipment to fill in coverage gaps and provide resilient Area Navigation (RNAV) operations during Global Positioning System (GPS) outages.
- **Unmanned Aircraft Systems (UAS) Implementation**: $58.4 million is requested for the implementation of small UAS (sUAS) capabilities in the NAS, including the operational transition of Low Altitude Authorization and Notification Capability (LAANC), and the FAA DroneZone IT platform that is required to support sUAS operations.
- **Implementation of Object Exchange and Enterprise Information Management**: $35.0 million is requested for the continued development of the EIM platform capability and the continuation of the systems development life cycle (SDLC).
- **System Safety Management Portfolio**: $19.5 million will support improvements to Safety Management Systems as a result of safety information discovered and shared through this portfolio.
- **Aeronautical Information Management Program (AIM)**: $5.3 million will support delivery of digital aeronautical information that enables the processing of data to improve mapping, flight planning, and the timeliness and accuracy of air traffic control instructions.

<u>NAS Infrastructure</u>

This funding will assure modernization of air traffic control facilities, systems, and equipment that provide direct automation, communication, surveillance, and navigation functions within the NAS. FAA must sustain the current facilities, systems, and functions that NextGen is built upon. Key work components include infrastructure upgrades, system replacements, and technology refresh at manned and unmanned facilities. Infrastructure sustainment is also completed on systems that are repositories for safety and certification data, training infrastructure, and support aeromedical research and records.

NAS Facility Infrastructure Sustainment:

FAA has a multi-billion dollar maintenance backlog for programs included in the Air Traffic Control (ATC) Facilities Sustainment Strategic Plan. $528.6 million is requested to advance the state of good repair for FAA infrastructure facilities. This infrastructure funding will improve and maintain the Facility Condition Index (FCI) ratings at FAA facilities that provide the backbone for the NAS and NextGen functionality. While the request represents a shift to re-invest resources in critical infrastructure, the deferred maintenance backlog is so large that additional incremental increases for these facilities are necessary in order to reduce FAA operational risk. This undertaking targets the following projects:

- **En Route Traffic Control Center (ARTCC) and Combined Control Facility (CCF) Building Improvements** - Projects will replace obsolete plant equipment and provide improved work areas at selected ARTCCs (21).
- **Air Traffic Control En Route Radar Facilities Improvements** - 157 Long Range Radar (LRR) surveillance facilities provide aircraft position information to FAA, to the Department of Defense, and Homeland Security for security monitoring of the NAS. The 66 LRRs established in the early 1950's have reached the end of their useful life.
- **Terminal Air Traffic Control Facilities Improve** - Initiates modifications, improvements, and repairs to Tower/TRACON facilities. System engineering, configuration management, facility planning, and facility condition assessment activities determine the projects to be accomplished and scheduling.
- **National Airspace Systems (NAS) Facilities Occupational Health and Safety Administration (OSHA) and Environmental Standards Compliance** – Funds initiatives that safeguard FAA personnel from occupational hazards and minimize the impact of FAA activities on the environment.

- **Fuel Storage Tank Replacement and Management** – Funding is requested for 153 tank unit replacements, modernization, and upgrades at approximately 63 locations across the US in support of electrical power systems.
- **Unstaffed Infrastructure Sustainment** - Program is responsible for sustaining more than 12,000 Communications, Surveillance, Navigation, Weather, and support sites across the country.
- **Facilities Decommissioning** – Program is responsible for final disposition of decommissioned infrastructures and associated property restorations.
- **Electrical Power Systems – Sustain/Support** - Is an infrastructure sustainment and renewal program that replaces and refurbishes components of the emergency power system and cable infrastructure to maintain and improve the overall electrical power quality, reliability, and availability.
- **Energy Management and Compliance (EMC)** – Program saves operational costs by installing advanced electric meters, monitoring energy and water consumption, developing cost-effective recommendations to reduce energy and water use, and implementing energy and water efficiency projects.
- **Facility Security Risk Management (FSRM)** - Implements standardized facility access and protective measures at all FAA staffed facilities.
- **Mobile Assets Management Program** - Provides easily transportable NAS equipment to establish, restore, or augment air traffic control operations. Funding will refurbish or replace 20 years old Mobile ATCT's.

NAS System Sustainment:

Funding in FY 2020 is requested for Automation, Communication, Navigation/Landing, and Surveillance Air Traffic Control (ATC) systems infrastructure. These systems allow the NAS to operate at the highest safety standards and provide airline operators and general aviation the dependable ATC services they require. Providing continued safe and expected services to these users requires sustainment of the aging systems infrastructure. The inventory of radio's supporting terminal communications is between 40 to 50 years old, voice switches used to communicate between pilots and air traffic controllers are 17 to 22 years of age, and on-airport radars are 15 to 20 years old. Of the 1,200 Instrument Landing Systems in operation today, 125 are over 25 years old. Funding is requested to replace unsupportable components and systems for this NAS System Infrastructure. As FAA progresses to satellite based services and technology, a number of these systems will continue to provide required support for advanced NextGen capabilities or to provide redundant and safety backup capabilities in the event of satellite service outages and interference. Included among these programs are:

- **Standard Terminal Automation Replacement System (STARS)** provides sustainment of a common and standardized automation system/software infrastructure across the NAS.
- **Next Generation Very High Frequency (VHF) Air/Ground Communications System (NEXCOM)** – This program will modernize the existing Air/Ground voice communication system using the limited available radio frequency spectrum more efficiently.
- **Voice Switch and Control System (VSCS)** –This is the existing legacy En Route voice switch and it will have to remain operational until the full deployment of a replacement system.
- **The VHF Omni-Directional Range (VOR) Minimum Operational Network (MON) Implementation Program -** Will conduct activities that will transition the legacy network of approximately 957 VORs to a MON of approximately 650 VORs with a target date of 2025.

What benefits will be provided to the American public through this request and why is this program necessary?

The procurement and modernization of the nation's air traffic control system was first highlighted in 1980 with the publication of the first NAS Modernization Plan. Since that time, FAA has replaced old technologies with new systems that perform required functions better and more efficiently. During this period, aviation services were extended to new, small and medium-sized localities through the expanded deployment of updated air traffic control technologies, equipment, and infrastructure at these locations.

FAA has met most of the cost and schedule goals for the programs within F&E. F&E programs contribute to the success of metrics that show a safe and efficient Airspace System and include runway incursion reduction, Air Traffic Control (ATC) system operational availability, and NAS on-time arrivals.

Detailed Justification for - 1A01 Advanced Technology Development and Prototyping

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Advanced Technology Development and Prototyping	$26,800	$33,000	$33,000	$40,900

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Runway Incursion Reduction Program (RIRP)	---	$4,000.0
B. System Capacity Planning and Improvements	---	1,500.0
C. Operations Concept Validation and Infrastructure Evolution	---	5,000.0
D. Major Airspace Redesign	---	2,000.0
E. Strategy and Evaluation	---	1,000.0
F. Dynamic Capital Planning	---	2,000.0
G. Operational Analysis and Reporting System (OARS)	---	12,500.0
H. Operations Network (OPSNET) Replacement	---	4,000.0
I. Operational Modeling Analysis and Data	---	2,000.0
J. Enterprise, Management, Integration, Planning and Performance	---	4,000.0
K. In-Service Engineering	---	2,900.0

What is this program and what does this funding level support?

The FAA's mission is to provide the safest and most efficient aerospace system in the world. To accomplish this mission, FAA's Advanced Technology Development and Prototyping (ATDP) program develops and validates technology and systems that support air traffic services. For FY 2020, a total of $40.9 million is requested to support the evolving air traffic system architecture and improvements in airport safety and capacity.

A. Runway Incursion Reduction Program (RIRP)

For FY 2020, $4.0 million is requested for technology prototype development, testing, demonstration and documentation within the Runway Incursion Reduction Program (RIRP). This work will reduce risk to people and property, caused by collisions in the runway environment. The RIRP's objective is to discover research and innovative technologies that will detect the incorrect presence of an object in the Runway Safety Area at every airport, and deliver a directive cue to the individual who can take corrective action.

Consistent with standing National Transportation Safety Board recommendations, RIRP research emphasis will remain on testing the application of technology for pilot, controller, and vehicle operator situational awareness tools. Current initiatives include Runway Safety Assessment (RSA) studies such as Runway Incursion Prevention Shortfall Analysis (RIPSA) to identify candidate small-to-medium sized airports with historically high rates of Runway Incursions. Candidate technologies best suited to an airport based on causal factors encountered at that site (e.g. converging runways, ground vehicle operations, taxiway/runway hotspots, etc.) will be identified. In FY 2020, RIRP will continue the prototype operational evaluations of RIPSA technologies at candidate test locations in order to assess system suitability and performance.

B. System Capacity, Planning, and Improvements

The System Capacity, Planning, and Improvements program provides data and analyses on National Air Space (NAS) operations to FAA executives and managers to help them identify deficiencies and develop proposals to improve NAS performance. This program sponsors performance metric tasks under FAA Memorandums of Cooperation as well as NAS performance and airport capacity studies where experts from the FAA, academia, and industry collaborate to analyze and develop recommendations for improving capacity and system efficiency, and reducing delays at specific airports. It has the added capability of using its performance measurement systems and operations research to quantify the efficiency of the NAS and form the basis of proposals for overall system improvements. This works includes research, modelling, analysis of benefits of capital investment and future trends; and identifying the relationship factors between NAS modernization and industry performance. These efforts will ensure the NAS remains the safest and most efficient ATC system in the world. For FY 2020, $1.5 million is requested to conduct:

- Performance metric and analysis support for FAA International Memorandums of Cooperation with Europe, Singapore and others
- Performance metric and analysis support for the International Civil Aviation Organization (ICAO) and the Civil Air Navigation Services Organization (CANSO).
- Capacity rate analysis tools used for planning and assessment of Traffic Management Initiatives
- Harmonized FAA/Airline Metrics Reporting (used for FAA/Customer forums on Capacity, Planning and Improvement)
- Initial Development of Operational Metrics for Commercial Space

C. Operations Concept Validation and Infrastructure Evolution

Operational Concept Validation and Infrastructure Evolution is a program that develops and validates NAS level operational concepts that are key to the FAA modernization programs and the Next Generation Air Transportation System (NextGen). For FY 2020, $5.0 million is requested for the conduct of analysis and planning for NAS evolution by determining the required annual updates to the following NAS Enterprise Architecture products. These include Operational Improvements, Operational Sustainment and Operational Requirements. Conducts shortfall analyses as part of service analysis and ensures the linkage of proposed solutions back to validated operational needs to support budget planning and investment decisions. Develops detailed second level concepts that support validation and requirements development. Ensures that the NAS level operational concept and sustainment activities are integrated and consistent with the overall NAS Enterprise Architecture. Supports the development and sustainment of analytical and computer models used to assess and validate operational changes to the NAS. In addition, Operational focus areas include Commercial Space Operations in the NAS, Trajectory-Based Operations, Advanced Rerouting and Time-Based Metering Operations, and Operational Integration Analysis.

D. Major Airspace Redesign

Major Airspace Redesign serves as one of the FAA's primary efforts to modernize the Nation's airspace. The purpose of this national initiative is to review, redesign and restructure airspace. The FAA prioritizes candidate airspace redesign projects to determine which projects provide the most benefits and develops criteria for assessing a project's system-wide impact. This program supports increased efficiency and enhanced safety by funding the physical changes in facilities necessary to accommodate airspace redesign. Redesign projects have taken on increased emphasis at both the national and regional levels to ensure that FAA is able to effectively manage the projected growth in demand at FAA facilities and airports.

For FY 2020 $2.0 million is requested to continue implementation of airspace redesign efforts frequently results in changes in the number and shape of operational positions or sectors, including changes to sector, area, or facility boundaries. Required infrastructure changes can include communication modifications such as changes in frequencies, connectivity of a radio site to the control facility, controller-to-controller connectivity; surveillance infrastructure modifications to ensure proper radar coverage; automation modifications to the En-Route Automation Modernization (ERAM) data processing or flight data processing. Airspace Redesign will increase system efficiency the greatest in those areas of the system that are inherently complex such as the Northeast Corridor from Washington DC to Boston and in areas experiencing high air traffic growth such as the region between the U.S and the Caribbean.

E. Strategy and Evaluation

The Strategy and Evaluation program develops and maintains mathematical models of the NAS which are used to aid organizations throughout the FAA with analyses of proposed new investments, trade-off studies, and analyses of the impacts of changes in operational conditions (e.g., weather, air carrier schedules, commercial space operations, etc.) on NAS performance. The FAA and contractors use a NAS-wide model, known as the System-Wide Analysis Capability (SWAC) to analyze advanced Air Traffic Management (ATM) concepts and aid with NextGen program trade-off studies, investment analyses, and NAS performance analyses. SWAC is being enhanced to support new modeling capabilities and analysis. In addition, an airport capacity model, Airfield Delay Simulation Model (ADSIM+), is being developed for use in analyzing new airport capacity-related projects. The model will facilitate rapid analysis of airport improvements, the impact of air travel demand changes, and ATM technology insertions. It will support runway capacity studies, investment analyses, NextGen analyses, and the evaluation of airport infrastructure changes. This model provides a de facto standard for airport capacity analyses. For FY 2020, $1.0 million is requested to:

- Deliver SWAC executable software capable of modeling more complex airspace flows, for example, time based metering.
- Deliver SWAC executable software with an advanced interface with Graphical Information System.
- Deliver ADSIM+ executable software with an advanced capability of generating arrival/departure sequencing based on user-defined scenarios to support post-implementation analyses of recently deployed NextGen capabilities.
- Deliver ADSIM+ executable software with an enhanced graphical user interface to support user-defined scenarios.

F. Dynamic Capital Planning

The Dynamic Capital Planning tools and support will allow FAA to make optimum decisions based on best business practices. These tools and support will provide verification that disciplined management of capital programs continues to be carried out. The program will focus on the following activities:

- Determining quantitative economic value and internal benefits validation for capital projects
- Milestone tracking, schedule modeling, and performance measurement
- Auditing and trend analysis
- Earned Value Management (EVM) and monitoring through program life cycle
- Field implementation planning and support for capital portfolio management
- Post implementation analysis for corporate lessons learned results

This project will provide reliable data with an automated tracking and reporting system for F&E projects that will enable decision-makers enhanced use of agency resources. This project will help keep major acquisition programs on schedule and within cost by maximizing limited resources linked to budget information and processes. Managers and engineers will have up-to-date reliable data on F&E projects through the resource tracking program (RTP) and productivity continues to improve under standardized project management operating procedures.

G. Operational Analysis and Reporting System (OARS)

The FAA collects and analyzes safety data to make data-driven decisions in order to assess safety risk, determine repeatability, implement mitigation plans, and provide performance monitoring with minimal impact to operations. Due to the vast amount of unintegrated operational data and the limited capacity of available analytical tools, safety practitioners spend excessive time collecting data. Daily safety information not available to safety practitioners and operational personnel in a manner easily accessed and manipulated.

OARS is an enterprise portal that provides one-stop access to data and applications for safety analysis to support ATO's System Safety Management. OARS improves data collection and analysis in order to provide immediate safety information (Hazards, Mitigations, Performance Monitoring, etc.) based on near real time data for a wide range of users to effectively analyze large amounts of data associated with safety events in the NAS (e.g., potential losses of separation). OARS will deliver a suite of FAA analytics and user interfaces that will improve the efficiency of safety analysis and provide the framework for integrating future NextGen technologies into the NAS. OARS Phase 1 will achieve Final Investment Decision in May 2019 and a prime contract will be awarded by the end of the second quarter in FY2020.

For FY 2020, $12.5 million is requested for Phase 1 prime contract award, system design and development, system engineering support, and program management support.

H. Operations Network (OPSNET) Replacement

The OPSNET data collection consists of an automation component collecting data from multiple systems, and a manual component requiring data entry from personnel at each facility. The OPSNET reporting components generate and distribute delay and traffic activity reports to the Department of Transportation (DOT) and FAA Executive leadership, Air Traffic Management decision makers, and the Aviation Community. Primary uses of OPSNET include NAS performance monitoring, post-operational assessments of traffic management initiatives, measurement of NextGen improvements, financial benchmarking, facility reviews and classifications, and investment planning.

The legacy system is currently constrained by obsolete data definitions, inconsistent data entries, and difficulties in correlating data from multiple sources to resolve flight delay issues. The OPSNET replacement program will replace and modernize the existing system to provide a comprehensive, granular, and accurate accounting of delays with appropriate attribution of causal factors. The replacement system will provide near real-time delay reporting capability for evaluation of performance during the day-of-operation. The replacement system will automate, to the maximum extent possible, the collection of operational data and minimize manual entries. For FY 2020 the OPSNET Replacement program requests $4.0 million for planning, analysis, design, development, and system engineering activities, and to migrate and transition from the legacy system. The resourcing and successful outcome of these activities will support the goal of achieving Initial Operating Capability in 2021.

I. Operational Modeling Analysis and Data

The Operational Modeling Analysis and Data program provides support to National Airspace System (NAS) performance analysis by improving the efficiency and integration of operational data, NAS performance reporting, and the tools used for both. This program also makes enhancements to the individual and consolidated products to keep up with the growing data demands in the agency.

Many Air Traffic Organization (ATO) operational units, model and analyze NAS data to support both operational and capital investment planning. A study of FAA-wide operational databases identified a shortfall in available analytical products and recommended the creation of a database to capture operational events associated with individual flights to improve the timeliness of operational analyses and reduce the cost. This program will develop and publish standardized operational events data on a per-flight basis and by facility (e.g. airport). For FY 2020, $2.0 million is requested to modernize and integrate the NAS Data Warehouse (NAS-DW) and the Aviation System Performance Metrics (ASPM) systems.

J. Enterprise, Management, Integration, Planning and Evaluation for NAS/NextGen

The Enterprise Management, Integration, Planning and Evaluation for NAS NextGen program will support human capital management, enterprise management, technical support, and outreach functions required to deliver the NextGen enterprise. Transforming the NAS into a flexible, scalable, and time-based management system is the fundamental objective driving work needed to complete the NextGen research, infrastructure development and operational integration. The successful, ongoing rollout of NextGen is the result of rigorous portfolio, program and acquisition management partnered with stakeholder commitment and engagement. This program provides technical support for conducting proof of concept for new technology planned for implementation into the NAS. This will lead to the transformation of the national airspace system and provide benefits directly supporting the metric of maintaining average daily capacity.

K. In-Service Engineering

In-service engineering allows for immediate response and tactical distribution of resources to emerging technology solutions. Funding is requested for ongoing engineering support of all prototyping efforts.

What benefits will be provided to the American public through this request and why is this program necessary?

The projects that are funded under this program will ensure that the essential hardware and software components are in place and operational in order to accurately collect and report operational and safety data associated with air traffic operations. These projects will support management and oversight of implementation for new programs, assess metrics and operational parameters of new programs, and allow for alterations of programs based upon that data. These efforts will ensure the NAS remains the safest and most efficient ATC system in the world.

Detailed Justification for - **1A02 William J. Hughes Technical Center Laboratory Sustainment**

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
William J. Hughes Technical Center Facilities	$23,000	$21,000	$21,000	$20,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. William J. Hughes Technical Center Laboratories	---	$16,900.0
B. William J. Hughes Technical Center Laboratories – Flight Sustainment	---	3,100.0

What is this program and what does this funding level support?

This program sustains the William J. Hughes Technical Center Laboratories. This centralized set of laboratories is depended on to support the Acquisition Management System (AMS) lifecycle of programs/projects from Concept and Requirements Definition through In-Service Management. These laboratories are the only location where it is possible to realistically simulate the National Airspace System (NAS) and it is necessary to maintain the laboratory systems with capabilities that match field sites that currently exist or are planned for the future. These test beds can be altered to replicate desired field configurations and traffic scenarios providing stakeholders with an understanding of how upgraded systems will perform prior to operational deployment. These labs also provide a flexible high-fidelity environment to conduct research and perform Human-In-The-Loop (HITL) simulations that evaluate advanced air traffic concepts and are fully integrated with the other WJHTC capabilities. For FY 2020, $20.0 million is requested to support the following activities:

- **Laboratory Support Contracts:** Includes contract support services to sustain the operation of the laboratories including infrastructure engineering; technical services; laboratory networking; test and simulation services; laboratory maintenance; scheduling support for multi-user laboratories; and laboratory management.
- **Hardware/Software Licenses and Maintenance Agreements:** Over 55 annually renewed hardware and software licenses and maintenance agreements are required for the Laboratory equipment each year. Examples include Cisco maintenance; Lutron lighting maintenance; AutoCAD License and annual subscription services; Linux; Red Hat; etc.
- **Laboratory Space and Infrastructure Master Plan:** A long-term laboratory Master Plan will improve the overall function and efficiency of the facility. Phase 1 of this Plan consolidates essential Priority 1 (operational) systems into one ATO-compliant equipment space. Phase 2 provides for the full continuity of operations for these systems by constructing the required ATO-compliant priority 1 utility plant required for this operational equipment. The reconfiguration of space required for accomplishment of Phase 1 will free up room for new programs in the labs, such as expansion of the Unmanned Aircraft Systems (UAS) labs. Phase 3 Complete the design and initiate construction project of the space for the relocation and consolidation of the Cockpit Simulation Facility (CSF) and the Airway Facilities Tower Integration Lab (AFTIL).
- **Laboratory Equipment Technology Refresh:** Laboratory Equipment refresh addresses life-cycle replacement of NAS supporting equipment, so that equipment utilized in the laboratories is available for use and in proper operating order. Technology Refresh is required of the Laboratory Network Management and Laboratory Network Operations Center systems.
- **Land Leases, Miscellaneous Supplies and Parts:** Items include land leases for three radar sites, laboratory communications, laboratory cabling, general supplies, and diagnostic equipment.

- **Continued Improvements to Laboratory Systems and Infrastructure:** The FAA's centralized set of laboratories and infrastructure must be modified, upgraded, and reorganized as Facilities and Equipment (F&E) Programs and their supporting systems are delivered, installed, and eventually removed. The laboratory infrastructure encompasses over 210,000 square feet of laboratory space in the main buildings, along with numerous outlying buildings, and remote sites. Lifecycle replacement of infrastructure includes some of the on-going improvements such as transient voltage surge suppression (TVSS) upgrades; raised floor replacements; electrical distribution panel life-cycle replacements; power monitoring in electrical distribution panels; computer air conditioning (CAC) unit replacements; replacement of main lighting panels; and the computer room air conditioning (CRAC) monitoring system. Some improvement projects may be implemented because an opportunity exists that would generate short and long-term savings. For example, a new lab installation is an opportunity to repair raised flooring.
- **Flight Sustainment:** Maintain the day-to-day operations, support aircraft enhancements, and sustain flight test and evaluation capabilities of the Air Traffic Organization (ATO) Flight Program Operations Research, Development, Test, and Evaluation (RDT&E) support mission. Day-to-day flight program operations include pilot proficiency training, aircraft maintenance, parts, fuel, and other supplies required to maintain fleet readiness. Aircraft enhancements include acquisition of required capabilities, modifications to existing aircraft, and upgrades to aircraft and aircraft systems. Services provided support programs/projects with flight and ground testing, mission planning, safety analysis, aircraft modification; as well as design, certification, fabrication and installation. Flight test and evaluation support includes in-flight testing of Agency, ATO, and NextGen systems (e.g., Surveillance Broadcast System (SBS), System Wide Information Management (SWIM), and Aircraft Collision Avoidance System (ACAS)). ATO provides additional funding to supplement crewmember training/proficiency and aircraft maintenance flights.

What benefits will be provided to the American public through this request and why is this program necessary?

The American public benefits by having a world-class laboratory that is efficient, flexible, and provides a high fidelity platform to support research, development, testing, and evaluation of the NAS along with NextGen and the transition to NextGen. The goal of this program is to sustain and modernize the equipment and infrastructure necessary for FAA's centralized NAS laboratory facilities so that F&E programs can deliver products and capabilities that result in a safe, reliable, and efficient NAS. The WJHTC centralized laboratories eliminate the need for each acquisition program to establish and sustain separate laboratory facilities to support their individual programs and fielded systems. The capabilities developed in the laboratories will reduce the overall cost of NAS and NextGen development and will enhance the safety and efficiency of air travel.

This program is necessary to sustain the WJHTC Laboratory Facilities, which are also utilized for the operational support of NAS systems in the field. When problems are identified at field locations, the appropriate laboratory is utilized to recreate or simulate the problem; identify a solution; test the solution; and if necessary, develop a field modification that will be installed to correct the problem. Additionally, this program is necessary to maintain these laboratory systems in configurations and capabilities that match field sites that currently exist or are planned for the future.

Detailed Justification for - 1A03 William J. Hughes Technical Center Infrastructure Sustainment

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
William J. Hughes Technical Center Infrastructure Sustainment	$15,000	$15,000	$15,000	$15,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
William J. Hughes Technical Center (WJHTC) Infrastructure Sustainment	1	$15,000.0

What is this program and what does this funding level support?

For FY 2020, $15.0 million is requested to accomplish the following projects that promote sustainment of the FAA's infrastructure at the WJHTC:

- **Mold Remediation Program - Building 300 Equipment Replacements (AC-4 and AC-5)** construction required to replace Heating, Ventilation and Air Conditioning (HVAC) equipment in Building 300. Specifically, three air conditioning (AC) units, which are more than 35 years old and have exceeded the industry standard lifecycle. The new AC units will be environmentally friendly, reduce utility costs using modern, energy efficient equipment, and reduce maintenance expenses. Employees that reside in the affected areas will be temporarily relocated.
- **Site Electrical Distribution Upgrades and Repairs** design effort to replace site electrical distribution elements that are well beyond their useful lives. Some systems are already failing or are exhibiting symptoms of potential failure. The improvements to the Site Electrical Distribution will be environmentally friendly, reduce utility costs using modern, energy efficient equipment, and reduce maintenance expenses.
- **Water, Sanitary Sewer and Storm Water Improvements** design effort to replace Water, Sanitary Sewer and Storm water infrastructure systems at the WJHTC. Many of these systems date back as far as the 1940s are well beyond their industry standard lifecycle and are already failing or are exhibiting symptoms of potential failure. These improvements will be environmentally friendly, reduce utility costs using modern, energy efficient equipment, and reduce maintenance expenses.
- **Building 300 Security Dispatch Facility Improvements** design will focus on the useful reconfiguration of the workspace consoles, the relocation of security equipment racks, reconfiguration of the HVAC, upgrade to the electrical service to this space, and replacement of architectural finishes.
- **Mechanical Equipment Replacements at Advanced Automation System Building - Building 316** design effort to replace HVAC equipment and associated equipment in Building 316. This equipment has all exceeded their industry standard lifecycle of 25 years and maintenance has been difficult because some parts are no longer available. The new equipment will be designed to be environmentally friendly, reduce utility costs through the use of modern, energy efficient equipment, and reduce maintenance expenses.
- **Building 300 Cafeteria Refurbishments** design effort will focus on updating the cafeteria space configuration, architectural finishes, lighting, sound attenuation elements, flooring finishes and replacement of operational equipment. The existing equipment and architectural finishes have all exceeded their respective industry standard lifecycle of 25 years. Maintenance has been difficult because some parts are no longer available.
- **Building 300 Business Center** construction effort for the creation of a new Business Center will include the demolition of the existing office space partitions and file storage areas. The William J

Hughes Technical Center has seen an increasing demand for this type of space which is intended for field and visiting employees, who need a temporary quiet space to get their work accomplished in a useful and productive environment.

- **Mechanical Systems Replacements at Technical Support Facility - Building 305** construction effort to replace Heating, Ventilation and Air Conditioning (HVAC) equipment in Building 305. This equipment has all exceeded their respective industry standard lifecycle of 25 years and maintenance has been difficult because some parts are no longer available. The new equipment will be environmentally friendly, reduce utility costs using modern, energy efficient equipment, and reduce maintenance expenses.
- **Electrical Distribution Replacements at Water Treatment Plant - Building 208** construction effort will focus on the replacement of the incoming power distribution equipment is from the late 1960's and reached the end of its useful life. The original equipment manufacturer is no longer in business and parts for this system are no longer available, and leads to costly maintenance.
- **Program Support** provides project engineering design services, design reviews, and construction management/oversight for various engineering disciplines. This work includes, but is not limited to electrical, mechanical, and architectural engineering type projects in the Capital Investment Plan.

The FAA William J. Hughes Technical Center (WJHTC) owns and operates approximately 1.6 million square feet of test and evaluation, research and development, and administrative facilities, plus numerous project test sites. In addition, the WJHTC owns and operates a majority of the site infrastructure located on the 5,000+ acres of land, which includes utility distribution lines for electric, water, sanitary sewer and storm water as well as roadways, parking lots, curbing, sidewalks, fencing, gates and airfield ramp space. The current value of the buildings and infrastructure is in excess of $600 million. Accordingly, the infrastructure at the WJHTC requires an annual program of capital improvements and modernization. This program is the only available funding stream to sustain the 1.6 million square feet of space together with the required utility and roadway support systems.

What benefits will be provided to the American public through this request and why is this program necessary?

Infrastructure sustainment at the WJHTC saves taxpayer money by reducing expenses associated with ongoing operation and maintenance activities as well as reducing the frequency of expenses associated with system replacement. System updates reduce energy consumption, and cost, on a per-square-foot basis, thus supporting current Federal Energy Management requirements for sustainability and energy consumption. For example, CUP Chiller No. 1 was recently replaced under this program, and the new equipment has reduced energy, translating into a savings of approximately $200,000 over the past calendar year.

The WJHTC Infrastructure Sustainment Program is necessary as it provides and sustains a reliable environment (i.e. power, cooling, etc.) for numerous NAS and NextGen operational and support programs hosted at the Technical Center, some of which operate 24x7x365. In addition, this program provides site infrastructure support to other governmental agencies residing at the WJHTC. The WJHTC must keep the Central Utilities Plant, utility distribution systems, and the infrastructure supporting these entities in operating order. The WJHTC must also ensure compliance with International Building Codes, the National Fire Codes, the Americans with Disabilities Act (ADA) and current energy policies.

Detailed Justification for - 1A04 NextGen - Separation Management Portfolio

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Separation Management Portfolio	$13,500	$16,000	$16,000	$33,500

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. ADS-B In Applications – Flight Deck Interval Management Planning	---	$7,000.0
B. Wake Turbulence Re-Categorization	---	2,500.0
C. Separation Automation System Engineering	---	10,000.0
D. Closely Spaced Parallel Runway Operations	---	1,000.0
E. Integrated National Airspace Design and Procedures Planning (INDP)	---	3,000.0
F. Space Integration Enhancements 1	---	3,000.0
G. Unmanned Aircraft Systems (UAS) Upper Airspace	---	7,000.0

What is this program and what does this funding level support?

The Separation Management portfolio conducts pre-implementation activities to reduce risk, and implementation activities supporting the safe and efficient separation of aircraft and other vehicles in the National Airspace System (NAS). This portfolio evaluates and matures concepts and capabilities that focus on the enhancement of separation assurance through the use of both ground based automation and aircraft technology enhancements. This portfolio will identify improvements to runway access through the use of improved technology, updated standards, safety analysis, and modifications to air traffic monitoring tools and operating procedures that will enable more arrival and departure operations.

A. ADS-B In Applications – Flight Deck Interval Management Planning: ADS-B In Applications Advanced Interval Management (A-IM) consists of a set of ground and flight-deck capabilities and procedures that are used in combination by air traffic controllers (ATC) and flight crews to more efficiently and precisely manage spacing between aircraft. An air traffic controller can issue an Interval Management (IM) clearance that allows flight crews to manage spacing through speed adjustments generated by onboard IM avionics until reaching a planned termination point. New flight-deck functions implemented in Flight-deck Interval Management (FIM) avionics will provide speed guidance to a flight crew to achieve and maintain a relative spacing interval from another aircraft.

For FY 2020, $7.0 million is requested to:

- Complete the five-year avionics standards development effort for advanced interval management.
- Support the evaluation of ADS-B In applications to reduce implementation risk and support community acceptance of ADS-B In.
- Assess ADS-B In air/ground systems integration, which may include development of automation prototypes necessary to conduct human-in-the-loop assessments and provide greater definition and validation for ATC ground automation requirements.

B. Wake Turbulence Re-Categorization (RECAT): The RECAT program is focused on increasing the throughput capacity of airports and congested air corridors. Obtaining this increased throughput capacity requires wake mitigation separations to be tailored to both the weather occurring along the flight path and to the individual aircraft receiving the ATC wake mitigation separations. Terminal area solutions under development include the use of wake separations defined in terms of time intervals rather than distance.

Solutions to enable more en route throughput capacity are using aircraft observed wind along with National Weather Service forecast model information to allow aircraft to have wake separations less than the current five nautical mile minimum separation distance.

For FY 2020, $2.5 million is requested for the following:

- Develop parameters for use in en route wake risk mitigation decision support tools and through modeling develop safety assessment of wake risk mitigation guidance for en route controllers.
- Develop design description of the enhanced Terminal Wind Forecast to be used in determining the minimum time interval separation between aircraft

C. Separation Automation System Engineering (SASE): Separation Automation System Engineering (SASE) is a pre-implementation program that matures emerging NextGen Separation Management automation capabilities and develops automation enhancements for En Route, Terminal, and Oceanic domains to support planned NextGen operational improvements. Separation Management automation includes all ATC automation capabilities that assist controllers in maintaining safe aircraft separation while optimizing use of airspace system capacity. With Trajectory Based Operations, controllers provide separation assurance based on flight location and improved predictions of where and when the flight is expected to be in the future. Automation will synchronize a flight's trajectory using improved and consistent information, to result in better aircraft sequencing and fewer tactical maneuvers at these key points.

For FY 2020, $10.0 million is requested to complete remaining ERAM trajectory modeling and decision tool improvements necessary to support ERAM Enhancement 3 (EE3) potential content and to enable new TBO-related operational improvements. Potential EE3 capabilities include NextGen separation automation enhancements to:

- Support time-based management tools with separation advisories to resolve conflicts and maintain closed trajectories
- Enable local airspace activity by using automated information exchange; as well as, conflict detection and probe functions to manage and access unused special activity airspace
- Improve conflict detection and alert function accuracy to monitoring conformance on more closely-spaced PBN routes; increase PBN route utilization and enable new PBN procedures

In addition, new concept exploration and development activities are planned to evaluate new operational improvements and cross-domain interoperability.

D. Closely Spaced Parallel Runway Operations (CSPO): This program supports the simultaneous approach and departure procedure development for aircraft pairs at airports with parallel closely spaced runways (runways that are less than 4,300 feet apart). CSPO utilizes existing and emerging technology to increase arrival and departure rates to reduce traffic delays, and increase capacity during periods of instrument metrological conditions (IMC).

For FY 2020, $1.0 million is requested to execute modelling and simulation activities that support CSPO departure procedures using course deviation analysis, fast time simulations, hazard assessments, and the application of emerging NextGen technologies to regain runway throughput and increase predictability in the NAS.

E. Integrated National Airspace Design and Procedures (INDP): The INDP program integrates industry's priorities to improve efficiency by taking advantage of aircraft performance capabilities, Standard Terminal Arrivals and Optimum Profile Descents. INDP supports NAS-wide implementation of Performance Based Navigation (PBN) procedures with the initial focus on Established-on-Required Navigation Performance (RNP) (EoR) Instrument Approach Procedures (IAPs). This effort is aimed at investigating RNP, coupled with Area Navigation (RNAV), as a basis for enabling a new operational capability for simultaneous dependent operations and independent Dual, Triple, and Widely-spaced operations in the NAS for using both Track-to-Fix (TF) and Radius-to-Fix (RF) turns. RF turns are constant radius turns. RF is the most advanced navigation specification and therefore captures a minority of the fleet across the NAS. TF turns utilize a series of fixes with fly-by turns that are meant to emulate the smooth curved path of RF turns. TF requires a lower level of equipage, enabling more operators to equip their fleet with this capability. The program is focused on amending separation standards by leveraging the capabilities provided by modern day PBN-capable aircraft avionics with existing or modified ATC procedures, practices, and policies to increase operational efficiency while maintaining or potentially improving safety in the terminal airspace, in particular on final approach.

For FY 2020, $3.0 million is requested to:

- Conduct initial implementation of EoR scenarios at new launch sites to validate EoR operational concept
- Conduct a Multiple Airport Route Separation (MARS) assessment
- Develop modeling, safety analysis, and data collection plan for one new RNP approach scenario

F. Space Integration Enhancements 1: The objective of Space Integration Enhancements is to provide air traffic management with capabilities to support space operations integration into the NAS, while minimizing the effect of these operations on other NAS stakeholders. The FAA currently does not have the tools in place to efficiently meet the anticipated growth in space launch and reentry operations created by commercialization. This program will help meet this demand by defining capabilities to allow for easier integration of these vehicles into the NAS. As commercial space launch and reentry operations continue to increase in demand and frequency from new locations across the U.S., the FAA has devoted increasing attention to the manner in which these operations can be safely and efficiently accommodated within the airspace. For FY 2020, $3.0 million is requested to conduct investment analysis activities for capabilities that will enhance space launch and reentry operations in the NAS.

G. Class E Upper Airspace: This program will investigate future operations above FL600 and up to the Karman line (the unofficial boundary between the earth's atmosphere and outer space). While current Class E regulations are predicated on traditional airspace usage, increasing commercial interests and the advent of new technologies present new challengers for the diversified operations within this airspace. This program will analyze communications and surveillance requirements needed to integrate these types of operations such as geostationary, extreme velocity, and long duration. This includes developing requirements for a cooperative information network between users for separation and trajectory operations. Information requirements to support entry and exit operations to and from upper airspace from controlled airspace will be developed and international coordination (e.g. handoffs and connections) will be investigated.

For FY 2020, $7.0 million is requested for the following:

- Analyze traffic management requirements for Upper Class E Airspace
- Develop communication requirements between users and operators to support high altitude operations with shared separation responsibility
- Develop communication requirements for a cooperative network between users in high altitude airspace

What benefits will be provided to the American public through this request and why is this program necessary?

Separation Management Portfolio enhancements will provide controllers with tools and procedures to manage aircraft in a mixed environment of varying navigation equipment and wake performance capabilities. Separation management in the NAS can be accomplished procedurally and/or by using automation support. Through this request, procedures, orders and automation support capabilities will be enhanced, thus improving safety, increasing operational efficiency, and expanding current capabilities throughout the NAS.

Capabilities in this portfolio will support an increase in capacity by increasing airport throughput as a result of closer spacing of flights accepted from TRACON airspace and managed on final approach. This portfolio will provide improved efficiency through the introduction of capabilities that will enable more oceanic flights to ascend and descend to their preferred altitudes. This portfolio will provide controllers automated information about wake vortex separation requirements for any given aircraft pair, along with accurate wind data which will help predict more accurate and safer separation standards.

Detailed Justification for - 1A05 NextGen – Traffic Flow Management (TFM) Portfolio

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Traffic Flow Management Portfolio	$10,800	$17,000	$14,000	$27,500

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks		Locations/ Quantity	Estimated Cost ($000)
A.	Surface Tactical Flow (STF)	---	$3,000.0
B.	Strategic Flow Management Application (SFMA)	---	4,000.0
C.	Strategic Flow Management Engineering Enhancement (SFMEE)	---	2,000.0
D.	Advanced Methods	---	2,000.0
E.	Time Based Flow Management Enhancement 3	---	4,500.0
F.	Initial Trajectory Based Operation (TBO) Implementation	---	12,000.0

What is this program and what does this funding level support?

The TFM portfolio involves NAS operators and FAA traffic managers, along with advanced automation, in managing daily flight and flow decision-making, airspace and airport capability issues, such as special activity airspace and weather to improve overall efficiency of the National Airspace System (NAS). TFM provides greater flexibility to the flight planners, and makes the best use of available airspace and airport capacity.

A. Surface Tactical Flow (STF): STF provides guidelines for the development of a collaborative Surface Traffic Management (STM) system with tools necessary to achieve a fully collaborative surface environment, where airline, airport and air traffic controller input are all used to provide a shared surface situational awareness. In collaboration with National Aeronautics and Space Administration (NASA's) Airspace Technology Demonstration-2 (ATD-2), these efforts will produce new improvements that will increase Terminal Flight Data Manager (TFDM), Traffic Flow Management System (TFMS), and Time Based Flow Management (TBFM) connectivity and integration. STF will collaborate with NASA ATD-2 as a means of risk reduction of TBFM, TFMS, and TFDM Integration and as an option for the NextGen Integration Working Group (NIWG) commitment to Congress to conduct a Departure Management (DM) demonstration.

For FY 2020, $3.0 million will support activities that include:

- Complete a migration plan from ATD-2 demonstrations to TFDM Build 2 Initial Operating Capability (IOC) at Charlotte
- Document expected roles and responsibilities for Electronic Flight Bag (EFB) service providers to enable exchange of data between EFB applications and the NAS for departure scheduling

B. Strategic Flow Management Application (SFMA): This program will identify remaining operational shortfalls and gaps for rerouting of flights after the implementation of Airborne Reroute Automation, Collaborative Trajectory Options Program, and Data Communications in the timeframe between 2018 and 2020. SFMA will provide traffic managers and controllers with automated capabilities and integrated tools for flight-specific trajectory modifications and will address a wide range of input factors, including weather impact and metering time assignment. In addition, SFMA will mitigate TFM shortfalls and help with integration of TFMS and TBFM, support of NASA's ATD-3 technology transfer, trajectory modification capabilities to support TBO, weather impacted sector capacity prediction (CP), and TFM system performance analysis capability (TFM-PAC). For FY 2020, $4.0 million will support investigation and analysis of the remaining shortfalls in TFM, and develop concepts to mitigate them.

C. Strategic Flow Management Engineering Enhancements (SFMEE): SFMEE is a multi-year project that will support future work for TFMS enhancements. The individual work components support future Collaborative Air Traffic Management Technology (CATMT) work. The concept engineering work for the individual capabilities that comprise the future work will be conducted primarily through the SFMA and Advanced Methods (AM) programs. This project will be responsible for using the capability-level concept engineering artifacts developed in SFMA and AM to develop the full suite of future CATM work package Acquisition Management System (AMS) artifacts that will ultimately support a Final Investment Decision (FID). For FY 2020, $2,000,000 is requested to develop documents in support of acquisition decisions for future TFMS investments.

D. Advanced Methods: Advanced Methods will explore technologies, infrastructure enhancements, and procedural changes to meet current and future traffic management needs. This program will support improvements to increase airport capacity, sector throughput, and reduce sector delays through the use of emerging technologies. The program will develop and test prototype capabilities and provide operational concepts and requirements. Advanced Methods will explore the use of advanced coordination and data storage solutions to drive post operational analysis of Traffic Management coordination.

For FY 2020, $2.0 million is required to continue execution of work within the TFM - Advanced Methods program. The FY 2020 work will continue concept engineering in the areas of Traffic Flow Management (TFM) Advanced Coordination Analysis Capability and Advanced coordination capability for TFM recording and logging. Concept engineering activities in these project areas will result in capabilities and associated artifacts that inform the generation of prototypes and activities in later years.

Specifically, FY 2020 will result in:

- Completion of recommendations report detailing coordination logging lessons learned and recommendations to other Lines of Business.
- Feasibility assessment for an advanced automation learning/data mining capability that utilizes historical and real-time data.
- Engineering analysis on the sources and usage of multiple data sources available for advanced processing and storage.

E. Time Based Flow Management Enhancement 3 (TBFM E3): This project will build off previous TBFM enhancements to provide a new capability to enable continued metering operations. This enhancement will integrate a candidate set of tools from NASA's Airspace Technology Demonstration-3 (ATD-3) into TBFM to assist traffic managers in identifying optimum trajectory rerouting to maintain metering operations. This project will support system integration of TBFM and TFMS with the emphasis on enterprise flight management integration into TBFM.

For FY 2020, $4.5 million is requested for the following:

- Complete operational suitability assessment of NASA ATD-3 capabilities with existing Time Based Metering Capabilities
- Initiate technical analysis for improved TBFM - TFMS data integration
- Initiate Investment Analysis Documentation for TBFM Enhancement 3

F. Initial Trajectory-Based Operations (iTBO) is an Air Traffic Management (ATM) method for strategically planning, managing, and optimizing flights throughout the operation by using time-based management, information exchange between air and ground systems, and the aircraft's ability to fly precise paths in time and space. Initial TBO (iTBO) is the first step in implementing TBO and is enabled by a number of Performance-Based Navigation (PBN), surveillance, communications, and automation systems that together enable the creation of a four dimensional trajectory. Subsequent steps to fully realize TBO include Full TBO and Dynamic TBO, as defined in the TBO Vision document.

The implementation strategy for iTBO is focused on delivering the core NextGen capabilities to support trajectory based operations in the NAS. This program will provide the necessary overarching management activities to ensure that facilities receive the right capabilities, in the right sequence, and at the right time, consistent with the NextGen vision. In particular, the program will synchronize the deployment of the various iTBO elements such as en route metering, terminal metering, surface metering, PBN, etc., develop location-specific evolution plans, build an iTBO sustainment strategy, execute risk management activities, conduct risk reduction activities, conduct metrics gathering to support quantification of operational change, and employ other management activities such as stakeholder management, communications activities, status reporting, etc. This program will manage the "iTBO layer" amongst NextGen capabilities that support Initial Trajectory Based Operations to ensure the effective integration of them collectively.

Additionally, enhanced Air Traffic Services will be established in a pilot program at a location to be determined, within the Eastern and Central Regions. This pilot program will provide air traffic control services on a preferential basis to aircraft equipped with certain NextGen avionics. Analysis and finding resulting from the pilot program will be documented in a report to appropriate committees.

This program includes the Northeast Corridor (NEC) initiative, as the NEC is one of the Operating Areas within iTBO.

For FY 2020, $12.0 million is requested for:

- Program management – initialization of iTBO execution, overarching management of implementation strategy, location specific evolution plans, sustainment strategy, stakeholder management analyses, communication plans, reporting products
- Risk Management planning and execution
- Risk reduction activities, to include interoperability testing
- Change management analysis, planning and execution
- Data and metrics gathering to support quantification of operational changes
- Initiation of pilot program for enhanced air traffic services

What benefits will be provided to the American public through this request and why is this program necessary?

The TFM portfolio researches and implements capabilities that are expected to improve both the efficiency of individual flights and optimization of throughput. This work will make travel safer for the traveling public, help reduce passenger delays leading to a better traveling experience, and contribute to less pollution as the result of improved prediction performance for TFM decision support systems. These support systems include and flexibility to avoid airspace constraints, better predict capacity demands and ensure efficient utilization of NAS capacity.

The TFM portfolio supports the average daily airport capacity metric by providing more efficient use of system capacity through maximizing airspace and airport throughput using time-based management. It also provides improved operational predictability through more accurate and efficient end-to-end strategic planning and scheduling. Enhanced flight efficiency is achieved by delivering more efficient flows into and out of major metropolitan areas through integrated operations. Finally, increased operational flexibility is provided through increased user collaboration regarding preferred trajectories and priorities to support business objectives.

Detailed Justification for - 1A06 NextGen – On Demand NAS Portfolio

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
On Demand NAS Portfolio	$12,000	$28,500	$21,000	$10,500

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Flight Objects	---	$2,500.0
B. Common Status and Structural Data (CSSD)	---	3,000.0
C. Dynamic Airspace (DA)	---	2,000.0
D. Flight Deck Collaborative Decision Making (FD CDM)	---	3,000.0

What is this program and what does this funding level support?

The On Demand National Airspace System (NAS) Information (ODNI) portfolio conducts pre-implementation work to reduce risk in supporting the efficient and secure exchange of information within the FAA and between the FAA and other NAS users. This portfolio provides flight planners, Air Navigation Service Providers (ANSP) staff, and flight crews with consistent, complete, and easily processed information on changes of conditions in the NAS. The ODNI portfolio examines concepts and matures capabilities through validation activities, demonstrations conducted with stakeholders, and human systems engineering to mitigate adverse impacts to the NAS.

A. Flight Objects

The Flight Object program will define the mechanisms for capturing and sharing the most up-to-date information on any flight. Additionally, the program will develop a single common reference for all system information about a flight, and will seek to eliminate exchange of flight information that is redundant or inconsistently defined. The standards for flight information definitions must align with emerging International Civil Aviation Organization (ICAO) standards such as Flight and Flow-Integrated Collaborative Environment (FF-ICE). The Flight Information Exchange Model (FIXM) standard will be the basis for that information exchange. FIXM additionally supports new entrants and vehicles through efforts to standardize flight data exchange for UAS and commercial space. For FY 2020, $2.0 million is requested to develop the FIXM Standard and engineering analysis on initial Flight Object requirements and applications.

B. Common Status and Structure Data

The Common Status and Structure Data (CSSD) program will establish the requirements and information flows for the collection, management, and maintenance of Aeronautical Information (AI) in a digital format for machine-to-machine exchange. The common data and information services and integration activities enable improved flight planning and pilot briefing services, increased on-demand NAS operational performance information and better airspace management using timely schedule information and a common awareness of Special Activity Airspace (SAA) status across the NAS.

For FY 2020, $3 million is requested to fund work that focuses on the development of requirements for machine-to-machine information exchange using standardized formats for aeronautical information. This program will work toward enhancing the Aeronautical Information eXchange Model (AIXM), which is the internationally accepted standard for describing aeronautical information. FY 2020 requested funding will be used for concept exploration and requirements development, shortfall analysis, gap analysis of current capabilities versus candidate capabilities for consideration, and a concept readiness decision plan.

C. Dynamic Airspace (DA)

DA will provide the necessary research and analysis for a toolset that allows dynamic reconfiguration of existing NAS automation infrastructure to meet changing demand and capacity needs. The capabilities associated with DA include the remapping of NAS automation (including information access such as flight data and aeronautical information, and associated adaptations), communication, navigation, and surveillance infrastructure assets to support implementation of airspace configurations. To support the development of these capabilities, additional research and analysis will be conducted to evaluate other aspects of airspace reallocation, such as flexible airspace definition and dynamic sectorization.

For FY 2020, $2.0 million is requested to complete the following products in support of the Dynamic Airspace functional requirements development:

- Finalize development of Dynamic Airspace prototype
- Human-In-The-Loop-Simulations (HITLS) to test DA prototype
- Stakeholder coordination and engagement
- Begin final functional requirements development for necessary automation and communication systems

D. Flight Deck Collaborative Decision Making

The Flight Deck Collaborative Decision Making (CDM) program addresses the disparities in the implementation of flight deck automation advancements to support flight crew and air traffic management decision-making in a collaborative environment. The program will research and implement initial applications, standards, and advanced services for data provided by the FAA to support future NAS operations and collaborative decision-making. This program will determine the initial NAS and System Wide Information Management (SWIM) services to be exchanged with the flight deck. It will support the flight crew decision-making by providing Electronic Flight Bag (EFB) applications and the corresponding air traffic management enhancements, that will enable future capabilities such as taxi instructions compliance and surface movement monitoring by air traffic control and the flight crew. Leveraging research conducted in previous years and advancements in SWIM and ground automation systems, the Flight Deck CDM program will develop, standardize, certify, approve and implement flight deck applications that enable enhanced participation by the flight crew in the collaborative decision-making process.

For FY 2020, $3.0 million is requested to support Flight Deck CDM, which will be used for the following activities.

- Develop initial concept and requirements document.
- Conduct functional analysis for Flight Deck CDM applications to support surface movement applications.
- Evaluate airport surface Data Link network capabilities and requirements.
- Develop prototype environment and architecture to display system functionalities for surface movement applications.

What benefits will be provided to the American public through this request and why is this program necessary?

This portfolio will improve efficiency, minimize delays, and will provide benefits to the American Public in the areas of safety, capacity and efficiency, and cost avoidance.

Detailed Justification for - 1A07 NextGen – NAS Infrastructure Portfolio

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
NAS Infrastructure Portfolio	$17,500	$22,500	$20,000	$17,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Weather Forecast Improvements	---	$5,000.0
B. NextGen Navigation Engineering	---	1,000.0
C. New Air Traffic Management (ATM) Requirements	---	9,000.0
D. Information Management	---	2,000.0

What is this program and what does this funding level support?

The National Airspace System (NAS) Infrastructure portfolio conducts pre-implementation activities to reduce risk for aviation weather-related and cross-cutting engineering issues. This portfolio provides the research, development, and analysis of validation activities, human system engineering, and demonstrations. Work in this portfolio addresses aviation weather-related issues by supporting the improvement of the following:

- Air Traffic Management (ATM) decision-making during adverse weather conditions
- Weather forecasting in the transformed NAS
- Existing weather infrastructure, NextGen Navigation Engineering, New ATM Requirements, and Information Management conduct analysis to develop solutions that can apply across the NAS domain

A. Weather Forecast Improvements

The Weather Forecast Improvements (WFI) program seeks to improve weather predictions and determine how to improve the use of that information. Currently, there is minimal automation available to assist with identifying, analyzing, and translating raw weather data into NAS constraints. This program will improve the decision process and the accuracy of aviation weather information to include an automated translation of weather information into constraints placed on the NAS. WFI will improve aviation weather forecasting models with the goal of determining and reducing weather's effects on air traffic. The program also develops the necessary policies and guidance for for the provision of aviation weather services under U.S. commitments to the International Civil Aviation Organization (ICAO).

For FY 2020, $5.0 million is requested to fund concept requirements definition and investment analysis work for NextGen Weather Processor (NWP) and Common Support Services – Weather (CSS-Wx) Future Work Packages. Additionally, work includes conducting International coordination activities on aviation weather.

B. NextGen Navigation Engineering

The NextGen Navigation Engineering program supports the NextGen goal to increase NAS efficiency, capacity, and access to the NAS through innovation. NextGen Navigation Engineering conducts pre-implementation activities to explore navigation needs, and to identify and develop concepts to address these needs. NextGen Navigation Engineering will focus on activities such as exploring navigation services for

Class E airspace above Flight Level (FL) 600. Many potential applications for various operations are being developed by industry for use in this airspace, such as weather monitors, internet signal repeaters, pseudo-stationary Unmanned Aircraft Systems, pseudo space vehicles, hypersonic vehicles, etc.

For FY 2020, $1.0 million is requested to fund the NextGen Navigation Engineering (NNE) to identify reporting parameters such as intent and/or position for the performance envelope of users of upper Class E airspace. Additionally, NNE will develop minimum reporting requirements for the users in upper Class E airspace.

C. New Air Traffic Management (ATM) Requirements

This program identifies new opportunities to improve the efficiency and effectiveness of air traffic management operations. In FY 2020, New ATM Requirements will continue activities in support of Enterprise Information Protocol and Exchange Standards, Future Collision Avoidance Systems (CAS), Weather Transition, Synchronization of Air/Ground Procedures, Advanced Air/Ground Procedures, Command and Control in a Cloud Environment, Command Displays that are Commercial Off-the-Shelf (COTS), and Next Generation Input Devices. For FY 2020, $9.0 million will support requirements that include:

- Enterprise Information Protocol and Exchange Standards final guidance material for the implementation of information service governance, artifacts to support ICAO Information Management Panel, and a gap assessment between FAA information services governance and ICAO Standards And Recommended Practices (SARPs)
- Develop interoperability assessment and updates to Future Collision Avoidance System (Future CAS) for rotorcraft
- Indentify emerging weather requirements needs and gaps in support of in-winter weather information
- Develop final Security and other air/ground standards to support future operations
- Complete final Security standards development for future Aeronautical Telecommunication Networks/Internet Protocol Systems (ATN/IPS) Air-Ground Communication Systems
- Identify and evaluate NAS Systems potentially suitable for command and control in a cloud environment

D. Information Management

Information Management (IM) is performing engineering analysis on the information infrastructure to address future requirements for System Wide Information Management (SWIM) services in the cloud. IM will merge the information sharing needs with additional requirements from upcoming NextGen initiatives. The research initiated within the IM program will identify gaps, business needs, alternatives, and tradeoffs that exist in the transition from the current state of SWIM towards defining the functional requirements to support further information sharing with NAS systems and users. Research will also assess factors related to information sharing in the cloud such as security, performance requirements, and an increasing number of various types of FAA information users. For FY 2020, $2.0 million is requested to validate the functional requirements by executing the Proof-of-Concept plan, perform analysis for global exchange of information for Enterprise Services Infrastructure, and develop investment analysis documentation for the next SWIM package.

What benefits will be provided to the American public through this request and why is this program necessary?

The work under the NAS Infrastructure portfolio supports the NextGen goals of improved capacity, efficiency, and safety though its cross-cutting development programs. Through improved weather forecast timeliness and accuracy, WFI will optimize the usage of available airspace. The navigation capabilities developed under NNE will enhance NAS capacity and efficiency. New ATM Requirements' span multiple areas including communications, information management, and weather. The benefits delivered by these efforts support operational improvements that will increase the number of arrivals and departures at major airports. IM will improve the use of enterprise wide data and information management for data analysis purposes while also minimizing costs by providing an enterprise solution for the collection, storage and analysis of operational data for post-operational use. This program will also provide the American public greater access to desired data housed within the FAA.

Detailed Justification for - 1A08 NextGen Support Portfolio

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
NextGen Support Portfolio	$12,000	$12,800	$12,800	$13,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
NextGen Laboratories	Various	$13,000.0

What is this program and what does this funding level support?

The NextGen Support Portfolio provides the National Airspace System (NAS) laboratory environments required to evaluate, mature, and validate the broad framework of NextGen concepts, technologies, operational functions, and systems before they are introduced into the operational NAS environment. This program provides the evaluation platforms at the NextGen Integration and Evaluation Capability (NIEC) and Florida NextGen Test Bed (FTB). These labs facilitate the conduct of NextGen concept demonstrations using research NAS environments without affecting actual NAS operations.

Enterprise Operational Analysis – Performance (EOA-P) supports the transition to NextGen by developing a NAS implementation plan that support a comprehensive evaluation of fielded capabilities and reporting of post-implementation performance information. These activities also support NextGen benefits modeling and cost-benefit data collection.

For FY 2020, $13.0 million is requested to continue execution of work within the NextGen Support Portfolio and provide for enhancements to the NIEC and the FTB, and for EOA-P activities. New capabilities will be introduced to support emerging NextGen operational improvements related to Collaborative Air Traffic Management, Seamless Integration of Information, Integration of Unmanned Aircraft Systems (UAS), Commercial Space Operations, and Trajectory-Based Operations (TBO).

NextGen Integration and Evaluation Capability (NIEC) Laboratory and Florida NextGen Test Bed (FTB):

The NIEC is a NextGen integration and evaluation facility located at the William J. Hughes Technical Center (WJHTC) in Atlantic City, New Jersey. The NIEC provides a real-time, NextGen-capable environment that allows for concept development and validation, integration and operations analysis capabilities through Human-in-the-Loop simulation testing and data analysis capability. NextGen systems and procedures will be developed and integrated into the NIEC to support studies that measure and validate concept feasibility, human performance, usability, changes in workload, and safety. The program will include the development and validation of prototypes and analysis capabilities to support the definition of NextGen requirements while researching possible solutions to challenges posed by the integration of NextGen technologies.

The FTB is located at the Daytona Beach International Airport (DAB) in Florida and provides a platform where early stage NextGen concepts can be integrated, demonstrated, and evaluated. The FTB core infrastructure is architected and configured to enable remote connections with other FAA NextGen and industry partner sites to allow for multi-site demonstration capabilities. Through appropriate governance and oversight, the FTB provides the ability for industry to bring and integrate new concepts and technologies; maintain and sustain their systems at the FTB; and conduct ongoing activities.

For FY 2020, $8,200,000 is requested for the operations of the laboratories as well as the provision and modification of necessary licenses, maintenance agreements, and equipment of the laboratories.

Enterprise Operational Analysis (EOA):

For FY 2020, $4.8 million is requested for EOA to support NextGen implementation by performing work in three areas: Systems Analysis, NextGen Performance Snapshots (NPS), and Analyses Supporting NAS Lifecycle Strategic Planning (ASNP). The System Analysis component will focus on analyzing the operational impacts of fielded NextGen capabilities, including Trajectory based Operations (TBO) and NextGen Advisory Committee (NAC) requested analyses conducted jointly with the industry. The NPS website will track and report performance progress at specific locations where NextGen programs have been implemented as well as reporting the NextGen priorities. This project will also ensure the NSIP is updated to identify and manage incremental improvements necessary to develop, integrate, and implement NextGen capabilities and NAS current operations. EOA has completed assessments of Wake Re-categorization, Metroplex, Optimized Profile Descents, and Established on Required Navigational Performance. Future assessments are expected for Data Communications, Terminal Flight Data Manager, and Time Based Flow Management.

What benefits will be provided to the American public through this request and why is this program necessary?

The American public benefits by having an efficient and flexible platform to evaluate future NextGen concepts and technologies that will enhance the safety and efficiency of air travel. The laboratory environments provided by this program are necessary for Air Traffic Management (ATM) enhancements to be assessed at an early stage before implementation decisions or significant investments are made, allowing time to adjust the concepts or technologies, expediting their implementation in the National Airspace System (NAS), and reducing overall risk and cost to the taxpayer.

Detailed Justification for - 1A09 NextGen – Unmanned Aircraft Systems (UAS)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Unmanned Aircraft Systems (UAS)	$25,000	$25,000	$25,000	$68,400

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. UAS Concept Validation and Requirements Development	---	$14,000.0
B. UAS Flight Information Management	---	48,400.0
C. Urban Air Mobility	---	6,000.0

What is this program and what does this funding level support?

These projects will allow integration of UAS operations into the NAS without impact to manned aircraft operations or creating disruptions or delays. They will also ensure that NAS operations will continue to remain as safe as they are today.

A. UAS Concept Validation and Requirements Development:

This project will identify the requirements for FAA automation and other support systems to integrate UAS (predominantly larger UAS) into the NAS. It will continue identifying and maturing UAS needs as they relate to air traffic systems and services, and refining operational requirements associated with Air Traffic Management (ATM) automation, airspace management, policies, and procedures. Work under this project will primarily enable non-segregated UAS operations, and will support aspects of expanded UAS operations expected in the mid-term timeframe. Work under this project will ensure operational implications of UAS are well understood and necessary infrastructure changes are implemented in a timely manner to support Air Traffic Management (ATM) automation enhancements.

For FY 2020, $14.0 million is requested to complete an update of existing UAS concept maturation products (UAS Concept Maturation Plan, UAS Shortfalls, and Operational Requirements) and complete development of Investment Analysis (IA) artifacts for "UAS Phase 1" investment. In addition, the program will execute verification activities on UAS systems, information, data, and architecture (i.e. system operational evaluations, system simulations, storyboarding, Human in the Loop Studies, etc) and to identify NAS systems that may require augmentation to support emerging UAS capabilities.

B. UAS Flight Information Management (FIM):

In accordance with FAA Reauthorization Act of 2018, this project will develop a proposed Unmanned Traffic Management (UTM) system, which is a separate, but complementary system to the Air Traffic Management (ATM) system. The program establishes the concepts, use cases, and requirements associated with UTM/Flight Information Management System (FIM) to manage safely, UAS operations primarily through operator-operator and operator-FAA sharing of flight intent and airspace constraints. FIM will support the increasing pace of UAS access to airspace and will eliminate the need for waivered operations that are considered on a case-by-case basis. This will establish the necessary infrastructure, requirements, cybersecurity framework, and implementation plan to support the integration of UAS operations in a UTM environment. This program will also continue ongoing standards development work to expand collision avoidance research to develop requirements for a new user class (i.e., UAS) in the UTM environment to ensure future systems are interoperable within the National Air Space (NAS).

This program will examine the application of UTM airspace management for various levels of the NAS and other applicable operations. This program will improve the quality of data for UTM service providers by utilizing artificial intelligence/machine learning and data mining. This program will also examine varying performance and technology solutions in mixed environments for UAS integration into the NAS. This program will build on past Remote ID work to allow the evaluation of identifying and tracking cooperative and non-cooperative vehicles.

For FY 2020, $48.4 million will support work that includes:

- Develop Remote ID and tracking Concept of Operations, Concept Analysis Report, Scenarios Validation Report, and Operational Evaluation Plan; in addition explore emerging technologies and initial lessons learned
- Develop a final Concept of Operations for UTM applications; and continue maintaining UTM stakeholder engagement.
- For Urban Operations; Update the UTM Data Exchange Requirements, Perform comprehensive analysis of data exchange protocol and information sharing (intent, approval status, operational restraints, data specific to a vehicle or operation), and Update UTM System Prototype
- For Expanded Operations; Complete Reference Implementation
- For Heterogeneous Traffic Operations; Complete Operational Evaluation Final Report and System/Subsystem Specifications
- Airborne Collision Avoidance System – small Xu (ACAS sXu) will complete Initial ACAS sXu Standards Position Whitepaper; complete an Operational Analysis Report for Integration of ACAS sXu and UTM; and complete Version 2 of ACAS sXu System Logic and Prototype.
- Analyze Artificial intelligence/machine learning and data mining to support smart collection and dissemination of data to the applicable UTM service providers.
- Evaluate Cybersecurity for UAS network which looks at certificates, authentication, ensuring data integrity, etc.

C. Urban Air Mobility:

This project will develop requirements and use cases to allow the safe integration of Urban Air Mobility operations into the NAS. The rapid development of technology has introduced new entrants with the potential to provide transportation services to users within urban environments. Urban Air Vehicles may need to operate within both the UTM and ATM environments, requiring information exchange models between other occupants of the airspace. This program will identify applications for Urban Air Mobility. Urban environments lack traditional ATC surveillance systems and pose unique separation challenges. Communications, navigation, and surveillance requirements necessary for operations in low altitude environments and Class E/G airspace will be investigated. This program will analyze airspace for Urban Air Mobility operations including potential special purpose corridors.

For FY 2020, $6.0 million is requested for the following:

- Analyze operations within ATM, UTM, and mixed environment
- Develop requirements and exchanges models for Urban Air Vehicles operating in UTM environments including operational performance requirements on the information
- Conduct Airspace analysis including examining special purpose corridors

What benefits will be provided to the American public through this request and why is this program necessary?

The UAS programs play a critical role in enabling UAS operations in the NAS without impacting manned aircraft operations and creating disruptions or delays, and ensuring NAS operations will be as safe as or safer than they are today. Government cost of allowing UAS operations will decrease due to the reduction of "exception handling" of UAS flights, and improvements to NAS capabilities and operations will be made cost effectively due to the integrated framework approach to addressing needs and solutions.

Detailed Justification for - 1A10 NextGen – Enterprise, Concept Development, Human Factors, and Demonstrations Portfolio

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Enterprise, Concept Development, Human Factors, and Demonstrations Portfolio	$9,000	$19,500	$16,500	$32,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Enterprise Concept Development	---	$1,500.0
B. Enterprise Human Factor Development	---	1,500.0
C. Stakeholder Demonstrations	---	29,000.0

What is this program and what does this funding level support?

For FY 2020, $32.0 million is requested to conduct three enterprise level activities to support NextGen concepts related to trajectory based operations (TBO) and new entrants such as commercial space operations and unmanned aircraft/vehicle systems.

A. Enterprise Concept Development

As the NAS and global Air Traffic Management continue to evolve to Trajectory-Based Operations (TBO), precise trajectories will require accurate monitoring capability to maintain or increase available airspace capacity and efficiency while maintaining safety. The Enterprise Concept Development program is used to identify early NextGen concepts and maturation activities that will transform the National Airspace System (NAS) into the Next Generation of the NAS. Areas of interest include but are not limited to new entrants, trajectory-based coordination, and performance optimization during all phases of flight (e.g. Unmanned Aircraft Systems (UAS) Urban Air Mobility (UAM) and TBO). When appropriate, concept activities will be considered from a global perspective including ICAO requirements for global aircraft tracking and network communication.

For FY 2020, $1.5 million is requested to support concept development and validation activities, research, concept engineering, concept analysis, demonstrations and evaluations exploring concepts related to trajectory based operations.

B. Enterprise Human Factor Development

The Human Factor Development program provides proactive guidance on human performance considerations to concept development and validation teams. The identification of potential human performance issues at the concept development and validation stages is essential to the usability, acceptability, and safety of NextGen concepts and systems. This work will be conducted in close collaboration with teams to ensure any human factors risks and issues are documented and mitigated early in the concept design and validation process. Human factors activities are needed during concept development and validation stages to ensure concepts do not mature without appropriate human performance guidance. This work will result in fielded capabilities that are not underutilized by controllers.

For FY 2020, $1.5 million is requested to identify human factors considerations of NextGen concepts (e.g., Time, Speed, and Spacing; managing automation trust; human factors considerations for transitioning to Trajectory Based Operations).

C. Stakeholder Demonstrations

The Stakeholder Demonstration program provides practical application and analysis of proposed NextGen system improvements to validate and prove concept feasibility and to determine which initiatives might be accelerated through fast track modeling. These demonstrations utilize collaboration with users, operators, and other partners early on in the modeling process before capabilities are fully incorporated. Furthermore, demonstrations collect and provide data to support business case and investment decisions tied to the decision points in the NAS architecture. These demonstrations promote industry involvement and attain community buy in, while supporting global harmonization across NextGen. Rigorous demonstrations ensure the integration and interoperability of systems and reveal the need for rulemaking, policy changes, and training.

The program generally supports multiple events per year, with demonstration projects normally lasting anywhere from 24 to 30 months. Project objectives are laid out with clear target decision points in order to identify entry and exit criteria. When a demonstration is completed, the results are assessed to determine whether to proceed into the requirements definition phase.

For FY 2020, $29.0 million is requested to conduct multiple demonstrations to show how to reduce air traffic delays due to more efficient metering and spacing, increased capacity of the airspace, more efficient traffic flow management, and integrated arrival/departure routes (e.g. Class E Upper Airspace Traffic Management TBO, Innovative Airports, and Remote Towers). Activities will be considered from a global perspective when applicable for the International Civil Aviation Organization update of the procedures for Air Navigation Services Traffic Management.

What benefits will be provided to the American public through this request and why is this program necessary?

The Enterprise Portfolio will promote safety and efficiency and reduce air traffic delays:

- Concepts will be assessed to identify research issues; evaluate benefits; reduce aircraft reroute around the hazard area; develop preliminary operational requirements, data sharing and collaboration, and procedures to enhance safety; increase operational efficiency and airspace capacity; and expand current capabilities throughout the NAS.
- Human factors efforts will assess the intersection of tools and procedures' influence on the end users, and the end-users ability to perform their job. The program will evaluate human performance in the operational environment to ensure the delivery of benefits for the overall integrated system, and provide insight across domains and programs to avoid implementation and integration issues.
- Demonstration activities will show how to reduce air traffic delays due to more efficient metering and spacing, increased capacity of the airspace, more efficient traffic flow management, and integrated arrival/departure routes. These activities will identify key implementation issues, assist the FAA in developing its operational improvement plans to meet NextGen goals and objectives, and assist with implementing initiatives.

Detailed Justification for - 2A01 En Route Automation Modernization (ERAM) System Enhancements and Technology Refresh

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
ERAM System Enhancements and Technology Refresh	$91,650	$126,050	$115,250	$105,950

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. ERAM Sustainment 2	---	$29,500.0
B. ERAM Sustainment 3	---	46,000.0
C. ERAM Enhancements 2	---	30,100.0
D. Independent Operational Assessment (IOA)	---	350.0

What is this program and what does this funding level support?

A. ERAM Sustainment 2

The core ERAM system became operational at all 20 CONUS ARTCCs at the end of the second quarter of FY 2015. The original hardware was procured in the 2006-2008 timeframe. The ERAM Sustainment 2 Project is needed to sustain the system. The equipment is in critical need of technology refresh for the service sustainment of ERAM systems.

ERAM Sustainment 2 is the second step in the planned technology refresh update to the ERAM program. This step in refreshing ERAM technology will focus on the following: refreshing existing analog Radar position display with a new digital display, refreshing Radar position keyboard/video/mouse (KVM) switch, refreshing the IBM Power PC/RISC based processor with x86 based processor for both the tactical (Radar display) and strategic (Data entry) controller positions, deployment of Linux Open Source operating system (O/S) on the x86 based processors, refreshing the display graphics adaptor for displays, refreshing the display capture recording, and playback technology, and adding servers to existing backroom server farm to handle emerging increased demand for capacity. The FY 2020 funding will be required to complete the deployment of the new hardware solution to the remaining 17 ARTCCs.

For FY 2020, $29.5 million is requested for ERAM Sustainment 2 and this funding will be used to complete deployment of technology refresh hardware at 17 of 20 ARTCCs after In Service Decision (ISD)

B. ERAM Sustainment 3

ERAM Sustainment 3 is the third step in the planned technology refresh update to the ERAM equipment sustainment program. The Sustainment 3 program is targeted to start in FY 2019 and Final Investment Decision (FID) is planned for CY 2019. This sustainment program is planned to address the remaining ERAM infrastructure hardware, network equipment and operating system at operational, training and support environments that were not replaced in the previous technical refresh efforts. The ERAM Sustainment 3 program execution spans from FY 2019 to FY 2025.

For FY 2020, $46.0 million is requested for Sustainment 3. This funding will be used for system engineering, solution development, equipment procurement and test activities:

- Hardware transition related software modification

- Enterprise Storage System, Processors and Tape Backup units replacement
- IBM P5/6 Series processors (including Flight Data Processor, Surveillance Data Processor Servers and Air Traffic Workstations) running AIX (Operational Systems, Support, and ESSC) replacement
- Limited procurement of the replacement hardware in support to key sites

The ERAM Sustainment 3 Segment is needed to complete the sustainment of the ERAM infrastructure systems. This sustainment program also includes security adaptation to align security and network communication features with current FAA FTI standards.

C. ERAM Enhancement 2

ERAM Enhancements 2 (formerly ERAM Sector Enhancements) includes improvements in separation management, trajectory prediction, and human interface capabilities to improve the delivery of air traffic services today and to continue the evolution of NextGen trajectory-based operations. FID was completed in December 2016 and engineering of the first set of capabilities is ongoing.

ERAM Enhancements 2 is focusing on capabilities that the FAA has identified as high priorities, such as:

- Automating the handoff procedure between domestic airspace and international partner Canada will reduce controller workload
- Properly processing updates to International Civil Aviation Organization equipage will impact 160,000 flights per year that are currently improperly processed, leading to improvements in safety while improving the ability to perform Optimized Profile Descents (OPDs) due to the correct equipage at the Terminal Radar Approach Control (TRACON) boundary
- Conflict Probe Enhancements that Provide increased conflict detection and resolution capabilities to support separation management
- Aircraft Trajectory Modeling Enhancements that will lead to conflict probe accuracy and reduced occurrence of false and missed alerts

For FY 2020, $30.1 million is requested for ERAM Enhancements 2. This funding will be used for the following development contractor activities:

- Complete test and implementation for the Phase I (Infrastructure) and software development of Phase II of the automated handoff to Canada capability.

D. Independent Operational Assessment (IOA)

For FY 2020 $350,000 is requested for IOA for ERAM Enhancements 2.

What benefits will be provided to the American public through this request and why is this program necessary?

The program focus is on maintaining the high availability of the ERAM capability. The ERAM Sustainment projects are necessary for the replacement of equipment that is approaching the end-of-life and hardware being discontinued by the manufacturer. ERAM Enhancements will provide software enhancements for the En Route controller team and will improve the efficiency and effectiveness of En Route sector operations. This will sustain the safety critical Air Traffic operations as well as lower system life cycle cost.

Detailed Justification for - 2A02 En Route Communications Gateway (ECG)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
En Route Communications Gateway (ECG)	$2,650	$1,650	$1,650	$2,650

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. ECG Sustainment	---	$2,000.0
B. In-Service Engineering	---	650.0

What is this program and what does this funding level support?

The ECG system was a prerequisite to deploying the En Route Automation Modernization (ERAM) System at the ARTCCs. It formats and conveys critical air traffic data to ERAM. ECG increased the capacity and expandability of the NAS by enabling the use of new surveillance technology. ECG introduced new interface standards and data formats required for compatibility with International Civil Aviation Organization (ICAO) standards and adds capacity necessary to process data from additional remote equipment such as radars. ECG was planned to operate through 2015. Thus the need for continued technology refresh of the ECG system.

Technology refresh activities replace older and more failure-prone components and allow upgrades of operating systems and availability of spares to continue provision of critical surveillance and flight data to ERAM in support of Air Traffic Operations.

For FY 2020, $2.0 million is requested for equipment replacement, engineering services, and program support services for the ECG. Planned activities for FY 2020 include technology refresh of the Maintenance Local Area Network (LAN) switch, Government Accountability Office/Plan of Actions and Milestones remediation, and technology refresh of the Workstation, Printer, and Monitor.

In addition, $650,000 is requested to support in-service engineering work that provides an immediate response to emerging technology solutions.

What benefits will be provided to the American public through this request and why is this program necessary?

The work under this project will sustain the availability of the ECG system to support the continued provision of critical surveillance and flight data to ERAM for Air Traffic operations while reducing sustainment costs.

Detailed Justification for - 2A03 Next Generation Weather Radar (NEXRAD)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Next Generation Weather Radar (NEXRAD)	$5,500	$7,500	$7,500	$3,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Next Generation Weather Radar (NEXRAD)	---	$3,000.0

What is this program and what does this funding level support?

NEXRAD is a long range weather radar that detects, analyzes, and transmits weather information for use by the Air Traffic Control (ATC) System Command Center (ATCSCC), En Route, Terminal, and Flight Service Facilities. NEXRAD detects, processes, and distributes for display, hazardous and routine weather information which are processed by FAA's Weather and Radar Processor (WARP), Integrated Terminal Weather System (ITWS), and the Corridor Integrated Weather System (CIWS) systems. NEXRAD is a joint program between Departments of Transportation, and Commerce, with National Weather Service as the lead. Agencies share developmental costs in proportion to the number of systems fielded by each agency. The FAA owns and operates 12 NEXRADs, located in Alaska (seven), Hawaii (four), and Puerto Rico (one).

Originally installed between 1990 and 1996 with an economic service life of 20 years, there are currently 160 operational NEXRAD systems in the United States and overseas, jointly operated and maintained by the Tri-Agency partners. In FY 2015 the average age of NEXRAD reached the end of its economic life. A major Service Life Extension Program (SLEP) is required to extend NEXRAD's service life. The FAA's NEXRAD SLEP program will provide 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.

For FY 2020, $3.0 million is requested to support National Weather Service's (NWS) Next Generation Weather Radar (NEXRAD) technology refresh planning and procurement efforts. The FAA funding share for NEXRAD Program Improvement (NPI) is an annual requirement as established in the Memorandum of Agreement (MOA) between the Department of Transportation (FAA), and the Department of Commerce (DOC) NWS.

What benefits will be provided to the American public through this request and why is this program necessary?

NEXRAD has been successfully operating since 1996. 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. While Dual-Polarization technology, which provides a two-dimensional view of precipitation, has been utilized in the commercial weather radar community for over 20 years, it was only recently introduced onto the NEXRAD platform. Dual-Polarization will only provide incremental improvements in overall data quality over the present day NEXRAD but the introduction of the in-flight icing and hail detection algorithms will provide features that enhance aviation safety and detection of weather conditions while aircraft are aloft.

Detailed Justification for - 2A04 Air Route Traffic Control Center (ARTCC) and Combined Control Facility (CCF) Building Sustainment

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
ARTCC/CCF Building Improvements	$120,400	$108,050	$88,050	$96,900

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. ARTCC and CCF Facility Sustainment	23	$89,400.0
B. Enterprise Facilities Sustainment	---	5,000.0
C. In-Service Engineering	---	2,500.0

What is this program and what does this funding level support?

The ARTCC and Combined Control Facility (CCF) Building Sustainment Program supports En Route air traffic operations and service-level availability by providing life-cycle management of the physical plant infrastructure at the 21 ARTCCs and two CCF facilities. It is one of 14 programs within the Facilities Infrastructure Portfolio (FIP).

Many of these structures were built in the 1960s and have been expanded several times since then. As of FY 2017, there was a $280 million facility backlog of needed repairs or upgrades, which includes all building systems such as heating, ventilation, and air conditioning (HVAC) components; all piping, plumbing, control systems; and both the exterior and interior of the building. This backlog increases the risk of outages and may result in increased maintenance costs. This program sustains these buildings to meet air traffic service requirements and to reduce the backlog.

Under the Sustainment Strategic Plan, major construction projects will replace obsolete plant equipment and improve work areas. These projects include replacement of chillers and cooling towers and associated mechanical and electrical system elements necessary for cooling the facility to meet the operating temperature requirements of sensitive National Airspace System (NAS) electronics and computer equipment. Obsolete and proprietary building automation control systems that are no longer supported by the manufacturer are being replaced with current state-of-the-art open architecture systems. These projects also include replacement of fire detection and annunciation systems that have already achieved life expectancy and are no longer supported by the manufacturer. The new equipment is more efficient than the replaced equipment and would reduce the energy consumption of the facility.

For FY 2020, $89.4 million is requested for ongoing ARTCC sustainment projects. The requested funding amount is required to continue efforts to ensure that critical NAS En Route facilities are brought into and maintained in a state of good repair. This will prevent catastrophic outages and promote the health and safety of the Air Traffic and Technical Operations work force.

For FY 2020, $5.0 million is requested for the sustainment of FAA Enterprise Facilities. These facilities include the Air Traffic Control System Command Center and two National Enterprise Management Centers. The sustainment projects associated with this work will fund needed repairs or upgrades, which includes all building systems such as heating, ventilation, and air conditioning (HVAC) components; all piping, plumbing, control systems; electrical, conveying, and general infrastructure; and both the exterior and interior of the building.

In addition, $2.5 million is being requested for in-service engineering activities that provides an immediate response to emerging technology solutions.

Current major sustainment projects include:

- **Building Automation Controls System Replacement**—These projects replace aging direct digital control systems (DDCS) that monitor and control a facility's environmental systems, such as heating, ventilation, air conditioning equipment, chillers, cooling towers, pumps, air handlers, and computer room air conditioners, as well as monitoring water leak detection systems. This project will provide standardization of building automation control systems at all FAA En Route facilities.
- **Fire Detection and Annunciation System Project—**This project will replace the fire detection and annunciation systems at each facility. It includes demolition of the existing system and installation of a new system to include a fire alarm control panel, fire alarm annunciation panels, visual and audible annunciation devices, smoke and heat detectors, manual pull stations, addressable control devices, fire alarm conduit, and fire alarm wiring.
- **Central Plant/Control Wing Display System Replacement (DSR) First Floor and the DSR Attic Modernization Project**—This project includes the continued improvement of a facility's central heating and cooling plant along with the control wing DSR first floor and the DSR attic upgrades. The work in the plant includes replacement of facility chillers, boiler systems, hot water heaters, lighting and electrical panel board, and motor control center (MCC) replacement. The DSR work includes upgrades and restoration of fire-rated walls and floors, replacement or upgrades of access floor systems, code and accessibility upgrades, wall and floor finish upgrades, upgrades to fire suppression systems, replacement of air handling units, replacement of chiller and hot water piping systems, replacement of interior lighting, replacement of the lighting central battery system and dimming control system, and replacement of building electric distribution systems; including panel boards and branch circuits. The area for this project is the facility's Air Traffic Control Operations Room, which will remain in operation throughout the project.

Specific mission-critical and local sustainment projects will also be accomplished at each facility to replace obsolete equipment and infrastructure in order to support the air traffic control (ATC) mission, and to ensure the facility is maintained in an acceptable condition.

FY 2020 Construction Projects

- Fire Detection and Alarm System Replacement—Los Angeles, Houston, Kansas City, Anchorage, San Juan Combined Center Radar Approach Control (CERAP), Indianapolis, Miami, Chicago, New York, Washington, Denver, Atlanta and Guam CERAP.

FY 2020 Design Projects

- Fire Detection and Alarm System Replacement—- Oakland, Minneapolis, Salt Lake City and Seattle.
- Central Plant/Control Wing DSR – Chicago and Albuquerque.

What benefits will be provided to the American public through this request and why is this program necessary?

This program sustains 23 ARTCC and CCF facilities, which are critical and vital to facilitate the FAA's mission to serve the flying public. The mission of the En Route Facilities Sustainment Program is to support En Route Air Traffic operations and service level availability through facility life-cycle program management of the 21 ARTCCs and the CCFs at San Juan and Guam. Much of the plant equipment within these buildings has exceeded its life expectancy and must be replaced. This program replaces obsolete equipment and provides an efficient, reliable, and safe work environment for En Route air traffic control operations. There are no viable programs or alternatives for achieving the same results.

Detailed Justification for - 2A05 Air/Ground Communications Infrastructure

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Air/Ground Communications Infrastructure	$9,750	$8,750	$8,750	$7,850

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Communications Facilities Enhancement (CFE) Expansion	10	$6,000.0
B. Radio Control Equipment (RCE) - Sustain	---	1,000.0
C. In-Service Engineering	---	850.0

What is this program and what does this funding level support?

The Air-to-Ground (A/G) Communications Infrastructure Sustainment programs enhance operational efficiency and effectiveness by replacing aging radio equipment, providing new, relocated or upgraded remote communications facilities, and providing equipment and support to detect and resolve radio frequency interference with FAA communications.

A. Communications Facilities Enhancement (CFE) Expansion - For FY 2020, $6.0 million is requested to initiate the expansion/replacement/upgrade of 10 CFE sites, procure replacement radios, equipment racks, antennas, towers, and prepare sites for installations. These sites include: Memphis, Tennessee; Orlando, Florida; Detroit, Michigan; Pawtucket Rhode Island; St Charles, Missouri; Galbraith Lake, Alaska; Lake Henry, Pennsylvania; Raton, New Mexico; Lincoln, Nebraska; Yakutat, Alaska.

The CFE program provides new, relocated or upgraded Remote Communication Facilities (RCF's) to enhance the A/G communications between air traffic control and the aircraft when there are gaps in coverage or new routes are adopted.

B. Radio Control Equipment (RCE) – Sustain - For FY 2020, $1.0 million is requested for RCE obsolescence study and to install existing RCE units supporting 40 channels and support the construction and verification of the RCE test bed. The funding will also be used to procure 100 control type power supplies and 100 redesigned modules to replace obsolete parts while providing longer term support for the operational Control Site RCEs. The RCE program replaces obsolete radio signaling and control equipment which controllers use to select a remote radio channel.

Also requested is $850,000 for in-service engineering activities.

What benefits will be provided to the American public through this request and why is this program necessary?

Air/Ground Communications Infrastructure will significantly improve safety by replacing aging and increasingly unreliable equipment and communications facilities. New communications equipment will lower periodic and correctional maintenance costs associated with the old and technically obsolete equipment in the field, and as a result will reduce costs for the FAA and taxpayers.

Detailed Justification for - 2A06 Air Traffic Control En Route Radar Facilities Improvements

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Air Traffic Control En Route Radar Facilities Improvements	$5,400	$6,600	$6,600	$5,300

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Long Range Radar (LRR) Infrastructure Sustainment	28	$4,300.0
B. In-Service Engineering	---	1,000.0

What is this program and what does this funding level support?

The Air Traffic Control En Route Radar Facilities Improvements Program is responsible for 157 Long Range Radar (LRR) surveillance facilities that provide aircraft position information to Federal Aviation Administration En Route control centers for Air Traffic Control (ATC), and to the Department of Defense and the Department of Homeland Security for security monitoring of the National Airspace System (NAS).

About 80 percent of the LRR inventory is older than 30 years. Sixty-six of these sites were established in the early 1950's and have reached the end of their useful life. The ATC En Route LRR surveillance equipment will need to remain operational at least through year 2025. The NAS requires reliable and continuous operation of surveillance equipment. The repairs, improvements, and modernization to existing infrastructure will enable the facilities to continue to meet current operational, environmental, and safety needs. It will extend the service life of facilities, and most importantly, reduce the chance of outages that often cause air traffic delays and impact the requirement for continuous monitoring of the NAS.

The existing air surveillance infrastructure has shortfalls that must be addressed sequentially for the system to continuously meet the users' 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.

For FY 2020, $4.3 million is requested to sustain approximately 28 facilities that are in poor condition and have greatest impact to the NAS. The scope of the LRR infrastructure sustainment program includes upgrades and/or replacement of electrical, mechanical, lightning protection, fire detection, and facility security systems; buildings and structures; and facility access roads. In addition, $1.0 million is requested for in-service engineering activities that provides an immediate response to emerging technology solutions.

What benefits will be provided to the American public through this request and why is this program necessary?

Upon completion, the infrastructure improvements will provide greater efficiency and reduce operating costs in En Route ATC and facility maintenance operations. Average Facility Condition Index (FCI) of all 157 LRR facilities is currently at 80 percent, which is below the minimum 90 percent required for such facilities. The goal of the LRR infrastructure sustainment program is to reach 90 percent FCI by 2025. Air Route Surveillance Radar (ARSR) equipment availability has continued in an upward trend (99 percent availability) as a direct result of the LRR Infrastructure Improvements made under this program. The American public benefits from reduced operating cost and system availability.

Detailed Justification for - 2A07 Oceanic Automation System

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Oceanic Automation System	$34,950	$28,500	$23,100	$15,900

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Advanced Technologies and Oceanic Procedures (ATOP) Sustainment 2	---	$3,600.0
B. Oceanic Improvements	---	2,000.0
C. Advanced Technologies and Oceanic Procedures (ATOP) Enhancement 1	---	10,000.0
D. Independent Operational Assessment (IOA)	---	300.0

What is this program and what does this funding level support?

From 2005 to 2007, the ATOP program replaced the original oceanic air traffic control system, updated procedures, and modernized the Oakland, New York, and Anchorage ARTCCs, which house the oceanic automation systems. A support system was installed at the William J. Hughes Technical Center (WJHTC). ATOP fully integrates flight and radar data processing, detects conflicts between aircraft, and provides data link and surveillance capabilities.

Benefit analysis has shown that sustainment and enhancement of the current ATOP system will effectively meet the needs of the FAA. A replacement of the ATOP system would be both expensive and unnecessary since the current ATOP system with enhancements will be able to meet the future requirements of the FAA at considerably lower cost than a total system replacement.

A. ATOP Sustainment 2

The technology refresh of the ATOP system will provide compatible technology upgrades and replace the hardware at the three Oceanic Centers – New York, Anchorage and Oakland; the WJHTC; and the labs at the prime contractor sites. The investment is a full system technology refresh that addresses issues of performance, software end of service, and data storage.

The ATOP Sustainment 2 program will support maintaining the ATOP systems at the 99.7 percent availability or higher with the installation of refreshed equipment and an operating system starting in FY 2019. The ATOP technology refresh will be measured by ensuring the equipment is replaced on schedule in accordance with the program baseline and that the system replacement addresses the shortfalls listed below:

- Degraded system response times due to spike processing for system functions such as weather forecast updates and high traffic loads at New York Center
- Limited ability to process increased surveillance tracks from additional radar sources and Automatic Dependent Surveillance – Broadcast (ADS-B)
- Inability to store required amount of System Analysis and Recording (SAR), playback data, and security related events to meet required FAA standards/policy
- Lack of vendor support from IBM and Microsoft for obsolete operating systems (i.e., AIX 5.3 and Windows XP)
- Potential increased lifecycle costs to maintain proprietary system components

For FY 2020, $3.6 million is requested to complete the delivery of the final technology refresh software build to support performance improvements to target 2028 system loads. The performance improvements are needed to support NextGen, Surveillance Broadcast Services (SBS), and other NAS improvements required in the oceanic domain.

B. Oceanic Improvements

Oceanic Improvements support operational analysis, engineering analysis, solution development, and solution implementation activities designed to improve the delivery of oceanic domain services. The scope of these NAS enhancements is limited to operational changes that do not require significant capital investments. The identification, management, documentation, and overall governance of these NAS changes are coordinated with applicable stakeholders.

For FY 2020, $2.0 million is requested for Oceanic Improvements. Supporting a category of requirements that address necessary and unplanned changes, these needs are the result of operational changes like deployment of new separation standards, and ICAO mandates that are small in nature and must be addressed quickly. The funding will be directed for the operational analysis, engineering analysis, solution development, and solution implementation activities for ATOP system enhancements designed to improve the delivery of oceanic domain services.

C. ATOP Enhancement 1 (E1)

The ATOP E1 program will provide necessary large-scale enhancements required to minimize the current systems operational shortfalls as the FAA moves forward with NextGen and other NAS upgrades. The ATOP E1 acquisition program baseline will also include capabilities partially funded by the Advanced Surveillance Enhanced Procedural Separation (ASEPS) Automatic Dependence Surveillance – Contract (ADS-C) Reduced Oceanic Separation program. Due to the incorporation of ASEPS, the ATOP candidate enhancements have been refined and there are five currently under consideration to address the shortfalls below; however, due to resource constraints the final set of enhancements to be approved for funding will not be determined until a Final Investment Decision (FID) is made by the Joint Resources Council in the second quarter of FY 2019.

- Lack of surveillance and inefficiencies associated with communications, either Controller Pilot Data Link Communication (CPDLC) or High Frequency (HF) communications causing separation minima between aircraft in oceanic airspace to be higher
- User interface and data processing limitations impacting controller coordination
- Lack of a predictive, medium-term surveillance probe
- Inability to access and display required external weather data

For FY 2020, $10.0 million is requested for the ATOP E1 program to initiate development for the Enhanced Controller Coordination Interface and Enhanced Conflict Probe in Surveillance Airspace modifications to be deployed in FY 2023. The funding will also support requirements analysis of Data Exchange via System Wide Information Management (SWIM) (New Services) and Data Exchange via SWIM (Interface Rehost) modifications planned to be delivered in 2024 and beyond.

D. Independent Operational Assessment (IOA)

For FY 2020, $300,000 is requested for ATOP Enhancement 1 IOA.

What benefits will be provided to the American public through this request and why is this program necessary?

A modernized Oceanic Automation System (OAS) will provide user benefits by improving stability and enhancing system performance to address traffic growth through 2028. This sustainment will provide a foundation for new ATOP enhancements to be implemented that improve safety goals for the flying public by providing controllers with better coordination, conflict probe and surveillance tools. These new enhancements will also provide airlines and general aviation with reduced operating costs and system delays by delivering improved coordination and user request capabilities that support optimum flight profiles.

The refreshment of technology for the OAS will also provide the FAA with improved performance and capacity to support integration of planned NAS and NextGen improvements. Replacing the current end-of-life operating systems and aging hardware with state-of-the-art components will reduce supportability risk and lifecycle support costs.

Detailed Justification for - **2A08 Next Generation Very High Frequency Air/Ground Communications System (NEXCOM)**

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Next Generation Very High Frequency Air/Ground Communications System (NEXCOM)	$60,000	$60,000	$60,000	$50,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Next Generation VHF/UHF A/G Communications (NEXCOM) Phase 2	Various	$50,000.0

What is this program and what does this funding level support?

For FY 2020, $50.0 million is requested to replace and modernize the aging and obsolete National Airspace System (NAS) air-to-ground (A/G) analog radios that allow direct voice communication with pilots with new Very High Frequency (VHF) and Ultra High Frequency (UHF) radios at terminal and flight services facilities. The existing VHF analog controller-to-pilot communications system lacks the capacity and flexibility to accommodate future growth in air traffic. 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 important element of the ATC system supporting all phases of flight for En Route, Terminal, and Flight Service operational environments.

The NEXCOM program plans to use funding to deploy 3,000 new Terminal Air Traffic Control Radios (receivers and transmitters) at 140 terminal and flight services facilities, purchase VHF and UHF radios, procure 125 Emergency Transceivers, and fund related implementation and support activities. Ultimately 35,000 VHF and UHF radios will be deployed in the NAS under the NEXCOM Phase 2 program through 2026.

NEXCOM will meet the new and growing demands for air transportation services; provide the operational flexibility and Voice over Internet Protocol (VoIP) capability required for NextGen, utilize VHF spectrum required for voice communications more efficiently and have the ability to make recovered spectrum available for Data Communications should it be necessary.

What benefits will be provided to the American public through this request and why is this program necessary?

NEXCOM will improve reliability by reducing the number of unplanned outages by replacing existing communications equipment with modern Air to Ground Communications (A/G Comm) equipment. In addition, it will reduce the growth of maintenance costs by replacing A/G Comm equipment. An added performance benefit is the ability to increase capacity by expanding the number of communications channels within the spectrum assigned to the FAA. The Mean Time Between Failure (MTBF) performance metric, which is closely related to availability, will be increased from 11,000 hours to 50,000 hours at the completion of NEXCOM Phase 2. This will both increase the safety of the NAS benefitting commercial airlines, general aviation and the flying public as well as reducing costs to taxpayers.

Detailed Justification for - 2A09 System-Wide Information Management (SWIM)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
System-Wide Information Management (SWIM)	$50,050	$60,300	$55,300	$100,950

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Common Support Services Weather	---	$39,400.0
B. SWIM – Segment 2B	---	18,000.0
C. SWIM – Segment 2C	---	43,200.0
D. Independent Operational Assessment (IOA)	---	350.0

What is this program and what does this funding level support?

The SWIM program is an information management and data sharing system for Next Generation Air Transportation System (NextGen). SWIM provides policies and standards to support data management, secure data integrity, and control data access and use.

A. Common Support Services-Weather (CSS-Wx)

CSS-Wx will be the FAA's common support services capability for weather and establish an aviation weather publishing capability for the NAS. It will enable universal access and the standardization of weather information for dissemination to users by SWIM. CSS-Wx will filter weather information by location and time. Consumers of the information published by CSS-Wx will include air traffic controllers, traffic managers, commercial aviation, general aviation, and the flying public. CSS-Wx will be the FAA's single provider of aviation weather data, consolidating several legacy weather dissemination systems, and will provide weather information for integration into NextGen enhanced decision support tools (DSTs). CSS-Wx will also be scalable to facilitate the addition of new users and new systems. The CSS-Wx system is – planned to achieve Initial Operating Capability (IOC) in FY 2020.

The CSS-Wx System will make improved weather products provided by the NextGen Weather Processor (NWP), the National Oceanic and Atmospheric Administration's (NOAA) NextGen IT Web Services, and other weather sources, available to FAA and NAS users for input into collaborative decision-making. A Final Investment Decision (FID) occurred on March 18, 2015 and a Prime Contract was awarded in April 2015. The CSS-Wx program is now in the FAA's Solution Implementation Phase.

CSS-Wx will resolve the issue of multiple interfaces, inflexible and inefficient information data management, unique data types and point-to-point information exchange. Implementation of this capability will provide cost savings, improvement of capacity, efficiency and safety in adverse weather. For 2020, $39.4 million is requested to:

- Continue CSS-Wx Solution Development and Implementation activities
- Execute Project Management oversight by the government and its support organizations
- initiate Operational Testing (OT)

B. SWIM Segment 2B

SWIM Segment 2B received the Joint Resource Council (JRC) Final Investment Decision (FID) approval in October 2015. SWIM Segment 2B continues to improve the FAA's ability to manage the efficient flow of information through the National Airspace System (NAS). Segment 2B includes additional capabilities to strengthen the overall security of NAS information systems. NAS Common Reference (NCR) will develop efficient Net-Centric Operations (NCO) for Air Traffic Management (ATM) situational awareness, geospatial awareness, data correlation, and support services. NAS enterprise Identity and Access Management (IAM) capability will enable the interoperability of security controls with NextGen partners. Swim Terminal Data Distribution Service (STDDS) is a NAS-Enterprise Architecture (EA) Support Services system that has the capability to support various mission services in the terminal mission services area. Enterprise Service Monitoring (ESM) will provide situational awareness of Operations and Maintenance (O&M) status of NAS infrastructure and System Oriented Architecture (SOA) services, including service outages. For FY 2020, $18.0 million Segment 2B funding is requested to:

- Complete STDDS Phase 2 Release 5 Initial Operational Capability
- Complete NCR Initial Operational Capability
- Complete ESM Phase 3 Initial Operational Capability
- Complete IAM Phase 2 Initial Operational Capability for Attribute Based Access Control (Authorization) Capability

C. SWIM Segment 2C

SWIM Segment 2C plans to continue improving the FAA's ability to manage the efficient flow of information through the NAS. Segment 2C's plan includes additional infrastructure and capabilities to strengthen the overall NAS information system security posture, and a tech refresh of existing hardware to improve performance capabilities on the hardware side resulting in better overall system performance. For FY 2020, $43.2 million Segment 2C funding is requested to:

- Complete NAS Enterprise Messaging Service (NEMS) technology refresh internal Data Multiplexing Network (DMN) servers at Chicago Air Route Traffic Control Center (ARTCC), Anchorage ARTCC, Jacksonville ARTCC, New York ARTCC, and Oakland ARTCC
- Complete the additional SWIM infrastructure requirements due to CSS-Wx architecture changes
- Complete on ramping additional Tier 2 consumers to use available SWIM data via Cloud Services
- Add Web Service Capability to SWIM Cloud Distribution Services (SCDS)
- Create a secured Cloud environment for SWIM Tier 1 users

D. Independent Operational Assessment (IOA)

$350,000 is required to support IOA activities.

What benefits will be provided to the American public through this request and why is this program necessary?

SWIM reduces both the number and types of unique communication interfaces, reduces redundancy of information and better facilitates information sharing, improves predictability and operational decision-making, and reduces cost of service. The improved coordination that SWIM provides allows for the transition from tactical conflict management of air traffic to strategic trajectory-based operations. SWIM provides the foundation for greatly enhanced information exchange and sharing with other agencies.

Detailed Justification for - 2A10 ADS-B NAS Wide Implementation

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
ADS-B NAS Wide Implementation	$150,300	$143,700	$139,150	$174,400

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. ADS-B NAS Wide Implementation - Baseline Svc/App (Service Volume)	---	$122,500.0
B. ADS-B Sustain Leased Services	---	19,000.0
C. ADS-B Sustain/Relocate (Gulf of Mexico Platform)	---	2,000.0
D. ADS-B NAS Wide Implementation - Enhancement	---	30,600.0
E. Independent Operational Assessment (IOA)	---	300.0

What is this program and what does this funding level support?

Automatic Dependent Surveillance-Broadcast (ADS-B) is a cornerstone technology for NextGen. It reduces delays and enhances safety by using an aircraft's broadcasted position, instead of position information from traditional radar. ADS-B is an advanced surveillance technology that provides highly accurate and more comprehensive information. Aircraft position (longitude, latitude, altitude, and time) is determined using the Global Navigation Satellite System (GNSS), and/or an internal navigational reference system, or other navigation aids. The aircraft's ADS-B equipment processes this position information, along with other flight parameters for a periodic broadcast transmission, typically once a second, to airborne and ground-based ADS-B receivers. The information is used to display aircraft position on en route and terminal automation systems.

The Gulf of Mexico (GOM) implementation of Air Traffic Control (ATC) services provides ADS-B surveillance data for aircraft operating in a large area without access to traditional radar coverage. Energy platforms in the GOM are utilized by the program to host surveillance, communications and weather facilities. These platforms have a temporary lifespan that are impacted by a number of economic and technical criteria. The shutdown of a platform requires that existing facilities be removed and replacement facilities installed on platforms that address any operational shortfall.

ADS-B has interdependencies with the following Programs:

- Advance Technologies and Oceanic Procedures (ATOP)
- En Route Automation Modernization (ERAM)
- Standard Terminal Automation Replacement System (STARS)
- Airport Surface Detection Equipment Model X (ASDE-X)
- Time Based Flow Management (TBFM)
- Runway Status Lights (RWSL)
- Communications Facilities Enhancement (CFE) Program

A. ADS-B NAS Wide Implementation - Baseline Services and Applications

For FY 2020, $122.5 million is requested to provide for the continued implementation and operation of the following baseline applications:

- ADS-B Separation Services

- Traffic Information Services - Broadcast (TIS-B), Flight Information Service - Broadcast (FIS-B), and Automated Dependent Surveillance Rebroadcast (ADS-R) Broadcast Pilot Advisory Services
- Airport Surface Traffic Situation Awareness and Traffic Situation Awareness with Alerts
- Enhanced Visual Approach to support merging and spacing with Cockpit Display of Traffic Information (CDTI) Assisted Visual Separation (CAVS)
- Weather and NAS Situation Awareness
- Accommodation of Department of Defense operations with aircraft not yet ADS-B equipped

The funding will also allow Airport Surface Surveillance Capability (ASSC) services at all of the designated airports and allow continued implementation of ASSC, a surface multilateration system that will receive inputs from cooperative and non-cooperative sensors. Additionally, continued operation of Wide Area Multilateration (WAM) surveillance services capability will occur. WAM provides aircraft location information to the automation system at Denver Air Route Traffic Control Center, Southern California TRACON, and Charlotte TRACON.

This funding will also continue ADS-B Baseline Services, utilizing subscription fees for ADS-B infrastructure owned and operated by the prime contractor. The anticipated FY 2020 accomplishments for ADS-B Baseline Applications include:

- Achieve Initial Operating Capability (IOC) of Terminal ATC Separation Services at one site (155 cumulative)
- Complete IOC at one ASSC site (eight cumulative)
- Provide and maintain ADS-B baseline services and applications
- Pay subscription fees:
  - Provide service to more than 300 service volumes within specified requirements.
  - Provide WAM surveillance services supporting air traffic operations for selected airspace.

B. ADS-B Sustain Leased Services

For FY 2020, $19.0 million is requested to support the sustainment of ADS-B services and to support operational enhancements to the portfolio. Specifically, the funding will be used to:

- Implement systems upgrades to preserve baseline services and meet new security requirements
- Enhance existing capabilities/services to improve service resiliency and ensure continued delivery of high quality surveillance and ADS-B Rule enforcement

C. ADS-B Sustain/Relocate (Gulf of Mexico Platform)

For FY 2020, $2.0 million is requested to support the continuation of FAA Air Traffic Control services as agreed upon in the Memorandum of Agreement (MOA) with the Gulf of Mexico helicopter operators and energy platform owners. The funding will be used to:

- Remove and refurbish facilities and equipment from active energy platforms when MOA partner energy platform owners make the decision to shut them down.
- Identify and evaluate an appropriate site to restore any lost services.
- Install new or refurbished systems on strategically located energy platforms.
- Install equipment in new facilities on other strategically located MOA partner energy platforms.

D. ADS-B Enhancements

For FY 2020, $30.6 million is requested to support the operational enhancement of this portfolio. The funding will be used to provide additional benefits based on ADS-B by implementing activities that may include:

- Utilization of additional ADS-B parameters to monitor altitude compliance, enhancing safety and efficiency of the NAS.
- Expanding ADS-B service coverage in selected areas.
- More comprehensive vehicle ADS-B equipage at large airports.
- Security enhancements for National Institute of Standards and Technology (NIST) compliance

E. Independent Operational Assessment (IOA)

For FY 2020, $300,000 is requested to support IOA activities.

What benefits will be provided to the American public through this request and why is this program necessary?

Benefits provided by ADS-B to the American public include more efficient use of airspace capacity, fewer flight delays, and more optimal routing for aircraft. Other efficiency benefits include reduced weather deviations and fewer cancellations resulting from increased access to some Alaskan regions and GOM oil platforms during inclement weather conditions. These efficiencies translate to savings in both aircraft direct operating costs and passenger value of time.

ADS-B meets a large performance gap in the capability of pilots and ATC to receive situation awareness information, thus providing for safety in ways legacy systems cannot by delivering the following services through cockpit avionics:

- Enhanced see-and-avoid capabilities which will assist pilots in preventing mid-air collisions
- Air Traffic Control services in non-radar airspace
- Weather information, helping to reduce incidences related to Instrument Flight Rule operations

Detailed Justification for - 2A11 Windshear Detection Service

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Windshear Detection Service	$1,000	$0	$0	$1,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Windshear Detection Services Sustainment 1	---	$1,000.0

What is this program and what does the funding level support?

WDS Sustainment is a portfolio program consisting of legacy wind shear detection systems currently deployed in the NAS. The program will address obsolescence of the legacy Weather System Processor (WSP) and Low Level Windshear Alert System (LLWAS). The program will sustain existing service levels by upgrading components of existing systems to mitigate safety hazards and to resolve obsolescence/supportability issues of the 34 WSPs and 48 LLWASs currently deployed in the NAS.

- LLWAS and WSP detect microbursts and wind shear activity near runways and along approach/departure corridors
- Sustainment of these systems will allow Air Traffic Controllers to continue providing alerts to aircraft of hazardous wind shear conditions

$1.0 million is requested in FY 2020 to initiate a business case analysis and achieve the Investment Analysis Readiness Decision (IARD) for the next phase of technology refresh under the WDS Sustainment Project.

What benefits will be provided to the American public through this request and why is this program necessary?

The projects contained within the WDS portfolio contribute significantly to the overall safety of the NAS by preventing windshear related aircraft accidents. The WDS project intends to sustain the level of service provided by these legacy ground-based systems to Air Traffic Controllers and by extension, the flying public. WDS systems are deployed at commercial airports and provide increased aviation safety through the accurate and timely detection of hazardous aviation weather conditions. Operational benefits of these components include real-time detection of windshear, microbursts, gust fronts, wind shifts as well as prediction of wind changes that allow improved airfield efficiency when making runway changes.

The WSP and LLWAS systems alert controllers of dangerous wind shear events that are detected in approach and departure corridors. Since the deployment of these systems in the late 1980s to early 1990s, no major windshear related incidents have occurred in the NAS. WDS Sustainment will resolve system obsolescence to ensure that Air Traffic Controllers will continue to receive the windshear alerts necessary to maintain the safety of the NAS.

Detailed Justification for - 2A12 Air Traffic Management Implementation Portfolio

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Air Traffic Management Implementation Portfolio	$0	$0	$0	$77,100

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Traffic Flow Management System (TFMS) Enhancement 4	---	$24,300.0
B. Traffic Flow Management Improvements	---	2,000.0
C. Traffic Flow Management System (TFMS) Sustainment 3	---	49,100.0
D. In-Service Engineering	---	1,700.0

What is this program and what does the funding level support?

The Traffic Flow Management System (TFMS) supports the Federal Aviation Administration's (FAA) Traffic Management personnel in providing efficiency-critical National Airspace System (NAS) services. Throughout each day, Traffic Managers use TFMS to maintain near real-time situational awareness and predict areas which may experience congestion due to capacity reductions or unusual demand increase.

TFMS becomes especially important when external factors, such as adverse weather, reduces NAS capacity and requires proactive planning, coordination and adjustments to mitigate impacts, e.g., missed connections, canceled flights, increased fuel consumption, etc. The Air Traffic Control System Command Center (ATCSCC) uses TFMS to model and implement NAS-wide Traffic Management Initiatives (TMI) to make the most efficient use of available capacity to avoid gridlock and minimize delays. When delays are necessary, TFMS assigns departure times equitably and gives flight operators flexibility through submission of trajectory options and departure slot substitutions.

The FAA plans to continue incrementally adding functionality to TFMS in accordance with investment decisions and user-defined enhancement needs. TFMS serves as the primary platform for NextGen Collaborative Air Traffic Management Technology (CATMT) capabilities, built from 2010 to present and expected to host new NextGen functionality, including elements of the Terminal Flight Data Manager (TFDM), through 2025.

A. TFMS Enhancement 4 (TFMS E4) will be the next enhancement package providing NextGen Midterm Traffic Flow Management (TFM) capabilities. Capabilities under development for the project include:

- Improving Demand Predictions (IDP) - Enhancements aimed at improving the TFMS predictions of demand for NAS resources; this will help reduce unnecessary delays
- Integrated Departure Route Planner (IDRP) - Provides strategic/tactical forecast of departure route and fix status affected by convective weather and volume for specific terminals; provides traffic managers with semi-automated resolution algorithm to solve departure constraints
- TFMS ingestion of Weather Data – TFMS will replace the legacy Corridor Integrated Weather System (CIWS) Data Distribution System (CDDS) prototype with the new System Wide Information System (SWIM) Common Support Services Weather (CSS-Wx) service

For FY 2020, $24.3 million is requested to allow TFMS E4 to:

- Complete development and System Test of the IDP capability

- Complete System Design Review and Detailed Design Review of the IDRP/CSS-Wx capability

B. TFMS Sustainment 3 (TFMS S3)

This effort, beginning in FY 2019, will perform a technology refresh of the TFM Processing Center (TPC) hardware that is at its end of service life. In addition, this effort will modernize the remaining legacy front-facing applications supporting the TFMS that have become a cause for system outages. These efforts will increase integration and interoperability by establishing a robust, commercially available and standards-compliant system. The modernization of these legacy applications will improve system reliability/availability, and remove the current need for technical workarounds, specialized adaptors and unique, internal high-maintenance interfaces.

For FY 2020, $49.1 million is requested to conduct the following:

- Prepare the hardware component Final Investment Decision required documentation
- Develop the final cost estimate for TFMS S3
- Begin the hardware tech refresh system engineering analysis for implementation
- Procure the TFMS equipment for the hardware tech refresh
- Complete engineering studies, conduct the code assessment/analysis and prepare the documentation for Investment Analysis Readiness Decision (IARD) requirements for the software modernization component.

C. Traffic Flow Improvements

Traffic Flow Management (TFM) Service Improvements respond to stakeholder-identified inefficiencies in current TFM systems. The scope of these NAS improvements is limited to operational changes that do not require significant capital investments nor involve significant systems complexity, interdependencies, or National Airspace System (NAS) operational changes. This program will support operational and engineering analyses, solution development, and solution implementation activities designed to improve the delivery of TFM services.

For FY 2020 $2.0 million is requested to continue improvements that are currently underway. They include:

- Airborne Reroute (ABRR) and Predeparture Reroute (PDRR) Departure Sequencing Program (DSP) Improvements – Provide ABRR and PDRR tools with the capability to include Field 11 remarks in the flight plan initiated from the Create Reroute Tool (CRT), including remarks imported from the Route Management Tool (RMT). Modify Departure Sequencing Program (DSP) to automatically update the revision number on a flight plan so it always coincides with the ERAM revision number. Modify color coding to effectively reflect flight plan status. Correct sensing so DSP insure transmission of a flight plan revision when there is an FTI circuit change.
- Health of the TFMS – Reviewing TFMS to determine the system's capability to support future tools and better integration of existing tools.
- Route Management Tool (RMT) – The RMT is being modified to provide consistent and reliable database query results, import files containing coded departure routes (CDR's) from ERAM support the saving and importing of route updates from a local file
- Improvements to Enhanced Status Information System (ESIS) study – provide recommended improvements to the ESIS

D. Air Traffic Management – In-Service Engineering is funding for work that provides an immediate response to emerging technology solutions. For FY 2020, $1.7 million is requested.

What benefits will be provided to the American public through this request and why is this program necessary?

The requested funding will reduce erroneous alerts presented to EnRoute Supervisors and improve accuracy of demand predictions, which yields better traffic management decisions. The program will improve the overall availability and reliability of the TFMS tools by integrating data for departure management and making data readily available to traffic management unit users. In addition, sustainment of the system will allow TFMS to maintain the overall operational availability within the NAS, enabling the TFM system and capabilities that reside on it to continue providing benefits that include:

- Greater system reliability, dependability and availability, enabling TFMS to achieve and sustain its full benefits of avoiding NAS delay as well as retain TFMS users trust.
- Decrease maintenance and repair activities, thereby reducing time to repair which will reduce the impact of outages as well as avoid increased TFMS operational and support costs.

Detailed Justification for - 2A13 Time Based Flow Management (TBFM) Portfolio

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Time Based Flow Management (TBFM) Portfolio	$40,450	$28,150	$28,150	$30,700

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Time Based Flow Management Enhancement 1	---	$8,100.0
B. Time Based Flow Management Sustainment 1	---	2,600.0
C. Time Based Flow Management Sustainment 2	---	20,000.0

What is this program and what does this funding level support?

The TBFM portfolio includes Sustainment and TBFM Enhancement 1 initiatives that support the National Airspace System (NAS). The capabilities enhance system efficiency by leveraging the TBFM decision-support tool, a system that is already deployed to all Continental United States (CONUS) Air Route Traffic Control Center (ARTCCs), Terminal Radar Approach Control (TRACON) facilities and Air Traffic Control Towers. Evaluating and maturing these concepts and capabilities include validation activities and demonstration and integration of operational capabilities. Improvements in TBFM's core Time-Based Metering (TBM) capability, an expansion of TBFM and its departure capabilities to additional locations will enhance efficiency and optimize demand and capacity.

The following two capabilities are the core of the TBFM Enhancement 1 effort:

- Terminal Sequencing and Spacing (TSAS), which will provide efficient sequencing and runway assignment by making the time-based flight plan visible to the terminal controllers. Currently, visibility to the plan within the automation tool is lost as the flight is transferred from en-route to terminal controller. Terminal boundaries are about 80 miles from the runway.
- Expansion of Integrated Departure/Arrival Capability (IDAC) to additional locations, which will increase efficiency of departure operations

TBFM Enhancement 2 will build off TBFM Enhancement 1 to deploy existing capabilities to additional locations in the NAS, and provide new capabilities to enable/support the Performance Based Navigation (PBN) NAS Navigational Strategy 2016. New candidate capabilities include: Path Stretch, TBFM Planning Tool, and Weather Source Migration via System Wide Information Management (SWIM) from the FAA's Common Support Service Weather System (CSS-Wx).

For FY 2020, $30.7 million is requested for the TBFM Portfolio to continue its efforts with the installation and deployment of the TBFM concepts which include TBFM Enhancement 1, TBFM Sustainment 1, and TBFM Enhancement 2 task areas.

A. TBFM Enhancement 1 will use the $8.1 million to:

- Provide enhancements (adaptation, software, and procedural) as identified per Independent Operational Assessment and initial TSAS operational use in FY 2020.
- Conduct training of both controllers and maintainers.

B. TBFM Sustainment 1 will use the $2.6 million to:

- Complete all documents needed and achieve a Final Investment Decision (FID). TBFM Sustainment will use $1.0 million to complete the required FID documentation.
- Award Not to Exceed (NTE) for TBFM Sustainment 1

C. TBFM Enhancement 2 will use the $20.0 million to:

- Complete cost and benefit modeling for multiple capabilities and required documentation in support of the Final Investment Decision (FID).
- Achieve Final Investment Decision (FID).
- Complete contract proposal evaluation.
- Award a new prime contract.

What benefits will be provided to the American public through this request and why is this program necessary?

TBFM Enhancement 1 capabilities will enable an increase in arrivals and departures in areas where demand for runway capacity is high as well as areas in close proximity to airports with potential interference to airspace/approach. Efficiencies, previously not recognized due to a loss of controller visibility to automation recommendations, will be realized for the remaining 80 miles of airspace typically seen between terminal boundary and runway. TBFM will also increase efficiency by allowing aircraft to fly Performance Based Navigation (PBN) operations down to approach. The public will experience fewer delays, reduced carbon emissions, and less airport noise as the result of this TBFM Enhancement 1 Implementation.

TBFM Sustainment 1 benefits will reduce maintenance costs of the existing hardware and continue sustainment of the TBFM system. It will ensure Operational Availability of 99.5 percent at the TBFM sites.

TBFM Enhancement 2 capabilities will incrementally improve metering to further advance the use of PBN operations and capture associated benefits such as increasing throughput and efficiency, particularly during periods of high traffic demand.

Detailed Justification for - 2A14 Next Generation Weather Processor (NWP)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Next Generation Weather Processor	$45,450	$33,650	$28,650	$31,300

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Next Generation Weather Processors (NWP)	---	$24,000.0
B. Next Generation Weather Processors (NWP) Phase 2	---	7,000.0
C. Independent Operational Assessment (IOA)	---	300.0

What is this program and what does this funding level support?

The objective of the NWP program is to establish a common weather processing platform that will functionally replace the legacy FAA weather processor systems and host new capabilities. NWP uses data from the FAA and National Oceanic and Atmospheric Administration (NOAA) radar and sensors, and NOAA forecast models. NWP includes sophisticated algorithms to create aviation-specific current and predicted weather information. NWP creates enhanced weather products that will be available via the Common Support Services-Weather (CSS-Wx) system. It will perform the weather translation necessary to enable the use of weather information by automated decision-support tools (DSTs).

Air Traffic Management (ATM) and flight operations rely on weather information for decision making. Current aviation weather processing infrastructure and capabilities are inadequate and do not meet the real-time needs of Air Traffic Management (ATM) DSTs, operational decision-makers. Existing aviation weather products lack the spatial resolution and the timeliness necessary to assess the impact of weather phenomena on air traffic. Current legacy processing systems are built on closed architectural systems that are not compatible with one another. Legacy weather system infrastructure is limited and unable to ingest and process observation, forecast, and modeling data to create high-quality weather products with a longer time horizon then currently available.

For 2020, $24.0 million is requested to provide the following:

- Continue NWP Solution Development and Implementation activities (e.g. Site Acceptance Testing at Key Sites)
- Execute Project Management oversight by the government and its support organizations
- Initiate NWP WP1 Operational Test (OT). (APB milestone)

B. Next Generation Weather Processor (NWP) Enhancement 1

NWP Enhancement 1 will focus on additional weather products and advanced algorithms for aviation weather use. The program will coordinate and integrate user requirements and Research & Development (R&D) results for advanced capabilities in support of Trajectory Based Operations (TBO). It will enhance aviation specific weather products and advanced algorithms from the latest R&D on translating weather information into weather avoidance areas for integration into decision support tools for air traffic users.

For 2020, $7.0 million is requested to fund activities which include risk mitigation.

C. Independent Operational Assessment (IOA)

For 2020, $300,000 is requested for IOA for Next Generation Weather Processor (NWP) Enhancement 1

What benefits will be provided to the American public through this request and why is this program necessary?

The American public benefits from reduced airline operating costs (e.g. fuel) and passenger delays through NWP's delivery of aviation-relevant weather products that meet the needs of users and decision-support tools. Users will be able to identify the best routes to fly based on aircraft type, flight plan and flying preferences, using optimized weather observations, improved predictions, and translation of weather information into airspace constraints. Improved weather products will enable Traffic flow management to plan operations that optimize airspace capacity and reduce passenger delays. Additionally, the production of advanced aviation specific weather information improves safety for the American public.

Detailed Justification for - 2A15 Airborne Collision Avoidance System X (ACAS X)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Airborne Collision Avoidance System X (ACAS X)	$7,700	$7,700	$7,700	$6,900

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Airborne Collision Avoidance System X (ACAS X) – Segment 1	---	$6,900

What is this program and what does this funding level support?

ACAS X will replace the existing Traffic Alert and Collision Avoidance Systems II (TCAS II) that is required in airspace for all commercial aircraft with 30 or more seats and on all cargo aircraft greater than 33,000 pounds.

The ACAS X system will address shortfalls in the legacy TCAS II system. The system architecture will be designed so that threat detection and resolution logic changes can be quickly made using an automated process, which will be useful for future adaptations to Next Generation Air Transportation System (NextGen) operations. ACAS X will have enough flexibility to be able to accommodate a variety of sensor types, including new generations of sensors where necessary. Third, ACAS X will reduce the number of "nuisance alerts" while simultaneously providing a reduced probability of near mid-air collision. The ACAS X systems have three variants in active development:

- ACAS Xa: Will use active interrogations and replies in concert with passive reception of ADS-B information to perform surveillance
- ACAS Xo: For use with NextGen operations where other variants of ACAS X would generate unacceptably high rates of resolution advisories if used; an example of such an operation would be Closely-Spaced Parallel Operations (CSPO)
- ACAS Xu: For use with Unmanned Aircraft Systems (UAS), it is a complete Detect and Avoid (DAA) solution designed to facilitate the integration of UAS into civil airspace.

For FY 2020, $6.9 million is requested to support post Minimum Operational Performance Standards activities. Subject matter experts for the ACAS X program will continue to support system development and maturity in areas of verification/validation, safety, operational performance, requirements analysis, participation in the Radio Technical Commission for Aeronautics (RTCA) SC-147 groups to align with International Civil Aviation Organization standards harmonization while working with vendors to support proper implementation into manufacturing systems.

What benefits will be provided to the American public through this request and why is this program necessary?

ACAS X will create fewer false warnings of potential midair collisions and this improvement will promote the high level of aviation safety that is critical in terminal air traffic areas. Benefits include an increase in trust for ACAS X, reduction in workload for pilot and Air Traffic Control, faster and less expensive implementation of updates to ACAS X in the field, and improved safety when conducting operations under Instrument Meteorological Conditions.

Detailed Justification for - 2A16 Data Communications in Support of NextGen

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Data Communications in Support of NextGen	$294,100	$153,850	$118,902	$136,248

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Segment 1 Phase 2 (S1P2) Initial En Route Service	---	$64,700.0
B. Segment 1 Phase 2 (S1P2) Full En Route Services	---	46,348.0
C. Segment 1 Phase 1, DCIS Network Services	---	24,900.0
D. Independent Operational Assessment (IOA)	---	300.0

What is this program and what does this funding level support?

The Data Communications (Data Comm) program will provide data communications between Air Traffic Control (ATC) facilities and aircraft and will serve as an enabler for the NextGen operational improvements. Data Comm Segment 1 will deliver the initial set of Data Comm services integrated with automation support tools, which provides NAS benefits and lays the foundation for a data-driven NAS.

Data Comm is needed to bridge the gap between current voice-only ATC and the data-intensive NextGen. Data Comm will enable air traffic controller efficiency improvements and will permit capacity growth without requisite cost growth associated with equipment and maintenance. Data Comm is comprised of automation enhancements for ATC message generation and exchange (hardware and software) and the communications data link between ground and airborne 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 and, 30 percent of the high severity En Route operational errors were deemed to be communications related. The results of this study were independently reconfirmed in July 2009 and again in 2017. Data Comm will significantly reduce communications related operational errors and improve the safety of air travel. Segment 1 will lay the foundation for a data-driven NAS.

The capacity and productivity of the NAS will be improved by Data Comm. Initially, Data Comm will be used in conjunction with the current traffic control strategies as well as planned strategies such as traffic flow management (TFM) re-routes. Data Comm will increase controller efficiency by automating routine exchanges. As controllers become more productive, tower and En Route capacity will grow without the need to assign additional resources. This increase in traffic handling ability has a direct correlation to reduced delays and increased efficiency. Recent benefits analysis suggests airline operations will benefit from reduced gate delay and taxi times, improved on-time performance and the opportunity to expand flight schedules. The busiest airport clearance delivery positions at Core 30 airports will see the most dramatic benefit.

Data Comm services will improve operations in the following manner:

- Improve flight efficiency due to improved controller and flight crew efficiency by providing automated information exchange
- Improve re-routing capabilities

- More efficient routes for aircraft
- Decrease congestion on voice channels and provide an alternative communications capability
- Improve NAS capacity and reduced delays associated with congestion and weather
- Improve communication accuracy and safety with digital communication (i.e., reduced read/hear back errors, reduced loss of communications events)
- Reduce environmental impact due to less fuel burn and emissions
- Direct operating cost savings from increased throughput realized through reduced delays and improved communications

For FY 2020, $136.2 million is requested for the Data Comm program. This funding supports the deployment of Segment 1 Phase 2 (S1P2) Initial En Route Services, development of Segment 1 Phase 2 (S1P2) Full Services, and funding for the DCIS Network Services (DCNS).

A. Segment 1 Phase 2 (S1P2) Initial En Route Services

For FY 2020, Data Comm is requesting $64.7 million for S1P2 Initial En Route Services. This funding will be used to complete the waterfall implementation, site testing, and training activities at all 20 Continental United States (CONUS) Air Route Traffic Control Centers (ARTCC).The funding will go towards ERAM prime vendor support of site testing,training and fixing any software issues found during testing and implementation. The funding will also pay for the continued Data Comm Air-to-Ground Network services throughout the En Route domain.

Funding is also needed for program management, program control, operations and contract management support as well as second-level engineering support. S1P2 Initial En Route Services milestones include:

- Complete Operational Evaluation – FY 2019
- Achieve First Site IOC for En Route Services (APB Milestone) – FY 2019
- In Service Decision (APB Milestone) – FY 2020

B. Segment 1 Phase 2 (S1P2) Full En Route Services

For FY 2020, Data Comm is requesting $46.3 million for S1P2 Full En Route Services. Activities will include the completion of software development integration test of Data Comm Full Services capabilities. In addition, this funding will allow the vendor to provide specialty-engineering support related to system safety, security, human factors and reliability engineering. The vendor will also begin the test and evaluation process for Full Services and the program office will begin planning its implementation program. The program office will work with the vendors as well as Second Level Engineering to design scenarios, test processes and evaluation criteria, and deployment plans.

S1P2 Full En Route Services milestones include:

- Complete detailed design (APB Milestone) – FY 2019
- Continue software development for Full En Route Services – FY 2019
- Contractor Software Development Complete – Transition to Contractor Test (APB Milestone) – FY 2020

C. Segment 1 Phase 1 (S1P1) and Segment 1 Phase 2 (S1P2) DCIS Network Services

Data Comm is requesting $24.9 million in FY 2020 for network services. This funding will provide the Very High Frequency (VHF) Data Link (VDL) Mode 2 air ground network service that provides connectivity between the controllers and the cockpit. Costs for the DCIS network services that are covered in other activities are being transitioned to this activity. The DCIS network services also include operations and maintenance, monitoring and control, and certification suite activities. This Data Communications DCIS Network Service supports both surface and En Route operations.

E. Independent Operational Assessment (IOA)

$300,000 is for Independent Operational Assessment (IOA).

What benefits will be provided to the American public through this request and why is this program necessary?

Data Comm will reduce operational errors associated with communications, enhancing the safety and efficiency of the NAS. Data Comm will also reduce environmental impact due to less fuel burn and emissions. The program will improve NAS capacity and reduce delays resulting in estimated passenger value of time (PVT) savings of $11.3 billion for Tower and Initial En Route Services over the program life cycle. The addition of Full Services capabilities will add another $734 million of PVT savings over the program life cycle.

Detailed Justification for - 2A17 Non Continental United States (Non-CONUS) Automation

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Offshore Automation	$2,000	$14,000	$14,000	$1,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Offshore Automation Phase I	---	$1,000.0

What is this program and what does this funding level support?

Offshore Automation Phase 1 is the planned replacement and standardization of the existing Flight Data Processing (FDP) systems and associated infrastructure at the four offshore facilities (Anchorage ARTCC, Honolulu Control Facility, Guam Center Radar Approach Control (CERAP), and San Juan CERAP).

This will align the workforce in the four facilities to a single training, operations and maintenance baseline that ensures greater flexibility and efficiency. It will also allow for an easier transition to the Offshore Automation Phase 2 effort that will align the offshore facilities to the ATM automation and flight data processing systems that are utilized in the NAS baseline in the CONUS. Finally, this approach mitigates concerns with the Offshore Flight Data Processing Systems (OFDPS) reaching an End of Life Status due to hardware limitations with the mainframe computer as well as retention of legacy expertise.

For FY 2020, $1.0 million is requested to complete activities to achieve last site Operational Readiness Date (ORD). Final Investment Decision (FID) is scheduled for FY 2019.

What benefits will be provided to the American public through this request and why is this program necessary?

Offshore Automation Phase 1 will standardize the FDP hardware and software utilized by ATC at Anchorage ARTCC, Honolulu Control Facility, Guam CERAP, and San Juan CERAP facilities. This will provide greater workforce efficiency and flexibility as well as reduce the need for development of software and/or hardware solutions to needed new development and requirements across multiple ATC system platforms.

Detailed Justification for - 2A18 Reduced Oceanic Separation

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Reduced Oceanic Separation	$24,350	$25,000	$17,500	$32,300

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Advanced Surveillance Enhanced Procedural Separation (ASEPS)	---	$32,000.0
B. Independent Operational Assessment (IOA)	---	300.0

What is this program and what does this funding level support?

The Advanced Surveillance Enhanced Procedural Separation (ASEPS) program, is exploring near and long-term enhancements in surveillance to support reduced separation and contingency operations in U.S. managed airspace. In 2018, the Joint Resources Council (JRC) provided approval for near and long-term opportunities. The first of these opportunities, ASEPS Automatic Dependent Surveillance – Contract (ADS-C) Reduced Oceanic Separation will be included in the Advanced Technologies and Oceanic Procedures (ATOP) Enhancement 1, program.

ASEPS has interdependencies with the following programs:

- Advanced Technologies and Oceanic Procedures (ATOP)
- Surveillance and Broadcast Services (SBS)
- En Route Automated Radar Tracking System (ERAM)
- Standard Terminal Automation Replacement System (STARS)
- Microprocessor En Route Automated Radar Tracking System (MEARTS)

A. Advanced Surveillance Enhanced Procedural Separation (ASEPS)

Space-Based ADS-B (SBA) Operational Evaluation - will consist of an operational assessment of SBA in the Caribbean to assess system performance in an operational environment and evaluate long-term applications of this new technology across a broader range of airspace. ASEPS will acquire SBA data for oceanic service volumes in the Caribbean and feed data into En Route Automation Modernization (ERAM) at Miami Air Route Traffic Control Center.

Continued ATOP SBA Testing - includes planning and conducting proof of concept evaluations that explore ways to mitigate one or more of the top five risk safety hazards and address operational shortfalls while applying procedural control using SBA and existing ATOP prototype functionality.

ASEPS Future (Further Analysis of SBA in Ocean) - will develop a new concept for oceanic operations that includes enhanced communications and use of weather products paired with enhanced surveillance as part of a holistic approach to reducing separation minima. This effort will also include exploring strategies to accelerate the implementation of enhanced communications (equivalent to terrestrial communication) that, when combined with enhanced surveillance, could deliver the operational capability required to enhance Air Traffic Services in oceanic airspace.

Concept and Evaluation of SBA with Disaster Recovery and Upgraded Avionics - will explore opportunities to leverage near-term implementations of SBA in the Caribbean and potential other geographic regions, to deliver a partial Disaster Recovery capability across the NAS for a range of disaster events such as hurricanes, floods, etc.

For FY 2020, $32.0 million is requested to support the following:

- Program Management and system engineering support
- Oversight of Operational Evaluation, including coordination with ZMA and industry partners
- Prime vendor oversight and coordination
- One-year subscription costs for SBA Data
- Planning and execution of Human-in-the-Loop (HITL) experiments using simulated, higher-performing communications to evaluate reduction in controller intervention times
- Further analysis of user preferred routes in West Atlantic Route System and/or Central East Pacific airspace and the application of SBA separation standards for specific oceanic events (e.g., allowing weather deviation) at the William J. Hughes Technical Center
- Planning and implementation for an Industry Day "Challenge" event to solicit industry input on the state-of-the-art (e.g., availability, performance, and application) of potential new communications and other enhanced surveillance technologies
- Expedite concept analysis and evaluation for using SBA to achieve a partial disaster recovery and operational contingency capability. The funding will support additional systems engineering resources to assess requirements for Air Traffic operations and automation across different geographic regions and types of facilities based on various disaster and contingency scenarios.
- Facilitate contingency planning in the Gulf and Alaska by investigating the technical and operational feasibility of upgrading avionics on universal access transceiver (UAT) equipped aircraft (e.g., helicopters) that are otherwise not eligible for SBA service. This funding will help evaluate the opportunity to upgrade avionics among eligible aircraft in each geographic region and fund those upgrades where viable to accomplish the following:
    - Mitigate impacts in the Gulf from the anticipated loss of terrestrial ADS-B services due a potential increase in oil platform decommissioning where ADS-B radio stations are currently installed.
    - Facilitate surveillance expansion in Alaska through SBA services.

B. Independent Operational Assessment (IOA)

For FY 2020, $300,000 is requested to support IOA activities

What benefits will be provided to the American public through this request and why is this program necessary?

ASEPS is evaluating the potential and further developing the requirements for implementing SBA in U.S. managed domestic and oceanic airspace to improve the efficiency, safety and resiliency of Air Traffic Operations. In the near term, ASEPS will evaluate the benefits and operational requirements, including automation enhancements, for delivering an enhanced backup surveillance capability in the Caribbean, and other potential geographic regions, using SBA. In the mid-term, ASEPS will evaluate the potential for SBA to deliver a partial Disaster Recovery and operational resiliency capability across U.S. airspace, including CONUS, Alaska, Hawaii and Guam. These efforts will contribute to development of a new operational concept for oceanic operations in the long term that includes enhanced communications (e.g., VHF-like) and use of weather products paired with enhanced surveillance as part of a holistic approach to reducing separation minima.

Detailed Justification for - 2A19 En Route Service Improvements

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
En Route Service Improvements	$3,000	$1,000	$1,000	$2,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
En Route Service Improvements	---	$2,000.0

What is this program and what does this funding level support?

This program supports a category of requirements that address necessary and unplanned changes in the en route domain. These sudden needs are the result of operational changes in the field, unanticipated changes from external organizations (e.g. International Civil Aviation Organization (ICAO), third party data providers, neighboring Air Navigation Service Providers (ANSP) or potential cost-savings initiatives. For FY 2020, $2.0 million is requested for operational analysis, engineering analysis, solution development, and solution implementation activities to improve the delivery of en route domain services.

The scope of En Route Services Improvements is limited to operational changes that do not require significant capital investments or involve significant systems complexity, interdependencies, and NAS operational changes. The identification, management, documentation, and overall governance of these NAS changes will be articulated in an ATO domain service enhancement Standard Operating Procedure (SOP) and coordinated with applicable stakeholders.

This funding will be used to improve the presentation, access, and use of ERAM and other systems data by air traffic controllers and managers, resulting in more efficient, safer, and cost-effective delivery of en route services. These small but critical improvements are identified by current operations, and support FAA and/or International Civil Aviation Organization (ICAO) changes.

What benefits will be provided to the American public through this request and why is this program necessary?

This program will provide increased Air Traffic Management (ATM) efficiency, improved target levels of safety, and enhanced productivity through the implementation of high priority en route functional improvements. Improved interaction between the human and the systems, and increasing the accuracy and use of flight data will directly enhance the timeliness and fidelity of controller decisions. This will ultimately improve delivery of services. Advancing the interoperability between systems and facilities decreases manual coordination which directly enhances workforce productivity.

Detailed Justification for - 2A20 Commercial Space Integration

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Commercial Space Integration	$4,500	$9,000	$9,000	$33,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Commercial Space Integration into the NAS: SDI Prototype Sustain	---	$1,000.0
B. Commercial Space Integration into the NAS: SDI Development/Acquisition	---	32,000.0

What is this program and what does this funding level support?

The Commercial Space Integration into the NAS program will automate the FAA's ability to monitor and respond to launch and reentry operations in the NAS through development of a Space Data Integrator (SDI). As the commercial space industry continues to grow, many of the planned missions will include new technologies that have never been undertaken such as reusable rockets, presenting an unprecedented level of complexity. Planning and execution challenges are making it increasingly difficult for the FAA to manage the growing volume of operations in the NAS without significant disruptions to both space and air operators. During a commercial space launch or reentry, the Office of Commercial Space Transportation (AST) and the Air Traffic Organization (ATO) rely on rudimentary tools such as pencil and paper, to monitor, manage, and respond to off-nominal events. Interfaces for the acquisition and distribution of space vehicle data into existing NAS systems do not exist, so a small team transfers data across tools and networks verbally and on paper, enters the data by hand, completing multiple checks to minimize the potential for error.

The SDI is a new integration capability that will acquire commercial space data and automate the FAA's current manual process of managing launch and reentry operations. SDI will enable the FAA to safely reduce the amount of airspace that must be closed to other users, respond to off-nominal scenarios and during normal operations, release airspace that is no longer at risk as the mission progresses, and builds the foundation for integrating commercial space into the NAS.

For FY 2020, $33.0 million is requested to support the Commercial Space activities listed below:

A. Commercial Space Integration into the NAS: SDI Prototype Sustain

For FY 2020 $1.0 million is requested to continue sustainment of the Space Data Integrator (SDI) Prototype in the Commercial Space Integration lab. AST, in collaboration with NextGen, ATO System Operations, and Mission Support, developed a Space Data Integrator Proof-of-Concept (SDI POC) that enables a "reduce, respond, release" approach to safely minimizing the effects of these operations on NAS efficiency and capacity without impeding industry progress. The SDI POC demonstrates the benefits of an integration system but is limited in capability. The SDI POC is currently the only FAA system capable of acquiring and displaying launch and reentry data and is used for launch and reentry operator testing and SDI requirement validation within the Commercial Space Integration lab.

B. Commercial Space Integration into the NAS: SDI Development/Acquisition

For FY 2020, $32.0 million is requested for a contract award and design of an operational Space Data Integrator (SDI) capability that will allow the FAA to keep pace with the growing industry. The SDI is a new capability that will integrate commercial space into the NAS by automating the process of acquiring, transforming, disseminating, and displaying data (telemetry, mission status, aircraft hazard areas) during launch and reentry operations. Through SDI, FAA systems in the National Traffic Management (i.e. Command Center) environment and affected facilities will be able to receive and use launch and reentry vehicle data to improve situational awareness, monitor the transition of these vehicles through the NAS, and respond to off-nominal situations. The program is currently planning for a Final Investment Decision (FID) in early FY 2020.

What benefits will be provided to the American public through this request and why is this program necessary?

The Commercial Space Integration into the NAS program provides safety, flight efficiency, and cost avoidance benefits by enhancing the current level of safety through automating resource intensive processes and reducing the potential for human error during launch and reentry operations. It will allow NAS performance and capacity to keep pace with current and future demand, reducing delays and reroutes while increasing launch and reentry opportunities for each space flight. Additional benefits include the development of airspace management processes and procedures for transition from special operations to routine operations.

Detailed Justification for - 2B01 Terminal Doppler Weather Radar (TDWR) – Provide

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Terminal Doppler Weather Radar (TDWR) – Provide	$3,800	$4,500	$4,500	$2,200

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Terminal Doppler Weather Radar (TDWR) Sustainment 2	---	$2,200.0

What is this program and what does this funding level support?

The TDWR is a Doppler weather radar system used by Air Traffic Controllers (ATC) to increase the safety of the National Airspace System (NAS) and provide vital information and warnings regarding hazardous wind shear conditions to air traffic controllers managing arriving and departing flights in the terminal area. The current system is facing serious obsolescence issues and has been in service since 1994. 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. Without this Sustainment Program, TDWR outages will become more numerous and lengthy, and support costs will continue to quickly rise.

For FY 2020, $2.2 million is requested to support the following activities and/or tasks associated with the TDWR sustainment projects:

- Procurement of modification kits, equipment spares, and modification kits installation (Direct Digital Controller, Antenna Servo Controller, and Transmitter Microwave Assembly Replacement). This funding will support installation until FY 2022.
- Logistical and Engineering Support for the system and to acquire components to replenish depot spares as identified in a Diminishing Manufacturing Sources and Material Shortages Study.
- Program Office HQ Contract Support to execute and support sustainment tasks and activities (i.e. development of required documentation and provide adequate testing).

What benefits will be provided to the American public through this request and why is this program necessary?

FAA has an agreement with the National Weather Service to provide TDWR data. 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. In addition, weather-related delays have been reduced, allowing savings in aviation fuel consumption. The program will continue to deploy improvements that will lower TDWR operations costs and improve its reliability. Thus far, the sustainment program has eliminated outages due to antenna gear failure and maintained service availability by replacing parts of the system that are difficult to maintain and support.

Detailed Justification for - 2B02 Standard Terminal Automation Replacement System (STARS) (TAMR Phase 1)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Standard Terminal Automation Replacement System (STARS) (TAMR Phase 1)	$86,700	$76,900	$66,900	$41,300

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
STARS Sustainment 2	---	$41,300.0

What is this program and what does this funding level support?

This program will provide engineering that will enable the FAA to replace key elements of STARS that have reached their end-of-life (EOL) and are no longer compatible with current commercial offerings. Two significant activities include engineering required to upgrade the present Solaris Operating System that reaches EOL in FY 2018, the end of vendor support in FY 2021 and engineering to develop engineering change proposals (ECPs) and qualify hardware required to transition to Digital Video from current STARS analog video. Also included is Technology Refresh of five STARS G1/G2 Local Integrated Tower Equipment (LITE) systems with new STARS G4 remote tower equipment.

For FY 2020, $41.3 million is requested for the following:

- Deploy STARS to Sites 3, 4 and 5 (Technology Refresh of G1/G2 LITE systems).
- Complete engineering analysis required to transition from Solaris to Linux, including development of associated hardware and software Engineering Change Proposal (ECP) for the software builds.
- Complete engineering analysis and develop, hardware and software ECPs and qualify hardware required to replace the X3000 Processors and Data Recording Device (DRD).
- Complete engineering analysis and develop hardware and software ECPs and qualify hardware required to transition to Digital Video from current STARS video product.

What benefits will be provided to the American public through this request and why is this program necessary?

STARS is a fully digital system that is capable of tracking all aircraft within the defined terminal airspace using available FAA and Department of Defense (DoD) surveillance or with system upgrades to global positioning satellite reports. It is designed to incorporate new functionality more quickly and easily than the previous systems. 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.

Detailed Justification for - 2B03 Terminal Automation Program

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Terminal Automation Program	$8,943	$13,500	$8,500	$6,500

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Flight Data Input/Output (FDIO) Sustainment	---	$2,000.0
B. STARS Enhancement 2	---	2,500.0
C. Terminal Improvements	---	2,000.0

What is this program and what does this funding level support?

A. Flight Data Input/Output (FDIO) Replacement

The FDIO system provides standardized flight plan data, weather information, safety related data, and Wake Re-Categorization to air traffic controllers located at approximately 690 remote sites. This information assists controllers in tracking aircraft, providing departure clearances, and anticipating the arrival of aircraft in the sector under their control. The FDIO Replacement program replaces end-of-life (EOL)/obsolete FDIO equipment with fully compatible commercial off the shelf (COTS) and modified COTS equipment. In FY 2020, $2.0 million is requested to continue the procurement of hardware and software, to fund program management support, to procure and install replacement FDIO system components and all related logistics.

B. STARS Enhancement 2

Standard Terminal Automation Replacement System (STARS) Enhancements 2 is the next useful segment for the STARS platform by consolidating terminal automation onto a single platform as envisioned by NextGen. STARS Enhancements 2 will implement the capabilities necessary to enable trajectory-based operations in the terminal environment and identify and address outstanding operational needs. The funding request for FY 2020 is $2.5 million.

C. Terminal Automation Modernization Improvements

This program supports a category of requirements that address necessary and unplanned changes to various systems in the Terminal domain. These sudden needs are the result of operational changes in the field, unanticipated changes from external organizations (e.g. International Civil Aviation Organization (ICAO), third part data providers, neighboring ANSPs) or potential cost-savings initiatives. The funding request for FY 2020 is $2.0 million.

What benefits will be provided to the American public through this request and why is this program necessary?

The projects under the Terminal Automation Program reduce the operating costs associated with maintaining aging hardware and software. The replacement of aging components extends the service life of the systems and ensures the systems remain viable and operational components of the National Airspace System.

Detailed Justification for - 2B04 Terminal Air Traffic Control Facilities – Replace

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Terminal Air Traffic Control Facilities – Replace	$58,118	$27,200	$19,200	$24,327

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Terminal Air Traffic Control Facilities – Replace	---	$24,327.0

What is this program and what does this funding level support?

Terminal Air Traffic Control Facilities–Replace is one of the programs included in the Air Traffic Control (ATC) Facilities Sustainment Strategic Plan (SSP). Funding the programs in this strategy will improve and maintain the facility condition index (FCI) ratings at FAA facilities that provide the backbone for the National Airspace System (NAS). The FAA is seeking funding for design, to support construction costs, and for the purchase of equipment and utility installation at three different sites respectively.

The FAA provides air traffic control services from more than 500 Air Traffic Control Towers (ATCT) and Terminal Radar Approach Control (TRACON) facilities. Under this program, the FAA evaluates which buildings need to be replaced, sustained, or modernized (especially relative to other facilities across the country) to ensure an acceptable level of building conditions and to meet current and future operational requirements. The average age of ATCTs in the FAA portfolio is 33 years, and the average age of a TRACON is 26 years. There are facilities that are 65 years old. In some cases, ATCTs and TRACONs built 20 years ago do not meet today's Occupational Safety and Health Administration, operational, and building requirements. The facilities also may not have been built to meet today's technological needs and, while some facilities can be modernized or sustained, replacement may be the most efficient method for the FAA to meet operational needs and conform to current building codes and design standards.

The ATCT and TRACON replacements are large capital investments. Given constrained resources, the FAA is focusing on risk-based analyses to ensure that those facilities in greatest need are replaced first. The FAA has a prioritized listing of all NAS terminal sites and conducts ongoing studies that determine if and when the FAA needs to replace an ATCT due to its siting, size, and physical conditions. From that list, the FAA then initiates siting and design studies and ultimately, construction of the facilities with the greatest need.

Segment 1 funding in the amount of $8.5 million is requested for FY 2020 to support advance requirements definition and program management costs for planning and overseeing the program. Activities supported under Segment 1 include the evaluation of unique operational and maintenance requirements that impact ATCT/TRACON facilities, the development of business cases, mock-ups of the Airport Facilities Terminal Integration Laboratory (AFTIL) to assist with the evaluation of the attributes of proposed airport sites, actual site selection, and other advance engineering considerations.

Segment 2 funding, which encompasses the design phase of an ATCT/TRACON replacement project, is requested in the amount of $1.5 million in FY 2020 for one site. The design start is scheduled for Nashville, TN (BNA).

Segment 3 funding in the amount of $11.6 million is requested in FY 2020 to support construction costs associated with the new ATCT/TRACON facility at Teterboro, (TEB).

Segment 4 funding in the amount of $2.7 million is requested in FY 2020 for one facility. This segment funds the equipment and utilities installation at the facility in Greensboro, NC (GSO).

What benefits will be provided to the American public through this request and why is this program necessary?

The benefits provided by the Terminal Air Traffic Control Facilities – Replace program include:

- Eliminating line-of-sight issues, thus increasing efficiency and safety
- Providing adequate space for all approved operational and support positions to enhance efficiency at the ATCT/TRACON
- Providing adequate space and infrastructure for new modern equipment and systems to facilitate the transition to NextGen
- Reducing the high cost of maintaining old and outdated buildings
- Increasing the overall FCI of terminal facilities by providing new buildings that meet current codes

These benefits are instrumental in providing efficiency and effectiveness, which in turn will produce cost savings for taxpayers.

Detailed Justification for - 2B05 ATCT/Terminal Radar Approach Control (TRACON) Facilities - Improve

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
ATCT/Terminal Radar Approach Control (TRACON) Facilities – Improve	$91,800	$115,850	$95,850	$96,200

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. ATCT/TRACON Sustain	---	$90,200.0
B. Facilities Realignment Implementation	---	5,000.0
C. In-Service Engineering	---	1,000.0

What is this program and what does this funding level support?

ATCT/TRACON Terminal Facilities Improvement is one of the programs included in the FAA's Air Traffic Control (ATC) Facilities Sustainment Strategic Plan. For FY 2020, $96.2 million is requested for the following:

A. ATCT/TRACON Modernization - $90.2 million is requested to initiate modifications, improvements, sustainment and repairs to Airport Traffic Control Tower (ATCT)/TRACON facilities. Funding will also support system engineering activities, configuration management, facility planning, facility condition assessments and program support services.

The ATCT/TRACON Terminal Facilities Improvement program includes projects that 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. It will also improve the operational efficiency and environment of equipment within ATCT/TRACON facilities. The upgrades and improvements to terminal facilities support the NAS modernization strategy to achieve efficient aerospace systems and operations. Facility improvements must incorporate new requirements for relocated or replaced equipment with minimal impact to existing operations.

The program funds an average of 50 sustainment projects each year. Sustainment is defined as activities to continue the NAS/terminal service mission critical capability by modifying, repairing, replacing, and reconfiguring. Routine and ongoing maintenance activities are not funded from this program. The sustainment projects include many sites throughout the NAS and will consist of efforts such as mechanical, electrical, elevators and plumbing.

B. Facility Realignment Implementation - $5.0 million is requested for conducting transition planning, initiating and completing facility modifications, installing necessary equipment, supporting realignment-related training, and preparing workforce, facilities, and equipment for the transition. This project will fund the implementation of realignment recommendations submitted by the FAA Administrator to Congress.

C. In-Service Engineering - Also requested is in-service engineering funding in the amount of $1.0 million to promote the improvements and allow for immediate response and tactical distribution in response to emerging solutions.

What benefits will be provided to the American public through this request and why is this program necessary?

The benefits of the ATCT/TRACON Terminal Facilities Improve program are that repairs will be made to critical infrastructure that facilitates the movement of air traffic. These repairs will increase the overall Facility Condition Index (FCI) of those facilities and reduce the risk of air traffic control outages by providing safe, secure, resilient, and efficient buildings that meet modern codes. These improvements reduce the ongoing cost of operational maintenance at these facilities.

Facility realignments are expected to deliver cost savings, cost avoidance, and staffing and operational efficiencies upon implementation and may continue to accrue overtime.

Detailed Justification for - 2B06 NAS Facilities Occupational Safety and Health Administration (OSHA) and Environmental Standards Compliance

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
NAS Facilities OSHA and Environmental Standards Compliance	$46,700	$41,900	$41,900	$40,400

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
NAS Facilities OSHA and Environmental Standards Compliance	---	$40,400.0

What is this program and what does this funding level support?

The Air Traffic Organization (ATO) NAS Facilities Occupational Safety and Health Administration (OSHA) and Environmental Standards Compliance Program provide occupational safety and environmental risk management technical expertise to support compliance with applicable safety and environmental protection standards and mitigate identifiable hazards in the ATO workplace.

ATO acquisitions, installations, modifications, and operations must comply with a wide variety of safety and environmental protection standards governing areas ranging from fire and life safety for our facilities through the storage and disposition of hazardous wastes and materials.

The Environmental and Occupational Safety and Health (EOSH) Services provides safety and environmental protection and risk management support management expertise through the life cycle of ATO operations. EOSH professionals consult in the planning phases of retrofitted and new construction efforts to mitigate risks and even completely engineer out hazards at the earliest possible point. EOSH professionals devise, develop, and publish orders, policies, procedures, and practices that promote cultural risk management. EOSH professionals conduct job hazard analyses and facility inspections to identify actual and potential risks. Risk mitigation plans are developed and enacted. Risk mitigation methodologies range from educational opportunities focused on safety and environmental risks and how to apply risk awareness and mitigation techniques through modification of existing ATO assets.

The EOSH program performs data analyses to identify, track, and mitigate emerging or recurrent risk concerns.

EOSH program risk management efforts include:

- Protect employees and the environment
- Prevent damage and loss of FAA resources
- Promote a culture of safety and environmental responsibility

For FY 2020, $40.4 million is requested to provide technical compliance expertise to address Federal, State, and local environmental and safety regulations and binding commitments.

- Employee Health/Industrial Hygiene
- Fire and Life Safety

- Environmental Compliance
- Occupational Safety
- Service Area Technical Implementation
- Arc Flash Hazard Analysis

Non-compliance with Federal, State, and local environmental, safety, health, legal, and other requirements imposes significant liabilities on the FAA in the form of personnel injury or loss, interruptions to NAS operations, violations of bargaining unit agreements, post-incident response actions (such as costly cleanups), and a decrease in employee morale. Failing to effectively manage safety and environmental risks also incurs short- and long-term financial impacts for the agency. Employee injuries directly impact not only the injured worker (lost time and productivity) but also require the cost and time commitments associated with first- and second-level responders, generate unplanned workload for post-incident investigatory and administrative personnel, and create personnel backfill requirements to achieve the continuing mission.

What benefits will be provided to the American public through this request and why is this program necessary?

The program goal is to identify and reduce or eliminate occupational hazards and environmental liabilities present in FAA operations through a combination of compliance policies and procedures, continuous hazard identification and monitoring, targeted training, deployment of protective measures, and hazard abatement activities. Through these efforts, occupational safety and environmental risks are reduced, resulting in a safer, healthier workforce, reduced employee injuries and associated costs, a strong agency compliance posture, and reduced impacts to FAA operations. These efforts also put the FAA in compliance with several Federal and State compliance regulations.

Detailed Justification for - 2B07 Integrated Display System (IDS)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Integrated Display System (IDS)	$5,000	$18,000	$18,000	$24,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Enterprise Information Display System (E-IDS) Program	---	$24,000.0

What is this program and what does this funding level support?

Legacy Integrated Display Systems (IDSs) were first introduced in the 1990's to provide Air Traffic Management (ATM) personnel in the Federal Aviation Administration (FAA) National Airspace System (NAS) information separate from primary displays, providing Air Traffic Controllers (ATC), Front Line Managers, and Traffic Management Coordinators with supplemental but operationally essential information for controlling aircraft. The Terminal environment currently includes three distinct systems, each with a different hardware/software configuration: IDS-4, Automated Surface Observing System Controller Equipment-IDS (ACE-IDS), and NAS Information Display System (NIDS). The En Route environment created its own IDS called En Route Information Display System (ERIDS) that provides information to FAA personnel in Air Route Traffic Control Centers (ARTCC). The Alaska ARTCC also developed its own separate IDS, the Alaska Automated Information Display (AAID).

Multiple legacy IDS systems are facing hardware parts shortages and technology obsolescence that puts operational use at risk. These multiple legacy IDS systems and their growing lack of repair parts has proven costly to maintain these systems with aging hardware and software. The legacy IDS systems provide limited support for NAS resiliency and lacks the ability to interface with current FAA infrastructure and obtain additional information from authoritative sources.

To address these shortfalls, the Enterprise Information Display System (E-IDS) program will provide an enterprise-level platform and displays that replace the multiple types of legacy IDSs in the En Route, Terminal, Flight Service, Traffic Flow, Oceanic, and Offshore domains with standard functionality and common hardware/software. E-IDS will eliminate differences in the information displayed by obtaining it from trusted sources through the FAA System Wide Information Management (SWIM) program and distribute the information for display to client users in all domains, assuring common system operational awareness across all domains. E-IDS will reduce manual entry, facilitate interfacility coordination, and integrate information. E-IDS will also support contingency operations if a catastrophic event occurs by migrating and restoring position functionality to a different facility for the restoration of operations. This resiliency capability is the creation of a centralized enterprise database that stores the functions, data requirements, and presentation design that are unique to each specific position in the enterprise.

E-IDS is planned for multiple phases, where FY 2020 funding will be utilized to award a prime contract to support system development and implementation, development of software and hardware specifications, and development test and evaluation. FY 2020 funding will also provide for program management, contractor support, contract management, program control, budget, earned value management (EVM), and risk management.

What benefits will be provided to the American public through this request and why is this program necessary?

E-IDS will provide benefits to the American public by:

- Providing increased productivity, user efficiency, and NAS safety by displaying, entering, and distributing Notices to Airmen (NOTAMs), and access to Special Activity Airspace (SAA) schedule and status
- Enhancing safety in the NAS with Pilot Report (PIREP) collection and distribution across the E-IDS Enterprise and to other NAS users
- Replacing multiple legacy IDS systems that are approaching obsolescence
- Reducing total development and sustainment costs compared to the cost of maintaining current multiple legacy IDS systems
- Increasing program oversight efficiencies by reducing from multiple legacy IDS systems to a single E-IDS system
- Improving NAS resiliency by supporting faster recovery during adverse events, and providing required operational position information to any other properly configured position in the NAS will support ATM service providers in maintaining the continuity of operations

Detailed Justification for - 2B08 Remote Monitoring and Logging System (RMLS)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Remote Monitoring and Logging System (RMLS)	$7,400	$18,100	$18,100	$14,400

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Automated Maintenance Management System (AMMS)	---	$10,000.0
B. Remote Monitoring and Logging System (RMLS) Sustainment	---	4,400.0

What is this program and what does this funding level support?

A. Automated Maintenance Management System (AMMS)

AMMS will deliver benefits through technology and infrastructure by interfacing dispersed maintenance system within the currently existing System Wide Information Management (SWIM) Service Oriented Architecture environment. System interfaces will be standardized, and governance will be applied to data exchanges. Data will be cleansed, and authoritative data sources will be documented. Data exchange services will be utilized to provide common services for maintenance systems, and enhanced, modernized maintenance tools will be implemented, as to promote more efficient maintenance practices.

For FY 2020, $10.0 million is requested to perform software and hardware engineering activities to initiate solution implementation based on the chosen alternative for AMMS Phase 1 activities. The components to be addressed utilizing this funding will be to: procure required software licenses and hardware; execute hardware, software and database design, development, and configuration; initiate external interface development; initiate development of training materials; perform program management to assist with program solution implementation; and sustain the data exchange standard.

The specific initiatives to be supported by this funding are as follows:

- ($2.0 million) – Program Management contractor support to assist with activities associated with planning, implementing, and managing actions that must be accomplished for successful program implementation. This includes the following activities
    - Preparation of budgeting, risk management, schedules, meetings, and reporting artifacts
    - Continued documentation support (e.g. engineering, functional analysis, process flows, etc.)
    - Requirements integration support
    - Infrastructure engineering support (system interfaces, SWIM processes)
- ($6.9 million) – Perform software and hardware engineering activities to initiate solution implementation based on the chosen alternative. This includes the following activities:
    - The initial procurement of required software licenses and hardware for the mission support product
    - Activity associated with the hardware design, development, and configuration of the mission support product
    - Activity associated with software and database design, development, and configuration for the mission support product
    - Initiate external interface development activities that include software/hardware development, and SWIM on-ramping activities
    - Initiate development of training materials for the mission support product

  - (If required) Continued support for the AMMS Proof of Concept environment in collaboration with the use of the Maintenance Management Information eXchange Model (MMIXM)
- ($1.1 million) – Sustain the MMIXM data standard, in support of AMMS Phase 1, and other acquisition programs requirements. This includes the following activities:
  - Updates to the MMIXM data standard in support of required data elements and documentation
  - The integration of the MMIXM data standard, and common services into the final solution product, and SWIM infrastructure
  - The continued integration and testing of common services within the AMMS Phase 1 proof of concept environment

B. Remote Monitoring and Logging System (RMLS) Sustainment

RMLS Sustainment will replace aging legacy RMLS core hardware components to accommodate National Airspace System (NAS) growth and ensure that the legacy National Logging Network (NLN) and the National Remote Maintenance Monitoring (RMM) Network (NRN) infrastructure supports the agency's storage, bandwidth, and security needs. This program is necessary because the hardware upgrade will allow the RMLS infrastructure to comply with the FAA's mandated security requirements.

For FY 2020, $4.0 million is requested to perform hardware engineering activities to continue solution implementation. The components to be addressed utilizing this funding will be to: perform Key Site Test (Acceptance Test); initiate national delivery of the NRN infrastructure; and perform program management to assist with program solution implementation.

The specific activities to be supported by this funding are as follows:

- ($3.05 million) – Contractor support to install, assemble, test and checkout the RMLS NRN equipment at seven locations including:
  - (six) Air Route Traffic Control Centers (ARTCCs) locations and (one) Terminal Radar Approach Control Facility (TRACON).
- ($0.03 million) – Contractor support to assist the Remote Monitoring System Engineering Team (RMSET) with program management activities.
- ($1.32 million) – Contractor support for the RMLS Sustainment program management activities including preparation of schedules, budgeting, risk management, configuration management, reporting, and In-Service Decision work products.

What benefits will be provided to the American public through this request and why is this program necessary?

The benefits provided by the RMLS to the American public are providing cost savings and reduction in flight delays for the American Public and airline industry; streamlined maintenance practices; increased availability of equipment and services; and enhanced flight check scheduling for the restoration of NAS equipment and services. Also, RMLS provides increased safety by proper certification of NAS equipment and services, provides more timely issuance/cancellation of Notices to Airmen (NOTAMs), provides increased situational awareness of maintenance data, promotes more efficient maintenance practices, and reduces maintenance outages within the NAS.

Detailed Justification for - 2B09 Terminal Flight Data Manager (TFDM)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Terminal Flight Data Manager (TFDM)	$90,350	$119,250	$119,250	$135,450

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Terminal Flight Data Manager (TFDM)	---	$134,800.0
B. Independent Operational Assessment (IOA)	---	650.0

What is this program and what does this funding level support?

The Terminal Flight Data Manager (TFDM) program will deliver to tower Air Traffic Controllers and FAA traffic managers NextGen decision support capabilities that integrate flight, surface surveillance, and traffic management information. TFDM will provide the equipment for the collection, distribution, and update of flight data information in the terminal area, and will improve access to information for the safe and efficient control of air traffic. TFDM decision support capabilities will promote safe and efficient airport operations in managing airport surface traffic sequencing and scheduling. TFDM will automate manual flight data processes to enable enhanced data sharing between the Tower, En Route, Approach Control, Traffic Flow Management (TFM) and Flight/Airline Operations Centers.

A key component of the TFDM system is the transition from paper flight strips to electronic flight data representation and exchange. This will facilitate enhanced flight data exchange between controllers within the tower, those in other ATC facilities, and those overseeing Traffic Flow Management Systems. This will also facilitate data exchange with aviation partners such as the airlines' flight operations centers and airport operators to support Collaborative Decision Making (CDM). Providing flight data in electronic format eliminates the necessity of the physical exchange of flight data, reduces telephone call volume between facilities and reduces the manual re-entry of data among multiple ATC systems. Air traffic controllers will have more heads up time, looking out the window, to focus on the surface traffic, therefore, increasing safety.

Another key component of the TFDM system is the introduction of a surface scheduler/metering capability. TFDM will provide the basis for efficient management of traffic flows on the surface at U.S. airports by transitioning the performance of airport surface operations from a "first come, first served" model to a more strategic model that allocates taxi clearances to minimize taxi distance and time, thus reducing fuel burn and CO_2 emissions.

The Final Investment Decision was approved and the prime contract was awarded in June 2016. The program's implementation plan is based on a two software build approach (Build 1 and Build 2) and deployment to 89 airports from FY 2020 to FY 2028. TFDM is currently in the Development and Testing phase and starting the implementation activities. The program has completed the following key milestones:

Build 1 Key Milestones:

- System Requirements Review
- Preliminary Design Review
- Critical Design Review

- Development Test Start
- Operational Test Start

Build 2 Key Milestones
- System Requirements Review
- Preliminary Design Review
- Critical Design Review
- Development Test Start

TFDM will integrate into the NAS and will have program interdependencies for data exchanges with numerous other systems. The costs associated with other system interfaces and modifications required to deliver TFDM capabilities is included in the TFDM cost baseline. In FY 2018, TFDM begun providing incremental funding for these other systems and will conclude with the Traffic Flow Management System (TFMS) in FY 2020.

In FY 2020, $134.8 million is requested for the Implementation of TFDM Build 1 and the continued System Development of TFDM Build 2. The Prime Contract costs for FY 2020 will cover the completion of site surveys at 11 sites, hardware installation at eight sites, completion of Build 1 Operational Test, Build 1 Key Site Initial Operational Capability (IOC), and IOC at 3 additional sites. FY 2020 Prime Contractor costs also covers the TFDM Build 2 activities that includes the Build 2 Site Acceptance Test for key site, and Build 2 Development Test. The FY 2020 funds will also provide Program Management and Technical Support resources to support the TFDM Program Office and the Systems Operations office (a TFDM stakeholder) in the planning, oversight and management of the Prime Contractor. Additionally, the remaining FY 2020 funding will provide the TFDM Program Office with the Test resources required to oversee and witness the Formal System Test activities, conduct the Operational Test, and will provide resources needed to support further preparation for the implementation of the TFDM system.

Anticipated key milestones for FY 2020 are summarized below:

- Complete site surveys at 11 sites
- Complete hardware installations at eight sites
- Complete Build 1 Operational Test (APB milestone)
- Achieve Build 1 Key-Site Initial Operational Capability (APB milestone)
- Conduct Build 1 Independent Operational Assessment (APB milestone)
- Achieve Build 1 In Service Decision (APB milestone)
- Achieve Build 1 Key-Site Operational Readiness Date (APB milestone)
- Complete Build 2 Development Test (APB milestone)
- Achieve IOC at three sites (four of 89, four percent)

Also requested is $350,000 for IOA activities.

What benefits will be provided to the American public through this request and why is this program necessary?

This program focuses on gaining efficient flow and management of aircraft on the surface at selected metroplex airports and the complex terminal airspaces within the NAS. High density airports typically see higher demand for runway capacity, operate multiple runways, and have complex airspace and ground interactions in the arrival and departure phases of flight. The surface capabilities resulting from this program are expected to improve both the efficiency of individual flights while optimizing runway throughput. This work will make travel safer for the traveling public, help reduce passenger delays leading to a better traveling experience, and contribute to less pollution.

TFDM will enhance airport capacity utilization during severe weather and other off-nominal conditions, improve usability, and situational awareness.

These benefits are derived through:

- **System consolidation and elimination of paper flight strips** - Consolidating Air Traffic Control Tower (ATCT) systems, panels, displays to reduce costs and allow more real estate in the tower and removing paper strips and supporting infrastructure to reduce costs.
- **Reduced accidents on the surface** - Providing electronic flight data to reduce accidents caused by controller miscommunication and overlooked flights.
- **Reduced fuel burn through Departure queue management** - Providing tools to improve pushback planning thereby shifting taxi delay from the taxi phase to the gate or non-movement area leading to reduced fuel burn and operating costs.
- **Increased opportunity for flight prioritization** - Improving coordination and data sharing between the Air Traffic Control (ATC) system and flight operators to give airlines more flexibility in prioritizing flights based on business needs; allows substitution during Surface Metering.
- **Improved off-time compliance related to controlled departure times** - Providing more accurate predictions of event and taxi times to allow better compliance with the current controlled departure times.
- **Increased opportunity to take Call for Release (CFR) delay at gate** - Improving coordination and data sharing between the ATC system and flight operators to shift CFR delay from the taxi phase to the gate
- **Improved runway load balancing (strategic)** - Providing strategic airport configuration and runway load tools in the ATCT to better coordinate runway use.
- **Improved runway load balancing (tactical)** - Providing tactical runway balancing tools in the ATCT to better coordinate runway use.

Detailed Justification for - **2B10 NextGen – Performance Based Navigation (PBN) and Metroplex Portfolio**

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Performance Based Navigation (PBN) and Metroplex Portfolio	$20,000	$20,000	$20,000	$5,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Distance Measuring Equipment (DME) Support for PBN	---	$5,000.0

What is this program and what does this funding level support?

PBN uses Area Navigation (RNAV) and Required Navigation Performance (RNP) to improve access and flexibility in the National Airspace System (NAS) with the goal of providing the most efficient aircraft routes possible from departure runway to arrival runway while also enabling right-sizing of conventional procedures and navigation infrastructure. PBN defines the requirements for routes and procedures that enable aircraft to navigate with greater precision and accuracy. It provides a basis for designing and implementing new flight paths, redesigning airspace, and providing safe obstacle clearance. In support of PBN, the objective of NextGen DME is to provide a resilient network to continue PBN operations during a Global Navigation Satellite System (GNSS) disruption. Appropriately equipped aircraft will be able to continue PBN operations during both wider space-based and localized GNSS interference events.

The objective of the NextGen DME program is to provide a resilient navigation service to enable commercial aircraft to seamlessly continue PBN operations during Global Navigation Satellite System (GNSS) disruptions. The program will add DMEs to the existing network to eliminate single points of failure (critical DMEs) and fill coverage gaps to enable DME Area Navigation (RNAV) aircraft, without Inertial Reference Unit (IRU), to continue PBN operations during GNSS disruptions.

For FY 2020, the NextGen DME Program requests $5.0 million to procure eight new DME systems, acquire real property, continue site preparation and installation for DMEs procured in FY 2019, and commission four new DME sites.

What benefits will be provided to the American Public through this request and why is this program necessary?

These resources benefit the American public by allowing pilots flying aircraft equipped with RNAV to continue PBN operations in the event of a GNSS outage; significantly maintaining flight efficiency, reducing delays and reducing carbon emissions and noise, thereby providing an environmental benefit. DME/DME RNAV service will be available to the 30 percent of commercial aircraft that are not equipped with Inertial Reference Unit (IRU), significantly reducing the impact on pilot/controller workload during GNSS disruptions, thereby improving safety. The NextGen DME program will discontinue existing DME facilities that are not needed for RNAV, thereby reducing maintenance costs for equipment, facilities, and instrument flight procedures.

Detailed Justification for - 2B11 Unmanned Aircraft System (UAS) Implementation

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Unmanned Aircraft System (UAS) Implementation	$0	$0	$0	$58,400

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Small Unmanned Aircraft Systems (UAS) Implementation	---	$54,900.0
B. FAA Drone Zone	---	3,500.0

What is this program and what does this funding level support?

The FAA introduced new and updated regulations to manage the influx of Small Unmanned Aircraft Systems (sUAS) into the National Airspace System (NAS). Due to the nature of some of these new regulations, rapid implementation was necessary to manage public interactions and expedite internal FAA business processes. These projects will create the framework needed to allow UAS to operate safely without impact to manned aircraft operations or creating disruptions and delays.

A. Small Unmanned Aircraft Systems (UAS) Implementation:

This project will support the integration of UAS operations in a UAS Traffic Management (UTM) environment and the operational transition of Low Altitude Authorization and Notification Capability (LAANC) to the NAS, as well as activities driven from ongoing sUAS rule-making. These initiatives include capabilities in support of Heterogeneous Traffic, Urban, and Urban Air Mobility operations. This project also provides for two implementation cycles to support ongoing new capability needs. For FY 2020, $54.9 million is requested to develop products to implement sUAS capabilities in the NAS and implement new capabilities that are necessary to address ongoing sUAS UTM activities. Funding will be used to create architecture products, develop software for capabilities, conduct validation and security testing, enhance supportability, and provide training in order to transition LAANC to the NAS.

For FY 2020, $54.9 million is requested to:

- Develop products to implement sUAS capabilities in the NAS and implement new capabilities that are necessary to address ongoing sUAS UTM activities
- Early implementation of Remote ID capability including the development of data exchange mechanisms with UAS Service Suppliers (USS) and development of operating rules, governance mechanisms, specifications for FAA storage, and use concepts for intra-governmental exchange of Remote ID data
- Create architecture products, develop software for capabilities, conduct validation and security testing, enhance supportability, and provide training in order to transition LAANC to the NAS
- Deploy and manage communications and spectrum requirements for UAS C2 link
- Finalize and deploy ACAS standards for UAS
- Establish the standards for verification and validation of UTM services from third parties
- Implement analyzed and developed Right of Way rules for operations involving UAS
- Integrate established UAS safety standards for protection of persons and property
- Operational Assessment of Counter UAS standards for the effectiveness and efficiency of future technologies and the non-interference with other aircraft and air traffic systems

B. FAA Drone Zone:

The FAA Drone Zone is a cloud-based IT platform that hosts applications and the supporting infrastructure to improve the public user experience and increases efficiency of internal business processes required for the operation of sUAS. In addition to subsuming the sUAS Registration System, the FAA Drone Zone also implemented web applications to support the collection and processing of Airspace Authorizations and Waivers, Operational Waivers and Accident Reporting. Additionally, the FAA Drone Zone platform supports the backend IT systems that run LAANC. For FY 2020, $3.5 million is requested to complete the migration of the FAA Drone Zone to the FAA Cloud Services and build-out applications for sUAS users.

What benefits will be provided to the American public through this request and why is this program necessary?

The UAS programs play a critical role in enabling UAS operations in the NAS without impacting manned aircraft operations and creating disruptions or delays, and ensuring NAS operations will be as safe or safer than they are today. Government cost of allowing UAS operations will decrease due to the reduction of "exception handling" of UAS flights, and improvements to NAS capabilities and operations will be made cost effectively due to the integrated framework approach to addressing needs and solutions.

Detailed Justification for - 2B12 Airport Ground Surveillance Portfolio

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Airport Ground Surveillance Portfolio	$0	$0	$0	$19,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Airport Surface Detection Equipment – (ASDE) Sustainment	---	$14,000.0
B. Runway Status Lights (RWSL) Sustainment	---	3,500.0
C. NAVAIDS Monitoring Equipment (NME)	---	1,500.0

What is this program and what does this funding level support?

A. Airport Surface Detection Equipment – (ASDE) Sustainment

ASDE is a surface surveillance system that provides air traffic controllers with a visual representation of the traffic situation on the airport movement area and arrival corridors. It improves the controllers' ability to maintain awareness of the operational environment and to anticipate contingencies. The system provides visual and audible alerts to air traffic controllers when it predicts a collision. The surface movement radars (SMRs) are a subsystem of the Airport Surface Detection Equipment Model-X (ASDE-X) and Airport Surface Surveillance Capability (ASSC) systems and are critical to the operation of these systems. Failure of an SMR will result in a critical fault to the ASDE-X/ASSC system disabling the system for operational use. Many of the SMRs have been operational for over 20 years and the inventory of spare parts is being depleted and becoming obsolete.

The purpose of the ASDE Sustainment program is to sustain non-cooperative surface surveillance capability at airports with ASSC and ASDE-X systems until 2035. For FY 2020, $14.0 million is requested to support a Final Investment Decision (FID) in FY 2020 and to award a contract to the prime vendor.

B. Runway Status Lights Sustainment

RWSL integrates airport lighting equipment with approach and surface surveillance systems to provide a visual signal to pilots and vehicle operators indicating that it is unsafe to enter/cross or begin takeoff on the runway. The system has automated light control logic that commands in-pavement lights to illuminate red when there is traffic on or approaching the runway.

The RWSL Sustainment program will align RWSL to current technology, improving reliability and lowering the cost of maintenance. Replacing obsolete Commercial Off-the-Shelf (COTS) hardware and upgrading hardware and software to current technology will ensure the continued reliable and cost-effective operation of the system through its designated lifecycle. The RWSL was procured in late 2008, fielded between 2009 and 2018, and is intended to remain operational until replacement begins in 2026. For FY 2020, $3.5 million is requested to proceed toward Final Investment Decision (FID) in FY 2020 produce the necessary Investment Analysis (IA) artifacts and initiate contract award upon approval of the FID.

C. NAVAIDS Monitoring Equipment (NME)

There are currently two different types of consolidated Air Traffic control and monitoring systems operating in the National Airspace System (NAS) that replace multiple legacy control and monitoring panels used by Air Transportation System Specialists (ATSSs) for monitoring and controlling navigational aids (NAVAIDS) equipment at an airport. These two systems are the Integrated Control and Monitoring System (ICMS) and the Universal Interlock Controller (UIC). These systems monitor and control predefined sets of NAVAIDS from one or more user interfaces located in the airport facility. Those systems include: Instrument Landing Systems (ILS), Runway Visual Range (RVR) equipment, Runway End Identifier Lights (REIL), and Precision Approach Path Indicator (PAPI) light arrays.

The NME program will provide a common requirements baseline across all systems. NME will be deployed at approximately 32 airports across the NAS. For FY 2020, $1.5 million is requested to support a Final Investment Decision (FID) in FY 2020, and for the development and evaluation of the Screening Information Request (SIR), which precedes procurement of the NME system in FY 2021.

What benefits will be provided to the American public through this request and why is this program necessary?

The FAA's top priority is maintaining safety in the national airspace system. The safe and expeditious flow of air traffic at an airport is the product of a complex, disciplined interaction of people, aircraft, and vehicles, all supported by increasingly sophisticated processes, communications and control technologies, and regulatory oversight. These programs ensure the continued reliability of safety components through sustainment and standardization of control systems that support the situational awareness of air traffic control, air transportation system specialists, and pilots.

Detailed Justification for - 2B13 Terminal and En Route Surveillance Portfolio

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Terminal and En Route Surveillance Portfolio	$0	$0	$0	$68,500

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. ATC Beacon Interrogator Model 6 (ATCBI-6) Sustainment	---	$3,000.0
B. ATC Beacon Interrogator Model 5 (ATCBI-5) Sustainment	---	1,500.0
C. Airport Surveillance Radar Model 9 (ASR-9) Sustainment 3	---	11,600.0
D. Airport Surveillance Radar Model 8 (ASR-8) Sustainment 2	---	2,200.0
E. Airport Surveillance Radar Model 11 (ASR-11) Sustainment 3	---	4,400.0
F. Mode Select (Mode S) Sustainment 3	---	43,500.0
G. In-Service Engineering	---	2,300.0

What is this program and what does this funding level support?

The current stock of FAA Primary Surveillance Radars (PSRs) and Secondary Surveillance Radars (SSRs) is aging. This includes systems such as the Air Traffic Control Beacon Interrogator-5 (ATCBI-5) and the Airport Surveillance Radar – 8 (ASR-8), which were both originally fielded in the 1970s, and the ASR-9, which was originally fielded in the mid-1980s. While many of these systems will eventually be replaced, they must be maintained until replacement systems are fully fielded, preventing gaps in radar coverage.

The Surveillance Portfolio Analysis (SPA) Workgroup is identifying which radars will be retired upon adequate ADS-B equipage in 2020. A significant number of radar systems will remain in place and require sustainment past 2020. The Spectrum Efficient National Surveillance Radar (SENSR) is intended to eventually replace the remainder of these systems, but full SENSR deployment is not scheduled to complete until the 2035 timeframe. These sustainment efforts are essential to National Airspace System (NAS) critical surveillance services, until SENSR is deployed.

A. ATCBI Model 6 Sustainment

The ATCBI-6 is a Monopulse Secondary Surveillance Radar (MSSR) with selective interrogation capability that significantly improves the accuracy of aircraft position and altitude data provided to ATC automation systems. The ATCBI-6 program commissioned the first system in FY 2002 and the last system in FY 2013. This technology refresh activity will determine the retrofit requirement for the 132 operational and seven support ATCBI-6 systems, keeping the systems operational until SENSR deployment. For FY 2020, $3.0 million is requested to support Final Investment Decision (FID). This includes Contractor Support and Benefit Analysis, Program Management, Logistics and Sustainability Study, System Engineering and Second Level Engineering Analysis, Shortfall Analysis, the development of an Independent Government Cost Estimate, Business Case Analysis Report, and the Initial Implementation Strategy and Planning Document. FID is planned for December 2021.

B. ATCBI Model 5 Sustainment

The ATCBI-5 is a cooperative (secondary) surveillance radar system that provides aircraft data for air traffic controllers in En Route and Terminal airspace. ATCBI-5 systems are currently installed at 54 airports and 5 DoD facilities where they are co-located with ASR-8s and ASR-9s, and there are four support systems (three at the Mike Monroney Aeronautical Center and one at William J Hughes Technical Center). The ATCBI-5 was originally commissioned in 1973. The ATCBI-5 technology refresh program will replace and/or upgrade the entire system or obsolete ATCBI-5 equipment, including original, manufacturer peculiar, and Commercial Off-the-Shelf (COTS) hardware and software. This will ensure the continued reliable and cost-effective operation of the ATCBI-5 through its designated new lifecycle of 2035, until fully replaced by SENSR. For FY 2020, $1.5 million is requested to support investment analysis activities and artifact development in support of Investment Analysis Readiness Decision (IARD) planned for June 2020 and Final Investment Decision (FID) for December 2021.

C. ASR-9 Sustainment 3

The ASR-9 system was procured in the mid-1980s, fielded between 1989 and 1994, and has significantly exceeded the expected 20-year lifecycle. The ASR-9 Sustainment Phase 3 program continues the phased strategy to extend the service life of the ASR-9 systems, implementing modifications to the ASR-9 system to sustain primary radar surveillance in terminal airspace. The ASR-9 uses hardware and software architectures that are becoming obsolete. Without modifications, the ASR-9 system will experience decreasing reliability, lowering availability and increasing supportability risks due to the limited commercial availability of some critical components. ASR-9 Sustainment Phase 3 received a successful FID in March 2018, to keep the system operational. For FY 2020, $11.6 million is requested for the procurement of Data Communication Equipment (DCE) and program support.

D. ASR-8 Sustainment 2

The ASR-8 technology refresh program is needed to sustain the ASR-8 primary surveillance radar systems through the 2035 timeframe when the SENSR program is expected to be deployed. The ASR-8s were fielded between 1975 and 1980 to provide primary surveillance radar data to air traffic controllers at low and medium activity airports. Forty ASR-8 systems (38 operational systems, two support systems) currently remain in use in the NAS. The receiver portion of ASR-8's is being digitized through the Common Terminal Digitizer (CTD) program to enable the analog data to interface to the new Standard Terminal Automation System (STARS). The technical refresh will replace or redesign obsolete ASR-8 hardware and software in the legacy ASR-8 components not addressed by the CTD. For FY 2020, $2.2 million is requested to support investment analysis activities and artifact development in support of IARD planned for June 2020 and FID for December 2021.

E. ASR-11 Sustainment 3

The ASR-11 Sustainment programs ensure availability of critical weather and terminal surveillance services until a replacement system is deployed. The ASR-11 was procured via Interagency Agreement with the Department of Defense United States Air Force. The FAA procured 66 systems and fielded the last system in 2013. The ASR-11 Sustainment 3 (ASR-11 S3) will address parts obsolescence maintenance issues, current NAS requirements, and operational performance deficiencies, and other areas requiring technology refresh to ensure continued reliable and cost-effective operation of ASR-11 systems. The program plans to procure form, fit and function and/or redesign replacements, as required. For FY 2020, $4.4 million is requested for investment analysis activities and artifact development in support of the September 2020 FID. Additionally, ASR-11 Sustainment 2 (ASR-11 S2) activities will continue into FY 2020.

F. Mode S Sustainment 3

The Mode S system is a cooperative, secondary surveillance radar that provides aircraft surveillance and communication to support ATC automation. Mode S systems were installed at the nation's busiest airports, where they are co-located with ASR-9s and ASR-8s. There are also Mode S Systems installed at En Route sites, where they are co-located with Common Air Route Surveillance Radars (CARSR) and Mode S that are in a Beacon-only system (BOS) configuration. The Mode S Sustainment will replace the existing Mode S equipment, excluding the antenna, with a COTS based system, which will also support the All Purpose Structured Eurocontrol Surveillance Information Exchange (ASTERIX) formatted data and internet protocol (IP) as well as legacy Time Division Multiplex (TDM) communications. Concerns about near-term supportability, coupled with the need for continued operational capability in the NAS, have recently become the driving requirements for a Sustainment. The Sustainment will ensure that the radars will remain operationally supportable through 2035. For FY 2020, $43.5 million is requested for System/Software Architecture, Design and Development, First Article Systems, on-site Development Test, program management support, System Security Services, training development for FAA Field Maintenance and FAA Air Traffic Control Personnel and Information.

G. In-Service Engineering

$2.3 million is requested for in-service engineering activities that allow for immediate response and tactical distribution of resources to emerging technology solutions across the entire surveillance portfolio.

What benefits will be provided to the American public through this request and why is this program necessary?

Outages of primary and secondary surveillance systems are a significant contributor to aircraft arrival and departure delays at major airports throughout the United States. The sustainment work under this portfolio will increase equipment and service availability and reduce delays that cost airlines and the flying public money and time. Expected outcomes from the work will be to:

- Extend the Service Life of the System Capability
- Decrease System Maintenance
- Reduce Outages
- Increase Equipment and Service Availability
- Decrease Operating Costs for the Operations Account

Detailed Justification for - 2B14 Terminal and EnRoute Voice Switch Recorder Portfolio

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Terminal and EnRoute Voice Switch Recorder Portfolio	$0	$0	$0	$49,750

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Voice Switching and Control System (VSCS) Sustainment 4	---	$19,800.0
B. Terminal Voice Switch Replacement (TVSR) Sustainment 2	---	15,100.0
C. NAS Voice Recorder	---	14,500.0
D. Independent Operational Assessment (IOA)	---	350.0

What is this program and what does this funding level support?

A. Voice Switch and Control System (VSCS) Sustainment 4

The ongoing VSCS Sustainment program ensures the operational availability and system reliability of the VSCS and VSCS Training and Back-up System (VTABS) equipment. The VSCS equipment provides voice communication services to the Air Traffic Controllers (ATCs) in the Air Route Traffic Control Centers (ARTCCs) throughout the National Airspace System (NAS). VSCS allows the en route air traffic controllers to communicate with other ATCs, pilots, ground personnel and other locations while separating, managing and directing air traffic.

The VSCS Sustainment program replaces and upgrades obsolete components that are no longer supportable. For FY 2020, $19.8 million is requested for VSCS sustainment activities including engineering analysis, logistics support analysis of Diminishing Manufacturing Sources and Material Shortages (DMSMS), and replacement of VSCS workstation motherboards.

B. Terminal Voice Switch Replacement (TVSR) 2

The ongoing TVSR program involves replacing the aging, obsolete voice switches in Air Traffic Control Tower (ATCT) and Terminal Radar Approach Control (TRACON) facilities. Terminal voice switches provide voice communication services to Air Traffic Controllers in the airport towers and TRACONs. This allows the terminal ATCs to communicate with other ATCs, pilots, ground personnel and other locations while separating, managing and directing air traffic.

The TVSR program ensures that controllers continue to have reliable voice communications in the terminal environment. The program consisted of several multiyear equipment contracts for voice switches, including: Small Tower Voice Switches (STVS), Enhanced Terminal Voice Switches (ETVS), Rapid Deployment Voice Switches (RDVS), Voice Switch By-Pass System (VSBP), Interim Voice Switch Replacement (IVSR), and the Conference Control System (CCS-W) in the Air Traffic Control Command Center in Warrenton, VA. Of these contracts, IVSR is the only voice switch currently in production and is the only contract vehicle available to the FAA to procure voice switch equipment for new or modernized terminal facilities. Replaced voice switches are recovered for refurbishment or cannibalized for spare parts to restock the logistics depot to support sustainment efforts.

For FY 2020, $15.1 million is requested to procure, test, deliver and install up to seven Terminal voice switch systems, refurbish and/or cannibalize associated legacy systems for spare parts, and to conduct technical refresh to mitigate supportability risk of Terminal legacy voice switches.

C. National Air Space (NAS) Voice Recorder Program (NVRP)

The NVRP will replace the legacy Digital Audio Legal Recorders (DALRs) and provide enhanced digital voice recording functionality to meet new requirements. The replacement of aging voice recorders will reduce operational costs and address the increasing demand for more expeditious audio access and capabilities such as increased recording capacity, recording of Voice Over Intranet Protocol (VoIP) telephones, connection to FAA Telecommunications Infrastructure (FTI)'s enterprise Network Time Protocol (NTP).

As the voice recorder technology and voice recorder requirements have evolved, earlier digital voice recorders are experiencing obsolescence and supportability issues. There are currently over 460 recorders in operation today which were deployed between 2007 and 2015; they began to reach their end of service life starting in 2017. Full implementation of this program will result in the replacement of the legacy voice recorders, DALRs that do not meet current Safety Requirements. Additionally, it will decrease the risk of Diminishing Manufacturing Sources and Material Shortages (DMSMS) issues in order to maintain Operational Availability.

For FY 2020, $14.5 million is requested to procure equipment for up to 28 operational systems to be deployed throughout the NAS. It will also provide for system spares, depot level support, training, test and evaluation and second level engineering support.

D. Independent Operational Assessment (IOA)

The FY 2020 request also includes $350,000 for IOA activities in support of the NAS.

What benefits will be provided to the American public through this request and why is this program necessary?

Voice Switches and Recorders are integral parts of the FAA's air traffic control system. The reliability of communications from controller to controller and controllers and pilots is vital to a safe air traffic control system. The programs in this portfolio reduce obsolescence and maintain availability of voice switching and recording equipment throughout the NAS. These voice switch programs reduce operational costs by reducing the current annual maintenance cost for legacy switches and promote operational availability that reduces delays.

Voice recorders are used by the FAA for recording voice conversations between ATCs, pilots, and ground-based personnel. Recorded conversations are used in the investigation of accidents, incidents, and in the routine evaluation of air traffic operations. The NVRP program reduces costs associated with current voice recorder models that have obsolescence and supportability concerns.

Detailed Justification for - 2B15 Implementation of Flight Object Exchange Services (FOXS) and Enterprise Information Management (EIM)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Implementation of Flight Object Exchange Services (FOXS) and Enterprise Information Management (EIM)	$0	$0	$0	$35,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Flight Object Exchange Services (FOXS)	---	$19,000.0
B. Enterprise Information Management (EIM) Platform	---	16,000.0

What is this program and what does this funding level support?

NextGen is the strategic, modernization section of the FAA. NextGen matures and integrates operational improvements into the National Airspace System (NAS). The NextGen Implementation of Flight Object Exchange Services (FOXS) and Enterprise Information Management (EIM) Cloud will leverage prior pre-implementation efforts and both programs will utilize a centralized data construct to promote efficient data exchange. FOXS will improve preliminary flight plans and file flight plans with NAS automation systems. The Enterprise Information Management (EIM) Cloud Mission Enclave will realize a "big data" repository for NAS and non-NAS information.

A. Flight Object Exchange Services (FOXS)

Flight Object Exchange Service (FOXS)/Common Support Services – Flight Data (CSS-FD) is a new investment leveraging the FAA's previous investments in System-Wide Information Management (SWIM) to significantly advance Flight Information Management across the Air Traffic Management (ATM) enterprise and actors. CSS-FD will develop the following capabilities to meet the FAA's growing need for coordinated strategic flight planning and distribution of standardized flight information:

- Flight Planning and Filing (FP&F) – A Flight Planning and Filing service that provides a consolidated and enhanced FP&F capability for NAS users and provide a single entry point for both internal and external NAS users to file flight plans.
- Flight Data Sharing (FDS) – A SWIM service that disseminates and exchanges strategic flight planning data between NAS systems and external users, including:
  - Implements a modern, standards-based flight data exchange mechanism, simplifying global, national and inter-agency data sharing; and
  - Produces consistent values for flight data elements that are not redundant.

For FY 2020, $19.0 million is requested to support the FOXS/CSS-FD Final Investment Decision (FID) activities. The program plans to establish APB Milestones, work with Investment Planning and Analysis (IP&A) to complete the Chief Financial Officer (CFO) Package and successfully complete the FID process. In addition, the program plans to award the prime contract, start preparing system design documents and finalize implementation plans for Flight Planning and Filing (FP&F) and FDS capabilities.

B. Enterprise Information Management (EIM)

The Enterprise Information Management (EIM) Platform is a cloud-based platform in the Mission Support network, which unifies and secures agency-wide data. The Platform creates and provides efficient access to a unified data layer comprised of common enterprise data and it delivers core enterprise information management capabilities and services. The EIM Platform supports multiple simultaneous and independent research and development activities and environments, which enables more rapid and less costly acquisition of unique and additive applications and functional capabilities across the FAA. The Platform's flexibility and scalability allows rapid strategic growth in content and services, while reducing duplicate capabilities and functions, overcoming the cost and complexities associated with building and maintaining redundant capabilities to support the Agency's array of systems and applications.
The Platform is a modern, enterprise-scale big data capability that efficiently scales to support exponential growth in the volume of FAA data. This capability provides FAA systems and users with the ability to rapidly find and exploit relevant data from across the FAA, to support faster and more comprehensive analysis, synthesis and decision making, and overcomes current data access and processing challenges and existing limitations of the legacy infrastructure.

The requested FY 2020 funding will enable continued development of the Enterprise Information Management Platform capability using a "forward fit strategy" that scales to support requirements of new and modernized systems from across the FAA and delivers consistent development, test, staging and production environments, and the continuation of the systems development life cycle (SDLC) to include systems analysis requirements definition, system design, and security design.

The build out of the EIM Platform will enable the integration of existing and future systems and will bring in additional data sources to maximize the operational impact of these systems. The shared capabilities of the Platform will minimize overall costs by reducing the need for redundant development, deployment and operations of common enterprise data and information management systems.

For FY 2020, the program will use the $16.0 million to:

- Provide an FAA Cloud Service (FCS) EIM Platform hosted development environment to support pre-production design integration needs of Operational Analysis and Reporting System (OARS) Operational Network Replacement (OPSNET-R) and other NAS acquisition programs.
- Complete the integration of 20 additional data sources such as weather, obstacles, unmanned aerial systems (UAS), etc., required to support new systems/applications and 2 additional information domains, such as Human Relations, logistics, finance, etc.
- Complete the integration of additional data curation and processing capabilities to support new systems/applications.
- Provide 10 additional common service tools, such as Geospatial Information Services (GIS), machine learning, artificial intelligence etc., to deliver analytic and/or visualization services for external systems/applications.
- Deliver enhanced security capabilities updated security artifacts to support and obtain authority to operate, for all newly integrated capabilities.
- Create and maintain Enterprise Architecture artifacts.

What benefits will be provided to the American public through this request and why is this program necessary?

Implementation of FOXS will result in increased shared situational awareness during the flight planning and filing process and for flight data sharing, increased flight data standardization, and allow FAA Stakeholders to have timely and secure access to common Agency data. Benefits include the reduced need for certain Traffic Management Initiatives and late reactive changes, reduced workload for traffic managers and tower personnel, reduced manual coordination between users and ATM service providers, more accurate demand predictions, improved operational effectiveness, and reduced number of times in which multiple Flight Plans are filed for a single flight. Benefits also include reduced fuel, time, costs, and level of effort with flight planning and filing improved efficiency and accuracy.

Implementation of EIM will provide FAA stakeholders with timely and secure access to common Agency data that is appropriate to their needs. EIM will explore cloud-based solutions to reduce the need to build and maintain redundant data management capabilities that support individual programs/systems. This will enable an increase in efficiency of the NAS due to the shared use of common Enterprise Information Management Services that ultimately will improve the speed and accuracy of operational decision making. Benefits of this will include aligning existing and future data requirements into an efficient and effective information sharing environment, and the ability to use enterprise-wide data to enable complex analytical correlations.

Detailed Justification for - 2C01 Aviation Surface Observation System (ASOS)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Aviation Surface Observation System (ASOS)	$10,000	$10,000	$10,000	$4,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. ASWON Sustainment 1	---	$2,000.0
B. ASWON Sustainment 2	---	2,000.0

What is this program and what does this funding level support?

The Aviation Surface Observation System, also known as the Aviation Surface Weather Observation Network (ASWON), is a portfolio program that consists of the various facilities, equipment, and subsystems in the National Airspace System (NAS) that detect and report surface weather conditions required to conduct aircraft operations. Air Traffic Control (ATC), Part 91, 121, and 135 Operators, and National Weather Service (NWS) rely on the data provided by ASWON. The ASWON sustainment program continues to address obsolescence of FAA-owned surface weather equipment at approximately 1,100 airports.

For FY 2020, $4.0 million is requested to continue the technology refresh upgrades of FAA-owned surface weather equipment deployed at the approximately 1,100 airports. $2.0 million will be used to procure and install hardware/software upgrades for 571 FAA owned ASOS systems as part of the Inter-agency agreement with the National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS). $2.0 million will be used in FY 2020 to initiate investment analysis to achieve the Investment Analysis Readiness Decision (IARD) in FY 2020 for the next phase of technology upgrades under the ASWON technology refresh 2 Project. The following systems depend on the data provided by ASWON:

- Automatic Terminal Information Service (ATIS)
- Surveillance Broadcast Services (SBS) - Flight Information Service Broadcast (FIS-B)
- Standard Terminal Automation Replacement System (STARS)
- NAS Information Display System (NIDS)
- Weather System Processor (WSP)
- NEXTGEN Weather Processor (NWP)
- Common Support Services – Weather (CSS Wx)
- Integrated Terminal Weather System (ITWS)
- Weather and Radar Processor (WARP)
- Corridor Integrated Weather System (CIWS)

What benefits will be provided to the American public through this request and why is this program necessary?

ASOS/ASWON information increases the accuracy and timeliness of forecast and warning products that are provided by the National Weather Service (NWS) for protection of life and property and enhancement of the national economy.

Detailed Justification for - 2C02 Future Flight Services Program (FFSP)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Future Flight Services Program (FFSP)	$14,039	$10,100	$10,100	$19,200

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Future Flight Services	---	$12,800.0
B. Future Flight Services Air/Ground Media Gateway (AGMG)	---	6,400.0

What is this program and what does this funding level support?

A. Future Flight Services (FFS)

Currently, a combination of entities and platforms provide Flight Services to the General Aviation (GA) community. These services include but are not limited to: pre-flight and in-flight flight planning, advisory services, weather briefings, pilot weather report (PIREP) processing, and Search and Rescue (SAR) coordination. These services are provided within the Continental United States (CONUS), Puerto Rico, and Hawaii. Flight Services also provides Visual Flight Rules (VFR) coordination, orientation support to lost aircraft, helps maintain continuous weather broadcasts on selected Navigational Aids (NAVAID), and issues Notices to Airman (NOTAM). GA pilots access flight service information directly through web portals, thus reducing the need for pilots to talk to a flight service specialist.

FFSP will incentivize the self-assisted service delivery and drive the reduction of costly human-assisted delivery of flight services as much as possible. The timeframe associated with the transformation is dependent on the technologies responsible for enabling the new capabilities, availability of the interdependent programs to perform their essential functions, and involvement from industry stakeholders such as Aircraft Owners and Pilots Association (AOPA), National Business Aviation Association (NBAA), etc. FFSP will also leverage Next Generation Air Transportation System (NextGen) solutions in order to increase operational efficiency, and improve aeronautical data acquisition and utilization in the support of flight services. For example, prospective service providers will use weather data from Common Support Services - Weather (CSS-Wx) and aeronautical information from the Aeronautical Common Service (AIMM Segment 2) and leverage FAA enterprise infrastructure including SWIM and other planned infrastructure enhancements to the extent possible. The primary objective of FFSP is to realign the Flight Services mission by modernizing services and delivery methodologies.

FFSP will establish the Flight Service Engagement Team (FSET) to work with stakeholders to achieve FFSP objectives. The FFSP PMO works directly with AOPA and other stakeholder organizations evaluating recommendations for requirements changes, service delivery changes, conducting research with the objective of decrease the cost for flight service delivery.

Some Core Safety Functions will remain within Flight Services and FFSP while others will be integrated or reengineered into other service areas of the Air Traffic Organization (ATO). The Core Safety Functions were defined by Flight Service as functions that need to be provided by the FAA for the safety of the NAS and include:

- Visual Flight Rules (VFR) search and rescue operations

- Emergency services to aircraft in distress
- Weather Observation Entry (METAR Entry)
- NOTAM Coordination, Entry and Dissemination
- Security related to Special Flight Rules Area (SFRA)/Air Defense Identification Zone (ADIZ)/Flight Restricted Zone (FRZ) Flight Plans
- Instrument Flight Rules (IFR) clearance relay
- Pilot weather report (PIREP) entry
- Instrument Flight Plans (IFR) and Services provided to DOD

The Automated Flight Service Stations (AFSS) contract with Leidos currently provides human- and self-assisted flight services in the CONUS. A 42-month single source contract extension has been executed to ensure the continuity of services until the new FFSP contract is awarded.

The Direct User Access Terminal Service (DUATS) II contracts provided self-assisted flight service through a web portal allowing pilots direct access to flight service information. The DUATS II contracts were terminated in April 2018. The functionality is now being delivered by Leidos through the AFSS contract and will continue delivery of these services until the new FFSP contract is awarded. When the new FFSP contact is awarded it will include scope for both human- and self-assisted services.

The FFSP intends to leverage advances in technology and automation to enhance flight service capabilities, garnering efficiencies for long-term cost reductions. FFSP is a proposed single integrated service-based solution that will replace the existing Flight Service automation systems and services for CONUS, Hawaii, and Puerto Rico more cost effectively. FFSP will maximize technologies and procedures in use today to enhance automation, communications, navigation, and the way pilots manage information to generate cost savings, capture operational efficiencies, and consolidate services.

For FY 2020, $12.8 million is requested for FAA Telecommunication Infrastructure (FTI) non-recurring and initial recurring costs; and program management support activities (acquisition management, safety risk management, information systems security, implementation, in-service management, flight service operations; Remote Monitoring Control Facility (RMCF) activities; and non-prime support to facilitate new contract rollout). FFSP Program Management Office will continue to conduct stakeholder outreach activities critical to achieving the objective of migrating users away from costly human assisted services.

B. Future Flight Services (FFS) / Air-to-Ground Media Gateway (AGMG)

The Air-to-Ground Media Gateway (AGMG) will allow Flight Services to deliver inflight services using a standardized Voice over Intranet Protocol (VoIP) for the Flight Service Provider's voice switch. This will facilitate a Flight Service contract competition by reducing the need for voice switch customizations. AGMG will function similar to Radio Control Equipment (RCE) emulation, but will provide a standard VoIP interface in addition to providing audio to the Remote Monitoring Control Facility interface and being interoperable with NAS voice switches and recorders.

For FY 2020, $6.4 million is requested for site preparation and procurement of Air-to-Ground Media Gateway (AGMG) systems at six Air Route Traffic Control Centers (ARTCCs), and for lifecycle support.

What benefits will be provided to the American public through this request and why is this program necessary?

The American Public, as well as the GA community, will benefit from technology enhancements and cost savings gained by elimination/reduction of services which are redundant, obsolete and/or do not align with Flight Service Core Services.

FFSP will realize cost savings and achieve efficiencies in the delivery of flight services by modernizing services and delivery methodologies. FFSP will discontinue obsolete services and activities as well as redundant activities provided by other FAA service organizations based on collaboration with user groups and outcomes of Safety Risk Management panels.

Detailed Justification for - 2C03 Alaska Flight Service Facility Modernization (AFSFM)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Alaska Flight Service Facility Modernization (AFSFM)	$2,650	$2,650	$2,650	$2,650

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Alaska Flight Service Facility Modernization (AFSFM)	---	$2,000.0
B. In-Service Engineering	---	650.0

What is this program and what does this funding level support?

The Alaska Flight Service Facility Modernization (AFSFM) program is a multi-year facility modernization and sustainment program that addresses FAA Flight Service Stations (FSS) in Alaska. Thirty-three percent of the Alaska Flight Service facilities were constructed in the 1970's require extensive renovations to meet current building codes, fire life safety, electrical standards and generally do not meet the American's with Disabilities Act accessibility requirements, as defined and imposed by the Uniform Federal Accessibility Standards and the Architectural Barriers Act Accessibility Standard (ABAAS). These conditions endanger FAA personnel health and safety and increase the risk of service outages.

Specifically, 17 FSS facilities will be updated to meet environmental, safety and accessibility requirements and the electrical and safety systems will be upgraded to ensure they meet current standards. The program identifies and corrects deficiencies such as substandard lightning, grounding and bonding protection, electrical systems, and/or heating and cooling systems that could disrupt flight service operations by reducing the reliability of flight service automation systems.

For FY 2020, $2.0 million is requested to support mechanical, electrical, ABAAS and architectural upgrades at Barrow, McGrath and Cold Bay Flight Service Stations and FTE Contract Field Support.

Also requested is $650,000 for in service engineering activities. The AFSFM spend plan is revised based on seasonal and logistical limitations associated with material transportation and other inherent schedule risks due to the Alaska environment and transportation infrastructure limitations.

What benefits will be provided to the American public through this request and why is this program necessary?

This program efficiently uses funds to correct deficiencies in older FSS facilities to bring them up to date with current building and safety codes. Project schedules are developed at least two years in advance, which allows opportunities to reduce costs through efficient use of engineering and technical resources. Additionally, this program allows the FAA to avoid hefty expenses and costs associated with unscheduled and emergency upgrades to flight service facilities. Effectively managing this program to ensure costs for upgrades are within project scope provides cost savings to the American public.

Detailed Justification for - 2C04 Juneau Airport Wind System (JAWS) Technology Refresh

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Juneau Airport Wind System (JAWS) Technology Refresh	$0	$0	$1,000	$1,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Juneau Airport Wind System (JAWS) Sustainment	---	$1,000.0

What is this program and what does this funding level support?

JAWS measures and transmits wind information to the Juneau Automated Flight Service Station (AFSS), Alaska Airlines, and the National Weather Service for weather forecasting. Other Alaska aviation users access JAWS data via the Internet. JAWS provides terrain induced wind and turbulence data that addresses safety of flight and decreases the probability of experiencing unnecessary weather related delays in and out of the Juneau International Airport, Alaska. Although JAWS data is advisory, it is essential for pilots to be aware of wind conditions that affect approach and departure paths because of the restrictive geographical features on both sides of the corridor in and out of the Juneau Airport.

Periodic replacement of commercial off-the-shelf system components is necessary because of the weather condition on the mountains where the wind sensors are located. Updating these sensors assures continued supportability of the system through an indefinite service life. This program will include the replacement of computers and controllers, radios, firmware and software, anemometers, profilers, and may include National Center for Atmospheric Research consulting support.

For FY 2020, $1.0 million is requested to conduct the Final Investment Analysis and produce the Investment Analysis artifacts.

What benefits will be provided to the American public through this request and why is this program necessary?

During the JAWS Post Implementation Review, the system has achieved the baseline expectation for increased capacity with actual Required Navigational Procedures. The system has achieved 91 percent detection of all alert messages. JAWS has improved the commercial flight operations with a 52 percent improvement in flights diverted and 9.51 minutes of improvement in average arrival delays while improving arrivals on time. JAWS provides the safe operation of aircraft going in and out of Juneau Airport, and has received positive feedback from Alaska Airlines.

Detailed Justification for - 2D01 VHF Omnidirectional Radio Range (VOR) Minimum Operating Network (MON)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
VHF Omnidirectional Radio Range (VOR) Minimum Operating Network (MON)	$17,000	$25,000	$20,000	$18,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
VOR Minimum Operational Network (MON) Program	---	$18,000.0

What is this program and what does the funding level support?

VOR Minimum Operational Network (MON) Program

The VHF Omni-Directional Range (VOR) Minimum Operational Network (MON) Program will prepare the analysis, amend/cancel/replace procedures, flight check, determine the need to relocate any services/equipment collocated with the VORs, develop documentation and implementation plans for downsizing the VOR network to the minimum required to function as a backup navigation system for VOR equipped aircraft. Additionally, the program will begin final investment analysis activities in preparation for Phase 2 (FY 2021 to FY 2025) of the program. The VOR MON program will transition the legacy network of approximately 896 VORs in the continuous United States (CONUS) to a MON of approximately 585 VORs with a target date of 2025. Downsizing the VOR network to the minimum required as a backup navigation system provides an opportunity for cost avoidance and supports the National Airspace System (NAS) Efficient Streamlined Services (NESS) Initiative. It would allow aircraft to navigate and land safely under Instrument Flight Rules (IFR) in the event of disruption in a Global Positioning System (GPS) signal; however, the planned backup capability will be less than the current VOR network.

As the need for VOR based procedures and routes decreases due to the transition to Precision Based Navigation (PBN), resources that are currently being spent in sustaining and operating the current legacy VOR facilities, many of which are beyond their service life, can be shifted for more efficient use. The legacy VOR routes and procedures will be cancelled, amended, or replaced, as necessary prior to a particular VOR being discontinued. Removing the VOR infrastructure occurs as new PBN routes and procedures are added to support NextGen.

For FY 2020, $18.0 million is requested to meet the Phase 1 goal of the VOR MON Program and to complete Phase 2 FID activities. The program will work with the appropriate groups to discontinue 36 VORs. The program will fund approximately 1,786 procedures to discontinue up to 44 VORs in FY 2021, since procedures are typically funded prior to the fiscal year of the Navigational Aid's (NAVAIDs) discontinuance. This work will require substantial engineering; cancellation, amendment and/or replacement of routes and approach procedures and program management.

What benefits will be provided to the American public through this request and why is this program necessary?

The FAA is transitioning the NAS to more efficient PBN routes and procedures, so fewer VORs are needed. VORs do not enable PBN and few aircraft are actually using the VORs, electing to use their PBN equipment to fly the conventional Victor Airways and Jet Routes. The benefits of reducing the VOR facilities include opportunities for reduced operations and maintenance cost for facilities, instrument flight procedures, flight inspection, and opportunities to avoid potential recapitalization costs. This program will result in a more optimized NAS, where the more efficient PBN operations will be primary and a MON of VORs will be retained to serve as a back-up in the event of a GPS outage or interference.

Detailed Justification for - 2D02 Wide Area Augmentation System (WAAS) for GPS

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Wide Area Augmentation System (WAAS) for GPS	$110,300	$96,320	$96,320	$90,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
WAAS Phase 4B	---	$90,000.0

What is this program and what does this funding level support?

WAAS supports the FAA mission need of providing a satellite navigation capability across the National Airspace System (NAS). WAAS provides both horizontal and vertical navigation for precision approach operations for all WAAS equipped users at all qualified runway ends in the NAS. WAAS consists of a network of 38 precisely located ground reference stations distributed across the United States, Canada and Mexico that monitor the Global Positioning System (GPS) satellite signals. Three master stations collect 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 three commercial geostationary (GEO) satellites. The receiver on the aircraft applies the corrections and uses the integrity information from the WAAS message to ensure the validity and obtains a precise navigation position. During Phase 4B, the WAAS Program Office will continue to support GPS civil technical oversight efforts. The GPS technical oversight ensures changes the DoD makes to the GPS constellation does not impact the FAAs WAAS and GPS based aviation users.

WAAS was designed to support the unique needs of aviation but, its benefits extend well beyond aviation. The WAAS broadcast message improves GPS signal accuracy from 50 meters to less than 2 meters. WAAS accuracy, integrity and availability have led to the integration of a WAAS capability into most commercial GPS chips and receivers supporting numerous applications (marine, automobile, agriculture, surveying and recreation). Other investments that WAAS interfaces with include Continuously Operating Reference Stations (CORS) operated by the National Geodetic Survey under the National Oceanic and Atmospheric Agency and Mobile E911.

For FY 2020, $90.0 million is requested to execute planned tasks.

GEO Satellite Acquisition

- Complete design, manufacture, and procurement of GEO-7 components
- Complete initial on-orbit payload requirement verification (In-Orbit Test or IOT), to ensure communication between the ground station and GEO-7 payload

GEO Sustain Lease Services

- Maintain three operational GEO leases to provide WAAS Signal in Space services
- Monitor system performance, assess anomalies and execute corrective actions

Sustainment

- Develop, test, and field WAAS system modifications, to include replacement of obsolete equipment and performance improvements

- Complete CY20 maintenance release, integration of GEO-7, and modifications for the new GUS receiver and Ground Uplink Subsystem (GUS) signal generator line replaceable units
- Conduct architectural design studies to support future release planning, including Time Division Multiplex to Internet Protocol (TDM-IP) Architectural Design and Prototype L1/L5 Dual Frequency Algorithm prototypes
- Initiate Dual Frequency Operations (DFO) Segment 2 Contract procurement activities

NAS Implementation
- Support agency wide initiative to transition to performance based navigation (PBN) through the development and publication of WAAS Localizer Performance with Vertical Guidance/Localizer Performance (LPV/LP) approach procedures

Technology Evolution
- Conduct analysis and research to validate and maintain the deployed WAAS service, including, threat model assessments and ionospheric effects analysis.
- Conduct research, develop algorithm documentation, and conduct supporting analyses to develop new WAAS satellite navigation capabilities.
- Develop and validate Dual-frequency, Multi-constellation (DFMC) Satellite Based Augmentation Systems (SBAS) services and Advanced Receiver Autonomous Integrity Monitor services. Activities support the development of standards to enable development of operational equipment standards and operational test beds.
- Conduct incremental assessments of the safety of GPS as used in evolving augmentation systems for aviation

Technical Engineering/Program Support
- Provide systems, software, safety, reliability-maintainability-availability (RMA), test and evaluation, human factors, logistics and hardware engineering support
- Provide specialty engineering support for Hazardously Misleading Information (HMI) analysis efforts, Radio Frequency Interference (RFI) investigation and mitigation, system security assessments, and system performance assessments
- Provide program management support in areas of finance; quality assurance (QA); Earned Value Management (EVM); project planning, execution, and monitoring
- Develop documentation in support of FAA Acquisition Management System (AMS) Final Investment Decision (FID) for WAAS Phase 4B

What benefits will be provided to the American public through this request and why is this program necessary?

The FAA is required by law to establish, operate, and maintain navigation capability for all phases of flight. The FAA determined that the most, safe, efficient and cost-effective means of providing a performance based navigation capability within the National Airspace System (NAS) is via satellite-based navigation, specifically WAAS. WAAS increases the accuracy, continuity, availability, and integrity of GPS data, with associated improvements to air traffic system capacity and safety.

WAAS enables reduction or avoidance of expensive and high maintenance cost of ground based navigation aids. FAA has begun reducing the number of ground based navigation aids and have realized the associated cost savings.

WAAS supports all Automatic Dependent Surveillance-Broadcast (ADS-B) enhanced operations. The development of a common WAAS/ADS-B avionics suite using the same WAAS-based position sensor will reduce the overall cost to the user and will facilitate the widespread, rapid, and cost-effective deployment of both WAAS and ADS-B.

Regional airlines have shown fuel and time savings by utilizing satellite-based waypoints that facilitate straight-line, shortest-distance routes as compared to legacy (zigzag) routes that fly a series of straight line route segments connecting ground based navigation aids. Cargo aircraft have shown increased cargo capacity, reduced fuel loads, reduced divert rates (inability to land at planned destinations), and operational cost savings. Commuter airlines have demonstrated cost avoidances attributable to lower minimum descent altitudes at airports through the installation of LPV approach procedures. Business jet operators have been able to decrease in-flight conflicts with major airport traffic while on approach at feeder airports. This has allowed increased frequency of operations and reduction of in-flight and ground clearance delays.

In addition to aviation benefits, it is estimated that tens of millions WAAS enabled receivers have been sold for non-aviation purposes to industries such as maritime, surveying, recreation and agriculture.

The United States Coast Guard has determined that the positional accuracy provided by GPS and WAAS is sufficient to meet international maritime navigation requirements and safety requirements for harbor approach. The Coast Guard plans to discontinue service from its Differential Global Positioning System (DGPS) sites, beginning in 2018 and end with the curtailment of the Coast Guard broadcast of GPS corrections in 2020.

Real time data and plots, daily plots, performance videos and performance analysis is available for WAAS at the following website: http://www.nstb.tc.faa.gov/.

Detailed Justification for - 2D03 Instrument Flight Procedures Automation (IFPA)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Instrument Flight Procedures Automation (IFPA)	$8,500	$1,400	$1,400	$1,100

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Instrument Flight Procedures Automation (IFPA)	---	$1,100.0

What is this program and what does this funding level support?

IFPA is a suite of advanced Information Technology (IT) tools. These tools create products using fully integrated solutions for visual and instrument flight procedures. IFPA consists of the Terminal Area Route Generation, Evaluation and Traffic Simulation (TARGETS) design tool, IFP database application, Airports and Navigations Aids database (AirNav) application, Obstacle Evaluation system, and the Aeronautical Information Services Production Workflow System.

For FY 2020, $1.1 million is requested to continue technology refresh activities for IFPA technology refresh efforts. This activity continues Enterprise Integration which will allow users to leverage pushback of data digitally from the design system to documentation systems vice manual entry into the documentation systems.

What benefits will be provided to the American public through this request and why is this program necessary?

The IFPA tool suite provided productivity gains for all Aeronautical Information Services' major work products. Since the program's inception, the development time required for new and amended Instrument Flight Procedures, flight procedure NOTAM generation time, and obstacle evaluation time have all been reduced. These efficiency gains are multiplied by the hundreds and thousands of these products produced on an annual basis and they reduce the costs for these activities to the American public.

In addition, IFPA increases the airport arrival capacity for eight major metropolitan areas and at the nation's busiest airports when visibility is restricted. IFPA increases automated capabilities for all types of precision and non-precision flight procedures including conventional (ground-based navigation aids) and performance-based (satellite-based navigation).

Detailed Justification for - 2D04 Runway Safety Areas (RSA) – Navigational Mitigation

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Runway Safety Areas (RSA) – Navigational Mitigation	$1,600	$2,000	$2,000	$1,400

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Runway Safety Areas (RSA) Phase 2 – Navigational Mitigation	---	$1,400.0

What is this program and what does this funding level support?

For FY 2020, $1.4 million is requested to supply the RSA Phase II Program with additional funds. These funds will be used to fund the correction of approximately ten FAA-owned facilities and equipment (F&E) that are not in compliance with RSA standards contained in AC 150/5300-13 Airport Design and not part of the previous RSA Phase I Program.

The scope of the work will range from the installation of frangible connections on identified structures to the relocation of facilities within and outside the RSA. These facilities or structures are classified as: 1) fixed by function and 2) not fixed by function. Objects that are fixed by function are permitted within the RSA as long as it meets the frangibility requirements. The RSA must be free of all objects that are three inches above the grade and are not frangible. Objects that are not considered fixed by function will be moved outside the RSA to extent practical.

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 NAVAIDs violations. Interdependencies will be with the FAA Airports Organization (ARP) to provide access to the airports and runways to complete the necessary improvements.

What benefits will be provided to the American public through this request and why is this program necessary?

Compliance with the RSA standards provide a measure of safety in the event of an aircraft's excursion from the runway by significantly reducing the extent of personal injury or aircraft damage during overruns, undershoots and veer-offs. Thus, the primary benefit of the RSA Phase II program is the prevention of loss of life from aircraft striking non-compliant NAVAIDs located in designated RSAs.

Under the previous RSA Phase I effort, between Fiscal Year (FY) 2010 and FY 2017, the FAA successfully executed 1,305 projects to correct violations at 563 RSAs and plans to complete a total of 1,400 projects at 615 RSAs by no later than December 31, 2018. Although significant progress has been made to mitigate all known RSA violations, it is expected that additional RSA violations will be found during routine ATO and ARP inspections; decreasing in number each successive year. RSA Phase II will ensure that previously undiscovered violations are corrected in a timely manner.

Detailed Justification for - 2D05 Landing and Lighting Portfolio

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Landing and Lighting Portfolio	$0	$89,725	$56,000	$48,245

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Very High Omni Directional Range (VOR) Tactical Air Navigation (TACAN)	---	$4,040.0
B. Instrument Landing System (ILS) Sustainment	---	5,800.0
C. Distance Measuring Equipment (DME) Sustainment	---	5,000.0
D. NAVAIDS Sustainment	---	8,945.0
E. Visual NAVAIDS – Visual NAVAIDS for New Quailifers	---	1,000.0
F. Runway Visual Range (RVR) Sustainment	---	12,635.0
G. Approach Lighting System Safety Enhancement	---	5,000.0
H. Replace visual Approach Slope Indicator with Precision Approach Path Indicator	---	4,875.0
I. In-Service Engineering	---	950.0

What is this Program and what does the funding level support?

A. VOR Collocated with Tactical Air Navigation (VORTAC)

For FY 2020, $4.0 million is requested for engineering and technical services/support and funding to dopplerize one on-going VOR project, to initiate one new Doppler VOR (DVOR) project, to procure two DVOR antenna kits. This program relocates, refreshes technology at VOR and VORTAC facilities and improves VOR operational performance by procuring and installing DVOR electronic kits and DVOR antenna hardware kits to upgrade the conventional systems. Numerous VORs have radial restrictions because of encroachment by obstacles that block the transmission of VOR signals. Dopplerizing a VOR eliminates the signal reflection restrictions caused by most obstacles that include newly constructed tall buildings, nearby industrial parks with a high concentration of metallic buildings, overhead transmission lines, radio, television and cellphone towers, and, more recently, wind farm stations.

The VOR and VORTAC (a combination of VOR and Tactical Air Navigation (TACAN) system) provide navigational guidance for civilian and military aircraft in both the en-route and terminal areas. As the FAA transitions gradually to performance based navigation (PBN), a VOR Minimum Operational Network (MON) will be retained to serve as a backup to satellite navigation and define VOR routes and procedures for legacy users. These components will continue reliable, safe, and efficient ground based VOR and VOR/DME systems until the use of Global Positioning System is widespread.

B. Instrument Landing Systems (ILS)

For FY 2020, $5.8 million is requested for engineering and technical services/support, attain service availability at three ILS locations, procurement of four ILS systems, and initiate three sustain ILS projects. This program supports the establishment and sustainment of ILS and/or ALSF-2 systems needed for Category (CAT) II/III precision approach procedures, the assessment of needs and requirements of CAT I ILSs, and the sustainment of CAT I ILSs and Medium Approach Lighting System with Runway Alignment Indicator Lights (MALSR). An ILS precision approach system is comprised of a grouping of electronic devices: Localizer, Glide Slope and marker beacons) and, in some cases, ancillary aids (Distance Measuring Equipment, Approach Lighting System, Runway Visual Range, etc.) that provide landing aircraft with both

electronic guidance and visual landing aids. These systems allow properly equipped aircraft to land safely in adverse weather conditions.
The ILS provides both vertical and lateral guidance information for the pilot to allow safe landing to touchdown and rollout. The ILS sends information to instruments in the cockpit so that the pilot can maintain a predetermined flight path to the runway even in low visibility. The ILS also provides a backup landing capability in the event of a loss of Global Navigation Satellite System (GNSS) service. The ALSF-2 is a lighting system installed along the extended centerline extending a distance of 2,400 feet outward into the approach zone and ending at the runway threshold to provide visual cues to help the pilot see the runway.

C. Distance Measuring Equipment (DME)

For FY 2020, $5.0 million is requested for engineering and technical services/support, to initiate the evaluation of bidding vendors towards awarding a new contract, procurement of five DME systems, attain service availability for 9 establish/sustainment DME projects, and to initiate funding for 20 DME installations. DME is a radio navigation aid used by pilots to determine the aircraft slant distance from the DME location. The program is procuring and installing state-of-the-art DME systems to: support replacement of DMEs that have exceeded their service life expectancy, establish new DMEs at qualifying airports, to relocate DME facilities, and establish DMEs in lieu of Instrument Landing System marker beacons. DMEs reduce the need for less desirable step-down non-precision approach procedures in which a pilot descends to the minimum allowable altitude to visually locate the runway. DMEs lead to better specification and control over the vertical descent profile and reduces controlled-flight-into-terrain (CFIT) risk.

D. Navigation and Landing Aids SLEP

For FY 2020, $8.8 million is requested for engineering and technical services/support, completion of two Medium Intensity Approach Lighting Systems with Runway Alignment Indicator Lights (MALSR) replacement project, completion of four ILS replacement projects, procure five ALSF-2 RLMS kits, and completion of five RLMS installations. This program renovates or replaces airport approach lighting systems at sites where there is a high risk for failure and where that failure would result in loss of the primary precision approach. NavAids include: MALSR for Category I approaches, ALSF-2 for Category II/III approaches, Runway End Identifier Lights (REIL), and Precision Approach Path Indicator (PAPI).

E. Visual NAVAIDS – Establish/Expand

For FY 2020, $1.0 million is requested for engineering and technical services/support; completion of five site surveys at Precision Approach Path Indicator (PAPI) installation sites and completion of approximately five PAPI establishment projects. Visual NavAids are necessary to assist pilots in visually acquiring the runway environment. These lighting systems facilitate the transition from cockpit instruments to external visual references during the final landing phase. Different categories and types of approaches require different visual NavAids equipment.

This program supports the procurement, installation, and commissioning of PAPI systems and Runway End Identifier Lights (REIL) systems. The PAPI provides visual approach glide slope information to pilots and enables them to make a stabilized descent with a safe margin of approach clearance over obstructions. PAPI consists of four lamp housing assemblies arranged perpendicular to the edge of the runway. PAPI projects a pattern of red and white lights along the desired glide slope so a pilot can tell whether they are on the glide slope and how to correct their glide slope if they are above or below it. A REIL is a visual aid that provides the pilot with a rapid and positive identification of the runway end in use during approach. The REIL system consists of two simultaneously flashing white lights, one on each side of the runway landing threshold.

781 runway ends that require implementation of a visual glide slope indicator approach capability have been identified by Commercial Safety Aviation Safety Team (CAST) and will reduce the number of the controlled flight into terrain accidents during approach and landing. These include runways affected by Land and Hold Short Operations (LAHSO) requirements that increase airport capacity by allowing coordinated approaches on intersecting runways.

F. Runway Visual Range (RVR) Replacement/Establishment

For FY 2020, $12.6 million is requested for engineering and technical services/support, procurement of approximately 25 RVR systems and ancillary equipment, and to establish/sustain RVRs at approximately 25 locations. This program is required per the Code of Federal Regulations §91.175, Takeoff and Landing under Instrument Flight Rules. This program allows airports to conduct takeoff and landing operations during conditions of low visibility.

This program replaces older RVR equipment with Personal Computer (PC) Based RVR equipment as well as equipment for sites that have qualified for an upgrade from a Category I to a Category II/III precision approach. RVR provides air traffic controllers with a measurement of the visibility at key points along a runway that is used to decide whether it is safe to take off or land during limited visibility conditions. During reduced visibility weather conditions, RVR system measurements are used by Air Traffic to establish airport operating categories; thus, properly equipped aircraft with a trained crew may continue operations under reduced visibility Category I, Category II and Category III conditions. The RVR decreases diversions and delays at an airport by providing an accurate measure of the runway visibility. The RVR information affects airline scheduling decisions and air traffic management decisions regarding whether flight plans should be approved for an aircraft to fly to or take off from an airport with low visibility. There are 280 airports in the National Airspace System (NAS) that have RVR systems.

G. Approach Lighting System Improvement Program (ALSIP)

For FY 2020, $5.0 million is requested for engineering and technical services/support and completion of MALSR replacement project at approximately one location.

The Approach Lighting System Improvement Program (ALSIP) upgrades approach lighting systems built before 1975. It upgrades the equipment to current standards and reduces the potential severity of take-off and landing accidents by replacing rigid structures with lightweight and low-impact resistant structures that collapse or break apart upon impact. The entire approach lighting system is replaced when rigid structures are replaced. The High Intensity Approach Lighting System with Sequenced Flashing Lights (ALSF-2) provides visual information on whether the pilot is aligned with the runway centerline, the aircraft's height above the runway plane, roll guidance, and horizontal reference for Category II and III Precision Approaches. The MALSR provides visual information on runway alignment, height perception, roll guidance, horizontal references for Category I Precision, and Special Authorization Category II Approaches.

H. VASI Replacement – Replace with Precision Approach Path Indicator

For FY 2020, $4.9 million is requested for engineering and technical services/support; procurement of approximately 20 PAPI systems; initiate approximately 20 new Visual Approach Slope Indicator (VASI) system with PAPI projects, and completion of approximately 20 VASI replace with PAPI projects. The International Civil Aviation Organization (ICAO) has recommended that all international airports replace the VASI lights with PAPI lights. This standardizes the equipment used to allow pilots to determine visually that they are on the proper glideslope for landing. The program supports the procurement, installation, and commissioning of PAPI systems in order to comply with this ICAO recommendation.

I. In-Service Engineering

$950,000 is requested for In-service engineering activities that allow for immediate response and tactical distribution of resources to emerging technology solutions across this entire navigation portfolio.

What benefits will be provided to the American Public through this request and why is the program necessary?

The FAA is transitioning the NAS to more efficient PBN routes and procedures that rely on GNSS. To achieve the transition, FAA is aggressively pursuing the implementation of satellite navigation and the sustainment of the ground based navigation infrastructure. Ground Based Navigational Aids will continue to provide a backup function, as required, in the event of a GPS outage to ensure consistent and reliable landing operations and provide resiliency in the navigation domain.

Visual Navigation Aids must continue to identify runway parameters, provide visual landing ques, and identify visibility constraints to commercial and general aviation pilots. These visual systems provide enhanced safety of operations for landing aircraft. VORs, DMEs, and ILSs will remain in the NAS for the foreseeable future to provide resiliency during GNSS disruptions. A substantial portion of these ground based navigation aids and runway lighting/visual systems have exceeded the planned service life for those assets. This portfolio provides for the systematic replacement and sustainment of those systems. The result of this work reduces operational costs for FAA and enhances the reliability of the assets.

Detailed Justification for - 2E01 Fuel Storage Tank Replacement and Management

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Fuel Storage Tank Replacement and Management	$35,000	$35,700	$25,700	$26,400

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Fuel Storage Tank Replacement and Management	137	$26,400.0

What is this program and what does this funding level support?

The ATO active tank system inventory includes over 3,700 units that support communication, navigation, weather, and surveillance missions. Fuel storage tank (FST) systems store and supply electrical generator fuel, lubricating oil, building heater and boiler system fuel, service vehicle fuel, liquid waste, and similar bulk liquids.

FST system manufacture, installation, operation, and disposal is regulated under Federal, State and local statutes, including the Clean Water Act, the Oil Pollution Act, and the Resource Conservation and Recovery Act, among others, with significant penalties for compliance failures. The FST program operates to attain three primary objectives:

- Sustain NAS operational readiness — A loss of integrity on any storage tank component can negatively affect the operational capacity of the supported systems and may ultimately result in a total (ATC facility outage.
- Mitigate environmental damage and regulatory non-compliance — Non-compliance incurs short-term ATC operational impacts (use prohibitions result in inability to support the mission) and longer-term fiscal impacts, including costly cleanup activities, fines, and unplanned retrofit costs.
- Conduct effective in-service management and lifecycle replacement — As fuel tanks age beyond their service life, there is an escalating risk of failure and associated leakage with attendant operational impacts and environmental damage.

For FY 2020, $26.4 million is requested to fund tank unit replacements, modernization, and upgrades at approximately 137 locations across the NAS.

What benefits will be provided to the American public through this request and why is this program necessary?

Executing an FST lifecycle sustainment program achieves the cost benefit of sustaining availability of the systems for NAS operations, reducing the risk of leaking FST systems, minimizing adverse impact to personal and environmental safety, and preventing regulatory fines of up to $32,500 per day per unit for failing to comply with regulatory standards.

Monthly tracking confirms fuel systems continually achieve the goal of 99.7 percent sustained operational availability. Operating modern equipment, sustainable, and regulatory-compliant fuel systems mitigate damage and associated costs resulting from incidental release of hazardous, toxic, or dangerous materials and assures the travelling public and aviation stakeholders a reliable and safe transit experience.

Detailed Justification for- 2E02 Unstaffed Infrastructure Sustainment (UIS)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Unstaffed Infrastructure Sustainment (UIS)	$41,000	$56,050	$51,050	$36,800

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Unstaffed Infrastructure Sustainment (UIS)	191	$34,300.0
B. In-Service Engineering	---	2,500.0

What is this program and what does this funding level support?

For FY 2020, $34.3 million is requested to sustain 191 critical infrastructure sustainment projects of unstaffed FAA facilities. The FAA owns more than 12,000 buildings, broadcast towers, and poles whose sole purpose is to protect and support National Airspace System (NAS) communications, surveillance, weather, and navigation aids. These structures are failing. They suffer from leaking roofs, deteriorated foundations, inadequate air conditioning and electrical systems, and severely corroded guy wires and anchors. A majority of these sites are operating beyond their design service lives. In addition, $2.5 million is requested for in-service engineering activities that provides an immediate response to emerging technology solutions.

The UIS program sustains NAS supporting infrastructure, which enables the reliable and continuous operations of surveillance, navigation, communication, and weather equipment. Unstaffed infrastructure protects electronic equipment from weather hazards and unauthorized entry. UIS sustainment includes major repairs and replacement of real property assets and structures that are normally not staffed, such as:

- Major repair, refurbishment, and replacement of NAS antenna and equipment towers
- Major repair, refurbishment, and replacement of buildings; shelters; roofs; HVAC equipment; electrical panels and distribution wiring; locks and alarm sensors; lighting; access roads; grounds; and fencing
- NAS equipment shelter replacements at multiple locations
- Communication tower replacements and repairs at multiple locations
- HVAC replacements at airport surveillance radar facilities

What benefits will be provided to the American public through this request and why is this program necessary?

The American Public will benefit from a stable NAS infrastructure. This program will improve availability and reliability ATC services as a direct result of building improvements (e.g., HVAC replacement and electrical system upgrades) that provide a safe and functional operating environment for electronic systems. It will extend the operational service life of NAS remote facilities that house and protect valuable systems, equipment, and staff. A safer and more secure work environment provided for ATO technical operations personnel is the result of well-sustained assets.

Detailed Justification for - 2E03 Aircraft Related Equipment Program (ARE)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Aircraft Related Equipment Program (ARE)	$12,500	$13,000	$13,000	$10,900

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Flight Inspection (FI) Flight Program Operations	---	$9,000.0
B. Flight Simulation Testing and Research Technologies (START)	---	1,900.0

What is this program and what does this funding level support?

A. FI Flight Program Operations:

The Aircraft Related Equipment (ARE) program provides the funding to meet regulatory, sustainment, and obsolescence requirements for the Flight Program aircraft. Flight Program Operations missions ensures FAA navigational systems, facilities, and tools are sound and operating according to specifications. The Agency is also responsible for Department of Defense (DOD) worldwide flight inspection requirements. Missions also include Research, Development, Testing and Evaluation, Aviation Safety Training and Transportation. For FY 2020 $9.0 million is requested.

B. Flight START:

The Flight START Program will enable the continued technology refresh of the Airbus wide body Simulator, and Boeing 737 Simulator. These simulators assist in performing realistic, high fidelity operational evaluation activities and vital research and development projects such as Closely Spaced Parallel Operations, Required Navigation Performance, and Human-in-the-Loop (HITL) pilot/controller/aircraft terminal operations performance. These evaluations are necessary for the introduction of new NextGen technology initiatives, NAS modernization, and National Transportation Safety Board (NTSB) safety initiatives. For FY 2020, $1.9 million is required for technology refresh enhancements of FAA simulators.

What benefits will be provided to the American public through this request and why is this program necessary?

Safe, efficient, and regulatory compliant aircraft are necessary for the continued successful performance of the Flight Program Operations missions and Flight Simulators. ARE funds are required to meet this end.

Flight Program Operations missions are a key component of FAA safety and increased capacity initiatives. To meet these safety and greater capacity objectives, the Flight Program fleet must be updated to continue to certify an expanding number of landing systems.

Simulator upgrades will enable FAA to analyze and test the viability of new concepts and procedures for use in the NAS and develop the appropriate regulations regarding their use.

Detailed Justification for - 2E04 Airport Cable Loop Systems – Sustained Support

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Airport Cable Loop Systems – Sustained Support	$8,000	$12,500	$10,000	$10,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Airport Cable Loop Systems Sustained Support	14	$10,000.0

What is this program and what does this funding level support?

For FY 2020, $10.0 million is requested for advanced engineering, construction activities, and Fiber Optic Transmission Systems (FOTS) equipment installations for the initiation of four large scale Airport Cable Loop (ACL) projects, and continuation/completion of four large scale ACL projects. In addition, funding will allow the program to start and complete four smaller scale projects that will be determined at the Air Ground Integrated Requirements Team meeting in FY 2020.

The program replaces existing on-airport, copper-based, signal/control cable lines that have deteriorated, and obsolete underground telecommunications cable infrastructure systems are vulnerable to failure and have caused flight delays related to these cable outages. The primary focus will be on projects at airports with high traffic counts and enplanements. These lines feed airport surveillance radar, air/ground communications, landing systems data and information to the ATC Tower, and operational and maintenance information to FAA-staffed facilities. Where cost effective, the program will install fiber optic cable in a ring configuration to provide communications diversity.

The ACL program reduces the number of unplanned outages due to deteriorated copper lines, and improves signaling and communications, which allows for increased operational availability of infrastructure systems. There have been 1,498 delays and outages associated with on airport cable loop from 2004 to 2015 for airports in the NAS, which the ACL program aims to reduce over time.

The ACL program, along with multiple other programs, has mutual dependencies on the telecommunications infrastructure. ACL is linked with NextGen, and more than 15 FAA programs rely on ACL to provide connectivity to and from control facilities.

What benefits will be provided to the American public through this request and why is this program necessary

ACL is presently reducing on-airport telecommunication infrastructure related delays of core airports by three percent annually, on average. System reliability and safety are enhanced due to increased system performance from redundant or diverse pathways provided by the cable loop system. Standardizing requirements will simplify and reduce operation requirements for logistics, configuration management, training, procurement, and depot support, which saves taxpayer dollars.

Detailed Justification for - 2E05 Alaskan Satellite Telecommunications Infrastructure (ASTI)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Alaskan Satellite Telecommunications Infrastructure (ASTI)	$20,900	$16,300	$16,300	$4,300

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Alaskan Satellite Telecommunications Infrastructure (ASTI)	---	$300.0
B. Alaskan Satellite Telecommunications Infrastructure (ASTI) Sustainment	---	4,000.0

What is this program and what does this funding level support?

ASTI is a FAA-owned satellite based network that provides 90 percent of the inter-facility communications required by the FAA in Alaska to support ATC operations. The ASTI network topology consists of hub earth stations, remote earth stations, leased transponder space segment, and a NOCC. The ASTI Technology Modernization is an ongoing program that replaces/upgrades system components originally deployed in the 1990s as part of the Alaskan National Airspace System Inter-facility Communications System. The ASTI Technology Modernization program will improve system availability, reduce the frequency of system alarms and outages, reduce the level of FAA maintenance, provide satellite bandwidth savings, and improve life cycle support including training, second level engineering support, radome maintenance, and depot level supply support.

For FY 2020, $300,000 is requested to successfully complete the ASTI modernization efforts and to closeout annual recurring software/telecommunication costs for the last ASTI implementation locations. The ASTI Technology Modernization program provides for the replacement and upgrade of vital system components due to aging and obsolescence, and implements improved Support Services. ASTI is needed to address the current system deficiencies such as critical system components are no longer supportable for required system operations, environmental destruction of system components, and lack of support infrastructure.

For FY 2020, $4.0 million is requested for sustainment of the ASTI system. Sustainment efforts will ensure the fielded system remains operational by addressing end-of-life products, evolving security requirements, and ensuring the system architecture is able to meet IP bandwidth and maintainability requirements, and will reduce future operations and maintenance costs.

What benefits will be provided to the American public through this request and why is this program necessary?

The ASTI network is an integral part of the communications infrastructure in Alaska and ensures vital communication operations are available to controllers and pilots. Modernization and continued sustainment is critical to continue the availability of a safe and reliable ATC System in Alaska. It will improve the reliability of the network that connects air traffic controllers to the radios and sensors that provide the ability to see and communicate with all aircraft within the Alaska Air Space.

Detailed Justification for - 2E06 Real Property Disposition

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Real Property Disposition	$27,000	$9,000	$9,000	$9,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Real Property Disposition	75	$9,000.0

What is this program and what does this funding level support?

The Real Property Disposition program works with other FAA program offices to identify and plan for the timely disposition of real property assets that are no longer required by the agency. When the FAA decommissions a site or system, this program is responsible for conducting an assessment of the property and determining the best course of action for disposal. Planning for the orderly disposition of property at multiple locations across the country is prioritized considering cost, available technical resources for site restoration and disposal, and potential environmental or safety impacts to surrounding communities if disposition is delayed. With the implementation of NextGen, demand for disposal of real property is increasing as ground based sites are being minimized in the NAS as the FAA moves to satellight technology. Services provided by the program are:

- Identifying, verifying, and scheduling the disposition and site restoration work
- Investigating and documenting the structures to be removed at each site, determining the required restoration associated with the site, and developing scopes of work and schedules with milestones
- Final disposition of decommissioned infrastructure and property restoration including infrastructure removal or demolition, removal and disposal of debris and hazardous materials, and evaluation of impact upon cultural and historic preservation, wetlands, and natural resource protection
- Conducting Phase I Environmental Due Diligence Audits (EDDA) reports for government-owned properties, as required by the General Services Administration and applicable laws

For FY 2020, $9.0 million is requested to fund the final disposition of decommissioned infrastructure at approximately 75 projects.

What benefits will be provided to the American public through this request and why is this program necessary?

The program provides cost savings by reducing Operations and Maintenance (O&M) costs (e.g. grass cutting, snow removal, utility fees, communications frequency fees, etc.) and cost avoidance by eliminating lease costs. The final disposal of the FAA's unnecessary required real property assets supports effective financial management by optimizing maintenance costs and disposing of excess assets from the FAA cost accounting system (DELPHI). An added benefit has been removing safety and environmental liabilities of the FAA by disposing facilities/sites no longer required in the NAS. This program has experienced great success since FY 2005. Between FY 2008 and FY 2017, the Facility Decommissioning Program disposed of 1,662 sites at a 10-year cost avoidance of $65.9 million.

Detailed Justification for - 2E07 Electrical Power System – Sustain/Support

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Electrical Power System – Sustain/Support	$125,000	$150,400	$140,700	$150,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Electrical Power System – Sustain/Support	---	$150,000.0

What is this program and what does this funding level support?

For FY 2020, $150.0 million is requested by the Electrical Power Systems – Sustain/Support (PS3) program to sustain components of the FAA's power system infrastructure necessary to operate the NAS. The PS3 program ensures that Air Traffic operational electrical needs are meet with high quality electrical power that also meets NAS's reliability, maintainability, and availability requirements. Power Services Group (PSG) manages the PS3 program by sustaining and supporting the existing electrical power components and systems that include prime power, power conditioning, power regulation, power distribution, backup power, grounding, monitoring, and electrical power cable infrastructure. PSG executes the PS3 program through 11 program tasks. The funding will reduce a large backlog and address systemic problems by replacing obsolete equipment with state-of-the-art engine generators, power cables, and ARTCC Critical and Essential Power Systems (ACEPS) equipment within the NAS.

PSG systems have formal written NAS performance requirements, Reliability, Maintainability and Availability (RMA), and have daily National Airspace Performance Reporting System requirements. PS3's primary role is to sustain, replace, and refurbish components of the power system infrastructure after deployment (funded, installed, and commissioned.) PSG also provides power systems engineering guidance, power system standards, and maintenance orders and testing of electrical systems to NAS implementation offices and programs. PSG's secondary role is to provide additional equipment such as Power Conditioning System (PCS)/Uninterruptible Power Supply (UPS), Engine Generators (EG), Critical Power Distribution System (CPDS) and Direct Current Backup System (DC BUS) equipment on a limited, case-by-case basis for locations with poor electrical power quality to ensure meeting overall NAS RMA service goals and requirements.

The PS3 program also supports the Department of Defense's collocated ARSR equipment as well as the Department of Commerce's Non- CONUS NWS Weather Surveillance Radar-88D. PS3 also provides power support to other government agencies with collocated equipment such as the United States Coast Guard and the Drug Enforcement Administration. PS3 NAS interdependencies include providing highly reliable power to Automation, Communication, Navigation, Surveillance, Weather and Facilities environmental systems.

The FAA PS3 program sustains 11 electrical power systems tasks:

1. Program Management and System Engineering: provides system engineering to define and document customer requirements for power systems.
2. EG: provides backup power when commercial power is unavailable or becomes unreliable. EGs have a 20-year expected system operational life.
3. PCS/UPS: a power quality and backup system that conditions commercial power and provides a short-duration Alternating Current (AC) power source that prevents commercial power disruptions and surges

from adversely affecting electronic system performance and critical NAS services. The PS3 program currently sustains PCS/UPS systems that have an expected system operation life of up to 15 years, with the exception of batteries.

4. Lightning Protection, Grounding, Bonding and Shielding (LPGBS): sustains and optimizes components of LPGBS systems to minimize electrical hazards to personnel, facilities, and electronic equipment caused by lightning, voltage surges, electrostatic discharge and power faults at NAS facilities. Sites are hardened to prevent NAS delay or loss of service, minimize or preclude outages, and enhance personnel safety.
5. DC BUS: converts commercial AC power to high-quality, redundant, and reliable DC power for DC powered electronics. Provides a medium term power source at facilities with limited power needs. The PS3 replaces DC BUS systems with an expected system operational life of up to 15 years, with the exception of batteries. In some applications, DC BUSs can replace EGs on a case-by-case basis pending a review by PSG.
6. NAS Batteries: sustains large "stationary" batteries banks that supply DC power either directly to NAS service equipment or indirectly to NAS equipment via the ACEPS, PCS/UPS, and DC BUS equipment. Depending on NAS requirements, batteries can support anywhere from 15 minutes to 72 hours. PS3 periodically replaces batteries and monitoring components at En Route, Terminal, and Unmanned facilities to ensure NAS service reliability.
7. Electrical Line Distribution (ELD): sustains the FAA owned electrical power systems infrastructure at airports and ancillary facilities that distributes utility level electrical power to NAS facilities. Approximately sixty percent of the cable is beyond its expected system operational life.
8. ACEPS: provides high-quality and high-reliability power to 21 En Route ARTCC's and three large TRACONs. ACEPS consists of EGs, switchgear, and UPS systems. Most of ACEPS is obsolete with EGs having an average age greater than 50 years, which is beyond its expected system operational life of 20 years.
9. CPDS: a set of standardized power system configurations for FAA's large facilities that includes Combined Control Facilities, large TRACONs, and large ATC Towers. CPDS consists of components such as electrical distribution equipment, transfer switches, EGs, UPS, and batteries. The CPDS types have different RMA requirements optimally matched to the criticality and activity level of the NAS facilities they serve.
10. Environmental Remote Monitoring System (ERMS): provides power system sensors and interfaces to the ERMS network, which reports power system status to the operations control centers. The information provides the FAA with real-time data on the status of the systems, allowing a prompt response to system-related issues.
11. Alternative Energy Systems (AES): sustains and supports a broad range of clean energy technologies to meet NAS operational demands.

What benefits will be provided to the American public through this request and why is this program necessary?

The PS3 program funds the replacement, refurbishment, purchase, and installation of components to sustain NAS electrical power infrastructure valued at several billion dollars. The PS3 program is vital to maintaining and increasing NAS capacity, reliability, and availability through sustainment of NAS power equipment so that NAS systems and electronics can deliver their required availability. Commercial power disruption can result in flights being kept on the ground, placed in airborne holding patterns, or being re-routed to other airports but back up power systems mitigate the effects of such outages. The FAA's independent Investment Planning and Analysis (IP&A) Office determined that a single ACEPS outage results in an economic impact to NAS users of approximately $2 million per hour in terms of Aircraft Direct Operating Costs and Passenger Value of Time savings. This estimate is based on an August 15, 2016 ERAM outage event at the District of Columbia ARTCC. PS3 sustainment improves the power service technology, assuring that the Next Generation Air Transportation System (NextGen) Program reliably meets its service goals to NAS operations, the global aviation community, and to the American public.

Detailed Justification for - 2E08 Energy Management and Compliance (EMC)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Energy Management and Compliance (EMC)	$2,400	$3,400	$2,400	$6,400

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Energy Management and Compliance (EMC)	---	$6,400.0

What is this program and what does this funding level support?

The Energy Management and Compliance (EMC) program orchestrates cost-effective reductions of energy and water use at ATO facilities by coordinating policies, technical support, targeted infrastructure investments, and data analysis and reporting. By upgrading older facility infrastructure, such as mechanical and electrical systems, the EMC program will not only reduce operational costs but also increase reliability of the NAS by reducing the likelihood of facility outages and disruptions that can be caused by out-of-service building systems. The EMC program promotes energy and water-use efficiency and the use of off-grid power and non-polluting energy sources for all activities and acquisitions.

For FY 2020, $6.4 million is requested to support the following:

- Perform energy and water improvements at eight high energy using facilities
- Develop and implement performance-based contracts to maximize third-party investments in ATO infrastructure
- Provide required quarterly and annual reports on progress against legislative and executive order mandates to the Department of Transportation (DOT), the Department of Energy, and the Office of Management and Budget

The EMC program has identified 325 facilities that comprise 75 percent of the ATO's energy usage. The mandates of the Energy Independence and Security Act (EISA) and the Energy Policy Act (EPAct) require the agency to identify and implement recommended energy and water improvements to reduce utility usage and associated costs at these facilities. The EMC program has already identified more than $200,000,000 in recommended improvements to lower energy usage at ATO facilities, many of which would pay back in fewer than 10 years.

What benefits will be provided to the American public through this request and why is this program necessary?

The EMC program is necessary to provide a coordinated approach for identifying and implementing cost-effective investments in the FAA infrastructure to reduce ongoing utility expenses. The American public benefits from reduced energy consumption at FAA facilities as well as cost savings that are the result of those efforts.

Detailed Justification for - 2E09 Child Care Center Sustainment

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Child Care Center Sustainment	$1,000	$1,000	$1,000	$1,500

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Child Care Center Sustainment	12	$1,500.0

What is this program and what does this funding level support?

The FAA-owned centers are reaching a facility age of 20 - 25 years; many are in need of roof replacements, HVAC system upgrades, and modernization to meet safety and building code requirements. This program is a multi-year sustainment program that will address facility requirements for the 12 FAA Operated Child Care Centers. The Child Care Centers provides FAA personnel with priority enrollment and flexibility to meet the unique schedule needs of air traffic personnel. FAA is responsible for maintaining the safety of the buildings.

The program is necessary to ensure that the Centers are properly maintained, to local building codes and regulations, and are safe and secure. The lack of a consistent sustainment plan for these facilities has increased the risk to building occupants from failure of critical building components such as roofs, fire life safety and plumbing systems. Centers continue to be funded if/when funds are available. Repairs are prioritized by level of risk. The current level of risk assessment does not take into account that young children occupy the buildings and many "low" risk repairs are higher because of the ages and sizes of the occupants. A sustainment plan would ensure that these facilities are evaluated and repairs are addressed to avoid deterioration.

For FY 2020, $1.5 million is requested to improve the condition of Child Care Centers that are located at FAA facilities. This funding will be used to modernize the 12 FAA Operated Centers that are in need of major projects and other expenses unique to a child care center (e.g. kitchen, children size restrooms). Playground equipment located at FAA Child Care Centers is considered real property, permanent structures, and an integral part of the child care center facility.

What benefits will be provided to the American public through this request and why is this program necessary?

The required funding specifically allocated to these Centers will decrease deferred maintenance – which is the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime. It will remove the risk to building occupants from the potential failure of critical building components and it will increase the employee retention rate, employee satisfaction, loyalty, and decreases job vacancies. Employee satisfaction leads to more productive employees that benefit the American Public by making government more efficient. Additionally, these Centers have a 100 percent accreditation rate compared to only seven percent nationwide rate.

Detailed Justification for - 2E10 FAA Telecommunications Infrastructure 1 (FTI-1)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
FAA Telecommunications Infrastructure 1 (FTI-1)	$30,000	$59,200	$40,000	$48,500

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. FAA Enterprise Network Services (FENS)	---	$47,500.0
B. FAA Telecommunications Infrastructure Sustainment 1	---	1,000.0

What is this program and what does this funding level support?

A. FAA Enterprise Network Services (FENS)

The FENS program is the successor to the existing FTI program which provides the majority of the telecommunications services required by the FAA. Telecommunications services are essential to the operations of the National Airspace System (NAS) and the FAA. As the FTI program comes to an end, FENS is necessary to ensure there is no interruption to the NAS and FAA operations. The current FAA Telecommunications Infrastructure (FTI) program is providing services today with its contract ending in 2022. FENS will provide high-availability, low latency telecommunications services for NAS systems and a separate Mission Support network that serves as the FAA's Intranet for secure connectivity to FAA internal administrative applications as well as the public Internet.

FENS will be responsible for establishing a modern infrastructure that is capable of meeting the FAA's future demands for telecommunications services through 2035. FENS will provide a robust competitive environment for meeting the FAA's future telecommunications needs. For example, FENS will implement modern Internet Protocol (IP)-based infrastructure to replace legacy Time Division Multiplex (TDM)-based infrastructure that will no longer be supported in the commercial marketplace. The FENS network infrastructure will support the connectivity requirements of NextGen-enabling programs such as System Wide Information Management (SWIM) and Data Communications (Data Comm).

For FY 2020, FENS is requesting $47.5 million to fund the necessary resources, program and contract support, to complete the artifacts necessary to achieve a Final Investment Decision (FID), final SIR development, Statement of Objective (SOO)/Statement of Work (SOW) development, transition planning, stakeholder outreach, technology demos and security analysis. The requested funding will also support post FID activities, including technical design reviews, development of the test environment and initial testing activities, finalizing the evaluation of vendor proposals to complete source selection and award contract, prime vendor Program Office establishment, Program Management Office establishment and Operations Support System (OSS) planning and establishment. In addition, the funding will cover prime vendor activities including test plans for verification and validation efforts at over 4,000 sites, network engineering and site design, continued implementation planning and start of deployment activities.

B. FAA Telecommunications Infrastructure Sustainment 1

For FY 2020, FTI 1 technology refresh is requesting $1.0 million to support the sustainment of the existing infrastructure, which includes technology refresh of components that will go into obsolescence, or need upgrading to support the bandwidth requirements of NextGen programs.

What benefits will be provided to the American public through this request and why is this program necessary?

A. FAA Enterprise Network Services (FENS)

The FENS program will benefit the American Public directly and indirectly upon implementation:

- Ensure continuity of the telecommunications services required for the operation of the United States Air Traffic Control system as the existing telecommunications services contract reaches the end of its period of performance
- Reduce telecommunications service delivery timeframes so that new capabilities can be put into operation more quickly to support the flying public and air carriers
- Provide enhanced network service monitoring, control, and security capabilities that improve visibility in outage impacts and reduce restoration times
- Provide the enhanced security capabilities needed to ensure secure communications with internal and external stakeholders that depend upon the FAA's wide area networks and SWIM enterprise messaging services

B. FAA Telecommunications Infrastructure Sustainment 1

The FTI 1 technology refresh will benefit the American Public directly and indirectly upon implementation:

- Ensure continuity of the telecommunications services which supports the critical mission of the United States Air Traffic Control System, Department of Defense (DoD), National Defense Program (NDP), FAA operations, and other aeronautical partners until FENS is completely implemented.
- Technical refresh of the National Airspace System (NAS) Enterprise Security Gateway provides security access and control of sensitive data, which is viable to the mission and business functions of the FAA and its customers.
- Ensure protection of international and domestic flight plans, which support military flights, President/Vice-President of the United States (POTUS) movement and Alert Support, public safety, and national security.
- Ensure integrity of NAS data which could possibly prevent mid-air collisions, mis-routing of aircraft, or the incorrect issuances of clearances resulting in significant congestion.
- Provide sufficient network capacity for new programs, which allows them a more effective way of communicating and disseminating data to and from the airlines, mission partners, and the general public.

Detailed Justification for - 2E11 Data Visualization, Analysis and Reporting System (DVARS)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Data Visualization, Analysis and Reporting System (DVARS)	$5,500	$4,500	$4,500	$7,100

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Data Visualization, Analysis and Reporting System	---	$7,100.0

What is this program and what does this funding level support?

The Data, Visualization, Analysis and Reporting System (DVARS) program will provide data and analyses on NAS operations to FAA executives, Air Traffic Managers, and Air Traffic Operations personnel to help them identify deficiencies and develop proposals to improve NAS performance. DVARS is a replacement for the Performance Data, Analysis and Reporting System (PDARS) which currently provides a means for field facility personnel and FAA offices to develop recommendations for improving the NAS through identification of capacity and system efficiency improvements to reduce delays. PDARS provides data, tools, and analysis to operational facilities.

- DVARS will serve as a replacement to PDARS utilizing a modernized platform. DVARS will provide the same capabilities as PDARS through integrated visualization and reporting tools that allow users to access quality NAS data and perform modeling, analysis, and trending. DVARS will provide added benefits to the FAA that include leveraging FAA Enterprise IT services and data repositories, streamlined system updates with no required field facility technology refresh, the ability to expand user access, and less overall dependency on contract support. In FY 2018 the final Design Review for DVARS will be completed and work will begin on the development of the DVARS data and processing system to meet program requirements

For FY 2020, $7.1 million is requested to complete implementation of DVARS data and processing system capabilities as the foundation of the PDARS modernization. This funding will also allow for the development of the visualization and reporting capability requirements. Critical enhancements and transition support to the PDARS system will also be funded from this program.

What benefits will be provided to the American public through this request and why is this program necessary?

Planning for facility and system enhancements requires the ability to track, monitor, and analyze the daily NAS operations. The modernization of PDARS planned through the implementation of DVARS will provide a modernized enterprise solution inclusive of data processing, visualization, and reporting. DVARS will realize efficiencies by modernizing the implementation of services using FAA Enterprise technologies. Users will gain access to ad hoc reporting capabilities and will be able to query the database and create their own custom reports without assistance from the help desk. In addition, DVARS will increase its impact through improved accessibility of the tools that support this type of work across the FAA, which will result in greater productivity gains.

Detailed Justification for - 2E12 Time Division Multiplexing (TDM)-to-Internet Protocol (IP) Migration

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
TDM-to-IP Migration	$39,000	$38,000	$38,000	$20,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
TDM-to-IP Migration	Various	$20,000.0

What is this program and what does this funding level support?

Major U.S. telecommunications carriers have initiated the discontinuance of Time Division Multiplexing (TDM)-based services as early as Calendar Year (CY) 2018. The FAA is highly dependent on these services. More than 90 percent of the 23,000+ services obtained under the FAA Telecommunications Infrastructure (FTI) contract are TDM-based to meet the interface requirements of systems that provide critical NAS services such as surveillance radar, air/ground voice, and interphone (ground/ground voice). FTI makes extensive use of the infrastructure of commercial telecommunications carriers to reach more than 4,000 facilities operated by the FAA. To reach such widely dispersed locations, the majority of services are provisioned over wireline infrastructure provided by Local Exchange Carriers (LECs) and Inter-exchange Carriers (IXCs). As these carriers' phase-out, TDM based infrastructure and migrate to Internet Protocol (IP)-based technology, the potential impacts to the FAA are significant because the majority of NAS services are dependent upon the precision timing, deterministic performance, and low latency of TDM based services.

The FAA has developed a TDM-to-IP migration strategy that identifies a three-pronged approach for addressing the phase-out of TDM-based services:

- Modernize NAS systems to support IP communications with standard Ethernet interfaces
- Modernize the system communications interface of NAS systems to be IP-compatible as part of the standard technology refresh process
- Implement FTI provided TDM-to-IP network conversion device

For FY 2020, $20.0 million is requested to provide funding for the TDM-to-IP Portfolio Program for the following requirements:

- Development and implementation of an Enterprise Interface Modernization Solution. Interface Modernizations include but are not limited to programs within Air to Ground Voice, Ground to Ground Voice, Automation, Communication, Navigation, Surveillance and Weather service categories. Contractor support for the PMO's management and oversight of the TDM-to-IP migration activities

What benefits will be provided to the American public through this request and why is this program necessary?

The work under this program supports FAA initiatives to improve the NAS resiliency through a robust infrastructure that has the ability to auto-recover during outages so they will be transparent to FAA end user systems and result in a reduction in air traffic delays.

Detailed Justification for - 3A01 Hazardous Materials Management

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Hazardous Materials Management	$35,300	$29,800	$29,800	$20,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Hazardous Materials Management	40	$20,000.0

What is this program and what does this funding level support?

The FAA operates the HAZMAT management program to clean up approximately 772 contaminated areas of concern that require investigation, remediation, and closure activities. 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, and heavy metals.

The FAA has identified 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 (WJHTC) in Atlantic City, New Jersey prompted the Environmental Protection Agency (EPA) to place the site on the EPA's National Priority 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 HAZMAT management program account for a large portion of unfunded environmental liabilities documented in the FAA's financial statements.

For FY 2020, $20.0 million is requested to continue the management and remediation of 772 contaminated areas of concern (AOCs), as of October 2018. To achieve compliance with all Federal, State, and local environmental cleanup statutes, including the Resource Conservation and Recovery Act (RCRA) of 1976, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, and the Superfund Amendments and Reauthorization Act (SARA) of 1986, the FAA must continue mandated program activities.

- Continue the management and remediation of 40 contaminated AOCs.
- Continue remediation activities at the National Priority List Superfund site at the William J. Hughes Technical Center.
- Move the status of sites listed on the EPA Federal Hazardous Waste Compliance Docket (Docket) to "No Further Remedial Action Planned (NFRAP)" status. The majority of non-NFRAP status sites remaining on the Docket have significant technical challenges to obtaining closure (e.g., long timeframe for site remediation, Superfund site, and ownership liability issues). The five remaining FAA Docket sites include the Mike Monroney Aeronautical Center (MMAC); Ronald Reagan Washington National Airport (DCA); WJHTC; the Alexandria International Airport (AEX) Air Route Surveillance Radar (ARSR); and the Sunset Cove, Alaska (JNU) remote communications outlet (RCO).
- Continue to perform investigations and remediation projects at all other identified contaminated sites under Federal, State, and local mandates and enforcement agreements to limit future liability to the agency and foster environmental stewardship.

Postponing remedial activities at these contaminated AOCs can lead to noncompliance with the Federal, State, and local environmental cleanup statues. Noncompliance with these statues includes maximum penalty amounts that range from $1,000 (Bahamas) to $100,000 (Alaska) for the first day of violation, and that range from $1,000 (Bahamas and Idaho) to $50,000 (Hawaii, New Hampshire, and New Jersey) for each day after the first day of violation.

What benefits will be provided to the American public through this request and why is this program necessary?

The HAZMAT program intends to annually remove 10 percent of the average Program's cumulative closures from FY 2009 to present calculated as 70 of the AOCs listed in the HAZMAT management program's published Environmental Site Cleanup Report (ESCR). The FAA continues to exceed closing 70 AOCs annually. In FY 2018, the HAZMAT program began the year with 690 AOCs and removed 131 AOCs. However, during FY 2018, 213 new AOCs were added to the program. These new AOCs were predominately inflows from the facility decommissioning program. From FY 2009 through FY 2018, the HAZMAT management program has closed 847 AOCs.

The direct outcome of closing these sites leads to overall decreased environmental remediation (ER) liability to the FAA. The FAA is currently analyzing alternate remedial technology that optimizes remediation and cost efficiency. Examples of this optimization are at Area D, Area 20A, and Area 29 at the WJHTC NPL site, which is expected to yield at least a 1,000 percent return on investment (ROI) at Area D, 69 percent ROI at Area 20A, and 280 percent ROI at Area 29. Investigating, remediating, and obtaining site closure at the FAA's contaminated AOCs also increases employee and public safety by minimizing exposure to toxic and hazardous substances at these sites.

Detailed Justification for - 3A02 Aviation Safety Analysis System (ASAS)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Aviation Safety Analysis System (ASAS)	$12,000	$18,700	$18,700	$19,700

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Regulation and Certification Infrastructure	---	$19,700.0

What is this program and what does this funding level support?

For FY 2020, $19.7 million is requested to perform technology refresh of existing Information Technology (IT) infrastructure components supporting the Aviation Safety (AVS) safety workforce. This funding is required for Aviation Safety Analysis System (ASAS) Regulation and Certification Infrastructure for System Safety (RCISS) Sustainment 3 to continue deploying modern IT services in the following areas:

- Mobile Technologies
- Remote Connectivity Telecommunications
- Consolidated Server/Data Storage Systems
- Safety System Hosting Services
- Enterprise Software
- Disaster Recovery

These services ensure continuity of operations for critical and non-critical safety systems. Additionally, these services ensure that critical safety data are safeguarded against loss by providing a secure, reliable and timely back up of data. They also support the coming integration of AVS's disparate safety data, where individual stove-piped applications own specific data sets, into an enterprise level data store that isolates the data from the applications. In this new environment, safety workers assemble data as needed from various data sources to support new business processes. Data in these data stores requires critical recovery response.

ASAS RCISS provides all IT infrastructure components that support the AVS safety workforce and ensures standard and reliable accessibility to safety data. As it has done since inception, the program is continuing to enhance and maintain the AVS IT infrastructure to meet evolving AVS business needs by addressing its mobile safety workforce requirements and changes in the aviation industry. The program focuses on providing safety data to the AVS workforce while they are mobile (off-site); conducting safety inspections and investigations of airlines, manufacturers, pilots, accidents, etc.; and provides methods to access all AVS national safety applications developed by System Approach for Safety Oversight (SASO), Aviation Safety Knowledge Management Environment (ASKME), Aerospace Medicine Safety Information System (AMSIS), and all other AVS national safety programs including the Pilot Records Database (PRD) and Unmanned Aircraft Systems (UAS) initiatives. The ASAS RCISS infrastructure directly contributes to the success of AVS in meeting its mission goals as it is developed, implemented and administered as an integrated IT solution that provides the AVS safety workforce with the tools to perform their vital safety work.

RCISS investments encompass the following six key component areas:

- Devices for AVS's 6,400+ safety workforce (including mobile devices) - Activities include lifecycle replacement of existing devices to meet operational demands and replacement of outdated or malfunctioning devices.
- Telecommunications - Activities include lifecycle replacement of existing network devices and procurement of additional equipment and services where telecommunications bandwidth is deficient.
- Enterprise Services (hardware and software which allow components of the infrastructure to work together) - Activities include lifecycle replacement of existing devices and software.
- Application Data Servers (hosting of national AVS safety applications) - Activities include lifecycle replacement of existing servers and storage devices as well as supporting AVS migration to cloud based services.
- Commercial-Off-the-Shelf (COTS) software (operating systems, databases, data visualization, etc.) - Activities include acquisition and maintenance of enterprise software licenses.
- Contractor Support - Activities include providing the knowledge and expertise necessary to refine and streamline the ASAS RCISS enterprise infrastructure

ASAS RCISS addresses AVS's need for an enterprise IT infrastructure that supports AVS personnel responsible for promoting aviation safety through regulation and oversight of the civil aviation industry. It supports the AVS safety workforce in their effort to reduce aviation accidents by making real-time safety data immediately accessible to and from all involved, e.g., inspectors, engineers, investigators, and medical examiners. The ASAS RCISS IT infrastructure was designed to be flexible and scalable, allowing for adaptation to meet emerging AVS business requirements.

Additionally, workload capacity, performance, and reliability of the workforce is increased and enhanced by the ASAS RCISS IT Infrastructure. The infrastructure enables AVS to evolve its business processes without additional staffing requirements, such as allowing for a more mobile workforce and the creation of virtual workplaces.

What benefits will be provided to the American public through this request and why is this program necessary?

ASAS RCISS enables the safety benefits promised by the SASO, ASKME and AMSIS programs by providing the IT infrastructure they require. The data developed, manipulated, analyzed, and reported on by the SASO, ASKME and AMSIS programs will reside on the ASAS RCISS IT infrastructure. Without the ASAS RCISS IT infrastructure, the full capabilities and benefits promised by SASO, ASKME and AMSIS will not be realized.

The RCISS program management team periodically surveys end users to measure effectiveness of mobile safety devices deployed. Results are used to validate that solutions meet end user requirements and to identify lessons learned for future deployments. Surveys conducted to date have successfully demonstrated user satisfaction and validated safety workforce productivity projections.

The following program performance measures have consistently been met:

- Cost and schedule performance variances have never exceeded baseline management thresholds
- Availability of end user mobile telecommunication devices to the AVS safety workforce
- Technology refresh of end user devices to assure an acceptable level of system reliability, maintainability, and availability
- Development of standard aviation safety data sets to ensure enterprise conformity to increase efficiency and effectiveness of data analysis

Detailed Justification for - 3A03 National Air Space Recovery Communications (RCOM)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
National Air Space Recovery Communication (RCOM)	$12,000	$12,000	$12,000	$12,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
National Air Space Recovery Communication (RCOM)	---	$12,000.0

What is this program and what does this funding level support?

For FY 2020, $12.0 million is requested for RCOM. This program supports the Office of Security and Hazardous Material Safety's Command and Control Communications (C3) Division that provides the FAA with survivable, secure, and redundant communications that assure the Agency's ability to respond to emergencies, to assist in the minimum essential restoration of the NAS and enable the continuity of FAA operations. When normal common-carrier communications are interrupted, C3 provides and enhances variety of fixed-position, portable, and transportable emergency communications systems that support crisis management; enables the FAA and other Federal agencies to exchange classified and unclassified communications to protect national security; and several FAA continuity of operations (COOP) sites. This ensures FAA decision makers have command and control communications during times of crisis. Funding is requested to meet the minimum support necessary to maintain the infrastructure mandated by Federal continuity directives.

FY 2020 funding is requested for the following activities:

- Very High Frequency/Frequency Modulated and national High Frequency radio network modernization efforts.
- Emergency Operations Network (EON). Support includes the continued development of EON Geographical Informational Systems layers, maps, and visualization tools, as well as the EON Dashboard, EON Collaborative Communication platform, and the EON Data Discovery platform.
- Emergency Operations Facilities activities, which include audio/video display systems, national situational awareness view, Domestic Events Network, incident monitoring, conference-bridge, help desk support, and equipment refresh.
- Communications Support Team emergency response activities, related communication equipment, and Emergency Response Vehicle.
- Secure Communications (COMSEC) activities and exercises to ensure continued system viability related to all secure telephone, secure facsimile, and secure classified communication equipment to support National Security.
- Command and Control Communications IT activities used to maintain the IT infrastructure for COOP sites and the Emergency Operations Network.
- Technology refresh of the Microwave radio and router equipment.
- Support and refresh of the Satellite Telephone Emergency Network.

The C3/RCOM program office also has Presidential and Congressional mandated responsibilities to provide reliable communications support to the White House, DOT, FAA, and other government agencies during national security events, disaster recovery efforts, accident investigations, government exercises, and special invitational events.

Other efforts within the C3/RCOM program revolve around National Security. 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/RCOM program's responsibilities have increased to meet the current national security demands.

What benefits will be provided to the American public through this request and why is this program necessary?

The FAA's C3/RCOM program has 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 Emergency Operations Network (EON) 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.

During disasters, C3/RCOM assists in the minimal communications restoration of the NAS to help ensure safety of flight for the American public.

The American public benefits from the C3/RCOM program by ensuring that the FAA can reliably and continuously communicate and exchange information, enabling operations and decision-making at all times, especially during times of crisis and natural disaster.

Detailed Justification for - 3A04 Facility Security Risk Management

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Facility Security Risk Management	$20,400	$19,600	$17,800	$15,100

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Facility Security Risk Management	---	$15,100.0

What is this program and what does this funding level support?

In 1999, the FAA established the FSRM program. The program implements standardized facility protective measures at all FAA staffed facilities. These measures include personnel access control (via card readers, fencing, gates, and security guards), surveillance (cameras), vehicle access control (barriers), visibility enhancements (lighting), and X-ray machines. The FSRM program participates in the construction of facilities that secure FAA personnel and assets, such as guard houses, and facility retrofitting to protect against blast or explosive attacks.

The FSRM program manages contracts that install security systems, and that provide maintenance services to installed security systems regardless of age, manufacturer, or condition. In addition to the protection of FAA personnel and assets, another program goal is one of standardization across the NAS. The standardization of security equipment and processes will result in a substantial cost savings to the FAA. To aid in NAS-wide standardization, the FSRM program facilitates security system installation for not only ATO facilities, but also for facilities serving AVS and ARP lines of business within the FAA. FSRM is participating with NextGen Planning to identify the security needs and vulnerabilities of NextGen facilities in order to ensure that the safety and security of FAA assets and personnel are maintained as the FAA prepares for the future of flight.

The FSRM program is instrumental in ensuring that FAA efficiently and cost effectively implements all issued Presidential Directives aimed at securing Federal facilities and personnel. For FY 2020, $15.1 million is requested to support security upgrades that will result in increased security at FAA staffed facilities.

- Construction/Installation for security upgrades
- Engineering design and equipment installation for the Eastern and Western Pacific regional offices
- Security PIV upgrades at Facility Security Level (FSL) 2 and FSL 3 facilities
- Technology refresh of security systems at FSL 1, FSL 2, and FSL 3 facilities to replace outdated security equipment
- Begin installation of cameras and PIV card readers at all access points to areas housing critical NAS systems in all ARTCCs and ATsC Tower/TRACON facilities that support the busiest United State terminal areas

What benefits will be provided to the American public through this request and why is this program necessary?

FSRM has contributed to obtaining security accreditation at over 980 FAA facilities. This was accomplished by the program's management of national contracts through which security measures such as X-ray machines, cameras, card readers, gates, vehicle barriers, etc., were installed. The installation of the measures led to security accreditation of the facility as required by FAA Order 1600.69. The impact of those upgrades has been to reduce the risk of intrusion and unauthorized entry to the facility. The FSRM program is necessary because aviation assets are attractive targets for those who would seek to harm and terrorize the American public.

Detailed Justification for - 3A05 Information Security

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Information Security	$20,700	$26,000	$20,900	$33,300

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Information Systems Security (ISS)	---	$12,000.0
B. NAS Critical Infrastructure Cyber Enhancements	---	21,300.0

What is this program and what does this funding level support?

For FY 2020, $12.0 million is requested to fund Mission Support Information Systems Security (ISS) and $21.3 million is requested for NAS Critical Infrastructure Cybersecurity to support the integrity, confidentially and availability of FAA mission critical systems, networks, and infrastructure, inclusive of personally identifiable information, under conditions of increased threat from cyber terrorism and malicious activities. The Federal Information Security Management Act of 2014 requires that the FAA must identify and provide information security protection commensurate with the risk and magnitude of potential harm that could result from unauthorized access, use, disclosure, disruption, modification, or destruction of information that supports the agency, aviation safety and security, and the NAS. This includes detection of alerts and attacks generated against the FAA/DOT infrastructure, mitigation of cyber events, and privacy breaches. The FAA Security Operations Center (SOC), a 24x7x365 operation, serves as the foundation of the FAA Security Program by providing defensive knowledge of threats, attacks and weaknesses in FAA networks and systems. The SOC is also the central reporting point for all cyber events occurring within the FAA and DOT.

Funding supports a comprehensive cybersecurity strategy to improve management security controls, incorporate software development and life-cycle processes, and address the interdependencies between aircraft and air traffic systems. The FAA is evolving its risk-based approach to computer network defense by integrating new technologies into the cybersecurity program. The Mission Support ISS Program supports efforts that fortify the security and protection of FAA networks and infrastructure, including:

- Wireless Deployment – Provides a secure enterprise-wide core wireless infrastructure to FAA end users.
- Federal Identity, Credential, and Access Management - Streamlines how the FAA authorizes access and privileges of internal and external.
- Enterprise Security Architecture - Builds a repository of relevant IT information and establishes a plan to move from the current state of IT systems to a holistic IT future state.
- FAA's Office of Next Gen Enterprise/NextGen Cybersecurity Test Facility - Ensures the integrity and availability of FAA's critical information systems, networks, and administrative systems.
- Cybersecurity Operations – Addresses Advanced Persistent Threat and Emerging Technologies.
- Aviation Ecosystem - Improves the agency's understanding of cybersecurity risks to NextGen by assessing systems to determine risk exposure and impact of a security breach.

The NAS Critical Infrastructure Cybersecurity Program provides services and capabilities to enhance Air Traffic Control (ATC), ensuring the NAS remains secure and resilient. This includes enterprise security services used by NAS systems to protect assets from cybersecurity threats and Infrastructure Security Management tools used by NAS control centers to monitor enterprise networking and computer environment to detect and respond to anomalous or malicious events and data flows. The NAS Cyber

Program supports comprehensive assessments of risk and vulnerability to the systems including findings from GAO and OIG, and provides enterprise security services and funding to NAS F&E funded systems for vulnerability Remediation. Enterprise security services include:

- NAS Data Flow Monitoring (Intelligent Traffic Monitoring (ITM) – Enables full monitoring coverage of internal and external data flows through implementation of sensors.
- NAS Centralized Software Security Management (CSSM) – Provides the capability to effectively monitor and improve the cybersecurity posture of NAS-wide systems.
- NAS Security Enterprise Asset Management (SEAM) – Provides a centralized NAS asset inventory management capability and automated NAS asset information collection to meet OMB Mandates.
- NAS Cyber Management System (NCMS) - technical refresh and expansion to provide security event collection capabilities at NAS facilities to reduce network load and telecommunications.
- Enterprise Solution Program Management – Provides F&E program contract support to perform Secure Provisioning functions as defined in the National Institute of Standards and Technology (NIST) National Cybersecurity Workforce Framework.
- Solution Integration – Continues Enterprise Security Service Integration with NAS Systems to ensure utilization of F&E funded enterprise NAS security services in providing system identification, protection, detection, and response/recovery capabilities.

What benefits will be provided to the American Public through this request and why is this program necessary?

The continuing mission of the FAA is to provide the safest, most efficient aerospace system in the world. Such efforts include satellite communications, navigation, weather and aircraft worthiness to prevent aviation related fatality, injury or significant property loss. The FAA is undertaking multiple strategic and tactical initiatives in the development of a comprehensive and strategic framework to reduce cybersecurity risks to the NAS, civil aviation, and agency information systems. Cybersecurity ensures the reliability and accessibility of systems to the flying public.

The FAA plays a crucial role in the Nation's critical infrastructure through management of the national airspace and other critical mission systems for air transportation. Air traffic in the national airspace has increased dramatically. This, coupled with hundreds of internal and external users traversing the gateways, has increased the risk likelihood and potential threat damage. This may include unauthorized access to NAS and non-NAS systems. A major threat facing federal government departments and agencies is cyber espionage. Nation-state actors routinely engage in cyber espionage activities in order to steal critical information in an effort to gain advantages politically, economically, and militarily. There is a pattern of ongoing attacks to access and maintain a presence in the network and data of the target Department or Agency. Sophisticated threats, or advanced persistent threats, are found with increasing frequency within government networks and engage in long-term cyber espionage activities. Damage to, or compromising of, FAA systems and aviation safety related information, including Air Traffic, Airway, and Airport Information Systems, Pilot and Airman Medical processing and Certifications, have serious consequences to the entire aviation community and American public.

The majority of Critical Infrastructure Cybersecurity Program (NAS) initiatives are mandated by federal law. By implementing the initiatives at an enterprise level rather than on a system-by-system basis, provides NAS with economies of scale and reduces/eliminates redundant costs. Through analysis performed in accordance with Presidential Executive Order 13636, it was determined that a successful cyber-attack on the NAS could have catastrophic economic impact. Enhanced NAS Cybersecurity Protection, Detection and Response capabilities would greatly reduce the likelihood of a major cyber-attack against the NAS being successful; hence greatly reducing the likelihood of a major economic impact to the FAA and the nation.

Detailed Justification for - 3A06 System Approach for Safety Oversight (SASO)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
System Approach for Safety Oversight (SASO)	$25,800	$25,400	$25,400	$23,100

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. System Approach for Safety Oversight (SASO) Phase 3	---	$18,100.0
B. System Approach for Safety Oversight (SASO) Phase 4	---	5,000.0

What is this program and what does this funding level support?

For FY 2020, the System Approach for Safety Oversight (SASO) program requests a total of $23.1 million for continued development of the Safety Assurance System (SAS) which includes $18.1 million to continue funding activities supporting SASO Phase 3 and $5.0 million to commence activities supporting SASO Phase 4.

The SASO program increases aviation safety and controls cost by adopting the International Civil Aviation Organization (ICAO) mandate to revise Safety Programs to incorporate Safety Management System (SMS) principles. To accomplish this, the SASO Program is reengineering Flight Standards (FS) business processes and developing an oversight system based upon SMS principles. The scope of the SASO investment includes reengineering FS business processes and consolidating FS applications into the appropriate number of enterprise applications. SASO serves approximately 4,800 FAA Aviation Safety employees across headquarters and approximately 100 field offices, and more than 25,000 additional aviation industry professionals managing aviation safety throughout the United States.

FS is responsible for oversight of nearly the entire civil aviation industry using the National Airspace System (NAS). Its legacy safety oversight system is stove piped, reactive in nature, and "regulatory compliance-based." While many technical and human factors problems contributing to accident rates have been resolved, more complex organizational factors remain which requires additional systems-based, data-supported analysis and assessment for their resolution. SASO closes the performance gap between a "regulatory compliance-based" approach and the reengineered SMS-based approach to safety oversight.

Increases in technical and operational complexity of aviation operations and introduction of new technologies further stress today's oversight system. SASO implements a more structured data-supported risk-based oversight system, for the FS aviation safety inspector workforce. The primary product is the SAS. FS uses SAS to more efficiently manage its statutory responsibility to oversee NAS certificate holders, and as a hazard identification and risk assessment tool to formulate surveillance plans and target FS resources to the highest risk areas in the NAS. The SAS core functionality was first deployed in 2016 for oversight of three Title 14 Code of Federal Regulations (14 CFR) Parts, a subset of FS overall responsibility.

SASO Phase 3 implements the SASO program requirements associated with safety oversight of aviation training schools and adds an interface with the Designee Management System. SASO Phase 3 enhances SAS functionality in the areas of activity recording, office workload list, risk profile, and the Certificate Services Oversight Process. Finally, SASO Phase 3 develops SMS safety educational materials and support systems for general aviation certificate holders.

During FY 2020, SASO Phase 3 plans activities to continue the SAS automation development, integration and testing process. The program will conduct SASO Phase 3 SAS user acceptance testing (UAT) in November 2019, the first complete test with all Phase 3 functionalities. Following UAT, the program will move to key site deployment and acceptance testing in April 2020 and will achieve initial operational capability (IOC).

SASO Phase 4 will initiate forming integrated product teams and commencing business process reengineering. Work on the remaining SMS components that began in Phase 3 will continue to expand, such as avenues for outreach to the general aviation community; integrating the Operational Approval Portal System (OAPS) into the SAS; and extending safety policy to bring SMS to the full range of FS oversight activities. SASO Phase 4 is planned for a period of performance from FY 2020 to FY 2027.

The success of the SASO program depends upon continued development funding through FY 2027 to achieve and sustain full benefits. The required funding supports further SAS automation development, policy updates, training, and implementation to achieve the full oversight capabilities and benefits as envisioned during the business process reengineering analysis and design phase of the program.

What benefits will be provided to the American public through this request and why is this program necessary?

The primary benefit of the SASO program to the American public is its contribution to the reduction of aviation accidents and fatalities. By implementing the SMS principles, FAA oversight of the aviation industry results in fewer accidents attributable to FAA oversight gaps or failures. Standardization and consolidation of business processes and associated systems lowers maintenance costs and increases workforce efficiency while maintaining, rather than increasing, the current number of aviation safety inspectors.

The new processes and tools developed under this program allow FS to focus its resources on the highest risk areas in the NAS. The flying public is the primary beneficiary of SASO's SMS-based safety oversight system of the aviation industry.

Detailed Justification for - 3A07 Aviation Safety Knowledge Management Environment (ASKME)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Aviation Safety Knowledge Management Environment (ASKME)	$4,000	$6,000	$6,000	$5,300

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Aviation Safety Knowledge Management Environment (ASKME) Segment 2	---	$1,300.0
B. Aviation Safety Knowledge Management Environment (ASKME) Enhancement	---	4,000.0

What is this program and what does this funding level support?

ASKME is a suite of functional components designed to support and enable the FAA Aircraft Certification Service (AIR) to more efficiently certify new aircraft and modifications to existing aircraft, and assist The FAA Safety Organization to achieve critical agency goals including safety, organizational excellence, continued operational safety management, and international leadership. ASKME will provide specific capabilities including knowledge management, integrated data management, monitoring and predictive analysis of safety data, and business process assistance tools. When integrated into the safety management approach and practices, these combined capabilities will enhance aviation safety and promote a culture of system safety. For FY 2020, $5.3 million is requested to fund the following:

A. ASKME Segment 2

- Development of changes based on policy changes, AIR Transformation, or received from user community
- First-year production support

B. ASKME Enhancement

- Data Management - Identify similar data across existing systems; Identify authoritative reference data
- Complete design for future-state Complete design for future-state Continued Operational Safety (COS) system (Enhancement/Replacement for major ASKME Segment 1 system MSAD) incorporate new data architecture and taxonomy standards

What benefits will be provided to the American public through this request and why is this program necessary?

The ASKME Program will ensure the following:

- Increased Productivity and Efficiency: Centralized system to facilitate knowledge transfer promoting quicker more effective decision-making.
- Shares Data More Rapidly: Provides an external public portal allowing faster transfer of FAA data resources.
- Optimized Risk Reduction: Provides for rapid identification of potential safety trends reducing exposure of risks to the traveling public.

Detailed Justification for - 3A08 Aerospace Medical Equipment Needs (AMEN)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Aerospace Medical Equipment Needs	$7,000	$14,000	$14,000	$13,800

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Aerospace Medical Equipment Needs (AMEN) – Sustainment 3	---	$1,000.0
B. Wind and Wave Evacuation/Survival Facility Phase 1	---	12,800.0

What is this program and what does this funding level support?

A. Aerospace Medical Equipment Needs Sustainment 3 (AMEN 3)

Civil Aerospace Medical Institute (CAMI) research and training personnel discover methods and recommend strategies to enhance the safety, security, health, and performance of the most important aspect of the National Airspace System (NAS), the human operator and the public that she/he serves. CAMI is the only federal entity that performs this work on behalf of the U.S. The AMEN investment supports research that includes assessments of human performance under various conditions of impairment, human error analysis and remediation, and agency workforce optimization.

AMEN Sustainment 3 will replace a number of critical and highly technical pieces of specialized equipment. These items must be replaced due to advanced age, lack of support, diminished technology capability, and limited strategic resource optimization. The current funding of $1.0 million for FY 2020 supports Aerospace Medical Biodynamics Research with the purchase of a light array to provide the lighting intensity necessary to support high-speed video capture during impact sled tests. The new light array will draw less current, produce natural lighting, give off little to no heat, and result in video of higher integrity and accuracy.

To perform their missions, CAMI's personnel require sophisticated, highly technical, and specialized equipment. Much of the laboratory equipment used by CAMI's scientists, physicians, and engineers is old and becoming obsolete. As the single provider of key medical and human factors research, CAMI research laboratories must keep up with scientific and technical advances that aid the discovery of methods to improve human health, performance, and safety.

B. Wind and Wave Evacuation Survival Facility (WiWaves)

For FY 2020, $12.8 million is requested to enable the Wind and Wave Evacuation and Survival (WiWAVES) program to replace the aging Water Survival Research Facility (WSRF) at CAMI. The funding is to continue the process of building the new WiWAVES facility. The funding will support: (a) Complete acceptance of the Architecture and Engineering Type B Construction Design Drawings, (b) Complete documents for Construction Contract (c) Release Screening Information Request (d) Complete all Final Investment Decision (FID) artifacts and achieve FID approval.

CAMI plans to construct a new Wind and Wave Evacuation and Survival (WiWAVES) Facility, to be located west of the CAMI building. The WiWAVES facility will be approximately a 50,000 sq. ft. building that houses a water survival tank and a dry test area comprising a wind and wave chamber for escape and survival systems equipment studies, wind studies, research, education and testing. The tank and dry test area will be surrounded by structural and mechanical apparatus necessary to support: Fuselage placements; aircraft attachments for multiple escape slides; deployment of water survival inflatables; wind machines to emulate high-fidelity windstorm operating environments; and wave generating capability necessary to challenge the design and function of water safety and survival equipment and procedures. These upgrades are designed to facilitate the FAA's research and education activities that ensure aircraft passengers have the knowledge and equipment necessary for water survival during emergencies. No other such capability currently exists within the civil aviation industry.

WiWAVES is replacing the current WSRF, which was installed in 1967 and is deteriorating to the point of potential structural failure. The current WSRF failed structurally in 2012 and was out of service for several months. All activities involving the use of overhead cranes, aircraft escape slide attachments, fuselage dunking equipment, and emergency equipment repair/reconfiguration were not conducted during this period. The antiquated WSRF was repaired but is continuously being monitored for potential structural failure. The tank's structural failure could severely damage the adjacent surrounding infrastructure and resources, e.g., the newly installed impact sled, computer systems, aircraft simulators, multimedia equipment, classrooms, auditorium, and medical certification records.

What benefits will be provided to the American public through this request and why is this program necessary?

These investments will allow for the continued performance aerospace medical and cabin safety research. This research serves as the knowledge base for Physicians, Physiologists, Human Factors Experts, Engineers, Psychologists, Educators, Flight Attendants, Aircrew, and numerous other academia, industry, and government personnel in the U.S. and abroad who are concerned with the safety of humans in aerospace operations. Identifying survival factors in simulated studies is essential to prevent death and injury.

The beneficiaries of the research resulting from the use of the facility and equipment sought by AMEN and WiWAVES include: the General Public, Aeromedical Scientific and Engineering Communities, Aeromedical Education/Training Communities, Aeromedical Certification, including FAA AAM Regional Flight Surgeons and Aviation Medical Examiners (AMEs), Aircraft Accident Prevention and Investigation, Aircraft Certification, Flight Standards, Legal Counsel, Space Transportation, Quality Management, Aviation Operations Personnel and their organizations, Aircraft manufacturers, and Industry/Government Accreditation/Standards development organizations.

Detailed Justification for - 3A09 NextGen – System Safety Management Portfolio

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
System Safety Management Portfolio	$16,200	$15,700	$14,200	$19,500

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Aviation Safety Information Analysis and Sharing (ASIAS)	---	$16,500.0
B. System Safety Management Transformation (SSMT)	---	3,000.0

What is this program and what does this funding level support?

This portfolio contains activities that ensure that changes introduced with NextGen enhance or do not degrade safety while delivering benefits which result from the development and implementation of policies, processes and analytical tools that the FAA and industry will use for more efficient operations.

For FY 2020, $19.5 million is requested to continue development of both the ASIAS and SSMT programs by expanding their capabilities to better manage, integrate and process aviation safety performance data. This request will enable the development of tools to convert both text and numeric data into safety information. It will also support the development of anomaly detection and visualization capabilities to enable causal/contributing factor analyses and risk assessments. In addition, safety analysis capabilities, tools and metrics will be developed to integrate safety data from a number of disparate sources into a suite of system level models.

A. Aviation Safety Information Analysis and Sharing (ASIAS)

ASIAS is a collaborative government and industry initiative to share and analyze data to proactively discover safety concerns before accidents or incidents occur, leading to timely mitigation, prevention, and monitoring efforts. The primary objective of ASIAS is to provide the means to discover common, systemic safety problems that span multiple airlines, fleets and regions of the global air transportation system. ASIAS participation includes more than 150 stakeholder organizations including commercial and corporate aviation, general aviation, government agencies, and others within the FAA and across the aviation community. The objective of ASIAS data fusion is to provide a complete perspective of all available information at each stage of a flight.

For FY 2020, $16.5 million is requested to provide the following:

- Develop adaptive analytics (updatable models) to support automated identification of safety risks through continuous exploration of available ASIAS data resources.
- Deploy interactive and advanced visualization tools for improved safety analysis.
- Deploy text-mining capability enhancements to supplement analytical models using fused ASIAS data sources to improve the efficiency and effectiveness of ASIAS safety analyses.
- Complete Directed Studies using tailored analytical techniques with ASIAS data to support NextGen system changes and aviation hazard analysis.
- Deploy data-fusion platform architecture to merge text-based safety reports, flight operational quality assurance data, and surveillance radar information, to produce enhanced safety analysis capabilities for the aviation community.

B. Safety Systems Management Transformation (SSMT)

SSMT is a stakeholder-driven, cross-functional effort to support the development and implementation of integrated safety management systems across the air transportation system to ensure that safety risk throughout the system is managed to an acceptable level. SSMT incorporates integrated safety risk models, enables customization of models from the NAS to a single operator or region, and provides data and replay of detected candidate safety events. SSMT links system data and subject matter expert assessments to precursors that can be observed and tracked by FAA's Lines of Business (LOBs) and Service Offices (SOs) as well as by Hazard Risk Tracking systems supporting safety baselines and forecast monitoring within the FAA. SSMT's integrated safety risk assessment models enable proactive assessment of precursors and barriers to accidents and incidents, and it supports FAA and DOT safety analysis programs and risk mitigation strategies.

SSMT continues to work with FAA Lines of Business and Service Offices and individual airlines, supporting integrated safety risk assessments of NextGen OIs, airport operations, airline operations, rulemaking, and barrier assessment. Since 2017, SSMT and the European Organisation for the Safety of Air Navigation (EUROCONTROL) have engaged in the development of a harmonized and joint web-based integrated safety risk assessment platform.

For FY 2020, $3.0 million is requested to provide the following:

- Create automated methods to efficiently and comprehensively quantify the existing commercial aviation safety risk baseline, leveraging available FAA and other aviation data sources to inform data and barrier dependencies.
- Develop additional safety risk assessment models to represent general aviation (GA) and UAS operations.
- Deploy shared web-platform version of indexed sequential access method, incorporating standard and stakeholder-specified monthly risk assessment reports.
- Identify, implement, and deploy prioritized anomaly detection capabilities, to include (a) runway and taxiway use metrics, surface operation deviations, and historical pattern identification, in support of ASIAS and Runway Safety Office initiatives, and (b) identification of precursors for loss of separation events, in support of Traffic Analysis and Review Program initiatives.
- Develop integrated safety risk analysis capabilities to support coordinated FAA-wide wake safety risk procedures, airspace redesign), and assessment initiatives, NextGen system changes (e.g., Air Traffic Management procedures community changes (e.g., fleet changes, avionics upgrades).

What benefits will be provided to the American public through this request and why is this program necessary?

The planned growth and complexity in the air transportation system requires a fundamental change in the way the air transportation community manages safety. System safety management research provides a shared, proactive approach to identifying, assessing and mitigating risk, enabling all stakeholders to be more effective in their approach to managing safety.

The primary benefit of the ASIAS program to the American Public is its contributions to the reduction of the aviation accidents and fatalities across a broad range of aviation communities. ASIAS discovers and analyzes potential safety issues in the NAS and supports development of safety enhancements to mitigate risk. ASIAS will develop new metrics and analytical methods while continuing to be a focal point for industry collaboration, advancing critical safety initiatives and FAA objectives. These efforts will enhance aviation safety, and lead to improved safety analysis techniques and risk mitigation strategies for commercial aviation, general aviation, rotorcraft and UAS stakeholders in the NAS.

The primary benefit of the SSMT Program to the American Public is its contribution to the nation-wide goal of continuous safety improvement and reduction of risk through implementation of an integrated safety management approach. SSMT creates integrated baseline safety risk models built on best-available data, identifies candidate safety events through its anomaly detection tools, and enables risk-informed evaluation of proposed changes to operations and proposed safety enhancements.

Detailed Justification for - 3A10 National Test Equipment Program (NTEP)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
National Test Equipment Program (NTEP)	$4,000	$5,000	$5,000	$3,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
National Test Equipment Program (NTEP)	---	$3,000.0

What is this program and what does this funding level support?

The National Test Equipment Program (NTEP) manages the modernization, distribution, calibration, and inventory of test equipment. This equipment is required to perform preventive and corrective maintenance, equipment installations, modifications, and service certifications in support of numerous National Airspace System (NAS) Platforms. Failure to achieve certification of critical NAS systems (at any of the 27,000 FAA facilities) will result in the restriction of air traffic in the facility's air space and potentially cause major flight delays.

Test equipment supports NAS systems on the following platforms: communication, automation, surveillance, power, navigation, and weather. NTEP is responsible with procuring and maintaining test equipment. Furthermore, ensuring the NAS is operating to optimal standards by troubleshooting, repairing, and re-certifying both new and legacy systems.

A large portion of the test equipment is either damaged or rife with supportability and maintenance issues. The problem affects Mean-Time-To-Restore (MTTR), safety, maintenance cost, and inventory management for every system within the NAS; no other FAA program office or initiative currently addresses this problem.

For FY 2020, $3.0 million is requested to replace obsolete test equipment. The program will finalize the prioritization of test equipment requirements based on the facility need and equipment availability. Current requirements reflect critical need for oscilloscopes, universal data test sets, vector network analyzers, and reducing the test equipment backlog.

What benefits will be provided to the American public through this request and why is this program necessary?

The National Test Equipment Program's mission is to support the restoration of Air Traffic services by procuring and delivering functioning test equipment throughout the NAS. Failure to provide these services will have a negative effect on the NAS. Technicians need up to date calibrated test equipment in order to make necessary adjustments and alignments to major NAS systems. The lack of up to date test equipment poses a serious risk to the technicians that will result in delaying the restoration of critical Air Traffic systems crucial for the protection of the flying public.

Detailed Justification for – 3A11 Mobile Assets Management Program

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Mobile Assets Management Program	$3,600	$3,200	$2,200	$1,800

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Mobile Assets Sustainment	---	$1,800.0

What is this program and what does this funding level support?

The Mobile Assets Sustainment provides transportable NAS equipment to restore certain operations during periods of extended equipment outages. It ensures continuity of NAS operations. Mobile NAS equipment provides for the continuity or restoral of air traffic control when an ATC tower or other NAS system is out of service due to a disaster or an extensive repair, modernization, or upgrade. The MAMP provides assets needed to augment air traffic control in support of major public events such as NASCAR and the NFL Super Bowl. The MAMP provides mobile assets that function as ATC towers, TRACON facilities, remote transmitter/receiver sites, remote communications air/ground sites, and other facilities/systems that experience unexpected outages or planned system downtime for non-routine maintenance, modernization, or upgrade.

The FAA's inventory of mobile assets is in a serious state of disrepair and is often incapable of providing its intended service without first undergoing significant maintenance or repair before the asset can be deployed. The inventory consists of 104 assets, of which 45 are directly involved with controlling aircraft. The assets range from 30 kilowatt mobile engine generators to four-position mobile ATC towers (MATCTs). The near-term priorities are to upgrade/replace eight obsolete large four-position MATCTs, replace the deteriorating medium size MATCTs, and prioritize and restore the remaining assets in the inventory to a full operational capability. The four position MATCTs, which were acquired in the 1990s, are experiencing material failures and must be upgraded or replaced. The medium sized MATCTs are used to provide air traffic control services at uncontrolled airfields during firefighting activities and to support operations at small towers when they are out of operation. A National Mobile Asset Deployment Center (MADC) has been established in the Central Service Area. The MAMP will assist the Eastern Service Area and Western Service Area in the development of designs for their mobile asset staging areas. For FY 2020, $1.8 million is requested to ensure that a sufficient number of the FAA's mobile assets are available to maintain and restore continuity of aviation operations.

What benefits will be provided to the American public through this request and why is this program necessary?

The American public will benefit from the efficient restoration of air traffic control operations in emergencies or natural disasters within hours of MATCTs arriving on site. The program will be working to ensure the availability and readiness of mobile assets to maintain or re-establish continuity of air traffic operations in response to emergencies and natural disasters. The FAA's mobile assets have been deployed to support relief efforts during natural disasters such as the earthquake in Haiti or the hurricanes that hit the Gulf Coast each year.

Detailed Justification for - 3A12 Aerospace Medicine Safety Information System (AMSIS)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Aerospace Medicine Safety Information System (AMSIS)	$14,000	$16,100	$16,100	$13,800

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Aerospace Medicine Safety Information System (AMSIS)	---	$13,800.0

What is this program and what does this funding level support?

The Office of Aerospace Medicine (AAM) is responsible for advancing the field-of-study of aerospace medicine and for the medical certification of pilots, Air Traffic Control Specialists (ATCS) and other safety critical personnel. AAM processes approximately 450,000 medical applications annually and maintains records on millions of past examinations as part of AAM's role in the oversight of 600,000 pilots and approximately 15,000 ATCS.

Currently, all the coordination between FAA and the medical certification applicants is conducted through the United States Postal Service and is very labor intensive. In addition, the information systems that support the storage and record keeping for this information were originally developed in the 1990's, and while they have undergone several upgrades, the architecture of these systems is becoming unsupportable and will eventually become obsolete. The business processes that support the medical certification of airmen, and the other aviation safety programs, have changed and need to be re-engineered. The information technology must be aligned with Office of Management and Budget (OMB)/Department of Transportation (DOT)/FAA information systems architecture and security standards.

The AMSIS Program will eliminate the shortfall of the current labor-intensive process required by applicants today as well as align the new technology with industry architectural and security standards. AMSIS will provide better data accessibility and a greater ability to analyze medical information and denial data to identify safety trends that could impact system safety.

Specifically, AMSIS is necessary to:

- Improve safety for the public by reducing fraudulent certification
- Improve FAA's responsiveness to the individual/pilot by providing
  - A better user experience: reduced turn-around times, enhanced ability to track status
  - A better user protection: secure Protected Health Information (PHI) and Protected Identifying Information (PII)
  - Improved consistency with Pilot's Bill of Rights
- Share responsibility with employers of pilots by facilitating
  - Improved visibility for airlines and other employers on the certification history of their pilots
- Deliver a better product for the user community by
  - Improving automation for Aviation Medical Examiners (AME) with "one-stop shopping" like experience
  - Supporting auditability of Pilot's Bill of Rights
  - Aligning to International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10)

  - Reducing office staffing requirements
- Reduce associated risk by reducing
  - Pilot accident(s) due to fraudulent certification
  - Risk of personally identifiable information (PII) exposure
- Risk of intrusion by mitigating the risk of insertion of harmful data

AMSIS will be implemented in two phases. Phase 1, baselined in FY 2017, will deliver automation improvements to the following processes:

- Common Functionality (such as user management and support)
- Medical Certification (Airman) and Medical Clearance (ATCS)
- Industry Substance Abuse Oversight and Management
- Workflow Management
- Reporting and Data Services

For FY 2020, $13.8 million is requested to fund Phase 1 software development, development and operational testing, and to provide for program office system engineering and program management support.

What benefits will be provided to the American public through this request and why is this program necessary?

AMSIS will provide the tools required to capture, exchange, evaluate, and analyze information with significant improvements in efficiency, accuracy, and detail. AMSIS will simplify current processes and eliminate wasted effort by incorporating current technical medical standards. In addition, the updated automated process will reduce operational cost while improving customer service.

The information technology of these medical information systems will be aligned with OMB/DOT/FAA information systems architecture and security standards, the national health information technology standards and security requirements, private sector, and voluntary standards organizations. These systems will successfully and securely interface with approximately 4,250 AME's to perform pilot and ATCS medical examinations.

AMSIS will provide increased access to medical history and support earlier National Driver Register (NDR) checks to determine ineligible candidates more effectively. This will result in an improved ability to prevent pilots from flying while incapacitated by health conditions or substance abuse.

Detailed Justification for - 3A13 Logistics Support Systems and Facilities (LSSF)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Logistics Support Systems and Facilities (LSSF)	$0	$7,100	$7,100	$4,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Logistics Support Systems and Facilities (LSSF)	---	$4,000.0

What is this program and what does this funding level support?

For FY 2020, $4.0 million is requested for enhancement of the Logistics Center Support System (LCSS). LCSS is a mission support Information Technology procurement that automated the FAA's logistics management and supply chain processes.

The FAA Logistics Center (FAALC) at the FAA Mike Monroney Aeronautical Center (MMAC) in Oklahoma City executes maintenance, repair, and overhaul of National Airspace System (NAS) and equipment, manages the NAS inventory warehouse and distribution facilities, and provides field level services across the NAS for the Air Traffic Organization. The FAALC mission provides routine and emergency logistics products and services to FAA customers at facilities nationwide, as well as to the Department of Defense, state agencies, and foreign countries. It provides logistics support to systems nationwide, by providing parts, services, supplies and emergency restoration services. The LCSS program enhances the FAALC capability to accurately manage NAS spares and repair requirements in a centralized and automated manner.

What benefits will be provided to the American public through this request and why is this program necessary?

Once enhancements are made, the system will provide an integrated capability to manage the FAA's supply chain thus reducing multiple legacy systems and eliminating the maintenance costs of those systems. The LCSS system also provides a foundation as an Enterprise Resource Planning tool to build additional capabilities into one system as opposed to buying multiple systems to achieve the same goals, and thereby minimize future costs to the FAA for multiple systems that support the FAA supply chain.

The LCSS system at Full Operational Capability will enable the FAALC to meet the demands of sustaining the NAS in a more efficient and cost competitive manner by managing inventory levels, optimizing delivery channels to meet NAS Availability requirements, and reducing cycle time of parts acquisition. LCSS applies the "Just-In-Time" model of supply chain logistics which has been proven worldwide to be an effective cost management methodology in the delivery of products to customers. LCSS will provide the ability to identify and track appropriate safety stock levels, lead time to repair/procure, and demand fluctuations allowing for maximum support to the NAS and the flying public, while minimizing inventory of spares and thereby reducing cost.

Detailed Justification for: 3B01 Aeronautical Center Infrastructure Sustainment

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Aeronautical Center Infrastructure Sustainment	$14,000	$14,000	$14,000	$18,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Aeronautical Center Infrastructure Sustainment	1	$18,000.0

What is this program and what does this funding level support?

The Mike Monroney Aeronautical Center (MMAC) is an aging facility of 135 leased and FAA-owned buildings. The ages of the buildings vary from a few months to 73 years. Missions are accomplished in MMAC facilities whose personnel train controllers to direct air traffic across the country and at airports and train technicians to maintain NAS. Parts and repair services are provided by logistics personnel in these facilities and comprise the FAA's centralized NAS inventory, sharing support of some systems with DoD and foreign countries having common systems. There is $50 million of requirements to replace heating, ventilation, air conditioning, boilers/chillers, electrical/lighting, plumbing, interior finishes, exterior enclosures, roofs, interior construction, elevators, and stairs to prevent deterioration of building conditions. Seismic, wind bracing, and added fire protection is needed in many buildings. The requirements can be addressed with systematic funding to improve conditions and assure the aging infrastructure remains viable in future years.

For FY 2020, $18.0 million is requested for the following:

- To award design and renovation construction for replacement of building systems that include: heating, ventilation, air conditioning (HVAC), electrical, plumbing, roofs, energy systems (lighting, insulation) and building automation systems.
- Furniture for the Multi-Purpose Building (Bldg 24); Bldg 24 is a 211,203 square foot building that will undergo a full renovation comprised of the following: add fire detection/suppression systems, asbestos abatement/removal, replacement of electrical distribution/lighting systems, mechanical systems (HVAC), boilers/chillers, telecom, plumbing. The building is the workplace for approximately 600 FAA employees and contractors.
- To provide technology replacement of telecommunications at the Aeronautical Center. Over a six year phased cycle, funding will replace the telecommunications network switches, routers, internet filtering hardware for redundancy, reliability, security and availability in a total of 74 buildings.
- To provide NAS Integration Support Services and Technical Support Services Construction inspectors.
- To award contracts for mechanical, electrical and HVAC system upgrades in Building #195.

What benefits will be provided to the American public through this request and why is this program necessary?

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. It extends the useful life of the buildings, 25 to 30 years, for current and future generations of the FAA work force.

Detailed Justification for - 3B02 Distance Learning

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Distance Learning	$1,000	$1,000	$1,000	$1,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Distance Learning	---	$1,000.0

What is this program and what does this funding level support?

The Distance Learning Program provides the infrastructure to deliver simulations and training to all FAA employees via Distance Learning Platforms (DLP) and the FAA Academy Virtual Training Network (AVTN). The funding of this program provides for the technology refresh of DLPs at FAA field site Learning Centers, Expansion of AVTN through increased connectivity, and upgraded network multimedia support and services. Technology refresh is accomplished in a phased, multi-year approach. This year's funding will provide for the technology refresh of the DLPs at various Learning Centers located at all Air Traffic, Federal Contract Towers, and Air Traffic System Specialists (ATSS) Facilities around the world. The FAA is providing the technology refresh of the DLPs for two main reasons: to support high-performance media and simulations required in many lessons and to replace hard to obtain, obsolete parts for current platforms. This year's funding will also provide for multiple field sites to be connected to the AVTN system, thereby, allowing virtual training at an expanded number of field locations.

This program reduces the cost of training to perform Air Traffic operations and to maintain and operate the NAS by providing a standard training platform, the DLP, at field sites to accomplish initial, refresher, operator, and maintenance.

This program provides productivity improvements for ATO employees by shortening the time to achieve employee full performance and certifications. The training time reduction is a result of having Distance Learning delivered via DLPs at the employee's field site thus avoiding travel to FAA Academy or factory schools.

For FY 2020, $1.0 million is requested to fund contracts and hardware for the procurement, configuration, and installation of modernized DLPs to various Air Traffic and ATSS field facilities. The FAA will procure and install 200 DLPs.

What benefits will be provided to the American public through this request and why is this program necessary?

The requested resources will be used to support the FAA initial and qualification training to all ATC and ATSS personnel. A major cost savings benefit of distance learning is a substantial reduction in student time away from work and reduced travel and per diem costs associated with resident-based training. In addition, distance learning delivery methods increase training effectiveness as well as increase training opportunities for all FAA employees, and provide flexibility in training schedules through local management control.

Detailed Justification for - 4A01 System Engineering and Development Support

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
System Engineering and Development Support	$35,700	$39,700	$39,700	$38,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. System Engineering Support	---	$35,000.0
B. ATC/AFN Systems Support Program Evaluation	---	3,000.0

What is this program and what does this funding level support?

For FY 2020, $38.0 million is requested to provide technical contract support services, which will ensure sound systems engineering practices and business case development processes, instrumental to the safety, efficiency, and security of the National Airspace System (NAS).

The System Engineering and Development support budget line item provides future enhancement of the Air Traffic System by establishing and documenting the FAA's Enterprise Architecture (EA) requirements. The EA is the blue print for the future air transportation system and must be documented clearly and accurately. This program assists in developing, delivering, and implementing guidance and support tools to move forward the engineering and prototyping effort for NextGen. In addition, contract support services have ensured sound systems engineering practices and business case development processes. The contract also provides support to FAA's planning and budgetary processes and contract administration, ensuring consistent application of the AMS (Acquisition Management System) policy.

The research of emerging procedures and technologies will help to determine the best way to develop and deploy critical NextGen initiatives. These activities include demonstrating that NextGen procedures and operational changes will work on a large scale within the current and evolving air traffic system. In addition, automated data processing and information resource support is required to support the development and/or enhancement of computer simulation models, miscellaneous software upgrades, databases, and program management tools. Program management, financial management and investment analysis support are provided to assist with planning, decision-making, and budgetary oversight of the activities involved in implementing newly acquired systems, components, and equipment in existing operational NAS facilities.

A. System Engineering Support:

- Provides continuous critical support activities, which complement NextGen Air Transportation System programs, which include Configuration Management, Infrastructure Roadmaps, Operation Planning, Requirements Engineering, System Engineering Services, Enterprise Integration Services, Forecast Analysis and Investment Planning and Analysis for the life of the NextGen Program.
- Supports critical programs such as NAS Enterprise Architecture (integrate and align the Enterprise Architecture portal), Segment Implementation Plan, and Safety Process Improvement are procured through this budget line item.
- Provides portfolio of multiple prime contractors with large subcontracting teams who can provide support across a broad range of Research and Mission Analysis and System Engineering requirements thus reducing the need for new standalone contracts and contract vehicles, which reduces overall costs and promotes efficiency.

- Supports the Office of Investment Planning and Analysis (IP&A) to conduct investment analysis and to support business case development and analyses. Investment analysis is conducted in the context of the FAA Enterprise Architecture and strategic goals and objectives. This work will provide decision makers with a clear picture of investment opportunities, risks and value.
- Supports the integration and development of corporate tools and processes to strengthen NextGen integration into the NAS.
- Provides cost estimating, cost and benefit analysis, operations research, risk and schedule analysis, market surveys, and business case analysis and development in support of investment analyses for NextGen and the NAS. Conduct Engineering Analysis on NextGen systems.
- Supports application and upgrades to program management financial tools. Supports the design, development, maintenance, training, and reporting on all aspects of Simplified Program Information Reporting and Evaluation, FAA Acquisition System Toolset, Financial Management System, and other management tools.

B. ATC / AFN Systems Support:

- Supports technical analysis and oversight of acquisition programs goals and performance reporting

What benefits will be provided to the American public through this request and why is this program necessary?

This request will support the agency's goals of improving aviation safety, security, and efficiency while increasing capacity and productivity by providing technical assistance through cost effective contracts for various programs. The technical assistance will provide support for enhancing software tools, integrating and aligning the Enterprise Architecture portal, along with updating infrastructure roadmaps annually. The economies of scale created by the contracts under this project will allow for a reduction in award time of new tasks and a shorter cycle time for product implementation into the NAS. It also increases agility in response to stakeholder requirements and serves to track funding costs and resources efficiently and effectively.

Detailed Justification for - 4A02 Program Support Leases

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Program Support Leases	$47,000	$47,000	$47,000	$48,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Program Support Leases	---	$48,000.0

What is this program and what does this funding level support?

For FY 2020, $48.0 million is requested for approximately 2,800 real estate leases, comprised of land and facilities that are managed by this program. The funds are required to meet contractual obligations including rental payments or other requirements to provide the necessary real property rights for land, tower space, aerial easements, and technical operational space. Without these leases, there would be a direct impact to air traffic control.

The Program requirements 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
- Funding for leased access roads, easements providing ingress to and egress from leased facilities, and other leased restrictive easements
- 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, land surveys, and other costs associated with the acquisition and management of real property assets
- Funds to relocate offices, facilities, personnel, equipment, and to downsize or consolidate offices when technically feasible and economically advantageous to include finishes and furniture
- Funding for the development of 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

What benefits will be provided to the American public through this request and why is this program necessary?

Maintaining operational ground based navigational aids, towers, facilities, and equipment is paramount to the safety of the flying public. Accurate management will prevent FAA from incurring significant costs associated with defaults on leases. Funding for the implementation of co-location, consolidation, and oversight measures are an integral part of this program in order to achieve long-term savings and effectively use tax-payer dollars.

Detailed Justification for - 4A03 Logistics and Acquisition Support Services

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Logistics and Acquisition Support Services	$11,000	$12,500	$12,500	$11,800

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Logistics and Acquisition Support Services	Various	$11,800.0

What is this program and what does this funding level support?

For FY 2020, $11.8 million is requested to fund contractor-supplied property and acquisition support services. The FAA Logistics Support Services (LSS) program manages real estate, acquisitions, and property assets for NAS modernization and capitalizes agency assets as required by the agency's strategic plan. The LSS program provides critical support personnel involved in the acquisition of new or upgraded facilities, including air traffic control towers and TRACONs, throughout the NAS. These functions are performed throughout the three Service Areas (Eastern, Central, and Western), and the William J. Hughes Technical Center.

This program supplements the Federal workforce in acquisition, real estate, and property management at the FAA regions and centers. This support provides:

- Conduct of capitalization and property control-related activities
- Asset tracking and documenting of capital costs of FAA facilities in compliance with accounting standards set by the Government Accountability Office that lead to achieving and maintaining a clean audit opinion
- Performance of contract activities in support of FAA Capital Investment Plan projects, including contract oversight and audits that ensure that no unallowable or unreasonable costs are being paid

The requested funding will continue to promote efficiencies within acquisition, real estate, and property management made over the last several years.

What benefits will be provided to the American public through this request and why is this program necessary?

By achieving management goals for acquisition and real and personal property, the FAA ensures that tax payer dollars are utilized in the most prudent and transparent manner possible.

Detailed Justification for - 4A04 Mike Monroney Aeronautical Center Lease

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Mike Monroney Aeronautical Center Lease	$19,700	$20,200	$20,200	$20,600

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Mike Monroney Aeronautical Center Lease	1	$20,600.0

What is this program and what does this funding level support?

The MMAC leases provide leased land/building rent and insurance that comprise approximately 80 percent of Aeronautical Center space: 2.7 million square feet of leased space and 1,100 acres of land, having a leased facility replacement value of $756 million. The MMAC provides facilities that support the work of 6,300 employees, students, and contractors on a daily basis and is the largest concentration of FAA personnel outside of Washington D.C. In addition, approximately 11,000 visitors come to the Aeronautical Center annually.

The MMAC 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. It is a Level IV security site based on numbers of employees, facility square footage, sensitivity of records, volume of public contact, and mission essential facilities whose loss, damage, or destruction would have serious impact on the NAS.

For FY 2020, $20.6 million is requested to pay rent under the long-term lease agreement and to correct a backlog of deferred sustainment needs in leased buildings to prevent deterioration of facility conditions that affects the missions of FAA organizations. Leased MMAC facilities support FAA missions that include:

- Aviation training for 90,000 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 of medical and human factors impacting aviation personnel
- Standards and flight inspection services
- Regulation certification of safety related positions and equipment, airmen and aircraft records and registration

What benefits will be provided to the American public through this request and why is this program necessary?

This program benefits the American Public and NAS and by avoiding costs through the following:

- Lease cost that is advantageous to the FAA. Oklahoma City, Oklahoma market is one of the lowest lease rates in the nation. The MMAC lease is one of the lower rates when researching lease space available for rent as well as compared to the local GSA Buildings in Downtown Oklahoma City, Oklahoma. The utility rates for the Oklahoma real estate market are also some of the lowest you will find in the nation.

- Facilities allow flexibility and growth to support NextGen airspace requirements.
- Facilities support NAS operations/maintenance in support of ATO initiatives.
- Investments made at the MMAC continue to decrease energy consumption and operations costs due to replacing old equipment with more efficient systems.

Detailed Justification for - 4A05 Transition Engineering Support

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Transition Engineering Support	$24,900	$22,000	$22,000	$21,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. NAS Integration Support Contract (NISC)	---	$17,000.0
B. Configuration Management Automation (CMA)	---	4,000.0

What is this program and what does this funding level support?

A. NAS Integration Support Contract (NISC): The NISC program provides engineering and technical resources to the FAA organizations responsible for NAS transition and implementation. The NISC team, working in partnership with these organizations, ensures that capital investments and regional projects are implemented most effectively to support the NAS mission. This program provides technical support to assist the FAA's technical workforce in handling a surge in demand for short-term programs and projects that are vital to managing the volume of diverse systems and equipment associated with NAS modernization.

For FY 2020, $21.0 million is requested to support the modernization schedules for NAS programs. The budget level is necessary to provide continual NISC contract management and infrastructure support for the prime contractor for the NISC III contract valued at $1.4 billion. In addition, these funds will be used for program acquisition management, financial management, administrative support services, continued operation and IT support services for the NISC contract tracking system and reporting system, other indirect contractor costs, and other program management support.

B. Configuration Management Automation (CMA): The goal of FAA's Configuration Management (CM) is to record technical information, including system specifications and installation data, on all systems installed in FAA facilities. CM also requires documentation for all proposed and actual changes to these systems in order for maintenance workers and replacement programs to have accurate and up to date information for maintaining or replacing existing systems.

Configuration Management Automation (CMA) will provide the FAA a cost-efficient solution to support all CM activities for systems, programs, and asset lifecycle management as defined in the Acquisition Management System (AMS) and prescribed in FAA Order 1800.66. CMA will:

- Be an automated and integrated enterprise solution to support CM of FAA assets and investments
- Provide a single point of access with insight and traceability to configuration baselines reflected in the FAA Enterprise Architecture
- Effectively manage business rules, trace, predict and manage an asset's status, opportunities, and risks, during any phase of the lifecycle

What benefits will be provided to the American public through this request and why is this program necessary?

It affords the FAA the flexibility in obtaining the technical expertise required to meet demand surges with minimal lead-time and without the need for long-term commitments. The NISC program provides the FAA with rapid access to highly qualified and experienced professional engineering and technical support where and when determined necessary by the incumbent Federal workforce. The NISC program facilitates other national programs in defining, securing and administering the utilization of hard to capture professional labor categories once deemed necessary by those program offices.

CMA realizes benefits through greater efficiencies in improved processes. CMA will:

- Provide a scalable, network-centric architecture that ensures effective CM
- Provide fully functioning change management workflows and business rules necessary to manage the FAA change process
- Reduce CM-related errors and delays while providing up-to-date CM information to support enterprise-level decision making
- Allow all users simultaneous access to the same standardized information
- Provide a customizable workflow that is not currently available today
- Implement Mission Support Network CM change management. This is a step towards an enterprise level capability
- Provide real time reporting and audit functionality
- Replace inefficient manual and duplicative tasks with automation of assignments, notifications, tracking, auditing and core monitoring/reporting capabilities
- Provide a robust system that will encourage information sharing

Detailed Justification for - 4A06 Technical Support Services Contract (TSSC)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Technical Support Services Contract (TSSC)	$28,000	$28,000	$28,000	$28,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Technical Support Services Contract (TSSC)	---	$28,000.0

What is this program and what does this funding level support?

For FY 2020, $28.0 million is requested to continue the TSSC infrastructure. This will enable other programs to use its services to accomplish more than $110 million of project work each year.

Funding the TSSC infrastructure sustains the FAA's national capability to supplement and leverage Federal workforce skills during site-specific NAS implementation efforts. TSSC is the agency's primary installation support service vehicle and is used by a myriad of capital budget improvement program customers to achieve timely and cost-effective NAS modernization. The TSSC program is the agency's vehicle to provide a workforce multiplier that installs equipment and supports the capital budget improvements to the NAS in a timely, cost-effective manner. These activities include work planning, quality control, subcontracting, the contractor safety program, and award fee paid under the contract, as well as the usual rent, telecommunications, and utility costs incurred under the contract.

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 the FAA government employee workforce does not have or that exist in insufficient numbers. The TSSC program allows the FAA to avoid hiring additional employees for a limited duration to handle a surge in demand, such as when new equipment is installed at multiple locations and during compressed schedule periods.

TSSC infrastructure funding pays for the following:

- Project implementation safety, security, and quality control efforts
- The prime contractor's costs to award and administer subcontracts to accomplish $35 million of annual public works efforts on behalf of the FAA
- Contractor management of its personnel, office rent, communications, and utilities

What benefits will be provided to the American public through this request and why is this program necessary?

The TSSC program has an award fee for the performance-based acquisition contract vehicle to promote efficiency and FAA customer satisfaction. The TSSC customer award fee evaluation survey participation return rate is typically greater than 90 percent. Direct FAA customer award fee feedback rated contractor performance greater than 90 percent in the excellent and good range across several hundred individual contractor performance evaluations in the past years of TSSC performance.

Detailed Justification for - 4A07 Resource Tracking Program (RTP)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Resource Tracking Program (RTP)	$6,000	$8,000	$6,000	$8,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Resource Tracking Program (RTP)	---	$8,000.0

What is this program and what does this funding level support?

The RTP is a computer management system (including hardware, software, development, training, and support) used by the FAA Service Centers, the William J. Hughes Technical Center, and the Mike Monroney Aeronautical Center for identifying requirements, internal budget preparation, implementation planning, resource estimating, project tracking, and measuring performance of projects. The Corporate Work Plan (CWP) process is the ATO's method to implement approved projects and to standardize National Processes in support of the NAS. The CWP system, which falls under the RTP program, enables users to share FAA's project data during the various stages of implementation (e.g., planning, scheduling, budgeting, execution, and closeout). CWP and its supporting data are continuously used for reporting project metrics to project managers, responsible engineers, program offices, and various other customers.

For FY 2020, $8.0 million is requested to continue to keep hardware and software licenses current, program/project management support in the NAS, maintain TSSC and NISC, upgrade training documentation, and continue to provide training to users and data administrators. Also, hardware and software licenses will be maintained to keep the cost of upgrades to a minimum. The hardware and software for CWP must be constantly maintained and upgraded, to support FAA and the processes that will be impacted as it continues to evolve. CWP is used to track all ATO capital projects from cradle to grave. This system is also used to develop the CWP and work releases for the TSSC.

This system interfaces with DELPHI and Fund Control Module and various other systems. CWP is a centralized system with load-balanced servers residing in Oklahoma City, Oklahoma.

What benefits will be provided to the American public through this request and why is this program necessary?

CWP contributes to improving the efficiency of the FAA and enhances program management of FAA capital programs. This project provides cost and schedule assistance for major acquisition programs by providing enhanced program/project management capabilities with reliable data on cost accounting of capital expenses for FAA Managers and engineers through CWP. This product improves productivity (on time completion of projects in the field) when a standardized project management process is supported by the toolset and emulates current operating procedures.

Detailed Justification for - 4A08 Center for Advanced Aviation System Development (CAASD)

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Center for Advanced Aviation System Development (CAASD)	$57,000	$57,000	$57,000	$57,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Center for Advanced Aviation System Development (CAASD)	---	$57,000.0

What is this program and what does this funding level support?

CAASD is an FAA-sponsored Federally Funded Research and Development Center (FFRDC) operated under a Sponsoring Agreement with the MITRE Corporation since 1990. CAASD's high quality research, systems engineering, and analytical capabilities help FAA meet the technically complex challenges in the National Airspace System (NAS). CAASD provides independent advanced research and development required by the FAA to obtain technical analyses, prototypes and operational concepts needed to fulfill the agency's Strategic Initiatives, under the Capital Investment Plan (CIP).

The support provided by CAASD is critical for the continuing development for the future of NAS systems and the NAS Enterprise Architecture. CAASD's high quality research, systems engineering, and analytical capabilities are key to the FAA meeting technically complex challenges in the NAS. CAASD provides independent advanced research and development required by the FAA in technical analyses, prototypes, and operational concepts needed to fulfill FAA's mission and vision. CAASD plays a key role in meeting FAA's near and long-term mission objectives and in maturing the NAS to meet the nation's public air transport needs. Its expertise is critical to FAA's efforts in transforming the nation's air transportation system in an effective and timely manner.

FAA relies on CAASDs integrated knowledge of the NAS and long-term experience with FAA's enterprise level efforts developing the NAS infrastructure. The challenges the FAA faces in meeting established goals and charting an achievable course for the development of the NAS are extensive and technically complex. CAASD assists FAA with addressing NAS complexity challenges effectively. CAASD provides a unique system-wide integrated understanding, tools, labs, and other capabilities that are fundamental to FAA's ability to address these challenges. The required development of system architecture and comprehensive research, development, and system engineering services can only be provided by an FFRDC whose charter permits special access to sensitive Agency and Aviation Industry information and data, not normally available to support contractors. Numerous elements of the CAASD work program are highly specialized research and systems engineering activities that require extensive knowledge of the present and planned NAS systems.

For FY 2020, $57.0 million is requested to fund technical, engineering, as well as research and development support for the CAASD program. The FY 2020 funding will support 165 MITRE Technical Staff Years (SY) of research and systems engineering as well as technical and operational analyses.

The CAASD Program will get the following CAASD Contract and Program Office support:

- 165 MITRE Technical Staff Years (MTS) of systems engineering support and analyses under the CAASD

contract
- Program management contractor support services (CSS)
- DCAA contract audit support
- IT and KSN support services under the ANG-A shared services contract
- The MITRE-CAASD Contract work efforts to be supported in FY 2020 include:
  - Validation of the operational feasibility, user benefits and productivity of NextGen NAS operational improvements
  - Affordability assessments with long-term economic implications of FAA Strategic Initiatives, NAS
  - Investments, and proposed FAA Policies
    Analyses of US and International Air Traffic Management (ATM) Enhancements
  - Technology transfers of algorithms and capabilities to FAA and US Industry
  - Improvements to the NAS Cybersecurity Operations and Resiliency
  - Improvements to the Security of our Global Navigation Satellite Systems (GNSS)
  - Enhancements to TRACON and En Route controller training covering Terminal Radar Approach Controls
  - Airspace Policy and Rulemaking improvements focused on Integration of UAS Operations into the NAS
  - Identification and assessment of advance capabilities and standards mitigating Safety issues in the NAS
  - Assessment of Industry equipage (inventories and capabilities) alignments with proposed NAS/NextGen
  - Operations concepts
  - Analyses to reduce Separation Standards.

What benefits will be provided to the American public through this request and why is this program necessary?

This is a critical time for the Agency and the evolution of the NAS. NextGen's development of Trajectory Based Operations (TBO) is underway and CAASD provides key research and infrastructure support to those efforts across the FAA. Additionally, MITRE has access to commercial industry knowledge and data not available from any other source. MITRE CAASD leverages commercial aviation industry data (such as fleet equipage, pilot incident information, and airline operations planning) to directly assist FAA in its decision making - acting as a "trusted partner" for both the FAA and the commercial airline industry. Finally, MITRE's long term experience provides crucial support to agency rule making activities from an Aviation Safety stand point. The required development of system architecture and comprehensive research, development, and system engineering services can only be provided by an FFRDC whose charter permits special access to sensitive Agency and Aviation Industry information and data not normally available to the FAA or its support contractors.

Specific immediate benefits to the America public include:

- Improvements in Airport Operations through demand analysis and modeling under the MetroPlex Program
- Improvements to Arrival/Departure Scheduling through Time Based Flow Management (TBFM) under the Traffic Flow Management System (TFMS)
- Flight Safety improvements through Trajectory Based Operations, Procedure Design improvements and
- Operations Integration with Performance Based Navigation (PBN)
- Improvements to the National Airspace System (NAS) Cybersecurity Operations and Resiliency; and security of our Global Navigation Satellite Systems (GNSS)
- Airspace Policy and Rulemaking improvements focused on integration of UAS Operations into the NAS

Detailed Justification for - 4A09 Aeronautical Information Management Program

($000)

Activity/Component	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Aeronautical Information Management Program	$15,000	$5,000	$5,000	$5,300

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Aeronautical Information Management (AIM) Program Enhancement 1	---	$5,000.0
B. Independent Operational Assessment (IOA)	---	300.0

What is this program and what does this funding level support?

AIMM E1 will develop and integrate information flows for the management and maintenance of aeronautical information in a digital format for machine to machine exchange with NAS Automation systems. The digital format is essential for enabling NAS automation integration and information distribution to NAS consumers involved in NAS decision support, flight planning, and pilot briefing. These services will increase on-demand NAS operational performance and help manage airspace with timely NAS constraint information such as Notices to Airmen (NOTAMs).

The AIMM E1 program will establish an authoritative data source for Standard Operating Procedures/ Letters of Agreement, static airspace constraints, providing accurate Special Activity Airspace data, and providing a common airspace tool that consolidates capabilities of several legacy tools and provides a single access point to publish in digital format all airspace descriptions.

For FY 2020, $5.0 million is requested for the Aeronautical Information Management (AIM) Program. In FY 2020, AIMM E1 will perform acquisition activities to include: Acquisition Strategy Documentation, Statement of Work, Independent Government Cost Estimate, Screening Information Request, Proposal Evaluations, Source Selection Decision and Contract Award. Remaining funding will be used for Prime Vendor, Program Office Contractor Support, and Project Scope Agreements (PSA).

$300,000 is also requested for an Independent Operational Assessment (IOA).

What benefits will be provided to the American public through this request and why is this program necessary?

The AIMM E1 program is necessary because it develops capabilities for ingesting, fusing, and distributing constraint information in order to deliver integrated information products through web services and enables the FAA to provide integrated lifecycle management of the aeronautical information necessary to support NextGen capabilities. From a safety perspective, there will include a reduction in accidents attributable to pilot briefing errors, missing information, or accidents caused by violation of NAS flow constraints and restrictions. Flight efficiency and reduction in delays will be improved as airplane operators will realize savings due to better information leading to improved flight planning and pilot briefing. There will be Air Traffic Control operational savings because of better information leading to improved traffic and flow management and the access to near-real time NAS performance information. The FAA will realize costs benefits through infrastructure enhancement and SWIM connectivity as well as reduced cost of aeronautical information gathering, management, and utilization across NAS enterprise.

Detailed Justification for – 5A01 Personnel and Related Expenses

($000)

Activity/Component	FY 2018 Actuals	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Salaries and Benefits	$429,364	$441,830	$447,949	$459,968
Non-Pay	$68,636	$56,170	$64,874	$64,762
Total	**$498,000**	**$498,000**	**$512,823**	**$524,730**
FTP	2,630	2,748	2,748	2,821
FTE	2,626	2,685	2,685	2,786

What is this program and what does this funding level support?

This request provides funding for the personnel, travel and related expenses for the Facilities and Equipment (F&E) workforce performing work essential to FAA's efforts to sustain and modernize the National Airspace System (NAS). These employees are assigned to all phases of managing and implementing major capital acquisitions including site engineering, installation and implementation, and oversight of capital programs.

The F&E workforce levels include electronic, civil and mechanical engineers; electronics technicians; quality control and contract specialists; Ops research analysts, and safety inspector personnel. The F&E workforce resides in Air Traffic, Aviation Safety, NextGen, and Finance and Management offices. Seventy-seven percent are located in the field.

The request includes funding and staff to cover human factors work that had previously been included in the Research, Engineering & Development (R, E&D) account. This transfer affects staff who work on prototyping and development activities already funded in F&E Activity 1, which differs from the applied research that is funded from the R, E&D account.

FY 2019 Annualized CR	**$498,000**
FY 2020 Adjustments	**$26,730**
FERS Increase	$1,000
One Extra Compensable Day (262)	$1,688
Working Capital Fund	-$2
Human Factors Transfer from RE&D (10 FTP/10 FTE)	$1,800
Annualization of FY 2019 hiring	$8,850
FY 2020 hiring	$4,800
Travel and Training	$8,594
FY 2020 Request	**$524,730**

F&E personnel and related expenses are distributed across FAA Organizations as follows:

(Dollars in Thousands)

Organization	FY 2018 Actuals	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
ATO	$356,927	$357,010	$367,634	$377,559
AVS	$11,035	$10,955	$11,233	$11,490
AFN	$36,222	$35,705	$37,532	$38,026
ANG	$93,816	$94,330	$96,424	$97,655
Total	**$498,000**	**$498,000**	**$512,823**	**$524,730**

F&E employees perform essential services in managing the acquisition and installation of new systems into the NAS. Major capital programs can take over a decade to implement from proof of concept to final implementation, which requires a sustained engagement. Civil, mechanical and electrical engineers, along with technicians, provide technical support for design reviews, perform site preparation and installation, conduct technical evaluations, and provide systems integration and in-service management. Operations research analysts and cost estimators conduct investment analyses for new capital projects. Contracting officers provide acquisition services, and safety inspectors conduct the necessary regulatory and safety oversight functions for new services and operational capabilities being installed in the NAS.

On average, the FAA has over 8,000 active projects and completes approximately 2,500 every year. This requires long-term program management and oversight capabilities to ensure continuity and to get best value for the government's investment in new systems and technology. This budget line item provides FAA personnel with the long-term technical expertise necessary to oversee the design and implementation of new NAS systems as well as provide for the sustainment of core NAS Infrastructure such as radar, communication, automation, facilities, and navigation systems.

What benefits will be provided to the American public through this request and why is this program necessary?

The FAA's Facilities and Equipment capital program invests in developing and implementing new technologies to meet future demand and to sustain the current NAS.

The FAA is undertaking a wide-ranging transformation of the United States air transportation system. NextGen proposes to transform America's air traffic control system from a ground-based system to a satellite-based system. GPS technology will be used to shorten routes, save time and fuel, reduce traffic delays, increase capacity, and permit controllers to monitor and manage aircraft with greater safety margins. Planes will be able to fly closer together, take more direct routes and avoid delays. The FAA requires a stable workforce in order to sustain the current infrastructure of air traffic control facilities staffed and unstaffed and to move toward completion of the NextGen transformation.

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3C. Reseach
Enginering & Development

RESEARCH, ENGINEERING, AND DEVELOPMENT

(AIRPORT AND AIRWAY TRUST FUND)

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, $120,000,000, to be derived from the Airport and Airway Trust Fund and to remain available until September 30, 2022: 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.

Note.—A full-year 2019 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Further Continuing Appropriations Act, 2019 (Division C of P.L. 115-245, as amended). The amounts included for 2019 reflect the annualized level provided by the continuing resolution.

PROGRAM AND FINANCING
($ in Millions)

Identification code: 69-8108-0-7-402	FY 2018 Actual	FY 2019 Estimate	FY 2020 Estimate
Obligations by program activity:			
0011 Improve aviation safety	87	134	105
0012 Improve Efficiency	19	22	16
0013 Reduce environmental impact of aviation	36	36	34
0014 Improve the efficiency of mission support	5	5	6
0100 Subtotal, direct program	147	197	161
0799 Total direct obligations	147	197	161
0801 Research, Engineering & Development (Airport & Airway Trust Fund (Reimbursable)	9	9	9
0900 Total new obligations (total)	156	206	170
Budgetary resources available for obligation:			
1000 Unobligated balance brought forward, Oct 1	76	119	115
1021 Recoveries of prior year unpaid obligations	2	2	2
1050 Unobligated balance (total)	78	121	117
New budget authority (gross), detail:			
Appropriation, discretionary:			
1101 Appropriation (special or trust fund)	189	189	120
Spending authority from offsetting collections, discretionary:			
1700 collected	7	11	11
1701 Change in uncollected payments, Federal sources	2	......	......
1750 Spending Auth from offsetting collections, disc (total)	9	11	11
1900 Budget authority (total)	198	200	131
1930 Total budgetary resources available	276	321	248
Memorandum (non –add) entries:			
1940 Unobligated balance expiring	-1	. . . . .	. . . . .
1941 Unexpired Unobligated balance, end of year	119	115	78
Special and non-revolving trust funds:			
1950 Other balances withdrawn and returned to unappropriated receipts	2	. . . . .	. . . . .
1951 Unobligated balance expiring	1	. . . . .	. . . . .
1952 Expired Unobligated balance, start of year	5	7	7
1953 Expired Unobligated balance, end of year	4	7	7
1954 Unobligated balance canceling	2	. . . . .	. . . . .
Change in obligated balances:			
Unpaid obligations:			
3000 Unpaid obligations, brought forward, Oct 1 (gross)	144	137	117
3010 New obligations incurred, unexpired accounts	156	206	170
3020 Outlays (gross)	-160	-224	-196
3040 Recoveries of prior year unpaid obligations, unexpired	-2	-2	-2
3041 Recoveries of prior year unpaid obligations, expired	-1	. . . . .	. . . . .
3050 Unpaid obligations, end of year	137	117	89
Uncollected payments:			
3060 Uncollected payments, Federal Sources, brought forward, Oct 1	-3	-3	-3
3070 Change in uncollected pymts, Fed sources, unexpired	-2	......	......
3071 Change in uncollected pymts, Fed sources, expired	2	......	......
3090 Uncollected payments, Federal sources, end of year	-3	-3	-3
Memorandum (non-add) entries:			
3100 Obligated balance, start of year	141	134	114
3200 Obligated balance, end of year	134	114	86

	Budget Authority and outlays, net:			
	Discretionary:			
4000	Budget authority, gross	198	200	131
	Outlays, gross:			
4010	Outlays from new discretionary authority	47	94	64
4011	Outlays from discretionary 0balances	113	130	132
4020	Outlays, gross (total)	160	224	196
	Offsets against gross budget authority and outlays			
	Offsetting collections (collected) from:			
4030	Federal sources	-9	-11	-11
4040	Offsets against gross budget authority and outlays (total)	-9	-11	-11
	Additional offsets against gross budget authority only:			
4050	Change in uncollected pymts, Fed sources, unexpired	-2	......	......
4052	Offsetting collections credited to expired accounts	2	......	......
4070	Budget Authority, net (discretionary)	189	189	120
4080	Outlays, net (discretionary)	151	213	185
4180	Budget authority, net (total)	189	189	120
4190	Outlays, net (total)	151	213	185

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. The proposed funding is allocated to the following performance goal areas of the Federal Aviation Administration: improve aviation safety, efficiency, and environmental sustainability. The request includes funding for several research and development activities of the Next Generation Air Transportation System (NextGen), as well as activities related to unmanned aircraft systems.

OBJECT CLASSIFICATION
($ in Millions)

Identification code: 69-8108-0-7-402		FY 2018 Actual	FY 2019 Estimate	FY 2020 Estimate
	Direct obligations:			
	Personnel compensation			
11.1	Full-time permanent	28	31	32
12.1	Civilian personnel benefits	9	10	10
21.0	Travel and transportation of persons	1	3	1
25.1	Advisory and assistance services	21	30	23
25.2	Other services from non-Federal sources	48	67	52
25.3	Other goods and services from Federal sources	4	6	5
25.5	Research and development contracts	15	21	16
25.7	Operation and maintenance of equipment	1	1	1
26.0	Supplies and materials	2	2	2
31.0	Equipment	1	2	1
41.0	Grants, subsidies, and contributions	17	24	18
99.0	Direct obligations	147	197	161
99.0	Reimbursable obligations	9	9	9
99.9	Total new obligations	156	206	170

Employment Summary

Identification code: 69-8108-0-7-402	FY 2018 Actual	FY 2019 Estimate	FY 2020 Estimate
1001 Direct civilian full-time equivalent employment	223	245	245

EXHIBIT III-1

Research, Engineering, & Development

Summary by Program Activity

Appropriations, Obligation Limitations, and Exempt Obligations

($000)

	FY 2018 ACTUAL	FY 2019 ANNUALIZED CR	FY 2019 ENACTED	FY 2020 REQUEST	CHANGE FY 2019 - FY - 2020
Improve Aviation Safety	$ 117,960	$ 117,960	$ 117,708	$ 86,821	$ (30,887)
Improve Efficiency	$ 18,232	$ 18,232	$ 19,499	$ -	$ (19,499)
Reduce Environmental Impacts	$ 47,187	$ 47,187	$ 47,187	$ 27,603	$ (19,584)
Mission Support	$ 5,547	$ 5,547	$ 6,706	$ 5,576	$ (1,130)
TOTAL	$ 188,926	$ 188,926	$ 191,100	$ 120,000	$ (71,100)
FTEs					
Direct Funded	245	245	245	245	-
Reimbursable, allocated, other					

Program and Performance Statement

This account provides funding for establishing and overseeing FAA's Research and Development (R&D) policies and plans. Its diverse scientific, engineering and technical workforce supports all aspects of aviation from research on materials to development of new products and procedures.

In partnership with both domestic and international entities within the aviation community, the FAA RE&D programs provide world leadership by conducting high-priority research and developing innovative technologies to support a safe and efficient global aviation system.

*Enacted levels for FY 2019 are provided for informational purposes. The FY 2020 budget request was developed before a final appropriations act was enacted for FY 2019, and the request assumes a year-long continuing resolution for FY 2019.

Detailed Justification for A11.a Fire Research and Safety

FY 2020 – A11.a Fire Research and Safety - Budget Request
($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
A11.a Fire Research and Safety	$7,200	$7,200	$7,200	$7,562

What is this program and what does this funding level support?

The Fire Research and Safety program seeks to prevent accidents caused by in-flight fire and to improve survivability during a post-crash fire. The program is necessary due to the catastrophic consequences of an uncontrollable aircraft fire, which include: the large loss of life and the destruction of the aircraft. The program conducts research to understand the fire safety implications of new technologies and materials the aviation industry continues to introduce in order to decrease weight and increase operating efficiency. This research is used to develop effective mitigation procedures and to update existing regulations, which often do not address the unique behavior of these new technologies. Finally, the program conducts research to better understand and mitigate the threat of lithium battery cargo fires, which are a continuing concern due to the increasing number, sizes and energy densities of batteries being shipped and to the unusual and severe hazards associated with lithium battery fires.

The program supports 1) the FAA's Office of Aviation Safety, which is responsible for issuing regulations, standards, and guidance material to ensure the highest level of safety in commercial aviation; and 2) the FAA's Security and Hazardous Materials organization. Research efforts specific to hazardous material transport are completed in coordination with the Department of Transportation's Pipelines and Hazardous Materials Safety Administration (PHMSA). The program also supports safety enhancements (specifically: SE126, or 'Mitigation of Hazardous Materials Fires') recommended by the Commercial Aviation Safety Team (CAST), which is a voluntary collaboration between regulators and the aviation industry to identify emerging risks to aviation safety and developing mitigation procedures to reduce the risks.

The requested funding supports the fire safety facilities at the FAA's William J. Hughes Technical Center, Atlantic City, NJ, where the majority of the program's research is conducted. These facilities, where research is led by internationally recognized experts in aircraft fire safety research, are the most extensive civil aircraft fire test facilities in the world. The technical expertise developed through the use of these facilities has continually contributed to aviation safety through the ability to quickly and effectively address newly emerging fire hazards. As a result, the international aviation community looks to the FAA for leadership in aircraft fire safety research and development. Research activities to increase aircraft fire safety include fire tests for interior materials, fire detection and suppression systems, fire-fighting procedures and guidance material, testing to validate Halon replacement suppression agents against minimum performance standards, and safeguards to protect against fires involving lithium batteries, fuel cells, and hazardous materials.

Integrated Aircraft Fire Protection System

Current regulations require fire detection and/or fire suppression systems in specific areas in aircraft, such as cargo compartment, engines and auxiliary power units, and lavatories. Inaccessible areas above the cabin ceiling, below the cabin floor, behind sidewall panels, and in electronic accessory compartments generally do not require such systems. These areas contain electrical ignition sources and hidden in-flight fires in these areas have occurred. When fires in these areas do occur, the fire location is generally unknown and effective methods to suppress the fires are not readily available. In addition, incidents of smoke, fumes, or odors of unknown origin occur daily on aircraft in the U.S. fleet. Research will be conducted to establish criteria for aircraft-based systems that can detect fires in hidden areas and to discriminate between actual fires and non-threatening sources of fumes and/or odors. With this information available, the flight crew can make more appropriate decisions based on the severity of the situation and the need to divert the aircraft. Existing systems, such as the fuel tank inerting nitrogen source and/or cargo compartment fire suppression systems could potentially be redirected to fires in areas not currently protected by fire suppression systems.

Hazardous Materials Fire Mitigation

Research will be conducted to determine the effectiveness of cargo compartment fire detection and suppression systems on hazardous material fires for both passenger aircraft and freighters. The testing will include methods of improving the detection of cargo fires from both cargo compartment based detection systems and potential detection devices located within cargo containers and pallets. Research will also be conducted on methods to suppress and/or contain hazardous material fires. Testing will be conducted to achieve that goal with aircraft cargo compartment based systems, with unit load devices based systems, and at the hazardous material packaging level. This research was requested through recent CAST safety enhancement studies on the transport of hazardous materials.

Improved Understanding of the Role of New Structural and Cabin Materials and Aircraft Energy Sources in Accident Survivability

Aircraft manufacturing is evolving beyond the use of traditional aluminum alloy fuselage structural materials, materials used inside the passenger cabin, and sources of electrical power. These materials include carbon fiber reinforced plastic composites, new metallic alloys, new seat structures and new aircraft systems. Existing flammability regulations do not always address the potential effect on fire survivability due to differences in flame spread, heat transfer, toxic gas production, and fire initiation potential from these new materials. Full-scale testing will assess the overall impact on aircraft fire safety. The results of full scale testing could lead to recommendations for new flammability certification test standards, if warranted. The benefit of this research will be to document the effect of new materials used in aircraft construction on accident cause and survivability.

Fire Research

Computer modeling will be used to simulate in-flight fire hazards and identify mitigating strategies. Relevant fire hazards include heat, smoke and combustion gas transport in aircraft cabins and cargo compartments; flame spread over materials in hidden areas; under-ventilated burning/smoldering of structural composites; and fire suppression in hidden areas. Numerical simulations will be used to support FAA long-range plan to certify by analysis. This includes emerging fire threats at as well as new materials, components, and cabin configurations. The flammability parameters and combustion toxicity of cabin materials with replacement flame retardants will be assessed in small- and bench-scale tests to develop criteria to expedite recertification of materials. This is in response to the Environmental Protection Agency ban on flame retardants commonly used in aircraft cabins.

Major Activities and Accomplishments Planned in FY 2020 Include:

- Conduct testing to evaluate improved methods for the detection and suppression of hazardous materials cargo fires on aircraft.
- Conduct full scale and lab scale testing to support improved flammability certification requirements for new structural and cabin materials and energy sources used in the construction of commercial aircraft.
- Develop and validate computer modeling of inflight aircraft fires.

Goals for FY 2020 Funding:

- By 2024, develop the enabling technology to prevent accidents caused by in-flight fires in cargo and passenger large transport aircraft by improving fire detection and suppression capabilities and upgrading the flammability requirements for materials in inaccessible areas.
- By 2024, enable the introduction of new, lightweight/energy efficient, fire-safe materials, and components into commercial transport aircraft, such as composite structure, magnesium and other metallic alloys, cabin furnishings, and advanced electrical power sources, including lithium batteries and hydrogen-fueled fuel cells.

- By 2024, support and facilitate the evaluation and replacement of Halon fire extinguishing agents and halogenated cabin material flame-retardants with effective and practical alternatives.

What benefits will be provided to the American public through this request and why is this program necessary?

The primary benefit to the American public from this research is the prevention of catastrophic aircraft accidents caused by in-flight fires and increased survivability during a post-crash fire. Other benefits derived from this program include: 1) the introduction of enabling technologies to prevent accidents caused by fire in freighter aircraft and hidden in-flight fires in passenger-carrying airplanes, and 2) the development, validation, and transfer of cost-effective aircraft fire safety technology to the aviation industry.

Effective April 1, 2016, International Civil Aviation Organization (ICAO) approved the prohibition of lithium ion battery shipments in passenger aircraft, a reduced state of charge for lithium ion batteries on freighter aircraft, and elimination of unrestricted small quantity undeclared shipments on freighter aircraft. The ban on the shipment on passenger aircraft will remain in effect until safe shipping standards are developed. The ICAO actions were a direct result of FAA fire testing that demonstrated the hazards associated with lithium battery fires. Those test results also led Boeing and Airbus to recommend to operators of their aircraft that bulk shipments of lithium ion batteries be banned in passenger aircraft because the current cargo compartment fire suppression systems were not designed to protect against the severe and unusual hazards of a lithium battery fire. Cathay Pacific airlines unilaterally banned the bulk shipment of lithium batteries in freighter aircraft as a result of this testing. These measures have improved aircraft fire safety, but also underscore the need for the research proposed in this program to safely ship lithium batteries in both freighter and passenger aircraft cargo compartments. Hydrogen powered fuel cells are being proposed to provide electrical power for aircraft systems. Hydrogen is an extremely flammable gas and compressed hydrogen stored onboard aircraft is unprecedented with potential significant new fire hazard implications. These include both leakage during flight and potential contribution to a post-crash fire. The research proposed in this program will determine the appropriate safeguards needed to implement this new technology.

Research products from this program have been implemented in large passenger transport aircraft by regulation throughout the world to improve post-crash fire survivability. The probability of dying from a survivable post-crash fire has been reduced by a factor of three due in part to this past research. This is perhaps best demonstrated by the following recent accidents in which the aircraft were subjected to a post-crash fire: Asiana 777 (San Francisco, 2013), British Airways 777 (Las Vegas, 2015, and American 767 (Chicago 2016). There were 647 passengers and crewmembers in the three airplanes and zero fire fatalities. The introduction of new aircraft materials and technologies, and emerging fire threats increases the need for both in-flight and post-crash fire safety research.

A commercial fire research product resulting from this program is the FAA-patented microscale combustion calorimeter, which licensed to several manufacturers. The results have also been used to create the industry standard, “Standard Test Method for Determining Flammability Characteristics of Plastics and Other Solid Materials Using Microscale Combustion Calorimetry”, ASTM D 7309. Hundreds of these devices have been sold worldwide since 2007 for research and development of new fire resistant plastics for transportation, building/construction, and electrical/electronic applications. In addition, new flammability test methods have been developed by this program that provide realistic predictions of the contribution to overall fire survivability from individual materials used in aircraft construction.

Detailed Justification for A11.b Propulsion and Fuel Systems

FY 2020 – A11.b Propulsion and Fuel Systems - Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
A11.b Propulsion and Fuel Systems	$2,100	$2,100	$2,100	$3,708

What is this program and what does this funding level support?

The FAA establishes rules for the certification and operation of aircraft propulsion systems. FAA research is used as the basis for the development, implementation and modification of policy, guidance, and rulemaking to ensure the safety and continued airworthiness of aircraft propulsion systems and the approval of new propulsion and energy technologies. In addition, this program's research supports policy, rulemaking, and guidance to enhance the airworthiness, reliability, and performance of these systems for reduced environmental impacts and increased operational efficiencies. The program conducts research on new and existing aircraft propulsion systems and fuel and energy technologies. This program also conducts research on advanced damage tolerance and risk assessment methods to reduce and eliminate uncontained aircraft turbine engine failures by ensuring the structural integrity of critical life limited engine components. This program conducts research to mitigate the safety hazard that uncontained engine debris presents to the aircraft by developing advanced analysis methods for engine related impact.

For FY 2020, the following three research areas are targeted:

Aircraft Turbine Engines

Although the history of turbine engine operation in commercial aviation is a safe one, the risk of an engine failure is always present and the potential consequences are enormous: the large loss of life in accidents and the destruction of the aircraft. Accidents such as United Airlines Flight 232 on July 19, 1989 in Sioux City, Iowa, and Delta Airlines Flight 1288 on July 6, 1996 in Pensacola, Florida are noteworthy because they were caused by the failure of turbine engine components that caused catastrophic loss of life. Investigations revealed that the primary cause of these accidents were the result of material and manufacturing anomalies that degraded the structural integrity of the high energy rotors that led to the uncontained failures. Two more recent failures - one, a non-fatal failure of a high pressure turbine disk on October 28, 2016 on American Airlines Flight 383 and the April 17, 2018 fatal uncontained fan blade failure of Southwest Airlines Flight 1380 - serve as reminders that such failures, although extremely rare, do still occur.

Following the Sioux City and Pensacola accidents, significant collaborative initiatives by the FAA and industry via the Aerospace Industries Association Rotor Integrity Steering Committee resulted in a number of measures to increase the safety of turbine engines throughout their life cycles. Specifically, the research provided by this funding will develop and validate a probabilistic-based turbine engine design code called DARWIN® (Design Assessment of Reliability With Inspection) that determines the risk of fracture of turbine engine rotors containing undetected material anomalies. DARWIN® satisfies FAA requirements defined in the Federal Regulations, section 14 CFR 33.70 "Engine Life-limited Parts" for the purposes of preventing uncontained turbine engine rotor failures. DARWIN® is being developed and validated collaboratively with the major U.S. engine manufacturers. In addition to the software development, this research also provides data to support the preparation of a series of FAA Advisory Circulars that provide industry with technical information on acceptable means to comply with the regulation.

Research undertaken will also address the need to develop better nondestructive testing (NDT) methods to characterize engine component material conditions that can compromise integrity. This need has been highlighted by the NTSB in recommendation A-18-3 resulting from the AA Flight 383 accident investigation. In addition to the need for enhanced nickel alloy inspection, other inspection research is needed to measure compressive residual stresses, grain abnormalities, titanium texturing, and cracks. Improved NDT will not only detect defective components, but it can also be used to validate complex manufacturing processes and to feed more accurate data into DARWIN to improve its predictive capabilities in the presence of these conditions. Research will also investigate the use of DARWIN to analyze the risk of failure of new materials such as additively manufactured or three-dimensional printed engine components.

The FAA's Turbine Engine research program is working cooperatively with industry and the Department of Defense (DoD) on these initiatives.

Catastrophic Engine Failure

Specific to the Aircraft Catastrophic Failure Prevention Program, a new challenge has emerged with the proposed open-rotor engine concept, which promises greater efficiency. In this design, the engine containment is removed and two rows of counter rotating fan blades create a new configuration that requires certification. Current ducted fan designs used in large commercial transport completely mitigate a fan blade loss with engine containment. For these new engines, a fan blade failure is not contained therefore fuselage shielding is needed. Research is necessary to improve analytical tools previously developed under the program to evaluate this new configuration.

As a result of the Qantas Airlines uncontained engine failure on the Airbus A-380 aircraft that occurred in November 2010 the Australian Transportation Safety Bureau (ATSB) recommended to review and update the guidance in the FAA Advisory Circular AC20-128. Research is on-going to revise the large engine debris fragment model and Uncontained Engine Debris Damage Assessment Model (UEDDAM) code. Several events in recent years are under investigation by NTSB, and a new recommendation from the Chicago O'Hare 777 Uncontained event reinforces the ATSB recommendation for FAA review of AC20-128. Finally in 2018, the most recent fatality in U.S. commercial operations was from an uncontained failure of a first stage fan blade.

The current engine and aircraft certification methods require full-scale destructive tests of an engine. There is a need for more robust and accurate non-destructive analytical methods and predictive tools to assess safety risks to the aircraft to minimize or replace full-scale destructive tests. Research is necessary to achieve and validate certification-by-analysis using analytical and predictive tools. Standardized methods and numerical tools to analyze effects of both engine rotor-burst and fan blade releases assist the FAA certification offices and industry applicants in gaining a common understanding in demonstrating compliances of regulatory requirements. The option for standardized compliance by analysis (for specified rules) for derivative designs of already certified engines will be possible. The analysis tools developed in this program will 1) help to mitigate aircraft damage from uncontained engine failures and prevent potential aircraft catastrophic failures, and 2) allow FAA engineers to validate proprietary tools currently used by engine manufacturers and streamline the certification process. The long-term goal is certification-by-analysis.

Another new challenge for this program is the move away from the traditional aluminum and into composite aircraft structures. This creates a significant increase in the model complexity. Metal alloys typically have the same properties throughout the material and in all directions (i.e., isotropic). Composites have very different properties depending on the fiber orientation in the resin (anisotropic). Industry trends indicate an increased use of composites for both engine containment and fuselage structure. Better algorithms to predict the failure of these materials are needed.

The FAA works closely and collaboratively with National Aeronautics and Space Administration (NASA), DoD and FAA commercial space to advance design tools and guidance that can provide benefit to all participants and the user community.

Fuels and Energy

Certification challenges are arising due to the continual proposal of new fuel and energy propulsive technologies. The FAA is faced with considerable difficultly in both applying existing and creating new regulations, policy, and guidance for new fuel, energy, and propulsive disruptive technologies. Further, approving the existing fleet for use with new fuel and energy sources creates a unique set of challenges. The impact on performance, operability, and compatibility with existing aircraft and engine propulsion systems needs careful evaluation before approving an alternative fuel or energy source. Research conducted at both the Propulsion and air pOWer Engineering Research (POWER) and Aviation Fuel Research Laboratories is used to support FAA certification and rulemaking for the fleet wide authorization of alternative fuels, the evaluation of fuel and energy performance specifications, the safety evaluation of emerging propulsive technologies, the safe transition to more environmentally friendly fuels, and the development of regulatory and guidance materials.

This testing includes laboratory materials and performance testing, rig simulations, ground based test beds, altitude simulations, and in-flight operations at state-of-the-art laboratories. Research includes unleaded fuel replacement and associated technologies to support the Piston Aviation Fuels Initiative to address the recommendations of the Unleaded AVGAS Transition Aviation Rulemaking Committee, and to comply with section 504 of the FAA Reauthorization Act of 2018 Public Law No: 115-254. Research addresses the uncertainty in State of Charge for new electric propulsion systems, the durability and operability issues related to electrical propulsion in high altitude environments, and electrical propulsion and fuel cell failure modes, fuel performance and fit-for-purpose properties testing of alternative fuels, turbine engine performance, operability, and emissions testing on use of alternative fuels. The development and maintenance of fuel specifications that the FAA relies on for aircraft continued airworthiness will be addressed along with research that supports the FAA efforts to improve aviation prolusion efficiencies and reduced emissions.

Major Activities and Accomplishments Planned in FY 2020 Include:

Aircraft Turbine Engines

- Expand capabilities of the DARWIN probabilistic design code to address a new class of life limited engine components including shafts and cases.

Catastrophic Engine Failure

- Develop tools and guidance for certification by analysis for dynamic impact events under the LS-DYNA[1] Aerospace Working Group (AWG).
- Develop tools that support the revision of FAA Advisory Circular AC20-128A for multiple fragment analysis of Uncontained Engine Failures.

Fuels and Energy

- Create unified research protocols on engine and aircraft with alternative fuels and energy.
- Identify the scope of and initiate research testing on the non-authorized fleet.
- Enhancements to test cell equipment and facilities to support advanced electric and other propulsive technologies research.

Goals for FY 2020 Funding:

- By 2022, release new DARWIN version to support the proposed FAA Advisory Circular AC 33.70-5 on "Damage Tolerance of Lathe Turned Surfaces in High Energy Rotors".
- By 2022, validate fuel and oil additives for alternative fuels fleet-wide authorization.
- By 2023, validate composite material models with associated guidance for certification.

[1] LS-DYNA is the name of a general-purpose finite element program capable of simulating complex real world problems. It is used by the automobile, aerospace, construction, military, manufacturing, and bioengineering industries.

- By 2023, maintain the Uncontained Engine Debris Damage Assessment Model (UEDDAM) in conjunction with DoD, as a means of compliance for ducted and open rotor engines.
- By 2024, develop enhanced capabilities within DARWIN to conduct fracture and life prediction of nickel rotor components containing inherent anomalies.
- By 2024, complete GA Alternative Fuels & Propulsive Technologies research data to support transparent fleet authorization on unleaded AVGAS.

What benefits will be provided to the American public through this request and why is this program necessary?

The specific benefits of the aircraft turbine engine research to the American public will be the reduction or elimination of commercial aircraft uncontained turbine engine failures and in-flight engine shut downs attributable to rotor design, manufacturing, and service induced defects. Benefits will accrue in the form of reduced risk of engine failures and fewer aircraft accidents, which in turn will lead to fewer injuries, fatalities, and property damage. This research program is necessary because it is producing a publicly available probabilistic damage tolerance based engine design code that enables the industry to meet the enhanced safely requirements for critical engine components as mandated by federal regulation 14 CFR 33.70. The DARWIN® code (version 9.2) is currently used by nearly all major engine manufacturers. Additional research will enhance the DARWIN® code to allow probabilistic damage tolerance analysis of rotor blade slots, turned surfaces, and Nickel alloy anomalies. Finally, this research will provide additional insight and background data to enable the FAA to fulfill its oversight role during the certification process of new rotor designs and for continued airworthiness. The research conducted under this program is critical to the FAA's ability to understand these challenges and to ensure incorporation of acceptable safety improvements by the user community.

The Aircraft Catastrophic Failure Prevention Program has a long history of addressing the overlap between aircraft certification and engine certification, which is known as engine installation. Continued investment in computing capability promises to provide opportunity to improve the accuracy of failure analysis for the rare but hazardous engine fragment impact events. The long-term goal is to advance certification-by-analysis with predictive tools. This will improve safety and reduce the cost of producing new engine and aircraft designs. Anisotropic composite materials are the current focal areas of interest in impact analysis; and the A-380 accident recommendation is the current focus of aircraft vulnerability analysis. The safety benefits include a reduction in accidents related to engine failures and mitigation of fatalities and injuries if an accident occurs. Collaboration with NASA, commercial space and the DoD shares the cost and benefit of these advancements across the government.

Directly or indirectly, general aviation (GA) accounted for over 1.1 million high-skilled, high-wage jobs in professional services and manufacturing in 2015 and contributed over $219 billion to the U.S. economy. As the aircraft industry introduces new alternative fuels and energy used for propulsion, research products generated through this program become increasingly necessary to improve the FAA's knowledge base and understanding of the safety and airworthiness issues related to approval and continued airworthiness of these technologies. This knowledge base is necessary to apply and develop regulation and guidance used to certify these new propulsive technologies. In addition, this program will enhance the FAA's position as a worldwide leader in propulsive technology research.

Detailed Justification for A11.c Advanced Materials/Structural Safety

FY 2020 – A11.c Advanced Materials/Structural Safety - Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
A11.c Advanced Materials/Structural Safety	$10,500	$10,500	$14,720	$1,799

What is this program and what does this funding level support?

The Advanced Materials and Structural Safety Program conducts research to support the FAA safety and regulatory activities in the technical areas of composite and other advanced materials, and aircraft dynamic impacts. This program is divided into two research areas: Advanced Materials and Structural Safety (crashworthiness).

Throughout most of the history of civil aviation, aircraft have evolved slowly with little change to the basic aluminum materials or design concepts. A vast body of knowledge about such aircraft has been gained, often at the expense of fatal crashes. As this knowledge has grown, the safety record of civil aviation has steadily improved to the near perfect record of the past few years. Over the last decade, the pace of evolution of civil aircraft has increased dramatically. One of the most important changes has been the widespread adoption of composites in critical structures. This represents the first significant change in aircraft materials, design concepts, and fabrication techniques since the introduction of the first modern airliners in the 1930's. The current certification process for many advanced materials and structures was established for smaller, and in some cases, less critical components and service conditions. The difference in the structural characteristics, loading conditions, system interface issues, and increased scale of these components must be understood and incorporated into certification and operational plans to assure safety. In many cases, the body of knowledge accumulated for traditional aluminum aircraft does not apply. The long-term effects of aging, environmental factors, flight loads, damage, manufacturing defects, and many other aspects of the intensely complex operating environment of transport aircraft are not fully understood. The Advanced Materials component of the research program seeks to fill these gaps in our knowledge before they can cause catastrophic loss of aircraft and lives.

The Structural Safety component of the program performs research to evaluate test and analysis procedures used by the industry to meet crashworthiness regulations. These regulations are evolving and are supplemented with special conditions for transport aircraft with composite fuselage and wing structures. The program ensures new aircraft structures demonstrate levels of safety equivalent to existing aircraft structures subjected to survivable crash conditions.

The Advanced Materials and Structural Safety program works with industry, academia, and other government laboratories as research partners. In so doing, the program effectively leverages its resources, with industry fully matching research funds. The majority of the research performed by this program is funded through and managed by the congressionally mandated Joint Centers of Excellence (COE) for the Advanced Materials and Structures (JAMS). Under the leadership of the University of Washington and Wichita State University, the following serve as core members of the COE JAMS and external partners of this research program: Edmonds Community College, Florida International University, Northwestern University, Oregon State University, Purdue University, and University of California at Los Angeles, University of Delaware, University of Utah, Tuskegee University and the Washington State University. Mississippi State University is in the process of joining this list. The COE JAMS universities also act as vehicles for workforce education and technology transfer as most students participating in the program research projects are offered engineering and technology positions in the aviation industry and continue working on composite design and manufacturing.

Major Activities and Accomplishments Planned in FY 2020 Include:

Damage Tolerance of Composite Structures

The FAA will perform research to identify critical defects and damage threats that effect the damage tolerance of composite airframe structures not fully understood today. This research also evaluates methods to better characterize behavior of damaged composite materials as applied by the industry. Accomplishments planned in FY 2020 include:

- Develop Impact Damage Guidelines on Composite Aircraft Structures
- Develop and Evaluate Fracture Mechanics Test Methods for Sandwich Composites
- Investigate Influence of Environmental Factors on Composite Design and Certification

Composite Maintenance Practices

The FAA will perform research to evaluate current composite repair, inspection and other maintenance industry practices to ensure airworthiness of aircraft composite structures. Accomplishments planned in FY 2020 include:

- Define composite repair material properties, process specifications and associated test standards.
- Update the Composite Manufacturing Technology and Structural Engineering courses with revised content, lesson plans and job aids.
- Develop a computer-based short course for Aviation Safety Inspectors that have oversight responsibilities for complex composite repair facilities.

Continued Operational Safety and Certification Efficiency for Emerging Composite Technologies

This task addresses key issues for emerging composite technologies. Accomplishments planned in FY 2020 include:

- Investigate the effects of fire on composite failure analysis procedures and methods. Provide final technical report documenting testing and results.
- Characterize ignition source from lightning strike in composite structure. Develop appropriate detection techniques.
- Investigate the sensitivity of composite materials to new fuels and adequacy of current screening test.

Certification and Maintenance Protocols for Bonded Joints:

The FAA has identified bonding as the most critical continued operational safety issue related to composites in the Office of Aviation Safety (AVS) Strategic Composite Plan. Bonding also listed as an initiative for certification efficiency. All product types, from rotorcraft to general aviation to transport aircraft, as well as propellers and now even engines, use bonded structures. The task expands adhesive research to that of the entire bonded joint.

Goals for FY 2020 Funding:

- By 2021, update fatigue and damage tolerance modules for the FAA Composite Structural Engineering Technology course (FAA Strategic Composite Plan Deliverable).
- By 2022, provide detailed background on the unique static, fatigue, environmental durability, and impact performance of advanced composite splicing concepts.
- By 2022, provide documentation and background data for regulatory action to assure reliable processing of adhesively bonded structures. (FAA Strategic Composite Plan Deliverable).
- By 2022, develop a handbook for failure analysis of structures subjected to a fire event after structural malfunction. (FAA Strategic Composite Plan Deliverable).

What benefits will be provided to the American public through this request and why is this program necessary?

The use of advanced materials and structural concepts is central to a vibrant aviation industry in the U.S. All aircraft manufacturers are using more and more advanced composite materials on their aircraft. As the methods of structural verification are being extended to new components and aircraft applications, it is important to understand the envelope of acceptable design parameters that have not been explored with composite materials and structures. This will ensure that as more applications are introduced with composite aircraft structures, the safety record of the National Aviation System is maintained. This effort will assure the civil aircraft manufactured with these materials are safe and reliable. The benefit to the American public is a reduction in accidents related to the design and use of composite materials.

Currently, there are no existing structural crashworthiness requirements for transport airplanes. The FAA is seeking to develop a single policy for demonstrating crashworthiness that would be applicable to all transport airplanes regardless of the structure. The benefit to the American public is a reduction in fatalities and injuries in the event of a crash.

Output of the Advanced Materials and Structural Safety research program helps keep the flying American public safe. Research tasks and required funding levels outlined above are driven by industry advancements in construction of composite airframes and related components presented to FAA for certification. The FAA must assure that changes due to the ever-increasing use of composites in aviation maintain an equivalent or improved level of safety compared to that achieved with current operational aircraft. Requests from the FAA aircraft certification offices and from the aircraft manufacturers seeking approval for emerging composite technologies are major influences that shape the scope of this research program.

Additionally, The National Transportation Safety board review of accidents (e.g., AA587 (http://www.ntsb.gov/investigations/AccidentReports/Pages/AAR0404.aspx), R22 (https://www.atsb.gov.au/publications/investigation_reports/2007/aair/aair200701625.aspx) involving composite structures provides additional impetus for research required to understand advanced composite materials and structures as emerging technologies.

Detailed Justification for A11.d Aircraft Icing/Digital System Safety/Aircraft Cyber

FY 2020 – A11.d Aircraft Icing/Digital System Safety/Aircraft Cyber - Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
A11.d Aircraft Icing/Digital System Safety/Aircraft Cyber	$9,253	$9,253	$9,253	$7,450

What is this program and what does this funding level support?

Aircraft Icing

The Aircraft Icing Research Program conducts research on structural airframe icing in flight, ground deicing, and anti-icing prior to takeoff, and engine compressor icing due to the ingestion of ice particles into the engine core.

Structural aircraft icing also takes place in freezing drizzle and freezing rain (collectively called supercooled large drops, or SLD). A new icing certification rule for flight in SLD conditions took effect on January 5, 2015. Means of compliance for SLD environments are not as mature as those used for supercooled clouds not containing SLD. The Program has undertaken a new research effort to partnering with NASA Glenn Research Center addressing means of compliance for the new rule.

FAA policy for ground icing is guided by the "Clean Aircraft Concept," meant to ensure that aircraft are aerodynamically clean at takeoff. An aircraft with frozen contamination is deiced, and if freezing or frozen precipitation is falling, it is then anti-iced. The Program's ground icing research responds to new issues that arise due to operational issues both in the United States and globally. The Program conducts research on a range of issues that arise in operations, partnering with Transport Canada and the National Research Council of Canada, and enabling the FAA to play a leading role in the international SAE Ground Deicing Committee, which promotes uniformity and safety in ground deicing and anti-icing practices around the world, including the growing markets in Southeast Asia.

Approximately 200 engine icing events, involving many different engines, have been documented over the last 20 years in high ice water content ice crystal conditions in the vicinity of convective conditions, mainly at high altitudes. The events have included stalls, damage, and flameouts, with some cases of multiple flameout and dead stick landings, but no accidents. Ice crystals are ingested into a region of the compressor degrees above freezing, where they impact a surface, through a heat transfer process cooling it to the freezing point and providing a site on which melted or partially melted ice crystals can accrete. The FAA has partnered for several years with the National Research Council of Canada on the experimental study of this process.

Digital System Safety

Airborne systems' designs have become increasingly dependent on highly integrated software and hardware architectures that share power, computing, networking, input/output, and other resources to support the needs of multiple aircraft functions. Research is required to address the evolution of these highly complex architectures especially as they begin to integrate with ground systems and NextGen implementation. This will require a flexible system-level approach that focuses on system life cycle assurance in addition to development assurance at the software/digital level. The FAA is also working towards assurance standards and guidance that are focused on flexibility (less prescriptive) that does not compromise safety, or ignore rules. Research is required for these complex digital systems that begin to explore using a risk-based approach, to proactively address emerging safety risks and focus on process- vs product-based oversight.

The FAA has taken a proactive approach to keep pace with the ever-changing technological industry and is conducting research on software and digital aircraft systems to facilitate certification of such systems. The majority of operational software and electronic hardware issues are due to missing or incorrect requirements. Many of these issues can be attributed to system complexity and associated difficulty in requirements validation to ensure completeness and correctness. The research proactively addresses certification issues that may arise with the use of new methodologies, tools, and techniques. These issues can potentially cause new failure conditions posed by the introduction of new and novel development processes on the highly integrated and distributed systems. This is achieved by developing new assurance methods, assurance criteria, analysis tools, and by collecting long term service data of new airborne electronic hardware technologies. The research results will be used to help develop criteria and data useful in improving the assurance standards, guidance, and training material for certification engineers.

Outputs from Digital System Safety program research will be used to develop new or revised guidance and training material as well as to recommend best practices for the industry. The resulting best practices and the associated guidance will help in preventing the events similar to the following:

- The Malaysian Airlines Boeing 777 incident on August 1, 2005 (caused by a faulty accelerometer being processed by the air data inertial reference unit and used by the primary flight computer, autopilot and other aircraft systems).
- U.S. Customs and Border Protection Predator-B, Nogales AZ, 2006. (the loss of engine power resulted in loss of electrical power except for the standby battery, attributed to defective system design and missing requirement that allowed an unsafe condition to arise by allowing handover with a misplaced control lever setting and a susceptibility to a single point failure).
- The Qantas A330 incident on October 7, 2008 (caused by an abrupt pitch down due to a faulty air data inertial reference unit sending incorrect data to the flight control system and caused partially by a single event upset in the digital equipment).
- Several instances of Boeing 787 (e.g., October 29, 2014 Australian registered B787) transmitting inaccurate Automatic Dependent Surveillance—Broadcast (ADS-B) positional data due to improper software logic used for extrapolation of longitude and latitude.

<u>Aircraft Cyber</u>

The focus of this Aircraft Systems Information Security Program (ASISP) cyber research is on the aircraft itself and includes aircraft connectivity to external links (also called access points or apertures). The research tasks identify and assess aircraft cyber risk and provide recommendations for mitigation of security vulnerabilities in aircraft net-centric architectures and internal/external wired and wireless interfaces that could affect aircraft safety.

The research addresses one of the four FAA Administrator strategic initiatives (Risk-Based Decision Making RBDM), and outlined in broader FAA requirements from FAA Order 8000.369 (SMS - Safety Management System, May 2013) and FAA Order 8040.4b (SRM - Safety Risk Management, May 2017). Order 8000.369 states that *"FAA organizations with product/service provider oversight responsibility apply the concepts of Safety Risk Management (SRM) to decisions that may lead to the initiation of regulatory changes through rulemaking. Doing so ensures that regulations address hazards in the aerospace system and provide boundaries on acceptability of design and performance of products and services."* Order 8000.369 further states that *"SMS is the formal, top-down, organization-wide approach to managing safety risk and assuring the effectiveness of safety risk controls. It includes systematic procedures, practices, and policies for the management of safety risk. The four main components of an SMS are: (1) Safety Policy, (2) Safety Risk Management, (3) Safety Assurance, and (4) Safety Promotion. They provide a means of defining SMS within the FAA and a systematic approach to describing and achieving the desired safety performance."*

A systematic approach is needed for to address aircraft cyber risks, also known as ASISP. The Order also mandates that AVS *"must establish and maintain [a] SRM function that provides for initial and continuing identification of hazards and the analysis and assessment of safety risk."* "[An] *organization's SRM must meet the intent of the policy set forth in the latest version of FAA Order 8040.4, Safety Risk Management Policy, and accomplish"*: system analysis, identify hazards, analyze safety risk, assess safety risk, control safety risk, track and monitor. Given the more-recent introduction of networked aircraft avionics, ASISP is an emerging area of concern for the FAA, and there is a need to implement a systematic SRM process to address these potential safety risks.

In addition to these long-standing FAA Orders, on 8/17/17 OMB issued memorandum M-17-30, identifying Presidential priorities for R&D federal funding. The ASISP program addresses "American Security", one of the four "R&D Priority Areas". ASISP is responsive to "*Emerging threats…. [that] compel the Federal Government to develop the technologies necessary to prevent terrorist attacks, mitigate the effects of… adversarial threats and hazards. Agencies should invest in R&D to increase the security and resilience of the Nation's critical infrastructure from… cyber-attacks.*" Of the three "R&D Priority Practices", ASISP addresses two. The first is "Supporting Innovative Early Stage Research - agencies should give priority to funding basic and early-stage applied research that, supplemented by private sector financing of later-stage R&D, can result in the development of transformative commercial products…. Strong partnerships with the private sector will be critical to maximizing the efficacy of Federal funding. Furthermore, agencies should take advantage of innovation from the private sector, where possible, to adapt to Federal needs." The second is "Maximizing Interagency Coordination - Agencies should support ongoing interagency initiatives and participate in applicable interagency coordination groups. The interagency process is encouraged to avoid duplicative efforts and maximize collaboration…." Of the two "R&D Workforce and Infrastructure" areas, ASISP supports "Modernizing and Managing Research Infrastructure - Innovative partnership models involving other agencies, state and local governments, the private sector, academia, and international partners can help maximize utilization of underused facilities and lead to sharing the costs of new R&D facilities."

In FY 2020, the aircraft cyber security/ASISP research will refine a methodology to permit efficient complex subject safety risk assessments (SRAs). The research also will enhance the ability to estimate impacts to industry (including cost-benefit analysis) resulting from potential implementation of mitigation alternatives. Additional SRAs will be conducted on aircraft avionics subjects selected in coordination with AVS. Coordination efforts will begin with AVS field offices for definition and refinement of their role in the SRA process and to restructure SRA reports to focus on AVS data requirements and recommendations tailored to rulemaking and policy. A training package will be developed to define the role of AVS subject matter experts in the ASISP SRA process. Program efforts also will extend collaborative efforts with industry, academia and other Government organizations. Comparison of multiple completed SRA reports will be conducted for the first time to understand how FAA regulation and policy might be impacted more broadly and proactively.

The technical data from this ASISP research will be used to provide information to support the development of policy, guidance, best practices, standards, regulations, and training procedures to address gaps, safety issues, and potential malicious intent from various cyber threats.

Major Activities and Accomplishments Planned in FY 2020 Include:

Aircraft Icing

- Conduct collection efficiency tests using new process(es) for measuring collection efficiencies on target geometries.
- Conduct experiments and analysis to support developing, improving, and evaluating Computation Fluid Dynamics (CFD models) that incorporate large drop dynamics from impact through ice accretion and growth.
- Evaluate and improve the capability of a snow generation system ("snow machine") to simulate specified outdoor conditions.
- Investigate cold soaked fuel frost (CSFF) through facility testing and develop and evaluate frost thickness and frost roughness analytical models.
- Identify technical and operational issues important to the safety and efficiency of ground operations in winter conditions and amenable to research investigation.

- Complete small-scale model rotating rig to conduct simulated compressor studies.
- Investigate using a small-scale rotating rig the key drivers that cause internal engine ice accretions due to ice crystal icing conditions.

Digital System Safety

- Study the Distributed Integrated Modular Avionics Systems' architecture, identify the safety issues and validation and verification challenges, and develop recommendations to mitigate the assurance challenges.
- Develop a Generic Framework (Using Overarching Properties) and metrics for assurance processes and evaluate the assurance metrics using test cases.
- Study the assurance issues of Artificial Intelligence/Machine Learning implementations in airborne systems and develop assurance criteria/objectives.

Aircraft Cyber

- Extend collaboration with industry, academia and other Government organizations.
- Implement ASISP methodology into the Office of Aviation Safety's (AVS) business processes, which includes Certification.
- Development of training package for role of AVS subject-matter experts in SRA process.

Goals for FY 2020 Funding:

Aircraft Icing

- By 2021, develop data package of experimental, test, and analytical results that can be used for the development of guidance materials for means of compliance for certification in SLD conditions.
- In 2022, provide data package supporting annual guidance to airline industry for update of the ground deicing programs.
- In 2022, improve existing test and analysis capabilities and develop new engineering tools that can be used for means of compliance and for the development of new guidance material for engine rulemaking for aircraft engine certification and operations in mixed-phase, and ice crystal icing conditions.
- In 2023, provide data package supporting annual guidance to airline industry for update of the ground deicing programs.

Digital System Safety

- By 2022, identify assurance issues with the use of new technologies in the development of safety critical systems, analyze digital system safety issues that could affect aircraft airworthiness and develop assurance criteria for safe certification.
- By 2022, develop generic framework for assurance and determine an acceptable means to analyze, integrate, validate, and verify complex airborne digital systems to reduce cost and improve safety.

Aircraft Cyber

- By 2021, develop a comprehensive ASISP Safety Risk Management process for decision-making concerning policy, guidance and regulation.

What benefits will be provided to the American public through this request and why is this program necessary?

Aircraft Icing

Industry leaders believe that analysis using computational fluid dynamics (CFD) computer software is now sufficiently mature that aircraft icing certification can rely more on Certification by Analysis (CBA), and have asked the FAA to consider expanding the use of this approach. Use of CBA has the potential to increase icing certification efficiency, thus saving costs, while maintaining or enhancing the safety of the flying public. This program is necessary to establish a sufficient database for evaluation and validation of CFD software for icing certification of swept wing aircraft, which predominate among transport aircraft. Certification of aircraft under the new rule for supercooled large drop (SLD) conditions requires improved and validated means of compliance, ensuring safety of the flying public on these aircraft in SLD conditions. This program is necessary for development of needed methods for certification to the new rule. FAA ground icing research enables the FAA to provide industry timely guidance to airlines each winter on safety issues that have arisen, and also to provide international leadership in this area through its role in the international SAE Ground Deicing Committee. In this way it promotes uniformity and safety in ground deicing and anti-icing practices not only in the U.S. but also around the world, including the growing markets in Southeast Asia. This program is necessary for the FAA to continue to play this role both domestically and internationally. Engine power loss and other icing events in high ice water content ice crystal conditions pose a significant risk to the flying public. Research into the complex physical causes of these events in controlled environments provides information essential to industry in minimizing the risk through engine design and modification. This program is necessary to continue the research.

Digital Systems Safety

The Digital System Safety research proactively looks into the safety issues of highly integrated systems and has the potential to prevent accidents/incidents and mitigate fatalities and injuries. While great strides have been made in the processes of developing and verifying individual components, developing and verifying the functionality and behavior of a system of complex components still contains many challenges to be resolved at both the component level and system level. Inadequate and misunderstood integration, validation, and verification techniques for complex components leave potential for faults to exist with failure manifestation at the aircraft level. Most standards and regulations address development and safety requirements for individual components. Little exists for complex, highly integrated components and resulting systems, particularly using commercial-off-the-shelf equipment developed for a non-aviation (non-safety) market. As technology continues to change and become more complex, the verification and validation processes must change to adequately assess systems for compliance to the regulations and to minimize risk to the public. Research will be conducted in collaboration with the other agencies such as NASA to maximize the benefit and minimize the cost.

Aircraft Cyber

Aircraft network systems security is an increasing concern for current and future aircraft. Recently some of these concerns have also been documented by the Government Accountability Office (GAO)[2]. The future generations of aircraft will be increasingly network centric with expanded aircraft connectivity for improved safety, operations, and maintenance. The aircraft manufacturers and modifiers are installing avionic systems to allow increased connectivity within an aircraft, as well as to networks external to the aircraft, to take full advantage of new computer technologies for more efficient aircraft operations and safety enhancements. The increased connectivity - particularly to external networks and systems without sufficient security controls - could introduce information security vulnerabilities. If this is exploited, it could impact safe aircraft operations and continued airworthiness. Examples of such external networks and services - referred to as apertures - include airline operation centers, airport gate links, radio and satellite communication (including voice, data & navigation), aircraft software uploads and maintenance, electronic flight bags, flight information databases, etc. These concerns, which encompass certification and continued operational safety, will be addressed through the ASISP initiative. Because air transportation demands are expected

[2] GAO, GAO-15-370 (published April 14, 2015) entitled *FAA Needs a More Comprehensive Approach to Address Cybersecurity as Agency Transitions to NextGen*.

to continue increasing in the near future, capacity, and efficiency need to increase to avoid huge delays in civil aviation. One key enabling technology to improve the capacity and efficiency of the NAS is to allow future generations of aircraft to be network centric with advanced avionics systems that will allow for improved safety, operations, and maintenance. This can only occur if the aircraft avionics systems can ensure data integrity and reliability. The ASISP initiative will help the aviation industry and the FAA to promote the safety of aircraft avionics systems from cyber threats and provide the public benefit of timely and safe air transportation.

Detailed Justification for A11.e Continued Airworthiness

FY 2020 – A11.e Continued Airworthiness - Budget Request
($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
A11.e Continued Airworthiness	$11,269	$11,269	$11,269	$10,006

What is this program and what does this funding level support?

The Continued Airworthiness research program supports the FAA aviation safety oversight responsibility to ensure that aircraft maintain operational safety as they age. The FAA accomplishes this in two ways: first is by anticipating ageing issues during the certification process and ensuring that they are adequately covered in the operations, maintenance, and inspection protocols of the application; and, second, by monitoring the in-service data as it is accumulating, finding issues at the earliest possible point, and ensuring that they are managed through Advisories, Directives, regulation, or other guidance.

Since its establishment, the program has led extensive studies on the in-service behavior of airframe structures and aircraft systems. The knowledge and information produced directly supported a wide range of FAA safety rulemaking including: the *Aging Aircraft Safety Rule* (AASR) 2005; the *Damage Tolerance Data for Repairs and Alterations* rule under 14 CFR Part 26, 2007; Order 8110.104, *Responsibilities and Requirements for Implementing Part 26 Safety Initiatives*, 2007, as well as related guidance materials and advisory circulars.

Recent years have seen rapid evolution in every aspect of aircraft. Composites and new metallic alloys are being used extensively in primary structures. Large-scale integration techniques are being applied to combine the many diverse existing electronic systems - as well as entirely new systems driven by NextGen implementation - into a few digital electrical systems. Hydraulic and other mechanical systems are being replaced by electro-mechanical and electro-hydraulic systems, which in turn require radical changes to the electrical power system. Finally, propulsion technology is rapidly evolving as manufacturers seek and incorporate new technologies to increase fuel. The introduction of so many new technologies in such a short period results in great improvements in efficiency, cost, and environmental footprint. However, these new technologies are not as well understood as traditional ones and therefore represent significant risks to safety. Therefore, a proactive approach to research is necessary to maintain the level of safety that the American public demands today.

For FY 2020, the FAA will focus on the following topics:

<u>Aircraft Electrical Systems</u>

To improve aircraft efficiency, reliability, and maintainability, the aerospace world has found that progressive electrification of on-board services reduces or removes the need of the hydraulic, mechanical and bleed air/pneumatic systems. This change offers advantages in safety, efficiency and aircraft performance. Implementation and reliability issues have been experienced early on due to the large volume of installed electronics in new areas of the aircraft. Fast progress in semiconductors and materials will result in greater computer control of the aircrafts electrical power distribution system. New electrical energy storage devices will achieve greater power density and efficiency improvements in the future. Architectural solutions further improve overall aircraft performance, multiple use, energy-optimized aircraft coupled with high level of integration and interaction between systems will continue to grow exponentially. The output of this research will be used to develop and publish FAA regulations and guidance addressing safe certification of aerospace vehicles utilizing electrical concepts.

Flight Controls and Mechanical Systems (FCMS)

The small airplane branch's number one safety goal is to reduce general aviation fatal accidents due to loss of control. FCMS research will address this safety goal by conducting research in a number of different areas. The Integrated Flight Path Control research effort will help the FAA identify design and certification requirements for flight path control autopilot technology in General Aviation (GA), and will initially promote the design and certification of fielded systems through articles, policy, public venues, etc. This research will subsequently promote fully integrated flight path control through properly assured automation technology. Additional research will address the General Aviation Joint Steering Committee/FAA General Safety Interventions that feed the design and certification of an advanced flight path control systems to enhance general aviation safety. Research will also be conducted to address transfer of unmanned aircraft system (UAS) technologies for enhancement of general aviation safety and will explore whether unmanned aircraft systems technologies such as sensors, autopilots, and automation systems can quickly and affordably address loss of control accidents in general aviation.

Rotorcraft Systems

Rotorcraft research for FY 2020 will focus on one area: creating guidance materials for wire strike avoidance. Wires represent a significant hazard for low-flying helicopters. Collisions with wires can result in helicopter damage and, often, injuries or fatalities. This research will investigate numerous ways to mitigate wire strikes by providing the pilot with 1) the ability to locate – and ultimately avoid – wires near the rotorcraft or 2) technology to sever the wire before it causes major damage.

Structural Integrity Metallic (SIM)

Many of the new metallic materials being introduced are much more process intensive than more traditional materials. Others are alloys, which are being tailored for specific structural applications. In either case a good understanding of their mechanical behavior and long-term durability is needed to provide the appropriate regulatory guidance and to properly update the Metallic Materials Properties Development and Standardization (MMPDS). SIM research considers both air transport and small airplanes and will focus on the certification and continued airworthiness issues of emerging technologies such as new aluminum-lithium and other "tailored" alloys, Additive Manufacturing (AM), advanced joining methods, and hybrid metallic –composite structure. Data-driven risk management methods will also be developed to support risk-based continued operational safety decision-making process for aircraft structures.

Major Activities and Accomplishments Planned in FY 2020 Include:

Aircraft Electrical Systems

- Identify and quantify the short and long-term risks to current and future safety risks associated with more electric aircraft for aerospace applications including a potential failure mode and effect.
- Conduct research to describe mitigating factors constituting a FAIL/SAFE electrical energy storage installation for aerospace including investigation of an applications electrical primary propulsion systems.
- Examine current power distribution design of aircraft generators and auxiliary power unit and look at how for example multiple smaller generators and energy harvesting can be incorporated into a new aircraft electrical power distribution system.

FCMS

- Identify new autopilot systems that could be utilized to enhance General Aviation (GA) Safety, and identify on what platforms they could be used.
- Identify design and certification requirements for flight path control autopilot technology in GA Aircraft.
- Develop a Method of Compliance to certify new and novel Fly-by-Wire airplanes.

Rotorcraft Systems

- Identify currently available safety equipment to mitigate wire strikes (including wire cutters and sensor systems), conduct testing of both technologies and report on feasibility and recommendations.

Structural Integrity

- Assess emerging technologies in partnership with industry to support developing policy, guidance and standards needed for certification and continued airworthiness. Emphasis placed on testing advanced fuselage panels using the FAA's Full-scale Aircraft Structural Test Evaluation and Research (FASTER) Lab and repairs to wing panels using the FAA's Aircraft Beam Structural Test (ABST) fixture.
- Collaborate with NASA, DoD and industry in, developing, maintaining, and distributing the annual update to the Metallic Materials Properties Development and Standardization Handbook, recognized as the premier source worldwide for material properties used in aircraft certification and continued airworthiness.
- Through collaborations with industry-government consortia, generate data to assess metal additive manufacturing technologies in support of developing appropriate policy, guidance, standards, and rulemaking.
- Develop tools, methodologies and data to mitigate the risk associated with structural fatigue of small airplanes.

Goals for FY 2020 Funding:

- By 2021, determine characteristics of safe rechargeable lithium batteries and battery systems installations and develop technical data to evaluate battery systems for aerospace applications.
- By 2021, develop technical data to evaluate the feasibility of using fuel cell systems for aerospace applications while retaining or improving the current level of safety in commercial transport aircraft.
- By 2021, distribute annual update to the Metallic Materials Properties Development and Standardization Handbook and database.
- By 2022, develop a process for establishing mechanical property standards (used in FAA certification guidance) for emerging process-intensive metallic materials, including metal additive manufacturing.
- By 2022, develop technical data to evaluate the use of electronics to detect wires and physical wire cutting technology to reduce rotorcraft wire strikes.
- By 2023, publish advisory circular and/or share results with the American Society for Testing and Materials (ASTM) on the new autopilot technology, with advanced flight path control for incorporation into an industry standard.
- By 2024, develop an understanding of the certification and continued airworthiness issues associated with emerging technologies including unitized welded structure, new metallic alloys, hybrid bonded construction and repair technologies to be used in support of developing appropriate policy, guidance, standards, and rulemaking.

What benefits will be provided to the American public through this request and why is this program necessary?

The Continuing Airworthiness program provides increased safety for the public. By developing requirements and guidance for the certification of augmented flight path control, the FCMS research on 'Integrated Flight Path Control to Address GAJSC/FAA GA Safety' could significantly reduce the number of 'controlled flight into terrain' and 'loss of control' accidents in the GA community. In addition, the 'Transfer of UAS Technology for Enhancement of GA Safety' research requirement could dramatically improve GA aircraft safety by reducing accidents caused by stall, spin, and loss of control.

The primary benefit of SIM research is to allow the safe introduction of new metallic material forms and technology advancements onto the U.S. aviation fleet to improve operational safety, ensure continued airworthiness, and prevent and mitigate accidents. In addition, the program promotes a uniform level of safety by developing and maintaining safety standards through a widely recognized government-industry organization. Through this program, FAA resources are optimized by streamlining approval of data submittals, allowing for the rapid response to safety issues, and providing improved confidence in data for decision-making.

Technical data from the rotorcraft safety research will lead to improved rotorcraft safety in known wire strike areas. This program will diminish wire strikes and fatalities by implementing procedures and/or improving the certification basis for new helicopters and/or revealing new technology to alert pilots to the proximity of wires.

The ES research benefits the flying public by ensuring that the rapid pace of evolution of aircraft technology does not compromise safety. It also benefits industry by ensuring that the FAA is prepared for certification applications for novel aircraft technology and does not impose an unacceptable delay or regulatory burden. It assures that the Aircraft Certification Offices (ACOs) have a working understanding of the novel technology and risks and mitigation techniques for safe flight.

Detailed Justification for A11.f Flightdeck/Maintenance/System Integration Human Factors

FY 2020 – A11.f Flightdeck/Maintenance/System Integration Human Factors - Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
A11.f Flightdeck/Maintenance/System Integration Human Factors	$7,305	$7,305	$7,305	$5,973

What is this Program and what does this Funding Level Support?

The Flightdeck/Maintenance/System Integration Human Factors Program provides the research foundation for FAA to update guidelines, handbooks, orders, Advisory Circulars (AC's), technical standards orders, and regulations that help 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.

The Flightdeck/Maintenance/System Integration Human Factors Program focuses on the needs of pilots, inspectors, and aircraft maintainers. The revolution in digital avionics has changed flight deck design and operational practices and enabled new Head-Up Display (HUD) technologies, surface moving maps, electronic flight bags, advanced controls, communications, navigation, surveillance systems, and tools for aircraft system management. With these advances come important human performance implications which must be understood and applied in the appropriate guidance material developed for policy, procedures, operations, and training. This research supports the development of these products. Human error continues to be a major contributor to aircraft accidents and incidents both in commercial and general aviation (GA). Current research is proactive in identifying error tendencies and developing mitigations; thereby enhancing the safe and effective introduction of new technologies and procedures into the National Airspace System (NAS).

The Advanced Vision Systems (Enhanced Flight Vision System (EFVS), Enhanced Vision System (EVS), Synthetic Vision System (SVS), and Combined Vision System (CVS), Heads Up Display (HUD), and Head Mounted Displays (HMD) Research Program will characterize pilot performance considerations using the latest technology in Advanced Vision Systems, HUDs, and HMDs for low visibility conditions. Research will additionally inform operational requirements, standards, conditions, and limitations to ensure safe operations. This research will increase access to airports in adverse weather conditions without costly changes to the airport infrastructure.

The Fatigue Mitigation in Flight Operations Research Program will reduce accidents and incidents caused by air carrier pilot fatigue. Pilot fatigue data will be evaluated to determine the effectiveness of fatigue risk management approaches utilized by 14 CFR Part 121 certificate holders under Part 117. This research will improve flightcrew member alertness through regulatory updates and educational materials associated with fatigue risk-management programs (FRMP) and fatigue risk-management systems (FRMS).

The Pilot Training, Qualification, Procedures and Flight Operations Research Program is new in FY 2020. This research component will examine the effectiveness and appropriateness of various methods of training, qualification, and operations. This involves addressing methods and specific topics, including crew resource management and performance-based airman certification. This research will provide data-driven guidance to inspectors and operators on training methodologies (especially concerning use of technologies in training, such as distance learning and virtual reality) and operational procedures.

Major Activities and Accomplishments Planned in FY 2020 Include:

Advanced Vision Systems (EFVS, EVS, SVS, and CVS) HUD and HMD: Operational Standards and Approval Criteria

- Develop operational standards and approval criteria for specific Synthetic Vision Systems operations and head-up display operations.
- Identify potential pilot performance and operational impacts associated with using Combined Vision Systems in low visibility operations.
- Identify potential pilot performance and operational impacts associated with using head-mounted displays in place of head-up displays in low visibility operations and operations using advanced vision systems.

Fatigue Mitigation in Flight Operations

- Compare the effectiveness of fatigue risk management programs on fatigue mitigation both before and after implementation of 14 CFR Part 117.
- Investigate the effects of short haul multi-segment flight operations on pilot workload and cumulative sleep loss across trip pairings and provide recommendations for operational guidance and educational materials.
- Investigate the effects of multiple time zone shifts associated with long-haul and ultra-long-range flight operations on pilots behavioral and physiological adaptations and provide recommendations for operational guidance and educational materials.

Pilot Training, Qualification, Procedures and Flight Operations

- Assess different training methodologies to enable more cost-effective flightcrew training with similar or superior quality.
- Develop improved guidance for pilot operational procedures to enable safer and more effective flight operations.
- Analyze the upcoming pilot workforce to help adapt training and procedures to address any emerging risks associated with generational differences.

Goals for FY 2020 Funding:

- By 2021, reduce the accident rate with pilot fatigue in flight operations as a causal or contributing factor.
- By 2021, revise Advisory Circulars (e.g., AC 120-103 A) associated with the flightcrew member duty and rest regulations as determined by the continuous monitoring and analysis of the FRMS and FRMP databases.
- By 2021, revise FAA training and checking guidance based on Scientific and technical data from field tests on new methods of crew resource management training and checking with emphasis on pilot monitoring, startle and surprise, resilience, decision-making and command judgment.
- By 2022, make recommendations for training mechanisms and methodologies based on Scientific and technical data.
- By 2024, increase safety, access, efficiency, capacity, and throughput in low visibility conditions by expanding the use of advanced vision systems, head-up displays, and head-mounted displays.
- By 2024, develop and/or revise the guidance needed for pilots, operators, inspectors, and airport personnel to conduct low visibility operations using advanced vision systems.

What Benefits will be provided to the American Public Through this Request and why is this Program Necessary?

The flying public depends on the FAA to ensure the safety of flight operations and this program supports that goal by providing scientific and technical information to those responsible for regulations and guidance that ensure safe pilot and maintainer performance. Recent NTSB data show that human error is a contributory factor in 81 percent of aircraft accidents. Tragic accidents such as Asiana and Colgan emphasize the continuing need to address flightcrew performance. While many human errors warrant research, this program has been scaled to address some of the most critical areas for flight safety, as shown in the following:

Advanced Vision Systems — Certification and Operational Approval Criteria

This research program has demonstrated the safety of pilots using advanced flight vision systems to land at airports that do not have the appropriate infrastructure for low visibility conditions, and secondarily provided data posing the increased capacity of the national airspace system by use of these systems. This research program will continue to provide the FAA with guidance to keep up with the rapid pace of technology innovations. Pilot performance will be measured using new technologies to safely perform additional operations in low visibility conditions, increasing the capacity of our national airspace system.

Fatigue Mitigation in Flight Operations

This research provides the airline industry with methodology to measure fatigue and assess its risk. Research is needed to advance the science of assessing pilot alertness and predicting performance decrements due to fatigue. The findings of this research will be directly applied by the airline industry to improve flightcrew member alertness through educational materials associated with FRMPs and FRMS.

By taking advantage of new advancements in technology and improving the science of proactive risk assessments, this research will increase the safety and efficiency of air travel by ensuring highest level of human performance.

Pilot Training, Qualification, Procedures and Flight Operations

Analysis of accidents and incidents has determined that flightcrew training and operational procedures can be effective mitigations to reduce the accident rate in the near term. Concrete recommendations from this research will inform FAA guidance for training and procedures for both manual and automated flight, in the form of advisory materials and orders.

Detailed Justification for A11.g System Safety Management/Terminal Area Safety

FY 2020 – A11.g System Safety Management/Terminal Area Safety - Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
A11.g System Safety Management/Terminal Area Safety	$5,500	$5,500	$5,500	$4,309

What is this program and what does this funding level support?

<u>System Safety Management</u>

The System Safety Management (SSM) program is designed to improve safety through developing safety data collection methods, advanced safety data and risk analysis techniques, and prototypes of risk-based decision-making capabilities to identify and analyze emerging safety issues in a cooperative nature with aviation stakeholders. The program provides an ability to analyze trends across the aviation community that is more effective than monitoring individual certificated entities, (e.g., air operators and air traffic facilities).

The SSM program addresses issues identified in several U.S. Government Accountability Office (GAO) studies (e.g., http://www.gao.gov/assets/310/304182.pdf and http://www.gao.gov/assets/600/590389.pdf) that call for the FAA to collect better data and improve its effort to identify and address safety issues. In addition, the Integrated Domain Safety Risk Evaluation Tool (ID-SRET) project support the FAA commitment to the International Civil Aviation Organization's (ICAO) Global Aviation Safety Plan, which establishes objectives for 'implementation of an effective safety oversight system' and 'full implementation of the ICAO State safety program framework' by 2022, and 'establishment of an advanced safety oversight system including predictive risk management' by 2027. This program also promotes the FAA Risk-Based Decision Making Strategic Initiative.

Through this program, the FAA developed an infrastructure and capability - called Aviation Safety Information and Analysis Sharing (ASIAS) - that enables the free sharing and analysis of de-identified safety information derived from government and industry sources. Research is being conducted to understand the unique challenges posed by helicopters in terms of helicopter flight data monitoring (FDM) equipment, data formats, and processing techniques; and how to apply different safety risk methodologies to increase safety across the complex mix of helicopter mission segments and operational environments. Research will identify the tools and techniques necessary to analyze rotorcraft flight data and create prototype safety metrics specific to the unique needs of the helicopter community and its various mission segments. The helicopter FDM (HFDM) tool is available at HTTPS://HFDM-ASIAS.rotor.com. Research will also examine current and legacy training requirements and flight maneuvers for GA operations and assess the effectiveness of these maneuvers to determine which ones should be trained and tested to mitigate the loss-of-control accident rate.

In addition, through this program, the FAA developed a methodology and tool - called Facility Risk Assessment Tool - to determine risk at ATO facilities within the NAS by using safety indicators. The FAA's field and headquarter personnel can target available oversight resources towards facilities posing the highest risk to air traffic safety using this methodology. The research is being conducted to complete a methodology and decision-making prototype tool to support the evaluation of risk controls that are proposed by the Air Traffic Organization to mitigate or eliminate potential hazards due to changes in NAS. The scope and capabilities of the decision-making prototype tool available at HTTPS://ida.tc.faa.gov, identified as ID-SRET, supports the evaluation of risk controls proposed by the ATO to mitigate or eliminate potential hazards due to changes in NAS. The FY 2020 funding will allow the FAA to complete ongoing research, which includes an additional tool called Safety Oversight management System (SOMS), to improve the Air Traffic Safety Oversight Service's (AOV) safety oversight system and transform it into a state-of-the-art risk-based safety oversight system.

Terminal Area Safety

The Terminal Area Safety (TAS) program improves the safety of operations near or at an airport. Research projects in the program focus on developing training solutions and identifying effective technologies to mitigate key causes of fatal accidents such as the loss of control, runway excursions, and runway overruns. These are the leading causes of fatalities in the worldwide commercial jet fleet[3] .

The FAA will recommend solutions to reduce fatal accidents in the terminal area through:

- Extending simulator models to allow for better upset training;
- Exploring alternatives to determine runway slipperiness; and
- Developing objective motion criteria to minimize inappropriate simulator training.

In addition, the FAA will analyze the potential solutions to reduce fatal accidents in the terminal area through:

- Improving flight crew response during upset and recovery with an effective Angle-of-Attack indicator;
- Enabling safe helicopter approaches when using advanced vision systems;
- Exploring consistent operational standards for a stable approach to reduce runway excursions;
- Developing a logical go-around training curriculum that mitigates the operational go-around problems that have arise; and
- Performing flight tests on representative domestic and international runways that support turbine-powered airplane operations in order to validate the wet-ungrooved and wet-grooved wheel braking coefficient models in 14 CFR Part 25.109(c).

These projects address the principal causes of fatalities in the commercial jet fleet but also fill aviation safety research gaps identified in NTSB's Safety Recommendations A-07-003, A-04-62, A-07-64, A-01-069, and A-96-094 available at https://www.ntsb.gov/layouts/ntsb.recsearch/RecTabs.aspx.

Several landing overruns on wet runways, such as Southwest Airlines Flight 1919, a Boeing 737-700 at Chicago Midway Airport, IL on April 26, 2011, has raised questions regarding the validity of current wet runway stopping performance requirements and methods. Research will address issues regarding wet runway stopping performance requirements and methods and NTSB recommendation A-11-029 available at https://www.ntsb.gov/safety/safety-recs/_layouts/ntsb.recsearch/Recommendation.aspx?Rec=A-11-029.

Major Activities and Accomplishments Planned in FY 2020 Include:

System Safety Management

- Prepare technology transfer package and training materials for developed risk-based safety oversight capabilities.
- Conduct technology transfer to AOV users, i.e., AOV safety inspectors, technical staff, and management, and provide training to users.

[3] *Boeing Annual Summary of Commercial Jet Airplane Accidents* that is based on corresponding ICAO, NTSB, and Flight Safety Foundation (FSF) definition of accidents and events (*Statistical Summary of Commercial Jet Airplane Accidents Worldwide Operations 1959 – 2014*).

Terminal Area Safety

- Design flight test experiments to assess the feasibility and integration of new technologies or training solutions into aircraft onboard systems or flight crew training programs to improve safety.
- Perform flight tests using FAA's WJHTC Flight Program aircraft and resources, and/or using potential partners in aviation industry to conduct flight tests.
- Review current simulator/flight training device models for fidelity and gaps in model data.
- Conduct data analysis, document research findings, and provide recommendations, if needed, to the FAA's AVS.

Goals for FY 2020 Funding:

System Safety Management

- By 2021, complete and transform the risk-based safety oversight capabilities into a functional capability that can be utilized as a risk-based decision support tool for safety oversight of ATO operations.
- By 2023, provide risk-based decision-making support prototype tools to enhance Aviation Safety Services' oversight capabilities.

Terminal Safety

- By 2022, develop and validate models to estimate the wheel braking capability of aircraft based on runway parameters and meteorology data.
- By 2023, provide recommendations for wet runway performance standards as well as runway construction and maintenance standards.
- By 2024, provide recommendations for changes in policy, regulations, guidance material, and training requirements for implementing advanced vision systems in helicopter operations.
- By 2026, develop and test higher-fidelity mathematical and performance models of helicopter flight dynamics during various mission segments and phases of flight.

What benefits will be provided to the American public through this request and why is this program necessary?

SSM projects benefits the public through a reduction in the risk of accidents and incidents associated with air traffic control; in particular, by providing risk-based analysis capabilities that identify and assess emerging safety risk issues to support AOV's oversight mission. Many upcoming NAS changes affect airborne and ground-based systems as well as aircraft, airport, and air traffic procedures – elements that cross multiple FAA lines of business. The risk-based safety oversight capabilities will help to ensure that proposed changes to the NAS do not increase risk associated with existing NAS systems. In addition, these capabilities will help the FAAs field and headquarter personnel target available oversight resources towards facilities posing the highest risk to air traffic safety using this methodology.

Research projects in the SSM program support improved risk-based decision-making, which allows the FAA to (a) identify system-level vulnerabilities through evaluating and developing aggregate level data and metrics, (b) determine indicators of performance (safety metrics) and processes to reliably identify potential risk, and (c) identify and assess risks associated with anticipated changes in procedures or technologies.

TAS research benefits 1) the public, by reducing the risk of incidents or accidents through developing training solutions and identifying effective technologies to mitigate key causes of fatal accidents such as the loss of control, runway excursions, and runway overruns, and 2) the aviation community, by developing safety standards in collaboration with aviation industry such as wet runway performance and runway construction/ maintenance standards that reduce the risk of miscalculating aircraft stopping performance on wet runways.

Research projects in the TAS program are necessary to support the development of new operational guidance and data packages in support of training and standards that mitigate risk of fatal accidents such as the loss of control, runway excursions, and runway overruns in the terminal area.

Detailed Justification for A11.h Air Traffic Control Technical Operations Human Factors

FY 2020 – A11.h Air Traffic Control Technical Operations Human Factors - Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
A11.h Air Traffic Control Technical Operations Human Factors	$5,800	$5,800	$5,800	$5,474

What is this program and what does this funding level support?

The Air Traffic Control/Technical Operations (ATC/TO) Human Factors program responds to research and development (R&D) requirements defined by offices in ATO and other FAA headquarters technical sponsors. The program provides timely R&D products and consultation services that focus on improving the safety and efficiency of complex ATC systems. As R&D budgets have declined, efforts have been concentrated using in-house FAA R&D capabilities and staff to address ATO challenges in four human factors R&D focus areas (1) methods and data to optimize the controller and technical operations workforces, (2) guidance to reduce air traffic controller and technician errors and improve safety, (3) efforts to support integration of technology into the NAS; and (4) development of recommendations and methods for enhancing human performance, including individual and team performance.

ATO human factors challenges currently center on evolution of the workforce and the advancing technologies and associated procedures that are expected to be implemented in the NAS over the next several years. The workforce challenges are especially acute in the large terminal radar air traffic control facilities (TRACONs) and in several of the busy air route traffic control centers (ARTCCs). FAA is challenged to hire, place, and train several thousand new air traffic controllers in the coming years, while continuing to provide safe and efficient air traffic services to the users of the National Airspace System with a dwindling number of fully qualified staff (Certified Professional Controllers). We will also see considerable hiring and training to address a shortage of several hundred technical operations specialists, who are essential for maintaining and certifying systems and services for use in the air traffic control system. Funding in FY 2020 will enable us to help our ATO customers improve the efficiency with which they can select and train new aviation professionals.

Human performance is a key factor in total system performance, and enhancements to human performance will contribute to enhancing the total system's performance, reducing errors, and helping reduce life cycle ownership costs. The program, through the FAA Program Management Office's (PMO) coordination, strives to provide useful human factors R&D results that support the development and implementation of new technologies and procedures in the National Airspace System, in accordance with FAA Order 9550.8 *Human Factors Policy*, which specifically requires that *'Human factors shall be systematically integrated into the planning and execution of the functions of all FAA elements and activities associated with system acquisitions and system operations. FAA endeavors shall emphasize human factors considerations to enhance system performance and capitalize upon the relative strengths of people and machines. These considerations shall be integrated at the earliest phases of FAA projects.'* The program assures that the proper roles and responsibilities are assigned to the ATO workforce to assure that controller and technician capabilities are compatible with the advanced technology they use in their jobs, and that the resulting level of air traffic system performance meets operational requirements and fulfills the safety and efficiency objectives. FAA's headquarters human factors team also continues to provide human factors subject matter expertise to the Joint Resources Council and will coordinate with the PMO human factors office for reviewing how acquisitions have complied with human factors design requirements through the In-Service Decision review checklist process.

The ATC/TO Human Factors program currently includes the following research activities:

- Conduct analyses and develop recommended practices for facility managers to increase the likelihood that controller trainees will succeed in field training, such that trainees are not lost due to factors other than their ability to control air traffic.
- Conduct targeted analyses to support data-driven decision making at the FAA Academy's Air Traffic Division, to document and provide recommendations for improving the reliability of raters who evaluate ATC student performance.
- Develop data mining methods to obtain and evaluate controllers' use of new equipment and system functions that provide additional air traffic control capabilities, and develop an approach for analyzing the data that will provide insights to acquisition programs and operational evaluation teams about which capabilities have been under-used as well as some of the operational human factors aspects that may limit their use.

Major Activities and Accomplishments Planned in FY 2020 Include:

R&D to Support Controller Selection, Placement, and Training Performance Evaluation

- Evaluate controller selection in relation to predictors of FAA Academy and field training success, and use the results to identify potential areas for the Air Traffic Organization (ATO) technical sponsor and FAA Human Resources (AHR) to improve the selection process.
- Provide recommendations to AJI and ATO facility managers to address training environment challenges that adversely affect performance of developmental and CPC-IT controllers during field training.

Air Traffic Control Safety R&D

- Recommend improvements to controller visual scanning techniques to reduce runway incursions and loss of standard separation at tower-controlled airports.
- Provide recommendations to the ATO's Program Management Office for display of information to the controller, based on findings from human-in-the-loop simulations using multiple controller decision support tools and capabilities presented on large screen (43 inch) air traffic control displays.

Goals for FY 2020 Funding:

- By 2021, evaluate controller selection in relation to predictors of FAA Academy and field training success, and use the results to identify potential areas for AJG and AHR to improve the selection process.
- By 2021, provide recommendations to AJI and ATO facility managers to address training environment challenges that adversely affect performance of developmental and CPC-IT controllers during field training.

What benefits will be provided to the American public through this request and why is this program necessary?

The National Airspace System (NAS) is a human-centered enterprise. NAS safety and efficiency depend on well-designed, operated, and maintained systems. The FAA's Human Factors research program provides products to enhance the quality of this service through the successful integration of the human into the total system. The benefit is reflected in improvements to air traffic safety and efficiency, which are both necessary for an air transportation system that serves the American public.

Improving Infrastructure: Among the most complex and prevalent problems facing aviation safety are those involving human error. To achieve quantifiable improvements in aviation safety and improve efficiency, increasing emphasis is being placed on the human operator and those involved with the safe and efficient conduct of flight (e.g., supervisors, air traffic controllers, maintenance technicians). The human factors program is responsible for proactively identifying the potential for human error and recommending mitigations to reduce the probability that people will make errors, minimize the impact of such errors, and through the informed application of technology and procedures, enhance the potential for human operators and maintainers to arrest the error and recover in a timely manner. In addition, through our research efforts, we seek ways to capitalize on human capabilities to address unforeseen events. The intent is to improve human-system performance and the resilience of the air traffic system when system anomalies occur (e.g., when equipment or software degrades or fails, or if a situation arises where there is a gap in operational procedures).

Improving Mobility: This research program provides products that are intended to increase the probability of success in selection and training and to make better use of FAA resources for training air traffic controllers and technical operations personnel. The anticipated effects are reduced attrition and reduced training times for new personnel to achieve full qualification, and while reducing costs for selection and training efforts. Anticipated benefits include better ATC service and system support (i.e., greater NAS component availability) to promote the efficient delivery of air traffic services throughout the NAS.

Promoting Safety: One of the critical elements of this program relates to the human performance aspects of safety in the NAS. A review of the FAA ATC five greatest safety concerns during recent years shows that all of the issues involve controller performance. This program provides the human factors research and expertise upon which FAA system development programs rely to ensure that FAA ATC/TO systems are accepted by the user community and utilized to achieve maximum operational benefit. As new technologies and procedures are implemented, this program continues efforts to improve human performance by reducing the likelihood of human error and increasing the probability that controllers and maintainers will successfully recover from undesired events, improving the resilience of the NAS.

The request assumes that staff to conduct certain human factors work would now be included in F&E Activity 5. For FY 2020, this transfer 10 FTP/FTE who work on prototyping and development activities already funded in Facilities & Equipment Activity 1, which differs from the applied research that is funded from the RE&D account.

Detailed Justification for A11.i Aeromedical Research

FY 2020 – A11.i Aeromedical Research - Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
A11.i Aeromedical Research	$9,080	$9,080	$9,080	$9,575

What is this program and what does this funding level support?

The Aeromedical Research Program develops new and innovative ways to support FAA regulatory and advisory missions to improve the safety of humans in civilian aerospace operations. Personnel at the Civil Aerospace Medical Institute (CAMI) in Oklahoma City, Oklahoma, discover methods and recommend strategies to enhance the safety of the most important aspect of the National Airspace System (NAS): the human (e.g., the operator and the public who she/he serves). CAMI is the only entity that performs this work on behalf of the U.S. The results of this research improve aeromedical certification decision-making processes, education programs, accident investigation practices, certification of aircraft equipment and protective devices, and harmonization of standards across the world.

Aeromedical research is performed by in-house personnel of the Aerospace Medical Research Division of CAMI. The division has two branches, Bioaeronautical Sciences and Protection & Survival, each with five research teams. The program is formulated to keep abreast of emerging human safety risk issues such as those brought by the aging pilot population with changes in their health condition and accompanying therapeutic solutions. It also concerns aircraft materials, equipment, cabin configurations, life support systems, and cabin evacuation procedures that may affect survival from an aircraft accident. The program is also designed to address the complexity of software, technology, and systems integration practices as these continue to evolve. Advances in computational biology, omics sciences, modeling & simulation, and tools to facilitate the integration of very large aeromedical data sets containing disparate information will lead to improved knowledge management and decision-making processes in aerospace medicine.

Major Activities and Accomplishments Planned in FY 2020 Include:

- Aerospace Medical Systems Analyses
- Forensic Toxicology Reports - U.S. fatal aircraft accidents
- Human Protection & Survival
- Rotorcraft Safety
- Fire & Cabin Safety

Goals for FY 2020 Funding:

- By 2021, BASICMED: describe the effect on aviation safety of the BASICMED regulations issued by PL 114-190 of July 15, 2016 (Sec. 2307 h, Medical Certification of Certain Small Aircraft Pilots).
- By 2021, Evaluation of ELEVAID: The Electronic Emergency Evacuation Aid for Aircraft Passengers (ELEVAID) tool will be evaluated to assess cabin safety issues such as passenger information retention, substitution of a virtual environment for a physical laboratory for testing, and certification of new aircraft signage and equipment.
- By 2021, Modernization of ATD Apparel: Update as necessary FAA Advisory Circular 25.562-1B and SAE standard AS 8049-C.

- By 2022, provide an assessment of new safety equipment/technology that can be retrofitted onto legacy rotorcraft. Examples are adding four-point harnesses for all occupants, inflatable seatbelts and airbags, including side impact airbags (for rollover phenomena) and dynamic seats/energy absorbers for occupants.
- By 2022, provide potential applications for analytical modeling in various cabin safety areas, and establish criteria for validation, as well as credibility of models for use in certification.

What benefits will be provided to the American public through this request and why is this program necessary?

In-house aeromedical expertise is fundamental to the continued technical and scientific discovery that would assure the future of the FAA as a world leader in aviation safety. It is critical to the safety mission of the FAA to maintain and enhance its aeromedical research program, recognized as unique in the nation for civilian aviation operations, and a model sought by international civil aviation authorities. The efficacy of any product introduced in the NAS will be compromised if the safety and health of the user of such products (operators and customers) is neglected. While academic research priorities are subject to the temporary nature of their mission (graduating students, narrow in focus, limited in continuity of operations) and industry research activities are subject to corporate concerns (remaining competitive and realizing financial profits) and may not be readily inspired to share findings, the FAA's aeromedical research activities (a) promote transparent and collaborative scientific discovery, (b) allow for continuous development and high risk/returns, and most importantly, (c) ensure sharing of results and independent science and technology assessments in support of the regulatory mission of the FAA.

The aeromedical RE&D program addresses 7 of 10 research areas identified as priorities in White House (OMB & OST) Memorandum M-17-30: (1) Prosperity. FAA is the only entity engaged in the discovery of biomarkers that signal fatigue, hypoxia, impairment, and disease in civil aviation operations. (2) Health. We are the only entity that has the information and facilities to conduct research pertinent to incapacitation in-flight; aging U.S. airmen; and medications used by the same. (3) Accountability & Efficiency. Our products are peer-reviewed and available to the public - findings are based on sound science and do not duplicate others' efforts. Since 2003, the American Board of Forensic Toxicology has accredited our forensic laboratories. All laboratories are accredited by the International Organization for Standardization (ISO 9001:2015 and ISO 14001). (4) Modernizing. The FAA just completed an $18 million investment on its CAMI research equipment and facilities. (5) Innovation. We foster creativity and innovation to provide solutions beyond today's boundaries. (6) Interagency Coordination. Research personnel work with > 54 national and international external agencies (government, industry, and academia). (7) Future Workforce. Our success depends on the diversity and commitment of our personnel. The program actively supports STEM goals via internships and attracts talent due to the quality of our workforce and state-of-the art facilities.

Aeromedical research activities result in the following aviation safety products and services:

- Scientific and engineering reports assessing biological/chemical threats; hypoxia exposure; adequacy of protective technology (oxygen masks, restraints, airbags, rafts, escape slides, exit types /markings), procedures (brace for impact, cabin crew communications); incidence, prevalence, and distribution of medications or illegal drugs in post-mortem specimens; and other factors that influence human performance, physiology, safety, and health in civilian air operations.
- Comprehensive aerospace medical research databases and data visualization tools to support epidemiological, data-mining, and probabilistic risk analyses towards the realization of aerospace medical safety management systems.
- Recommendations addressing the impact of commercial space transportation (e.g., suborbital flight) including the effects of ionizing and non-ionizing radiation on living systems (e.g., cancer and genetic defects). These efforts include the development of software that assist the aircrew and aircraft cabin personnel in monitoring and maintaining their occupational exposure within safe levels.
- Technical evaluations of emergent biomedical techniques, devices, and screening procedures for their suitability in the aviation environment and their impact on human safety.

- Guidance to national and international aviation medical examiners, residents in aerospace medicine, accident investigators, and other aviation specialists in support of the harmonization of aeromedical standards and policies across the world.
- Forensic Toxicology Reports for all U.S. fatal aircraft accidents – from the performance of advanced toxicological and biochemistry methodologies to analyze human biological samples for alcohol, medications, illegal drugs, gases, toxins, and other substances. This activity includes offering expert witness testimony and supporting drug abatement programs.
- Aeromedical Review Reports of all U.S. fatal aircraft accidents – integrated evaluation of the accident's operational environment, survival factors, and medical records (e.g., autopsy, toxicology).
- Discovery of biomarkers that signal incapacitation or impairment due to stressors posed by the flight environment (e.g., altitude, radiation, and acceleration forces) or inherent condition of the human operator (e.g., fatigue, drug, alcohol, or disease).
- Integrated Medical Information Systems, Biomarker Libraries, Data Mining/Analytical Tools (including high performance computing/big data analyses).
- Regulatory language for flight standards and aircraft certification: aircraft seat cushions and restraint systems, evacuation equipment, post-crash survival, water survival, emergency equipment and procedures, and passenger information media.
- Criteria and methods to define the injury potential of new aircraft configurations and structures by utilizing advanced computational and impact test techniques under simulated crash environments.
- Didactic programs and other strategies that influence cabin crew performance and passenger survival from aircraft accidents and other emergency events.

The aeromedical research program is unique in its expertise regarding human vulnerability in civil aviation. The results of aeromedical research benefit the American public by providing:

(1) Continued Operational Safety – Results of research maximize the strengths of the human link in the NAS by improving human safety through evidence-based medicine.

(2) Enhanced Standards and Policy – Investigation and analysis of injury and death patterns in civilian flight accidents and incidents enable the development of preventive strategies.

(3) Risk Management – The results of this research support accident investigation, aircraft certification, flight standards, and medical certification processes to identify hazards and augment aeromedical safety information systems towards an Aeromedical Safety Management System.

The request assumes that staff to cover accident investigations conducted by the Civil Aerospace Medical Institute would now be included in the Operations account under Aviation Safety. For FY 2020, this transfer entails 18 FTP/FTE. AVS already funds investigation and aeromedical work, which differs from the applied research that is funded from the RE&D account.

Detailed Justification for A11.j Weather Program

FY 2020 – A11.j Weather Program - Budget Request
($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
A11.j Weather Program	$15,476	$15,476	$15,476	$6,391

What is this program and what does this funding level support?

As the aviation meteorology authority for the United States, the FAA is solely responsible for determining aviation weather requirements and weather research programs regarding impacts on the National Airspace System (NAS). The FAA's Weather Program, in particular, performs applied research intended to mitigate the impact of weather on the NAS. This program mitigates weather related NAS safety and/or traffic flow efficiency issues with a line of sight to operational exploitations. The applied research also supports the evolution of legacy weather capabilities that meet the weather information needs of today's NAS users into the capabilities that are being developed and deployed as NextGen decision-support weather processes. This work is frequently conducted in collaboration with the FAA's designated weather provider, the National Weather Service (NWS).

The Weather Program leverages research activities with members of industry, national laboratories, and other government agencies through interagency agreements, and memorandums of agreement. The Weather Program partners with the National Oceanic and Atmospheric Administration (NOAA) to develop high resolution rapidly updating models that have and continue to be implemented into NWS operations. These modeling efforts have resulted in enhanced diagnosis and forecasts of weather hazardous to aviation, including turbulence, convective weather, ground and in-flight icing and restricted ceilings and visibility (C&V). Weather Program radar technique development efforts, also in partnership with NOAA have been implemented into NWS operations and are enhancing in-flight icing, turbulence, and convective weather forecast capabilities.

In-flight and ground diagnosis and forecast capabilities developed by the Weather Program are being used by aircraft dispatchers and pilots to make ground anti-deicing decisions and takeoff and landing decisions, and by pilots, dispatchers, and controllers to make flow and route of flight decisions. These efforts are being coordinated and leveraged with radar technique development at the NOAA. The Weather Program has also developed Continental United States (CONUS) turbulence forecast capabilities. Planned efforts will address the expansion of turbulence capabilities globally in harmonization with International Civil Aviation organization (ICAO) requirements.

In FY 2017, the Weather Program transitioned an initial version of the Offshore Precipitation Capability (OPC) to the FAA Program Management Office for interim operations use by selected facilities responsible for offshore airspace in the Caribbean, Gulf of Mexico, and off the US East Coast. The OPC provides a radar-like depiction of the location and intensity of precipitation and storms in offshore airspace that has heretofore been limited or unavailable. It provides an accurate situational awareness tool helpful in controller pre-planning, anticipating pilot requests, and route availability.

Major Activities and Accomplishments Planned in FY 2020 Include:

- Complete development of a 6-36 hour probabilistic forecast of oceanic convection incorporating data from US and international weather forecast models.
- Test and evaluate a 3D weather analysis system with special attention/focus on clouds.

- AVS Wx - Use results from analysis of In-Cloud Icing and Large-Drop Experiment (ICICLE) flight campaign data to improve the forecast of hazardous icing conditions.

Goals for FY 2020 Funding:

- By 2021, assess and validate data for Terminal Area Icing Weather Information for NextGen (TAIWIN) from numerical weather prediction models and weather radars with research flight test data collected.
- By 2022, complete development of high-resolution ceiling and visibility analysis capability to National Weather Service for implementation into Helicopter Emergency Medical Services Tool. This will improve safety of operations in areas with limited observation capabilities.
- By 2023, complete a global version of the Offshore Precipitation Capability as well as a 0-12 hour forecast capability for offshore thunderstorms and precipitation.
- By 2024, complete development of a global-scale probabilistic turbulence forecast capability for implementation. This is anticipated to reduce aircraft encounters with unacceptable levels of turbulence, increasing passenger safety and airspace capacity.

What benefits will be provided to the American public through this request and why is this program necessary?

This request will enable the Weather Program to continue to develop and enhance diagnosis and forecast capabilities that will benefit the American public. This will include applied research in naturally occurring atmospheric aviation hazards including turbulence, convective activity, icing, and restricted ceiling and visibility. FAA will either deploy these capabilities on new or existing platforms and systems or transition them to NWS platforms or procedures through FAA regulations. These benefits include:

- Increased GA safety in Alaska, as focused efforts target enhancements to in-flight icing, turbulence, and restricted ceilings and visibility analyses and forecasts.
- Enhancements to convective weather forecasts that minimize gate-to-gate delays and improve efficiency of flights.
- Enhancements to turbulence analyses and forecasts to increase passenger comfort, safety of passengers and crew, safety of GA operations, and increased capacity in the NAS.
- Enhancements to icing diagnoses and forecasts to increase safety and decrease flight times especially for GA and commuter passengers.

The Weather Program works as evidenced by the implementation into operational use of significant safety, capacity, and efficiency enhancing capabilities including:

- Aviation Digital Data Service is a web-based portal offering access to weather information in text, digital, and graphical formats for a wide community of NAS users including pilots, dispatchers, and ATM. It provides access to forecasts, analyses, and observations of aviation-related weather conditions and hazards, including inflight icing, turbulence, and restricted ceilings and visibility. It is currently operational at the NWS.
- Rapid Refresh Weather Forecast Model, operational at the NWS, provides a 1-hour update rate and 13 km resolution of more accurate wind forecasts and improved analyses and forecasts of aviation hazards including en route turbulence, convective weather, in-flight icing and restricted ceilings and visibility over North America and Alaska. The Weather Program also funded the development of the High Resolution Rapid Refresh, also operational at the NWS, which provides storm-scale resolution to capture convective activity at the cell level.

The Weather Program supports NextGen operational improvements and FAA Strategic Priorities related to efficiency, capacity, safety, and environmental impacts. Weather is frequently cited as a primary or secondary cause for accidents and injuries. Per the National Transportation Safety Board, turbulence is the leading cause of inflight injuries and the GA fatality rate in weather related accidents, on average is 35 percent (GA accounts for 75 percent of weather related accidents). Between 2007 and 2016, air carrier delay hours were reduced by more than 55 percent, from 733,00 hours down to 328,000 hours, resulting in savings of more than $315 million in delay costs. While there are several factors that played a part in this reduction, forecast improvements and weather mitigation techniques developed from Weather Program research efforts directly contributed. However, $300 million in delay costs still occur annually. Continued evolution of improved forecasting algorithms with applicability to achieving higher aviation safety and capacity during hazardous weather is needed. The Weather Program also supports the need to provide high quality weather observations and forecasts, often in conjunction with the NWS, uniquely designed to allow for rapid and effective decision making by ATM, dispatchers, and pilots to proactively select safe and optimal routes. Weather Program initiatives whether benefitting commercial or GA, advancing science or facilitating integration into NAS decision support tools, are ultimately supporting the achievement of the NextGen weather vision.

Detailed Justification for A11.k Unmanned Aircraft Systems Research

FY 2020 – A11.k Unmanned Aircraft Systems Research - Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
A11.k Unmanned Aircraft Systems Research	$24,035	$24,035	$24,035	$7,546

What is this program and what does this funding level support?

The Unmanned Aircraft Systems (UAS) Research program supports FAA efforts in implementing the Next Generation Air Transportation System (NextGen) by studying safety implications of new aircraft operational concepts and technology to the National Airspace System (NAS) and supporting the development of new and modified regulatory standards. The program's research activities focus on new technology assessments, methodology development, data collection and generation, laboratory and field validation, and technology transfer.

Safe, efficient, and timely integration of UAS into the NAS poses substantial technical challenges not only to the FAA but also to the aviation industry. UAS often use new or novel technologies to achieve unique operational capabilities that challenge the expectations of current NAS users. These unique capabilities have demonstrated potential to address commercial applications as well as scientific research needs. Integrating UAS into the NAS will potentially affect the entire NAS due to various sizes of UAS (less than a foot up to the size of a commercial jet), a wide range of maximum take-off weight (less than a pound to the weight of a large jet), large performance disparities in reference to the existing certificated aircraft, and capabilities of operating in all classes of airspace. Even UAS weighing less than 100 pounds may be capable of operating in Class A airspace and the integration of a significant volume of UAS air traffic could potentially disrupt normal aircraft traffic flow and induce unknown safety hazards.

Research activities within the UAS Research program will generate technical information to support development of policies, guidance materials, and advisory circulars on using new or novel technologies to demonstrate regulatory compliance while operating UAS in the NAS. UAS-specific technical issues such as detect and avoid, datalink aircraft control and communications with air traffic control, and emergency response requirements, will also require research. UAS will also be integral to NextGen development and will help validate UAS concept of operations integration requirements and meet UAS roadmap goals.

FY 2020 funding will support the UAS program in conducting research on UAS technologies that directly impact the safety of the NAS. The FY 2020 portfolio of work will be focused on safety data collection, unmanned air carrier operations, autonomy, and other research that will support the safe, efficient, and timely integration of UAS in the NAS within the 14 Code of Federal Regulations (CFR) regulatory framework. Additionally, funding will provide for engineering, technical, and management support of overall research activities.

Major Activities and Accomplishments Planned in FY 2020 Include:

This research supports the integration of UAS into the NAS by studying new operational concepts and technology, and providing information that supports the development of new rules and regulatory standards. Outcomes of this research may also lead the development of new procedures or modifications to NAS equipment.

<u>DAA Multi Sensor Surveillance Data Fusion Strategies</u>

This effort will evaluate tracking and fusion strategies to support UAS DAA surveillance utilizing the products developed (sensor models, simulation environment and reference tracker) for SC-228 Phase One MOPS.

UAS High Performance Command and Control (C2) Link Systems and Networks

This research supports development of certification guidance and industry standards for C2 Link and Autoflight Interoperability.

UAS Flight Data Research in Support of ASIAS (Aviation Safety Information and Analysis Sharing) Program

This research will aggregate high quality UAS flight data with commercial and general aviation flight data and surveillance data, in order to develop enhanced safety analyses for NAS stakeholders and to support UAS integration in the NAS.

Air Carrier Operational Considerations for Unmanned Aircraft Systems

This research addresses safety concerns specific to Air Carrier Operations for UAS to include air carrier staffing, training, testing, duty, and rest requirements. It could help establish a separate rulemaking activity specific to air carrier operations.

ASSURE - Management support Budget

Per FAA Cooperative Agreement 15-C-UAS-MSU-A, the FAA is required to provide ASSURE with annual funding for operations and management of the UAS Center of Excellence (COE).

UAS Automation and Intelligent Systems

This research will examine the interaction between UAS pilots and automated UAS to provide data for developing standards and best practices for pilot information management of UAS and address automation issues (e.g., mode awareness).

Goals for FY 2020 Funding:

By FY 2020, collect additional UAS Flight Data Management (UFDM) data, examine technologies and techniques required to integrate UFDM into ASIAS, develop additional UAS analysis tools and techniques.

By FY 2021, conduct simulations as required to support requirements development for surveillance performance to support SC-228 Phase 2 DAA and SC-147 ACAS Xu MOPS development.

By FY 2021, validate by simulation and flight testing the functional performance of UAS Pilot-On-The-Loop automatic flight guidance and control system with different levels of automation.

By FY 2021, conduct designed experiments and related analysis for human operator considerations and system certification criteria.

By FY 2021, manage the UAS COE and provide high quality research products.

What benefits will be provided to the American public through this request and why is this program necessary?

The safe integration of unmanned aircraft into the NAS is a significant challenge. Current UAS research contributes and informs technical and regulatory standards, policy guidance, and operational procedures on which successful UAS integration depends. These research efforts significantly contribute to addressing the challenges of integrating UAS into the NAS by leveraging studies of UAS operations and associated technologies. These research programs will help develop unmanned aircraft systems, training, technology, and procedures that increase the safety of UAS operations and increase the confidence of the American public that UAS flights can be safely and efficiently integrated into national airspace. The research will facilitate approval and use of systems that prevent accidents and help reduce the severity of UAS accidents in the NAS. This research will also develop standards to mitigate human factor causes of incidents and accidents due to control station or pilot training design deficiencies.

Detailed Justification for A11.l Commercial Space Transportation Safety

FY 2020 – A11.l Commercial Space Transportation Safety- Budget Request
($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
A11.l Commercial Space Transportation Safety	$1,872	$1,872	$2,500	$5,971

What is this program and what does this funding level support?

The primary mission of the FAA Office of Commercial Space Transportation (AST) is to "protect the public health and safety, safety of property, and national security and foreign policy interests of the United States"[4] during commercial launch and reentry operations. AST's secondary mission is to encourage (~ "the United States private sector to provide launch vehicles, reentry vehicles, and associated services"), facilitate (~ "the strengthening and expansion of the United States space transportation infrastructure"), and promote (~ "economic growth and entrepreneurial activity through use of the space environment for peaceful purposes") commercial space launches and reentries. More recently, Congress tasked AST with "promoting the continuous improvement of the safety of launch vehicles designed to carry humans." The AST commercial space transportation (CST) research and development (R&D) program optimizes AST's mission execution through the creation, improvement, and validation of models and predictive capabilities, operational procedures, mission planning tools, and regulations, safety assessment analyses, and public safety technologies. Using these means, the CST R&D program aligns directly with the FAA R&D outcomes and goals and National Space Council/Department of Transportation strategic goals and objectives.

AST's CST R&D program supports the development of a 21st century licensing regime, through regulatory streamlining and innovation to support DOT's strategic goal of accountability.[5] The results include improved regulations and industry guidance material to address lessons learned and to keep pace with the dynamic commercial space transportation industry. CST R&D provides industry with flexibility to innovate, by allowing AST to regulate only to the extent necessary, and to execute its responsibilities under Presidential Space Policy Directive-2 (SPD-2)[6] and SPD-3.[7] AST plans include research to improve regulations that govern launch and reentry sites and operations, as well as industry guidance to support industry compliance with AST regulations.

In accordance with DOT's published Strategic Goals and Objectives, CST R&D develops and deploys a range of innovation (technologies and processes) to facilitate the safe and efficient integration of space traffic through the NAS, ensures the safety of population centers, and avoids overly burdensome regulatory approaches. AST's research will advance innovation with a detailed understanding of man-made and naturally-occurring hazards in the space environment to increase safety and efficiency while getting into and out of the NAS. State-of-the-art theoretical, analytical, and computational investigations will result in improved assessment methods: results that are easier to understand, easier to execute, require fewer input data, and reduce overly burdensome regulatory approaches.

The CST R&D program also focuses on systemic safety by applying a risk-based approach on advanced vehicle safety technologies, human spaceflight, and physiological safety guidelines that provide a direct benefit to the strategic needs of industry (e.g., improved preparation and operations, and ensuring safety of human spaceflight occupants).

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[4] Quotes in this paragraph cited from 51 USC Chapter 509 – Commercial Space Launch Activities, Sec. 50901. Findings and purposes.
[5] U.S. Department of Transportation, Strategic Plan for FY 2018-2022, February 2018, p. 30.
[6] Executive Office of the President, Space Policy Directive-2, May 24, 2018, Sec 2(b).
[7] Executive Office of the President, Space Policy Directive-3, June 18, 2018, Sec 6(b)-(h).

The multiple research activities included in the FY 2020 R&D program will be conducted with contracts and grants to the Center of Excellence for Commercial Space Transportation (COE CST) universities. AST committed to funding the COE CST at a minimum annual level of $1 million through FY 2020. The balance of the FY 2020 funds will be used to address other key areas for commercial space operations, guidelines, and regulations. Overall, FY 2020 funding will continue the activities to meet AST's needs for an improved regulatory framework, safety assessment methods, and industry guidelines and technologies. This important research will allow AST to keep pace with the dynamic CST industry. Research activities are grouped below according to their focus areas, on safe and efficient integration of increased commercial space launch and reentry activity into the NAS, advanced safety assessment methods, advanced vehicle safety methodologies, and human spaceflight safety.

Major Activities and Accomplishments Planned in FY 2020 Include:

Research regulatory reforms in pursuit of a 21st century licensing regime, focusing on ways to improve efficiency and maintain safety. Evaluate industry performance studies and assess the evolutionary status of different segments of the space transportation industry.

Increase "Lab to Market" initiatives that enhance the safety of airspace integration within the NAS and major population centers, major activities advance the concepts and architectures of air and space traffic through the NAS, including dynamic airspace response and decision-making. Tracking, identifying, monitoring, and forecasting of space vehicles and debris will also be advanced to increase the effectiveness of collision avoidance analyses for space transportation systems.

Develop new space vehicle safety technologies through research activities in vehicle breakup analyses, autonomous flight safety systems, and public safety critical subsystems. Research human safety through the application of risk-based analyses, and multi-disciplinary human factors studies to keep pace with industry advances in human spaceflight.

Develop spaceport siting analysis tool, and quantitative methods for evaluating impacts of space ports on environment, for use in space port planning and operation.

Goals for FY 2020 Funding:

By 2021, develop improved captive-carry separation standards, and improved collision avoidance analysis models and methods, to reduce over-conservatism applied to airspace keep-out areas resulting from potential launch or re-entry failures.

By 2022, develop methods to share data and software tools that estimate aircraft hazard areas suitable for use in early design and mission planning.

By 2022, provide performance based regulation recommendations and guidance, to support regulatory reform for commercial space, enabling greater flexibility for operators.

What benefits will be provided to the American public through this request and why is this program necessary?

Protecting the safety of the uninvolved public and their property from the potential consequences of commercial space launches and reentries demands that the FAA keep pace with the emerging technologies and operational concepts coming from a diverse and exponentially growing industry. The areas discussed above highlight critical topics that must be addressed for AST to achieve its statutory missions. Funding the program at the requested level will allow the FAA to continue to develop the portfolio of high-value research activities designed to ensure that CST is efficiently regulated in a streamlined manner that prioritizes public safety, reduces overly burdensome regulatory regimes, and facilitates the competitiveness of the U.S. in the international marketplace.

AST has consistently conducted license and permit application evaluations resulting in determinations made within the statutorily mandated time limit to ensure the continued safety of the public. This record has been maintained while experiencing significant growth in the number of space launch systems, operators, and spaceports, the complexity of operations. This research program will position the FAA to have increasingly timely guidance and regulations, and improve our responsiveness to this emerging sector. Similarly, the industry would benefit from improved techniques, practices, and technologies that result from a strong FAA commercial space R&D program.

The CST industry has noted that some regulations in 14 CFR 400 have not kept pace with modern operations and technology, such as the lack of requirements or formal guidelines for autonomous flight safety systems. The public and industry will benefit from a modernized set of efficient and effective regulations. An efficient and effective system to regulate the CST is in the public interest. A safe and efficient CST industry will help maintain an assured space access capability to meet U.S. government needs, and strengthen U.S. competitiveness in the international commercial launch market. A healthier, more competitive U.S. space transportation industry will facilitate new markets, encourage new industries, create high technology jobs, lead to greater economic growth and security, and promote the U.S. leadership role in space. In addition, improving the cost effectiveness of CST would allow the U.S. Government to invest a greater share of its resources in other needs such as facilities modernization, technology advancement, scientific discovery, and national security.

Detailed Justification for A11.m NextGen – Wake Turbulence

FY 2020 – A11.m NextGen – Wake Turbulence - Budget Request
($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
A11.m NextGen - Wake Turbulence	$6,831	$6,831	$6,831	$3,697

What is this program and what does this funding level support?

This research program is conducted to obtain additional throughput capacity gains by developing wake separation standards that adjust to the atmospheric conditions being encountered by the aircraft and through evaluating the flight performance of the leading and following aircraft. These complex technology-based dynamic air traffic control (ATC) wake hazard mitigation solutions and associated decision support tools are expected to increase National Airspace System (NAS) runway throughput capacity another five to seven percent above what can be achieved with the simpler current static wake separation procedures that have been researched by the NextGen - Wake Turbulence research program and further developed for implementation by the FAA's Wake Re-Categorization (RECAT) program. This research also provides ATC the wake hazard mitigation separation it needs to apply to new aircraft types being introduced into the NAS. Other near-term products produced by this program are ATC wake mitigation procedural solutions that help alleviate delays due to airport construction and runway maintenance projects that restrict airport operations.

Increasing NAS throughput capacity is the major focus of this research program; however, it also supports the analyses required to determine that the program's products will not adversely affect NAS safety. Developing safe, capacity-efficient, ATC wake hazard mitigation solutions requires measured wake decay and transport data to validate the analytical and probabilistic models. This data is used in evaluating proposed changes in wake hazard mitigation procedures. Aircraft generated wakes are not visible and do not lend themselves to be sufficiently detected by today's ground-based and air-based surveillance systems. Currently, the program has three wake data collection sites located close to major airports, using prototype light detection and ranging systems to collect and compile measured tracks of aircraft generated wakes. This program also analyzes wake data collected in flight by the Canadian National Research Council and wake data collected by NASA in collaboration with other research organizations. This collected data is being used to validate the outputs of wake transport and decay models being developed for evaluating proposed ATC wake hazard mitigation solutions and real-time applications in ATC wake hazard mitigation decision support tools. Early versions of these models are already contributing to safety case analyses for paired departures and proposed changes to intersection departure separations as part of an enhancement to ATC's use of RECAT wake mitigation separations.

Outputs of this research program that do not require any changes to the NAS infrastructure - such as recommendations for wake hazard mitigation separation standards for new aircraft (A380, 747-8/9, 787) go directly into operational use. Yearly, there are 25 to 125 new aircraft types recognized by International Civil Aviation Organization (ICAO), which the FAA must assess for wake turbulence categorization. While this must be done for all aircraft types, the FAA has a special commitment to the National Transportation Safety Board (NTSB) to assess Super, Heavy and Upper large aircraft for wake turbulence separations (in front and behind) prior to entry into service. These required assessments are accomplished by the NextGen – Wake Turbulence research program in partnership with Flight Standards.

The funding level supporting this research program addresses the needs of the FAA Air Traffic Organization and the Aviation Safety Organization to ensure new throughput capacity-increasing procedures and technology solutions are safe in terms of wake encounter risk. The program also provides the knowledge-based applied wake research, which has and will continue to enable incremental increases in airport and air corridor throughput capacity. It also provides analyses requested by airports (and associated air carriers) to determine if their runways can qualify for use of ATC wake mitigation procedures that would result in higher runway throughput capacity. The research program works with controllers, airlines, pilots, and aircraft manufacturers to include their recommendations and ensure training and implementation issues are addressed in the program's research from the start. Customers receiving direct benefit from this program include; pilots, FAA ATC, flight standards organizations, air carriers, and airport operators. Stakeholders include; commercial pilot unions, FAA unions, other International Civil Aviation Organization (ICAO), air navigation service providers, and aircraft manufacturers.

The NextGen – Wake Turbulence research program funding addresses both the FAA's near-term need (capacity-enhancing wake mitigation procedures and processes) for enhancing current operations and developing wake mitigation solutions that will be required as FAA transitions to trajectory-based and flexible terminal operations.

Major Activities and Accomplishments Planned in FY 2020 Include:

- Develop FAA wake separation to be applied to new aircraft entering service in 2020-2021 timeframe. This work will be incorporated into ATC Orders and associated decision support automation to further enhance NAS capacity.
- Analyze the use of real time aircraft based weather observations to enhance wake transport and decay predictions.
- Provide wake data analyses for developing requirements for adding wake risk mitigation capabilities to controller decision support tools.
- Continue developing measurement, modeling and analysis capabilities to evaluate aircraft wake hazard risk.

Goals for FY 2020 Funding:

- By 2023, develop feasible concepts including procedures, processes, and applications of NextGen era capabilities that allow the safe relaxation of the ATC wake encounter hazard mitigation constraint on NAS throughput capacity.
- By 2024, make available algorithms for use by flight deck avionics and ground-based ATC decision support tools that will allow safe and throughput-efficiency, dynamically adjusted wake hazard mitigation separations and operations between aircraft.

What benefits will be provided to the American public through this request and why is this program necessary?

Investing in the NextGen - Wake Turbulence Program provides the NextGen research and development, advanced wake mitigation processes and solutions that will be required to gain increased airport runway and air corridor throughput capacity both in the near and far term (2020 and beyond). More airports and air corridors throughput capacity translates into lower operating costs for air carriers and the ability to expand their business without airports having to invest in difficult (public resistance) and costly runway construction projects. For passengers, more throughput capacity translates into reduced flight delays, especially a reduction in flight delays associated with weather events. More available throughput will encourage air carriers to schedule additional flights – widening the flight choices for passengers and potential reduction of fares due to increased competition between air carriers. The benefits can also be realized in terms of more direct flight paths and a corresponding reduction in emissions and noise.

The RECAT wake separation standards are based on the research and data collected by this program, implemented for ATC's use at multiple airports across the NAS, have resulted in a 15 percent increase in airport departure throughput capacity and a 10 percent increase in airport arrival throughput capacity (during instrument approach operations).

The NextGen Advisory Committee formed the Joint Analysis Team (JAT) which includes operational and analytical experts from the FAA and industry. The JAT analysis methodology for ReCat has been applied to multiple ReCat 1.5 implementation sites (CLT, ORD, MDW, IND) and a ReCat 2.0 site (PHL) using different aircraft pair separation matrices. The JAT conclusions estimated yearly savings in airborne and taxi times of $6,451,000.

The following are the benefits reported by Delta Air Lines concerning its Hartsfield-Jackson, Atlanta International Airport (ATL) hub operations 90 days subsequent to the introduction of the RECAT Phase 1.5 at ATL in June 2014:

- Taxi times have reduced; varies from half a minute to two minutes
- Aircraft spend less time in the terminal airspace – reduction varies from half a minute to one minute

Additionally Delta estimated that the above observed operating time reductions would be providing them yearly savings in their Atlanta Hartsfield operations of $14.8 million (low side) to $38.1 million (high side). (Estimates are prior to 2015 fall in aviation fuel prices)

RECAT at O'Hare International Airport has provided user benefits of about $1M per year. With the upcoming intersection departure RECAT changes, an additional $3M per year of user benefits are expected to be realized by the users.

RECAT was implemented at JFK international airport at a critical time, just prior to the beginning of runway construction. Initial plans to manage the impact of the construction on airport throughput, the Port Authority was considering managing slot allocations. RECAT showed about a ~8-10% throughput gain at JFK, sufficient to essentially offset the throughput losses from runway construction. RECAT allowed runway construction to occur without significant impact on overall airport throughput, and continues to provide ~8-10% throughput gains there. Newark realized a smaller but important capacity gain, 2-5% overall.

RECAT II at LAX has provided a yearly savings of about $2.3M to the users.

The research by the NextGen – Wake Turbulence Program is now and will continue to provide necessary data and modeling results to drive the development of safe, more advanced capacity-efficient ATC wake mitigation solutions and standards that will add an additional 5 percent to 7 percent throughput capacity in the NAS. The resulting lessening of flight delays and decrease in flight costs especially during weather and other events at an airport that causes ATC to switch to capacity constraining instrument flight rule operations.

Detailed Justification for A11.n NextGen – Air Ground Integration Human Factors

FY 2020 – A11.n NextGen – Air Ground Integration Human Factors - Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
A11.n NextGen - Air Ground Integration Human Factors	$6,757	$6,757	$6,757	$1,717

What is this Program and what does this Funding Level Support?

This research program aims to maximize flight deck human-system performance by proactively identifying and responding to the coordinated impacts of NextGen technologies and future air-ground procedure integration needs. This program provides FAA stakeholders with scientific data, technical information, and targeted human factors solution integration strategies to support strategic FAA policy development, guidance material updates, and technology evaluation criteria. FAA stakeholders will apply program outputs to address known and potential human factors issues that are related to emerging NextGen technologies, strategic flightcrew adaptation/readiness needs, and complex procedure development.

The FY 2020 research program will focus on the examination of the individual and summative impacts of NextGen changes on future air-ground human-system interactions, and potential human factors integration issues driven by developmental NAS concepts (e.g., Trajectory Based Operations (TBO), transition to a time-based ATM, etc.). This research will emphasize four core areas: Human Error & Complex Systems, Avionics Design & Evaluation, NextGen Air-Ground Procedures, and NextGen Flightcrew Readiness.

Human Error & Complex Systems will identify the impact of emerging flight deck technologies on total human-system performance. This includes understanding whether potential technologies will reduce or increase the opportunity for human error. This research will use data-driven recommendations and repeatable human error assessment methods to support the development of guidance for NextGen operational and equipment approvals, training program criteria, and flightcrew procedure development. The results of this research will support updates to FAA regulations that are related to pilot training and airworthiness standards (e.g., 14 CFR, Part 121 Subparts N, O & Y), and procedure design.

Avionics Design & Evaluation will identify potential NextGen flight deck human-system integration issues that may arise from the introduction of future technologies, procedures, and modes of operation. The products of this research will help to quantify the risks associated with new technologies in the NextGen operational environment.

NextGen Air-Ground Procedures will identify and respond to human factors issues that may arise from the introduction of complex NextGen procedures. This includes issues that are related to design, depiction, usability, and fly-ability of instrument procedures and associated charts for inclusion in advisory material and standards for instrument procedures and associated charting. This research will also produce guidance and best practices that will reduce susceptibility to errors by pilots. The guidelines, recommendations, and data will address known difficulties with use of instrument procedures, and also address NextGen instrument procedure requirements.

NextGen Flightcrew readiness will identify new training and checking requirements for pilots and dispatchers acting as individuals, crews, and teams in the NextGen environment. This work also ensures that Flight Standards will have sufficient information and criteria to evaluate and approve these procedures.

Major Activities and Accomplishments Planned in FY 2020 Include:

NextGen Human Error Mitigation Research

- Automated Systems: Analyze planned NextGen enhancements of automated systems to identify how the implementation of the system(s) changes the tasks and required skill set of the pilot and develop recommendations on how to adequately prepare pilots for enhancements of automated systems.
- System Resilience: Analyze how NextGen changes to the NAS in support of Trajectory Based Operations will contribute to the brittleness of the system and develop guidance for how the TBO system can be expected to alter the roles of pilots and service providers.
- Task Management: Conduct research to understand the envelope of successful task management in a TBO environment and assess the difference between today's task management approaches with the challenges of task management expected in a TBO environment.

NextGen Procedures, Tasks, Skills, and Training for NextGen Air Carrier Pilots and Dispatchers

- Assess the Instructional Systems Development (ISD) methodology for developing training and checking guidance for the NextGen NAS including use of training simulations because some new tasks constrain use of past experience to make decisions about what is trained and tested, how it is trained and tested, and how frequently recurrent training and checking must occur.
  - Update guidance in the report Flight Crew Training for NextGen Automation. This report provides recommendations on individual, crew and team training and checking requirements for pilots and dispatchers operating in the NextGen NAS.

Goals for FY 2020 Funding:

- By 2021, minimize pilot and dispatcher error rates associated with new implementation of NextGen operations.
- By 2022, reduced accident rates due to human error with airspace procedure design or use as a causal or contributing factor and improved operational implementation of PBN-based airspace procedures, with reduced need for redesign after initial implementation.
- By 2024, create comprehensive human factors guidelines that will assist certification and flight standards personnel. Examples include:
  - Develop guidance and job aids to assist inspectors in the field
  - Collect empirical data for updating FAA guidance and industry standards
  - Support streamlining the certification approval process

What Benefits will be Provided to the American Public Through this Request and why is this Program Necessary?

The NextGen - Air Ground Integration Human Factors program addresses flight deck and 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 assesses interoperability of tools, develops design guidance, determines training requirements, and verifies procedures to support certification and flight standards for ensuring safe, efficient, and effective human system integration in transition of NextGen capabilities.

Research supports development of policy, standards, and guidance required to design, approve, and operate NextGen equipment and procedures. To meet the requirements of new NextGen capabilities, human factors research supports updates to standards for pilot certification and training.

NextGen Human Error Mitigation Research**:** As NextGen moves toward Trajectory Based Operations there will be a tradeoff between predictability and flexibility in operations. As a system becomes more prescriptive and calculated it also becomes more brittle. When new concepts mature in development it is important to have an understanding of how that concept will contribute to the brittleness of operations and how that shift changes the role of the pilot. For decades pilots have been trained to make the best decision for their aircraft and their mission. In the future it will be necessary for pilots to take into account the domino effect their decision making has on the bigger picture of the NAS, and make a decision that is maybe not optimal for their mission but is safe for the aircraft and stays within the bounds of the operation's resilience parameters.

NextGen Procedures, Tasks, Skills and Training for NextGen Air Carrier Pilots and Dispatchers**:** Past research has shown that the tendency for human error increases when new systems and procedures are introduced. This research will proactively identify and address operational integration issues that could result from the implementation of future NAS procedures and advanced flight deck separation management concepts. FAA stakeholders may apply research outputs to develop NAS procedure design and evaluation criteria, assess the feasibility of procedure design alternatives, and address the human factors impacts (e.g., workload, cognition, usability) of proposed NAS procedures and NextGen concepts on flightcrew performance. This research will also examine how crews assess, diagnose, and respond to non-normal events in the NextGen NAS.

Human performance is often the largest contributor to system variability, so the implementation of advanced systems and the implementation of new procedures associated with NextGen will challenge the human components of the aviation system. Reviews of accidents and incidents have identified that human factors and human performance is a major factor in two thirds to three quarters of all civil aviation accidents. Specifically, research is required to ensure that system design, procedures, and training support the flightcrew functions, responsibilities, information needs, and interactions necessary for successful implementation of NextGen operational improvements, which often involve multiple new technologies operating in parallel.

Detailed Justification for A11.o NextGen – Weather Technology in the Cockpit

FY 2020 – A11.o NextGen – Weather Technology in the Cockpit - Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
A11.o NextGen - Weather Technology in the Cockpit	$3,644	$3,644	$3,644	$1,963

What is this program and what does this funding level support?

The NextGen - Weather Technology in the Cockpit (WTIC) program is tasked with developing recommendations for a minimum weather service (MinWxSvc) needed to support sound pilot decision making and cockpit decision support tools (such as the Flight Management System) through the provision of meteorological (MET) information that is ready for direct integration to support operations in the transformed National Airspace System (NAS). The WTIC program will determine and recommend standards and guidance for a Part 121/135 and a Part 91 MinWxSvc. The MinWxSvc will define the necessary MET information, the associated parameters of the information (i.e., accuracy, latency, update rates), and presentation elements to safely and efficiently incorporate it into collaborative decision making (CDM) relative to adverse weather decisions and performance based navigation. In defining the Part 121/135 MinWxSvc, the WTIC program will also specifically reduce or resolve inefficiencies including those that result in excessive greenhouse emissions. Both the recommended Part 91 and Part 121/135 Minimum Weather Services will resolve or minimize previously-identified and WTIC-identified safety risks and hazards. The Part 91 MinWxSvc will also address shortfalls in training and will include training updates associated with MinWxSvc recommendations.

Some specific NTSB facts and data demonstrating the need for this program include:

- Approximately 29 percent of all GA accidents are weather related.
- Weather related accidents have one of the highest fatality rates.
- The overall GA accident rate has decreased over the last few years, but it has increased approximately 20 percent for recreational/personal GA flights.
- For Part 121 flights, approximately 37 percent of the 446 accidents reported over a recent 10 year span are weather related.
- For Part 121 flights, turbulence is the number one cause of serious passenger injuries accounting for approximately 71 percent of 446 reported accidents.

The minimum weather services, including the resulting standards and guidance, recommended by the WTIC program will enable NextGen weather-related goals including reducing weather delays via increasing capacity and efficiency under adverse weather conditions, enhancing air traffic management (ATM) and aircraft re-routing flexibility to avoid adverse weather, reducing safety risks which have the potential of lowering the number of weather-related accidents and incidents, and reduction of emissions through lower fuel consumption resulting from optimized routing and rerouting during adverse weather. In addition, the WTIC program will develop functional and performance requirements based on the WTIC concept of operations and pilot roles in performance based navigation operations far-term concepts.

In addition to supporting NextGen goals, the WTIC program benefits numerous stakeholders that include Flight Standards by providing MinWxSvc recommendations and supporting research data to support their efforts to update/develop standards, guidance documents, and pilot written exams. The WTIC program also benefits Flight Services and Future Flight Services by providing research to support their goals of enhanced automated services to general aviation pilots at reduced costs compared to voice services and to modify VFR Not Recommended (VNR) statement procedures that align more with the increased use of automation and meet pilot preferences for delivery of services. The WTIC program also benefits non-FAA stakeholders such as the Aircraft Owners and Pilots Association (AOPA), RTCA, the National Association of Flight Instructors (NAFI), and the Alaska Air Carriers Association (AACA). There are benefits to General Aviation as the result of addressing selected weather related safety issues identified by AOPA. Benefits to NAFI include the development of enhanced training techniques, curriculum, and online modules to enhance the quality of the weather training provided to student pilots and the identification of weaknesses in pilot weather knowledge through weather knowledge assessment research. Benefits to RTCA include participation in various special committees and performing research to support their development of weather related standards and guidance documents. Benefits to the AACA from WTIC research include innovating techniques, such as crowd sourcing, to provide pilots with essential weather information including ceiling, visibility, and surface winds without the need for new, cost prohibitive infrastructure.

The WTIC Program conducts demonstrations and evaluations for service and benefits quantification of new concepts and MET technologies for possible applications in NextGen. Also, the WTIC program will work closely with multiple RTCA special committees, European Organization for Civil Aviation Equipment, and other industry and stakeholder committees to further the program objectives as well as the development and harmonization of industry and government minimum systems standards. Demonstrations and flight evaluations will be conducted to verify minimum weather service recommendations for airworthiness standards or recommended practices. The NAS mid-term concept of operations and numerous NextGen operational improvements have identified a need for additional or higher quality MET information in the cockpit or integrated with decision support tools. This MET information will enable NextGen operations and performance based navigation to achieve planned benefits in adverse weather conditions.

For GA operations, the WTIC program is performing research to identify gaps of MET information in the cockpit that were identified as causal factors in previously reported accidents or incidents and gaps of MET information in the cockpit that have potential of being a causal factor in a future GA accident or incident. The WTIC program is developing recommendations to resolve or reduce these MET information gaps to potentially reduce the weather-related GA accident, fatality, and incident rates. In addition, the WTIC program is providing enhanced training modules, curriculums, and questions for the pilot written exam on the minimum weather service recommendations and evolving cockpit MET technology.

Recent newsworthy accomplishments of the WTIC program include numerous airlines and aircraft manufacturers implementing the Eddy Dissipation Rate algorithm using the WTIC developed technical transfer package and cockpit reader to provide objective turbulence information to the cockpit which enhances crew management relative to turbulence encounters and enhanced efficiency due to improved turbulence avoidance decision making. For General Aviation, the WTIC program has provided 100 new weather related test questions to Flight Standards, published numerous articles in general aviation magazines informing pilots of gaps associated with weather latency, inadvertent flight into Instrument Meteorological Conditions, and "change blindness" that results from cockpit displays that have poor salience causing pilots to miss information informing them of deteriorating weather conditions. Current anticipated outcomes from the WTIC produced research outputs include enhanced safety, a reduction in aviation emissions that are harmful to the environment and public health, wind and temperature precision requirements to support NextGen aircraft 4-D navigation operations, and fully implemented NextGen capabilities that are utilized and provided anticipated benefits in adverse weather conditions.

Major Activities and Accomplishments Planned in FY 2020 Include:

- Complete development steps for Part 121/135 MinWxSvc recommendations including finalized recommendations for Cloud Top Height (CTH) and Convective Diagnosis Oceanic (CDO) based on flight demonstration results, feasibility study on providing a three dimensional presentation of selected adverse weather in the cockpit, and an assessment of metrics to determine impacts of implemented recommendations, and via collaboration with industry, define MET Information. Services for global harmonization to support the implementation of advanced global Air Traffic Management (ATM) concepts.

- Complete development steps for Part 91 MinWxSvc recommendations including finalized recommendations to produce georeferenced weather radar information using crowd source weather radars and for weather information latency nulling, and productions of finalized research plan to resolve Phase 2 selected GA, including helicopters, weather in the cockpit gaps.
- Complete research for method to produce virtual graphics for weather standards to enhance pilot training and guidance documents, and complete the transition of the Weather Information Latency Demonstrator capabilities to commercial training devices.

Goals for FY 2020 Funding:

- By 2021, complete development steps for Part 91 MinWxSvc recommendations including trade studies to resolve a selected gap in helicopters or special GA operations cockpit MET information and technology.
- By 2021, transition virtual graphics processes to standards and guidance developers to incorporate virtual graphics into weather handbooks, circulars, and training materials.
- By 2022, complete research efforts to develop initial MinWxSvc recommendations for uncertainty information in Part 121/135 and Part 91 cockpits and three-dimensional renderings of selected adverse weather.

What benefits will be provided to the American public through this request and why is this program necessary?

Per the National Transportation Safety Board (NTSB) data shown above, adverse weather continues to be one of the major causes of accidents, incidents, injuries, and fatalities. In addition, adverse weather contributes to inefficiencies in operations for commercial airlines and business aviation. Though recent advances in cockpit MET technology and information have provided improvements in safety and efficiency relative to adverse weather encounters, NTSB and airline performance statistics indicate that there is still significant opportunity for continued improvement in both areas.

Enhancing aviation safety and efficiency, as well as reducing gaseous emissions, are objectives that the FAA, the American public, and the government fully support. The WTIC program is necessary to achieve these goals since current gaps in cockpit MET technology and information, and pilot use of these, significantly impacts the ability to attain them. WTIC research is needed to identify resolutions to these gaps which ultimately will enable aviation to achieve the desired goals and planned benefits of NextGen. The WTIC developed minimum weather services will provide recommendations to resolve the current gaps related to cockpit MET information and technology while not limiting competition and commercial innovation since the recommendations will identify minimum levels necessary to achieve desired results, but will not limit industry in methods to meet or exceed the recommendations.

WTIC funding will be used to execute a portfolio of research projects that will identify gaps that are causal factors in safety hazards and risks for all types of aircraft and research projects that will resolve or reduce known and identified gaps. By reducing or resolving these cockpit MET-related gaps, the American public should see improvements in aviation safety and efficiency as well as a reduction in gaseous emissions. The trade studies, demonstrations, and verifications being performed by the WTIC program are necessary to identify optimum resolutions to the associated gaps and to ensure that there are no unanticipated negative impacts that will result in new gaps, risks, or operational shortfalls. Previous WTIC research has already identified dozens of gaps and has produced a number of recommendations to resolve/reduce selected gaps. The impacts of cockpit MET-related gaps are cross cutting across aircraft types, current operations, and NextGen operations so they are most effectively resolved by the WTIC Program which is focused on identifying solutions for all stakeholders versus being solely focused on a specific operational scenario or aircraft type.

Metrics for the WTIC Program include monitoring NTSB statistics for a reduction in weather and turbulence related incidents, accidents, and injuries, improvements in throughput at core airports during adverse weather, the number of standards invoked that incorporate WTIC minimum weather service recommendations, and WTIC conducted demonstrations verifying the resolution/reduction of current cockpit MET-related gaps and their associated operational shortfalls.

Detailed Justification for A11.p Information Technology/Cyber Security

FY 2020 – A11.p Information/Cyber Security Program– Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
A11.p Information Technology/Cyber Security Program	$1,000	$1,000	$1,232	$2,675

What is this program and what does this funding level support?

The Cyber Security Research and Development (R&D) program will continue the research, analysis, demonstration, evaluation and operational transition of tools, technologies and methods to detect, prevent and mitigate the effects of disruptive cyber incidents to include innovative concepts such as using Machine Learning and Artificial Intelligence in the National Airspace System (NAS) and Mission Support domains. Recognizing the need to protect, defend and enhance the resiliency of the national air transportation infrastructure and pursuant to congressional direction specified in the FAA Extension, Safety and Security Act of 2016, the FAA established FAA Cybersecurity R&D Plan. The R&D program is also consistent with the goals specified in the FAA Cybersecurity Strategic Plan (2019-2024) and with the four major research project initiatives specified below. Within each initiative, the program will establish research, analysis and exploratory development activities, which will be pursued to discover and validate improved capabilities to enhance the cybersecurity posture of the NAS and Mission Support domains.

In addition to the statutory direction contained in FAA reauthorization congressional language, the necessity for this program is required to "strengthen and maintain secure, functioning, and resilient critical infrastructure."[8] More specifically, many recent reports from the Government Accountability Office and the National Research Council point to the urgency of additional work in the area of cybersecurity for the NAS. This research program is also in direct alignment with the American Security National Research Priority that calls for agencies to "invest in R&D to increase the security and resilience of the Nation's critical infrastructure from both physical threats and cyber-attacks, which have increased rapidly in number and complexity in recent years."[9]

The requested funding supports the execution of concept exploration studies, demonstrations and evaluations on promising tools, technologies and/or methods to enhance the security and resiliency of NAS and Mission Support components. When such studies and evaluations establish the feasibility and utility of particular technologies, program funding will be applied toward formulation of technology development, implementation and operational transition plans. The cyber security research goals of technology transition to the FAA domains will be accomplished through demonstrations, coordinated approaches with various programs and also establishing policy directives or requirements specifications for future program implementation.

Major Activities and Accomplishments Planned in FY 2020 Include:

Consistent with the FAA Cybersecurity R&D Plan the program will pursue major research project initiatives in each of the following four research areas:

- **Security and Resiliency** research to develop methods to enhance FAA's ability to prevent, detect, and respond to cyber-attacks.

[8] Presidential Policy Directive (PPD-21), The White House Office of the Press Secretary, February 12, 2013
[9] Executive Office of the President, OMB Memorandum M-17-30 , August 17, 2017, p2

- **Data Analytics** research and develop capabilities that are built on the disciplines of computer science, information systems and technology, and statistics for aggregating and correlating current data with the intent of understanding, predicting, and responding to cyber-attacks for system-wide safety assurance.
- **Respond and Recovery** research to develop and validate human-in-the-loop policies, training, and procedures to detect and respond to cyber-attacks.
- **System Wide Safety Assurance** research to develop real time, continuous, safety analysis and assurance tools and capabilities to prevent/mitigate the impact of cyber-attacks.

Goals for FY 2020 Funding:

- Concept exploration studies on cyber physical systems and the utilization of distributed cyber functional elements. The study will explore the performance characterization and efficiency of such distributed cyber systems and the placement of distributed sensors in a network. Sensor types, attack vectors and data requirements will all be characterized and modeled.
- Maturation of Self Adaptive Systems and Networks principles and technologies and Design Assurance methods for mixed trust environments for implementation into FAA networks.
- Transition of cyber data science analytical capabilities and research findings to operational implementation.

What benefits will be provided to the American public through this request and why is this program necessary?

The NAS is an integral part of the nation's critical infrastructure as identified in PPD-21. Maintaining continuity of operations of the nation's air traffic management system and preventing interruptions of its functions are essential to providing an efficient air travel system and ensuring the safety and security of the American Public. This request will enable critical research and development leading to enhanced capabilities for a more resilient, safe and secure system.

Detailed Justification for A11.q NextGen – Flight Deck Data Exchange Requirements

FY 2020 – A11.q NextGen – Flight Deck Data Exchange Requirements - Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
A11.q NextGen - Flight Deck Data Exchange Requirements	$0	$0	$1,035	$1,005

What is this program and what does this funding level support?

The implementation of Trajectory Based Operations (TBO) in the NAS requires the ability to exchange extensive information between the flight operator and the Air Navigation Service Provider (ANSP) in a secure manner. The current voice based information exchange mechanisms are not adequate to enable the rich data exchange requirements of TBO. The implementation of Data Communications Aeronautical Telecommunications Network (ATN) Baseline 2 (ATNB2) is expected to address these requirements, however, equipage of ATNB2 capabilities will be limited among non-scheduled air carriers and business jet operators, and retrofit of older equipment among large air carriers will be limited due to the costs of equipage. The resulting mixed equipage in data communication capabilities will result in less than optimal realization of the efficiency benefits envisioned through TBO. To supplement the ATNB2 equipped aircraft, alternate means of data exchange capabilities are possible by leveraging emerging technologies that are already being implemented by flight operators. Technologies such as Electronic Flight Bags (EFBs) and Aircraft Interface Devices (AIDs) coupled with data link capabilities can provide a subset of the capabilities of ATNB2 to enable increased participation in TBO, benefiting the NAS. It is imperative that these new capabilities have robust security protocols and exchange mechanisms that ensure that safety critical systems onboard the aircraft and NAS automation systems on the ground are not compromised.

The Flight Deck Data Exchange (FDDE) Requirements program addresses the data exchange format and performance requirements, which enable enhanced data exchange between onboard avionics systems and ground systems to enable TBO. Recent advancements in flight deck automation such as EFBs, AIDs, and the availability of new on-board data links have introduced an opportunity for flight operators to leverage these technologies in the collaborative decision making process. There is ongoing work to evaluate the feasibility of utilizing these technologies to enable operational functions like trajectory negotiation and downlink of aircraft specific intent data to synchronize trajectories with ground automation with extensive work in improving the ground automation capabilities, but further research is required on the flight deck automation performance and information security requirements. This research will evaluate the emerging technologies that enable the exchange of data between certified avionics such as Flight Management Computer, and non-certified avionics like EFBs through aircraft interface devices. The research will evaluate the current security requirements and state-of-the-art security standards that can be imposed on the new FDDE architecture. This will enable safe data exchange between certified and non-certified systems, the performance standards required to enable operational information exchange like intent downlink and trajectory negotiations, and the data exchange protocols to enable seamless integration between airborne and ground systems. The project will also seek to evaluate and address the security requirements for information exchange and interaction between certified and non-certified avionics, and between airborne and ground automation systems to maintain the integrity of systems that are safety critical to flight operations while enhancing data exchange capabilities.

For FY 2020, the requested funding will be used to finalize a detailed research plan for flight deck data exchange requirements, identify flight deck information exchange architecture alternatives, initiate prototype development to conduct flight deck data exchange requirements research, and validate flight deck data exchange concepts, scenarios, and use cases.

Major Activities and Accomplishments Planned in FY 2020 Include:

- Complete final Flight Deck Data Exchange Requirements research plan.
- Complete final concept and operational use cases.
- Identify flight deck information exchange architecture alternatives.

Goals for FY 2020 Funding:

- By 2021, finalize detailed research plan for flight deck data exchange requirements.
- By 2021, identify flight deck information exchange architecture alternatives.
- By 2021, initiate prototype development to conduct flight deck data exchange requirements research.
- By 2021, validate Flight Deck Exchange data concepts, scenarios, and use.

What benefits will be provided to the American public through this request and why is this program necessary?

This program aims to benefit the American Public by addressing the national aviation priority of flight deck and ATC integration for NextGen operational capabilities. Ongoing research conducted by this program will ensure that pilots receive the right information at the right time for decision-making and collaboration with ATC in order to operate in the NAS safely by ensuring critical data is exchanged in a secure manner.

Through this work, the Flight Deck Data Exchange Requirements program will enable the participation of an increased number of aircraft in the necessary data exchange environment required to enable collaborative decision making and the evolution to TBO through secure and standardized data exchange protocols. By leveraging these capabilities, more aircraft can conduct dynamic and flexible operations that reduce the inefficiencies present in a rigid navigation and surveillance structure. These requirements and flight deck capabilities will enable flight operators to operate at their optimal performance envelopes while reducing the need for air traffic control intervention and restrictions by enabling reduced and delegated separation management. The flying American Public derives benefits in the form of safer flights, reduced delays, and more optimized and predictable flights. In the long term, TBO environment enhanced by advanced flight deck capabilities will lead to lower operating costs for the FAA as well as the airline industry.

Detailed Justification for A13.a Environment and Energy

FY 2020 – A13.a Environment and Energy - Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
A13.a Environment and Energy	$18,013	$18,013	$18,013	$15,103

What is this program and what does this funding level support?

The Environment and Energy (E&E) Program is key to the FAA's strategy to achieve environmental protection that allows sustained aviation growth. The Program advances understanding of civil aviation noise and emissions at their source, how noise and emissions propagate and are modified in the atmosphere, and their ultimate health and welfare impacts. A central part of the program is the continued development of an integrated aviation environmental tools suite that can be used to evaluate a wide range of environmental mitigation solutions. The suite is built upon a sound scientific understanding of aviation noise and emissions as well as their environmental, health, and welfare impacts. The tools analyze and inform decision-making on technology development, operational procedures, regulatory compliance, and international and domestic policies relating to civil aviation's energy use and environmental impacts.

Aviation noise and emissions are a considerable challenge to the continued growth of the National Airspace System (NAS). Despite the technological advancements achieved during the last four decades, and the resultant 95 percent reduction in the population exposure to significant noise, the impact of aircraft noise demands considerable Federal resources and is a constraint on aviation growth. Since 1982 the FAA has provided over $10.5 billion for sound insulation of houses and schools around U.S. airports through the Part 150 Program. Environmental impacts, especially aircraft noise, are often the number one cause of opposition to airport capacity expansion and airspace redesign[10]. The implementation of precision navigation over the last few years has contributed to increased airport community concerns regarding noise. This challenge is anticipated to grow with new entrants such as unmanned aerial systems, urban air mobility, civil supersonic aircraft, and commercial space vehicles. The ability to manage this growth will partly depend on the extent to which we address the effects of noise and emissions. Technologies that reduce noise and emissions are regulated at the vehicle level as a part of airworthiness certification. These environmental standards are harmonized internationally through the International Civil Aviation Organization's (ICAO) Committee on Aviation Environmental Protection (CAEP). A significant portion of this Program is devoted to informing decision making at ICAO CAEP. Further, this Program supports domestic policy and regulatory considerations in the absence of timely consensus on international policies and standards.

NOISE INNOVATION. The E&E Program is producing data and knowledge that are the scientific and technical foundation for decision making and mitigations development for aviation noise. Through the Aviation Noise Research Roadmap, the Program is advancing our understanding of the impacts of aviation noise on community annoyance, sleep, health, and children's learning. The Program also supports noise measurements of existing air vehicle types and new entrants for the airworthiness noise certification requirement. The E&E Program, in close collaboration with industry, NASA, and international partners through ICAO CAEP, is providing the technical basis for a review and possible elimination or modification of existing regulations to enable the development and growth of supersonic air transportation.

EMISSIONS INNOVATION. The E&E Program is also producing data and knowledge that are the scientific and technical foundation for decision making on aviation emissions. Through the Aviation Emissions Characterization Research Roadmap, the Program is advancing our understanding of how aviation emissions form and are dispersed

[10] http://www.gao.gov/assets/310/309622.pdf

in the atmosphere. Because of their adverse health impacts, the current focus of emissions research is on aircraft particulate matter emissions, a regulated criteria pollutant in the United States, and the development of an engine particulate matter emissions standard in ICAO CAEP. The Program is also supporting the development of aviation emissions standards for supersonic aircraft and laying the groundwork to understand the emissions impacts from other new entrants.

AVIATION ENVIRONMENTAL TOOLS SUITE. The E&E Program is developing a comprehensive suite of analytical tools to quantify the environmental consequences and impacts of aviation. These analytical tools provide the ability to characterize and quantify the interdependencies among aviation-related noise and emissions, impacts on health and welfare, and industry and consumer costs, under different market, policy, technology, and operational scenarios. At the center of these analytical tools is the Aviation Environmental Design Tool (AEDT), which can quantify the noise, fuel burn and emissions resulting from aircraft operations from the airport gate through ground movements, takeoff, climb-out, cruise, approach, and landing at the aircraft's final destination. Research continues to improve the ability of AEDT to model noise at lower levels to address community concerns in areas at relatively large distances from airports as well as to include supersonic aircraft. These new capabilities will enhance our ability to design effective options to mitigate noise and emissions impacts of aircraft operations. The Program also supports the development of analytical tools that quantify the costs and benefits of varied solutions to reduce aviation noise and emissions.

STREAMLINING ENVIRONMENTAL APPROVALS. The E&E Program is providing knowledge and tools to improve and streamline the required environmental review processes for infrastructure projects and other Federal actions. Given the sensitivity and high visibility of such activities in today's environment, the Program is developing an improved screening tool that will allow users to rapidly and conclusively identify Federal actions that do not require further environmental review, thus reducing the time and costs for environmental reviews. The new tool will enable the FAA to perform effective screening analysis and provide users with powerful analytics to improve the communication of results to the public.

ANALYSIS. The E&E Program uses the aforementioned models and knowledge to inform decision-making on technology, fuels, operational procedures, and policies relating to aviation's energy use and environmental impacts. Efforts under this project support the development of standards, market-based measures, and policies within ICAO CAEP for subsonic and supersonic civil aircraft. Efforts also support the development of operational procedure concepts to reduce noise, emissions and fuel use from aircraft and helicopters.

Major Activities and Accomplishments Planned in FY 2020 Include:

- Using advances in understanding of aviation impacts on the economy and environment, enhance the aviation environmental tool suite to improve our ability to calculate environmental consequences and impacts of aviation.
- Analyze and develop mitigation options for reducing environmental impacts including operational procedure concepts, policy measures, and standards.
- Develop improved measurement capabilities and airworthiness certification methods for both noise and emissions, for both existing air vehicles and new entrants.

Goals for FY 2020 Funding:

- By 2020, develop advanced operational procedural concepts that could reduce community noise exposure while maintaining safe flight operations and guidance for air space planners on how these concepts could be incorporated.
- By 2021, advance understanding of supersonic aircraft noise, the public reaction to advanced supersonic aircraft noise, and procedures needed to certify aircraft noise to create the body of knowledge to support development of noise standards for airplanes that exceed Mach 1.

- By 2021, improve international standards for measuring regulated pollutants from civil supersonic engines.
- By 2021, release AEDT Version 4 with improved noise characterization.
- By 2021, develop improved analytical tools and methodologies for cost-benefit analysis of both domestic and international policy options and scenarios.
- By 2022, complete analyses to quantify the potential health impacts of aircraft noise.
- Through 2024, complete analyses to support the development of new standards for supersonic transport aircraft and engines in ICAO CAEP.

What benefits will be provided to the American public through this request and why is this program necessary?

Civil aviation is evolving continuously, and so must the analytical tools and research that quantify and characterize the environmental consequences of civil aviation. The increased knowledge and analytical capabilities provided by the E&E Program ensure the FAA has ability to define and mitigate environmental issues that the aviation industry will need to overcome to ensure sustained aviation growth. This request would continue efforts to advance our scientific understanding of the environmental impacts of civil aviation, develop tools to quantify these impacts, and then use the tools to inform decision making to ensure that cost-effective solutions are developed to address the environmental and energy issues confronting aviation.

MITIGATION OF PARTICLE EMISSIONS. The E&E Program has been instrumental in supporting the development of a new standardized particular matter emissions measurement system for gas turbine engines. The new measurement system can simultaneously perform gaseous emissions measurements, which are also required. The new standardized particulate matter emissions measurement standard reduces emissions certification time by half saving industry time and money while improving the quality of the emissions measurements. This new system is currently being used to develop the emissions database to create an international aircraft engine particulate matter standard.

PUBLIC TOOLS. The E&E Program has enabled the development of AEDT to quantify the integrated fuel burn, noise, and emissions consequences of aviation as well as the analytical tools to convert these consequences into impacts on the community. AEDT version 3a (https://aedt.faa.gov) is the FAA's standard noise and emissions model. AEDT3a is saving the government money by enabling noise, fuel burn, and emissions calculations to be run simultaneously. Additionally, AEDT is used internationally by academia, industry, and manufacturers in over 30 countries, thus establishing AEDT as the recognized reference tool for modeling environmental consequences and furthering the global leadership position of the U.S.

INTERNATIONAL STANDARDS SETTING. During the ICAO CAEP/8, CAEP/9, and CAEP/10 triennial meetings - which took place in 2010, 2013, and 2016, respectively – the aviation environmental tool suite was used to inform the U.S. positions on the internationally negotiated nitrogen oxide, noise, and fuel efficiency standards. The tools were also the primary providers of the data upon which the standards were evaluated and selected. Continued funding for the E&E Program would ensure that 1) the U.S. has the scientific information to make informed decisions on a particulate matter standard and a global market based measure for aviation, both of which are currently being developed in ICAO CAEP and 2) the U.S. leads the development of standards for supersonic aircraft emissions and noise, which are anticipated to be developed in ICAO CAEP in the early 2020s. Each of these impact the health and welfare of the American public as well as having a multi-billion dollar impact on the aviation industry.

U.S. INDUSTRY BENEFITS. At present, aviation equipment (aircraft, spacecraft, and related equipment) is the largest export sector in the U.S. economy accounting for over 8 percent of total exports. The U.S. aviation industry relies on the international harmonization of standards to ensure that aircraft that leave the U.S. are accepted for operation across the globe. The U.S. aviation industry relies on the FAA to negotiate these standards at ICAO CAEP and to certify that their aircraft and engines comply and can be sold to airlines around the world. If standards are either not harmonized or are not promulgated domestically, then U.S. manufactures of aviation products will need to seek certification from foreign governments. The result would be increased cost for industry and delays in product launches of new aircraft and engines. Finally, the development of supersonic aircraft production industry in the U.S.

would lead to the expansion of U.S. aviation equipment exports. In addition to narrowing our trade imbalances with the rest of the world, this would undoubtedly lead to domestic economic growth and the creation of U.S. jobs. Maintaining U.S. leadership at ICAO CAEP will ensure policy/rule making for both subsonic and supersonic aircraft and equipment is aligned with U.S. interests and the industry is not unduly burdened by international regulation.

WORKFORCE DEVELOPMENT. Much of the research in this program is carried out via the Aviation Sustainability Center (ASCENT - http://ascent.aero), which supports 16 universities and over a hundred students nationwide. In addition to producing world-class research, ASCENT is developing a workforce that will help aviation overcome challenges posed by aviation noise and emissions for decades to come.

Detailed Justification for A13.b NextGen – Environmental Research-Aircraft Technologies and Fuels

FY 2020 – A13.b NextGen – Environmental Research – Aircraft Technologies and Fuels – Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
A13.b NextGen - Environmental Research - Aircraft Technologies and Fuels	$29,174	$29,174	29,174	$12,500

What is this program and what does this funding level support?

In partnership with industry through the Continuous Lower Energy, Emissions and Noise (CLEEN) program, the "NextGen – Environmental Research–Aircraft Technologies and Fuels Program" develops aircraft and engine technologies that reduce noise and emissions while increasing fuel efficiency and leading to reduce operating costs. Technologies developed by this Program will result in a fleet of aircraft that have lower noise, use less fuel, and produce fewer emissions, thus supporting the overarching environmental performance goal for NextGen to achieve environmental protection that allows sustained aviation growth.

Historically, advances in aircraft technology have been the main factor in reducing aviation's environmental impacts. Because of advancements in technology, there has been a 95 percent reduction in the number of people exposed to significant noise and more than a 70 percent improvement in fuel efficiency. The vast majority of noise reductions over the last four decades have come from enhancements in engine and airframe design that have also yielded substantial gains in fuel efficiency. However, because of factors such as the growth in the number of operations and the implementation of new airspace procedures, noise and emissions remain a considerable challenge in terms of community reaction.

A primary component of this research portfolio is the CLEEN Program. CLEEN is a partnership with aviation manufacturers to accelerate the development of new aircraft and engine technologies. Through the public-private partnership of the CLEEN Program, the FAA and industry work in collaboration to develop technologies that will enable manufacturers to create aircraft and engines with lower noise and emissions as well as improved fuel efficiency. Further, the technologies being accelerated by the CLEEN Program have relatively large technological risk; as such, government resources help mitigate the risk and incentivize aviation manufacturers to invest and develop technologies that will have important benefits. By cost-sharing the development with the FAA, industry is willing to accept the greater risk associated with this technological development.

CLEEN addresses a critical market failure related to environmental stewardship by helping accelerate environmentally conscious technologies through a crucial phase in their maturation, culminating in full scale ground and flight test demonstrations and showing readiness for product implementation. At the conclusion of the development effort for a CLEEN technology, each company, having cost shared the development with FAA, is invested in the technology's success and confident in its maturity to enter product development for entry into service.

Once entered into service, the CLEEN technologies will realize their noise, fuel burn, and emissions benefits throughout the fleet for years to come. Since its inception in 2010, the CLEEN Program has been successful in maturating technologies to enter into service sooner than what the industry had anticipated. For example, the low emissions engine combustor has met and exceeded the original CLEEN goal for nitrous oxide reductions. This combustor has been introduced into service in 2016. Other demonstrated CLEEN technologies have shown significant progress toward the fuel burn and noise reduction goals.

In FY 2020, the NextGen – Environmental Research – Aircraft Technologies and Fuels Program will continue to advance system design, integration, and testing of CLEEN aircraft technologies for accelerated progress towards flight demonstration and system-wide assessments within the third, five year phase of the CLEEN program.

Major Activities and Accomplishments Planned in FY 2020 Include:

- Conclude activities within the second phase of the CLEEN Program to assess and demonstrate aircraft and engine technologies that can reduce energy use, emissions, and noise.
- Initiate activities within the third phase of the CLEEN Program.

Goals for FY 2020 Funding:

- Through 2020, demonstrate technologies that can reduce energy use, emissions, and noise in the second phase of the CLEEN Program.
- By 2020, assess the benefits of the airframe and engine technologies from the second phase of the CLEEN Program.
- By 2020, initiate activities within the third phase of CLEEN to demonstrate technologies that can reduce energy use, emissions, and noise.
- Through 2024, continue activities within the third phase of CLEEN to demonstrate technologies that can reduce energy use, emissions, and noise.

What benefits will be provided to the American public through this request and why is this program necessary?

The CLEEN Program is lowering the risk of new and emerging technologies such that they can be adopted by industry. The maturation of environmental technologies that deliver improved environmental performance allows aviation system growth and associated positive economic impacts.

The technologies matured in the first five-year period of CLEEN will reduce U.S. fleet-wide fuel burn by 2 percent from 2025 through 2050, representing a cumulative savings of 22 billion gallons of jet fuel. The CO2 savings are the equivalent of taking 1.7 million cars off of the road over the duration of this 25 year period. It will also save airlines $2.75 billion per year. These benefits are in addition to substantial reductions in noise and emissions that degrade air quality (go to http://partner.mit.edu/projects/eds-capability-demonstration-assessing-cleen-program for further details).

The CLEEN Program matured a low emission combustor technology, the General Electric Twin Annular Premixing Swirler (TAPS) II combustor, which entered into service in 2016 in a CFM International engine. This engine is being used on the Boeing 737 MAX and Airbus 320 aircraft with almost 8,000 orders already placed. The combustor technology reduces landing and takeoff emissions by 55 percent relative to current standards and reduces particulate matter by 90 percent relative to the current international visibility limit.

Industry anticipates that additional CLEEN technologies will enter into service in the next several years as opportunities arise for their insertion into new aircraft and engine designs. The CLEEN Program anticipates another CLEEN engine technology will have more than 4,000 orders placed after 2020. As additional new aircraft and engine products are announced by industry, there will be many more orders placed for products that were matured via the CLEEN Program. Additional details on the CLEEN Program are available at

https://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=22534.

With continued funding, this program will enable the FAA, through the third phase of the CLEEN Program, to partner with industry to accelerate the maturation of technologies with the result being a fleet of aircraft with increased fuel efficiency and lower noise and emissions. This program would build on the second phase of the CLEEN Program, which had technology goals to develop and demonstrate certifiable engine technology that reduces:

- Noise levels by 25 dB cumulative, relative to Stage 5 standard.
- Aircraft fuel burn by 40 percent relative to year 2000 best-in-class in-service aircraft.
- LTO cycle, NOx emissions by 70 percent below the International Civil Aviation Organization standard adopted in 2011.

By reducing the environmental impact of aviation through new technologies this funding helps to ensure the continued growth of aviation while also reducing the impacts of aviation noise and emissions on airport communities as well as on the public at large.

Detailed Justification for A14.a System Planning and Resource Management

FY 2020 – A14.a System Planning and Resource Management - Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
A14.a System Planning and Resource Management	$2,135	$2,135	$2,135	$2,717

What is this program and what does this funding level support?

The System Planning and Resource Management (SPRM) activity leads the planning, coordination, development, presentation, and review of the FAA's research and development (R&D) portfolio. Its key programmatic outputs include the National Aviation Research Plan (NARP), the Annual Research and Development Review – both of which are annual statutory deliverables to Congress – and administration of the congressionally mandated (P.L. 100-591 Section 6 Advisory Committee) Research, Engineering and Development Advisory Committee (REDAC) and resultant reports. SPRM also provides program advocacy and outreach and maintains alignment with departmental R&D program planning and performance reporting guidance.

SPRM leads the portfolio planning, formulation, presentation and review activity to ensure the FAA meets the President's criteria for R&D, increases program efficiency, sustains and maintains management of the program within operating cost targets, and enables effective program review by the REDAC and the OST Office of Research and Technology.

Established pursuant to the Federal Advisory Committee Act (FACA), 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.

SPRM also develops program guidance and conducts compliance reviews to ensure that departmental R&D program planning and performance reporting requirements specified in the Fixing America's Surface Transportation Act (Pub. L. No. 114-94) are satisfied. It also coordinates the establishment and administration of the Air Transportation Centers of Excellence Program and ensures compliance with related Financial Assistance and Grants Management departmental policy guidance.

Major Activities and Accomplishments Planned in FY 2020 Include:

- Completion of annual Congressional deliverables (NARP, Annual Review).
- Coordination and completion of REDAC reports, guidance and transmittals.
- Development and dissemination of R&D Program Performance Reports.
- Development and submission of R&D investment portfolio.
- Development and coordination of OST R&D management deliverables.

Goals for FY 2020 Funding:

Sustain and maintain program operation within specified operating cost targets as follows:

- Maintain an RE&D management workforce of no more than 10 percent of the total RE&D workforce, each year through FY 2020.
- Control expenditures of the REDAC to less than 1/10 of 1 percent of the total RE&D budget, and each year through FY 2020.

What benefits will be provided to the American public through this request and why is this program necessary?

This program provides the support for the FAA to formulate its annual RE&D portfolio and submit the mandatory R&D planning documents to Congress each year. Through the management of the FAA REDAC, this program facilitates an independent, expert review of the FAA's R&D portfolio that provides meaningful recommendations for the FAA to refine and improve its portfolio. This results in a more effective research program that will benefit the public by making aviation safer and smarter and enhancing the U.S. global leadership in aviation.

Detailed Justification for A14.b William J. Hughes Technical Center Laboratory Facility

FY 2020 – A14.b William J. Hughes Technical Center Laboratory Facility - Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
A14.b William J. Hughes Technical Center Laboratory Facility	$3,412	$3,412	$4,571	$2,859

What is this program and what does this funding level support?

Research and Development (R&D) programs require specialized facilities that provide flexible, high fidelity environments to conduct research and perform Human-In-the-Loop (HITL) simulations that evaluate advanced air traffic concepts. This program sustains the specialized research facilities located at the William J. Hughes Technical Center (WJHTC) that are utilized to support R&D program goals.

The WJHTC R&D laboratories are fully integrated with the other WJHTC capabilities, which provides researchers an extremely high fidelity environment, including the ability to emulate and evaluate field conditions. Numerous R&D programs use the laboratory facilities to conduct research activities that encompass current day capabilities, the Next Generation Air Transportation System (NextGen), and the transition to NextGen.

Researchers measure baseline human performance using existing air traffic controller configurations and identify changes in performance when new systems or procedures are introduced. These laboratories include integrated cockpits, air traffic controller workstation capabilities (simulated and real), and specialized biometric data collection systems to evaluate the system and human components that can only be addressed in a full mission end-to-end simulation environment.

The funding supports the sustainment of the existing laboratory infrastructure; project support; engineering support; R&D facility modifications and improvements; equipment and software/hardware licenses; and support tools.

The WJHTC R&D laboratories are comprised of the Cockpit Simulation Facility (CSF), Target Generation Facility (TGF), Research Development and Human Factors Laboratory (RDHFL) and the NextGen Prototyping Network (NPN).

<u>Simulation Facilities - (CSF & TGF)</u>

The Simulation Branch supports development and test programs at the WJHTC by generating realistic traffic for engineering, operational, and Human Factors (HF) evaluations of National Airspace System (NAS) equipment, procedures, and operations. The TGF is a dynamic controller-in-the-loop real time/fast time Air Traffic Control (ATC) simulation capability used to generate real time, interactive traffic in support of HITLs. Realistic aircraft trajectories and associated digital radar messages and maps for aircraft and controllers are generated in a simulated airspace environment. Simulation pilots are provided by the Simulation Branch and include a cadre of current and retired airline and commercial pilots who interact with air traffic controllers and dynamically control aircraft movement during HITL simulations. The Simulation Branch also maintains several cockpit simulators of transport category including B-737-800, A-321, Embraer 175, and several General Aviation (GA) aircraft. All cockpit simulators are integrated with TGF and are capable of acting as interactive targets in NAS simulations.

<u>Concepts and Systems Integration – RDHFL</u>

The RDHFL conducts research to acquire a better understanding of the role that a human plays in current and future aviation systems. This research environment is specifically designed to measure and assess human performance and workload. Additionally, the RDHFL investigates how new technologies should be integrated into air traffic control and airway facilities systems. This research increases the overall safety of the NAS while also minimizing implementation costs by evaluating the effectiveness of air traffic concepts and requirements. The RDHFL has supported a number of legacy systems and NextGen projects in many areas of research including NextGen Terminal Radar Approach Control (TRACON) (Human Factors Division), En Route Data Communications, modular NextGen TRACON facilities, separation management, tower ground surveillance, unmanned aircraft systems (UAS), wildlife Human Factors mitigation simulation, weather simulations, virtual reality demonstrations, and many more. The RDHFL will continue to provide the resources to conduct robust and high fidelity HITL air traffic simulations.

Network Capabilities (NextGen Prototyping Network)

The WJHTC R&D laboratories are connected to each other and to other FAA and partner R&D facilities through the NextGen Prototyping Network (NPN). The NPN serves as the FAA's primary R&D network that provides a scalable and secure infrastructure that facilitates R&D activities. FAA WJHTC, Florida Test Bed, and Oklahoma City, OK laboratories as well as Government (Department of Defense Research Network, National Aeronautics and Space Administration, National Weather Service) industry, and academia resources are accessible via the NPN private network. The NPN also has established connections to the FAA Telecommunications Infrastructure (FTI), which enables supportability of full lifecycle management of NAS Programs. The funding level supports network engineering and resources required to fulfill the planned network related major activities for FAA programs, such as cybersecurity, unmanned aircraft systems (UAS), Commercial Space, and other FAA related research and development.

Major Activities and Accomplishments Planned in FY 2020 Include:

Simulation Facilities - (CSF & TGF)

- Implement intelligent agent-based capability for Terminal controllers to the TGF simulation platform.
- Implement initial Trajectory Based Operations (TBO) capability in the Boeing 737 flight deck simulator, including the capability for flight plan exchange through data communications

  US.

Concepts and Systems Integration – RDHFL

- Enhance the ATC simulation infrastructure with capabilities added to the baseline NAS automation systems.
- Develop the capability to scan an environment into 3D virtual reality software for the purposes of providing a research platform into proposed future working conditions.

Network Infrastructure - NPN

- Support FAA Enterprise Network Services (FENS) proof-of-concept exercises that will be used to explore network technologies in support of program acquisition (FENS, FTI-2).

Goals for FY 2020 Funding:

Simulation Facilities - (CSF & TGF)

- By 2021, implement intelligent agent-based capability for both En Route & Terminal environments into TGF for CONUS simulations in Tech Center R&D and field support laboratories as well as remotely located simulation facilities.
- By 2021, implement TBO improvements and connectivity capabilities to the B737 simulator to support integrated, high fidelity, multi-lab simulations.

Concepts and Systems Integration – RDHFL

- By 2020, develop prototypes within the ATC simulation software that support research into advanced separation and spacing initiatives.
- By 2021, support research into a conceptual 4 Dimensional Trajectory (4DT) controller interface to research trajectory based operations.

Network Infrastructure - NPN

- By 2021, support cybersecurity Incident Response Plan exercises with the DoD.
- By 2023, integrate FAA and partner networks and facilities into the NPN baseline to expand the collaborative capabilities and position the FAA to best support NextGen research within the FAA, other government agencies, industry and academia partners.

What benefits will be provided to the American public through this request and why is this program necessary?

The R&D laboratories are fully integrated with the other WJHTC capabilities, which allows for an extremely high fidelity environment supporting R&D research. This research encompasses capabilities of the current day, NextGen, and the transition to NextGen (e.g., mixed equipage and adjacent site deployment). The American public benefits by having an efficient and flexible platform to evaluate future NextGen concepts and technologies that will enhance the safety and efficiency of air travel.

In order to provide this robust research platform, it is necessary to modify, upgrade, and sustain the R&D laboratory infrastructure in order to support the R&D program goals.

Simulation Facilities - (CSF & TGF)

The capability developed by the Simulation Branch enables the research of complex problems due to weather, UAS, and commercial space flight in a controlled laboratory environment. The fully integrated facilities enable research from the ground and airborne elements, for a complete simulation capability. Cost savings and safety are realized by performing this research in simulation rather than the use of live aircraft. The implementation of new technologies, such as the intelligent agent-based capability, allow for a reduction in the number of test subject participants needed for a given study in order to further maximize cost savings and efficiencies. Moreover, the safety of simulation allows the study of the extremes that would not be possible in live flight conditions.

Concepts and Systems Integration – RDHFL

The benefit of conducting proactive HF research on proposed changes to the NAS is to identify human performance issues early in the concept development phase. HF related issues resolved prior to implementation result in cost savings and ensure that the agency's safety standards for air traffic control operations are met.

Network Infrastructure – NPN

Use of the NPN maximizes shared resources; relieves the need to establish separate connections; and minimizes duplication of efforts and the resources to manage these extra connections and efforts. The NPN provides a common network approach that affords distributed access to NextGen and R&D laboratories and a distributed set of capabilities that frees up R&D funding which is extremely important during times of austere budgets. The modern enterprise network architecture of the NPN ensures data separation and end-to-end segmentation for both FAA and partner networks. It meets the most stringent security requirements while providing a flexible and scalable architecture to best meet R&D program needs.

GRANTS-IN-AID FOR AIRPORTS

(LIQUIDATION OF CONTRACT AUTHORIZATION)

(LIMITATION ON OBLIGATIONS)

(AIRPORT AND AIRWAY TRUST FUND)

(INCLUDING TRANSFER OF FUNDS)

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, $3,000,000,000, 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 $3,350,000,000 in fiscal year 2020, 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 $112,353,000 shall be obligated for administration, not less than $15,000,000 shall be available for the Airport Cooperative Research Program, and not less than $33,224,000 shall be available for Airport Technology Research.

Note.—A full-year 2019 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115–56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

Program and Financing
(in millions of dollars)

Identification code: 69-8106-0-7-402	FY 2018 Actual	FY 2019 Estimate	FY 2020 Estimate
Obligations by program activity:			
0001 Grants-in-aid for airports	3,303	3,180	3,190
0002 Personnel and related expenses	112	112	112
0003 Airport technology research	33	33	33
0005 Small community air service	12	10	. . . .
0006 Airport Cooperative Research	15	15	15
0007 Grants-Appropriation	205	995	0
0008 Administrative Expenses – Appropriation	0	5	0
0100 Total direct program	3,680	4,350	3,350
0799 Total direct obligations	3,680	4,350	3,350
0801 Grants-in-aid for Airports (Airport and Airway Trust Fund) Reimbursable	. . . .	1	1
0900 Total new obligations, unexpired accounts	3,680	4,351	3,351
Budgetary Resources:			
Unobligated balance:			
1000 Unobligated balance carried forward, Oct 1	18	815	815
1001 Discretionary unobligated balance brought fwd, Oct 1	2	795	. . . .
1021 Recoveries of prior year unpaid obligations	125	. . . .	. . . .
1033 Recoveries of prior year paid obligations	1	. . . .	. . . .
1050 Unobligated balance (total)	144	815	815
Budget Authority:			
Appropriations, discretionary:			
1101 Appropriation (special or trust fund)	4,000	4,000	3,000
1137 Appropriation applied to liquidate contract authority	-3,000	-3,000	-3,000
Contract authority, mandatory:			
1160 Appropriation, discretionary (total)	1,000	1,000	. . . .
1600 Contract authority (Reauthorization)	3,350	3,350	3,350
Spending authority from offsetting coll., Discretionary:			
1700 Collected	1	1	1
1900 Budget authority (total)	4,351	4,351	3,351
1930 Total Budgetary Resources Available	4,495	5,166	4,166
Memorandum (non-add) entries:			
1941 Unexpired unobligated balance, end of year	815	815	815
Change in obligated balances:			
Unpaid obligations:			
3000 Unpaid obligations, brought forward, Oct 1	5,708	6,073	6,278
3010 Obligations incurred, unexpired accounts	3,680	4,351	3,351
3020 Outlays (gross)	-3,190	-4,146	-4,296
3040 Recoveries of prior year unpaid obligations, unexpired	-125	. . . .	. . . .
3050 Unpaid obligations, end of year	6,073	6,278	5,333
Memorandum (non-add) entries:			
3100 Obligated balance, start of year	5,708	6,073	6,278
3200 Obligated balance, end of year	6,073	6,278	5,333
Budget authority and outlays, net:			
Discretionary:			
4000 Budget authority, gross	1,001	1,001	1
Outlays, gross:			
4010 Outlays from new discretionary authority	243	561	450
4011 Outlays from discretionary balances	2,947	3,585	3,846
4020 Outlays, gross (total)	3,190	4,146	4,296
Offsets against gross budget authority and outlays:			
Offsetting collections (collected) from:			
4030 Federal sources	-1	. . . .	. . . .

4033	Non-federal sources	-1	-1	-1
4040	Offsets against gross budget authority and outlays (total)	-2	-1	-1
	Additional offsets against gross budget authority only:			
4053	Recoveries of prior year paid obligations, unexpired Accounts	1	....	....
4070	Budget authority, net (discretionary)	1,000	1,000	....
4080	Outlays, net (discretionary)	3,188	4,145	4,295
	Mandatory:			
4090	Budget authority, gross	3,350	3,350	3,350
4180	Budget authority, net (total)	4,350	4,350	3,350
4190	Outlays, net (total)	3,188	4,145	4,295
	Memorandum (non add) entries:			
5052	Obligated balance, SOY: Contract authority	3,114	3,464	3,814
5053	Obligated balance, EOY: Contract authority	3,464	3,814	4,164
5061	Limitation on obligations (Highway Trust Funds)	3,350	3,350	3,350

Subchapter I of chapter 471, title 49, U.S. Code 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)

Identification code: 69-8106-0-7-402		FY 2018 Actual	FY 2019 Estimate	FY 2020 Estimate
	Direct obligations:			
	Personnel compensation			
11.1	Full-time permanent	67	78	73
11.5	Other personnel compensation	1	1	1
11.9	Total personnel compensation	68	79	74
12.1	Civilian personnel benefits	22	23	23
21.0	Travel and transportation of persons	3	3	3
23.2	Rental payments to others	1	1	1
25.1	Advisory and assistance services	26	27	27
25.2	Other services from non-Federal sources	2	2	1
25.3	Other services from Federal sources	23	25	24
25.7	Operation and maintenance of equipment	4	4	3
26.0	Supplies and materials	1	1	1
31.0	Equipment	5	1	1
32.0	Land and Structures	6	....	....
41.0	Grants, subsidies, and contributions	3,508	4,174	3,192
94.0	Financial Transfers	10	10	....
99.0	Direct obligations	3,679	4,350	3,350
99.0	Reimbursable obligations	1	1	1
99.9	Total new obligations, unexpired accounts	3,680	4,351	3,351

Employment Summary

Identification code: 69-8106-0-7-402		FY 2018 Actual	FY 2019 Estimate	FY 2020 Estimate
1001	Direct: Civilian full-time equivalent employment	564	599	600
2001	Reimbursable: Civilian full-time equivalent employment	1	1	2

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EXHIBIT III-1

GRANTS-IN-AID FOR AIRPORTS
Summary by Program Activity
Appropriations, Obligation Limitations, and Exempt Obligations
($000)

	FY 2018 ACTUAL	FY 2019 ANNUALIZED CR	FY 2019 ENACTED*	FY 2020 REQUEST	CHANGE FY 2019-2020
Grants-in-Aid for Airports	4,174,927	4,174,927	3,676,690	3,189,423	(487,267)
Personnel & Related Expenses	116,863	116,863	115,100	112,353	(2,747)
Airport Technology Research	33,210	33,210	33,210	33,224	14
Airport Cooperative Research	15,000	15,000	15,000	15,000	-
Small Community Air Service	10,000	10,000	10,000	-	(10,000)
TOTAL	$ 4,350,000	$ 4,350,000	$ 3,850,000	$ 3,350,000	$ (500,000)
FTEs					
Direct Funded	599	599	599	600	1.0
Reimbursable, allocated, other	2	2	2	2	0

* Enacted levels for FY 2019 are provided for informational purposes. The FY 2020 budget request was developed before a final appropriations act was enacted for FY 2019, and the request assumes a year-long continuing resolution for FY 2019.

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 rights and safeguarding the public investment.

Executive Summary: Grants-in-Aid for Airports

What Is the Request and What Funds are Currently Spent on the Program?

For FY 2020, the President's Budget requests $3.35 billion to fund the Grants-in-Aid for Airports program, also known as the Airport Improvement Program (AIP). The budget will enable the FAA to continue providing capital funding to help airports preserve and maintain critical airport infrastructure. The Grants-in-Aid program enables FAA to advance important safety, capacity and efficiency projects at more than 500 airports supporting commercial service and more than 2,800 general aviation airports that provide critical functions at the national, regional, and local level. The AIP also helps airports address environmental concerns for neighboring communities, which may otherwise oppose or delay airport modernization projects.

What Is this Program and Why is it Necessary?

The AIP provides grants to local and state airport authorities to help ensure the safety, capacity, and efficiency of U.S. airports. Through the AIP, the agency funds a range of activities to assist in airport development, including preservation of development of critical transportation infrastructure.

The FAA identifies public-use airports for the national transportation system and the National Plan of Integrated Airport Systems (NPIAS). These public-use airports support scheduled air carrier service at more than 500 commercial service airports. In addition to the scheduled passenger and cargo service, the airport system serves a diverse range of functions at approximately 2,800 general aviation airports that support emergency medical services and disaster response, flight training, law enforcement support, agricultural activities, and business/corporate activities.

Why Do We Want/Need To Fund The Program At The Requested Level?

Every two years, as required by statute, the FAA publishes a report that looks five years into the future, identifying AIP-eligible development needs for the NPIAS airports. The latest NPIAS report, which was published in September 2018, identified approximately $35.1 billion in capital needs over the 5-year period from 2019-2023.[1] The FAA will publish the next update in September 2020. The FAA funds capital projects that support system safety, capacity, and environmental projects and the highest priority needs in the NPIAS.

What Benefits will be Provided to the American Public Through This Request?

The investment of AIP funds in the national system of airports is critical to helping maintain and improve the safety, capacity and efficiency of the U.S. system of airports. The FAA works closely with airports and the state aeronautical agencies to monitor the condition of critical airfield infrastructure, and can draw direct connections between our efforts and improvements in safety, capacity, efficiency, and reduction in environmental and community impacts. Through the AIP, the FAA helps ensure there is a safe and reliable system of airports to support the needs of the traveling public, the airlines and other aeronautical users (including businesses that depend upon aviation for time-critical delivery of goods and communications). AIP also contributes in efforts to ensure access to basic community needs such as emergency medical services and disaster response, flight training, law enforcement support, agricultural activities, and business/corporate activities.

[1] Report to Congress National Plan of Integrated Airport Systems (NPIAS) 2019-2023. See https://www.faa.gov/airports/planning_capacity/npias/reports/

Detailed Justification for Grants-in-Aid for Airports

FY 2020 Grants-in-Aid for Airports Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Salaries and Expenses				
Program Costs	4,174,927	4,174,927	3,676,690	3,189,423
Total	**$ 4,174,927**	**$ 4,174,927**	**$ 3,676,690**	**$ 3,189,423**
FTE	**0**	**0**	**0**	**0**

What is this program and what does this funding level support?

For FY 2020, the President's Budget requests $3.19 billion to fund the Grants-in-Aid for Airports program (AIP).

Through AIP, the agency funds a broad range of capital projects at eligible U.S. airports. As required by statute (49 U.S.C. §47103) the FAA maintains the National Plan of Integrated Airport Systems (NPIAS), which identifies airports eligible for AIP funding as well as the kind and estimated costs of eligible airport development projects under the AIP. Currently, there are more than 3,300 public use airports in the NPIAS, of which approximately 531 are able to support scheduled air carrier service. In addition to the commercial service airports supporting scheduled passenger and cargo service, approximately 2,800 eligible airports in the NPIAS provide critical community access, support emergency medical services and disaster response, flight training, law enforcement support, agricultural activities, and business/corporate activities.

With this funding request, the FAA will continue to award AIP grants for eligible projects at NPIAS airports within four key focus areas:

Safety: Among the agency's long-term safety goals are to provide AIP funds to projects that eliminate outmoded airport conditions that contribute to accidents and enhance the margin of operating safety by ensuring that airport safety standards projects receive the highest funding priorities. This includes projects that will help reduce the risk of runway incursions; reduce the risks of injuries, fatalities and property damage when runway excursions occur; eliminate or mitigate obstructions; reduce risks associated with wildlife hazards; and other categories of safety enhancements.

Capacity and Efficiency: The FAA will continue its focus on enhancements throughout the system that will enhance capacity and increase efficiency. AIP will accomplish this by providing financial and technical support to regional and metropolitan system plans, airport master plans and environmental reviews, and by directing funding toward the preservation or construction of runways, runway extensions, and airfield reconfigurations.

Environmental: The FAA will also continue to address environmental issues and community concerns to allow airport infrastructure improvements to proceed in a timely manner, including grants to help airports complete environmental review and permitting processes as expeditiously as possible.

Although not a primary FAA focus area, the AIP does provide funding for specific types of security projects required by statute or regulation. These projects carry a high priority for AIP funding, particularly those related to protecting the airport's "secured area." This includes airport perimeter fencing, security gates, lighting and closed circuit television cameras as part of access control to the secured area. The FAA continues to support infrastructure and facility modifications that allow the Transportation Security Administration (TSA) to optimize the layout and functionality of public screening areas, as well as works with TSA to consider other capital needs to determine whether AIP can support any aspect of those needs.

What benefits will be provided to the American Public through this request and why is this program necessary?

The U.S. aviation system plays a critical role in the success, strength, and growth of the U.S. economy. Approximately 584,000 active pilots, 210,000 general aviation aircraft, and more than 7,000 air carrier aircraft rely upon the U.S. airport system. The economic impacts of the air traffic control system are well documented in FAA's report on "The Economic Impact of Civil Aviation on the US Economy," published in November 2016.[2] It states that, in 2014, aviation accounted for 5.1% of our gross domestic product, contributed $1.6 trillion in total economic activity, and supported 10.6 million jobs.[3] Since 2000, the AIP has funded infrastructure projects at 23 major airports to accommodate more than 2 million additional annual operations each year.

AIP funding in FY 2020 will support the following key infrastructure projects:

- To mitigate safety risks, enhance capacity, and increase efficiency, AIP will be used to fund reconstructed and rehabilitated runways, taxiways and aprons to preserve the nation's critical aviation infrastructure as well as mitigate the risk of foreign object debris damage to aircraft from cracked or broken pavement surfaces;
- To reduce the risk of runway incursions, one of the agency's significant safety initiatives, AIP will fund projects to reconfigure taxiways, perimeter service roads and other airport facilities; and improve marking, lighting, and signage;
- To enhance safety, AIP will fund projects to conduct wildlife hazard assessments and develop wildlife hazard management plans;
- To modernize and enhance efficiency and capacity at airports using a safety risk model. AIP will fund Safety Management Systems (SMS) manual and implementation plans to expand the use of voluntary SMS across the system; and
- To improve environmental reviews and mitigation activities, the AIP will fund projects required to achieve compliance with existing noise, air quality, and water quality laws and policies, with the goals of reducing impacts and streamlining processes.

The Grants-in-Aid for Airports program is crucial to help support the FAA's mission to provide the safest and most efficient transportation system in the world. The AIP helps assure the American Public has a safe, reliable, and efficient system of airports to support and advance U.S. economic interests as well as technology, security, and safety at all levels of consumerism from next day air deliveries to emergency support services.

Safety: The AIP supports the FAA's safety focus by providing funding for safety-related development at airports that benefit U.S. aviation consumers at all levels, whether commercial service and general aviation operators and passengers, or recipients of goods transported via aircraft worldwide. For example, AIP provides funds to airports to make improvements that help reduce runway incursions caused by vehicle/pedestrian deviations or by pilot error due to complex or confusing geometry intersections, most of which were developed before modern airport design standards were established. The Runway Incursion Mitigation (RIM) Program is a key initiative that the Office of Airports is managing to reduce incursions at runway/taxiway intersections where at least 3 incursions have occurred in a year or that average at least one incursion a year, at various airports throughout the country. The FAA has begun and completed mitigation at many RIM locations and is currently developing an estimated schedule and cost estimates for FY 2020 through FY 2026. Additionally, ARP maintains an annual report on RIM projects to date.

AIP also provides support to accelerate improvements to Runway Safety Areas (RSA) that do not meet current standards and other similarly high priority projects that support safety through efforts to reduce the risks of air transportation-related injuries and fatalities. RSA improvements include the installation of Engineered Materials Arresting Systems at some airports. Other projects include pavement rehabilitation and geometric improvements to avoid pilot confusion and enhance safety.

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[2] The Economic Impact of Civil Aviation on the U.S. Economy – November 2016. See https://www.faa.gov/air_traffic/publications/media/2016-economic-impact-report_FINAL.pdf
[3] The Economic Impact of Civil Aviation on the U.S. Economy – November 2016. Page 5. See https://www.faa.gov/air_traffic/publications/media/2016-economic-impact-report_FINAL.pdf

Capacity and Efficiency: The AIP ensures maintenance of existing airport infrastructure as well as modernization of the national system of airports. The AIP also supports vital technical and financial assistance for planning, environmental analysis, engineering design, and the construction or rehabilitation of runways, taxiways, and aprons as well as other measures to expand capacity and make more efficient use of airports.

By providing grants to airport owners and operators to maintain critical facilities, including runways, taxiways, aircraft parking areas (aprons) as well as many other airport facilities, systems and equipment, the AIP helps ensure maximum capacity and efficiency. A significant part if the FAA's safety efforts also support capacity and efficiency. For example, the AIP helps ensure that the vast majority of runways at more than 3,300 NPIAS airports are maintained in excellent, good or fair condition. This reduces system delays by assuring capacity is not compromised due to pavement safety issues.

Other AIP-funded safety projects also serve to ensure system capacity and efficiency—for example, providing equipment to enable airports to keep runways and taxiways clear of snow, ice, and ponding water that can jeopardize aircraft directional control or braking action. Chemicals and plowing, as well as freeze-thaw cycles, all take a toll on runways, taxiways, and other paved areas, requiring careful environmental analysis and engineering planning to ensure adequate drainage. Additionally, AIP grants help fund expert professional planning, engineering and environmental consulting services, as well as pavement maintenance programs to ensure airports are maintained and operated in safe and serviceable conditions as required by statute (49 U.S.C. §47107).

Every other year, FAA is required to publish a five-year prospective analysis of AIP-eligible capital needs. The latest NPIAS, published in September 2016, identified $32.5 billion in estimated capital needs over the 5-year period from 2017-2021.[4] This funding request will contribute to the immediate airport safety, capacity, efficiency, and environmental projects identified by the FAA and airport sponsors to maintain our existing airport infrastructure as well as modernize it to support the air transportation needs of the American public.

[4] Report to Congress National Plan of Integrated Airport Systems (NPIAS) 2017-2021. See https://www.faa.gov/airports/planning_capacity/npias/reports/

GRANTS-IN-AID FOR AIRPORTS

Grants-in-Aid for Airports
($ in Thousands)

Item Title	Dollars	FTP	FTE
FY 2019 Annualized CR	**4,174,927**	**0**	**0**
Adjustments to Base	**0**	**0**	**0**
Program Level			
1. Grants-in-Aid for Airports	-985,504		
Increases/Decreases	**985,504**	**0**	**0**
FY 2020 Request	**3,189,423**	**0**	**0**

Detailed Justification for Personnel and Related Expenses

FY 2020 Personnel and Related Expenses Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Salaries and Expenses	97,808	97,808	91,138	90,044
Program Costs	19,055	19,055	23,962	22,309
Total	**$ 116,863**	**$ 116,863**	**$ 115,100**	**$ 112,353**
FTE	**573**	**573**	**573**	**574**

What is this program and what does this funding level support?

For FY 2020, the President's Budget requests $112.4 million, 573 positions and 574 FTEs to cover the administrative expenses for the Office of Airports (ARP). The request supports ARP's legislatively directed mission of leadership to plan and develop a safe and efficient national airport system to satisfy the needs of the aviation interests of the United States, with consideration for economics, environmental compatibility, local proprietary rights, and safeguarding the public investment. (See, 49 U.S.C. §47103).

The additional funding will support two additional safety positions in FY 2020, to fulfill regulatory oversight requirements ensuring airport compliance with safety regulations, as well as to support integration of Unmanned Aircraft Systems (UAS) into airports through policy development and outreach.

What benefits will be provided to the American Public through this request and why is this program necessary?

Congress statutorily directed the FAA to plan and develop a safe and efficient national airport system to satisfy the needs of the aviation interests of the United States, with consideration for economics, environmental permitting, local proprietary rights, and safeguarding the public investment.

The FAA's Office of Airports has responsibility for maintaining this plan to include establishing standards for the safe planning, design, construction, operation and maintenance of the nation's airports. This is critical because the safe operation of air transportation requires nationwide, as well as international in some cases, consistency in design standards, construction standards, signage, marking, lighting and emergency response.

ARP personnel possess expertise in many professional and technical areas. ARP employees also engage in opportunities to work collaboratively across government agencies, with industry, and with affected stakeholders. It is important to have the appropriate amount and technically competent ARP employees to perform work on behalf of the American public to maintain the existing national airport system. This staff must also work to modernize this airport infrastructure to meet safety, capacity, efficiency, and environmental requirements with the goals of ensuring our system of airports supports the safest, most efficient aerospace system in the world.

For our new requested safety inspector positions, airports today are currently integrating UAS operations into their own operations, or are accommodating UAS operations by tenants and customers. Developing guidance, education, and communications with airports and their stakeholders on how best to safely integrate UAS operations in and around an airport has become one of the airport community's top priorities.

Airports and their tenants and customers are rapidly attempting to integrate UAS into the airport environment. Airport operators are also looking for FAA guidance on how to detect and mitigate UAS being flown around airports that could become hazards to air navigation. This has created challenges for both the airport's operations and the FAA's oversight. Many airports have requested additional visits and consultations with Airport Certification Safety Inspectors, as well as FAA experts in planning, compliance, and environmental impact as they integrate UAS operations into the Part 139 regulatory environment. UAS research can expand on ways to identify and evaluate the issues and requirements for using UAS for airport-centric operations, such as wildlife monitoring, aircraft rescue and firefighting operations, and pavement and infrastructure inspection. This research can lead to efficiencies and cost savings for airports. In addition, dedicated operations personnel with the knowledge and skills in safety, planning, and compliance are needed to deal with the multiple policy development, operational issues, and outreach required that airports face. All these factors are accelerating to a level beyond FY 2018 resources.

GRANTS-IN-AID FOR AIRPORTS

Personnel and Related Expenses

($ in Thousands)

Item Title	Dollars	FTP	FTE
FY 2019 Annualized CR	**116,863**	**573.0**	**574.0**
Adjustments to Base			
1. One Additonal Compensable Day	335		
Total Adjustments to Base	**335**	**0.0**	**0.0**
Other Adjustments			
1. Reduction of $2.5 million related to supplemental funding and offsets to uncontrollable increases	-5,000		
Total Other Adjustments	**5,000**	**0.0**	**0.0**
New or Expanded Programs			
1. 2 new positions(1 FTE) for UAS and Safety related activities	155	2.0	1.0
Total Discretionary Increases	**155**	**2**	**1**
FY 2020 Request	**112,353**	**575.0**	**575.0**

Detailed Justification for Airport Technology Research

FY 2020 Airport Technology Research Budget Request ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Salaries and Expenses	3,672	3,672	3,672	3,686
Program Costs	29,538	29,538	29,538	29,538
Total	**$ 33,210**	**$ 33,210**	**$ 33,210**	**$ 33,224**
FTE	**23**	**24**	**24**	**24**

What is this program and what does this funding level support?

For FY 2020, the FAA requests $33.2 million and 24 positions to fund the Airport Technology Research (ATR) program. This is required to support the execution and management of a program that has 19 research program areas and more than 125 on-going complex projects.

The research activities will continue to support research in airport planning and design, runway incursion reduction, analysis of airport safety data, airport rescue and firefighting, wildlife hazard mitigation, visual guidance, runway surface technology, airport surveillance sensors, aircraft noise issues around airport, airport pavement design, wet runway aircraft braking tests, airport pavement long-term performance, and UAS integration at airports.

ATR findings are used in updating Advisory Circulars, manuals, and technical specifications that airports heavily rely on to maintain and expand their infrastructure in the safest and most efficient manner. This includes all engineering standards for airport construction projects as well as specific safety guidance and requirements to assure safe aircraft and airport operations on the ground. For example, current research projects will advance ARP's ability to maintain the highest safety standards in areas with rapidly evolving technologies such as visual guidance, airport surveillance systems, pavement testing and materials research, and airport geometry enhancements to name a few. All ATR activities are designed to support ARP's mission in to enhance the nation's system in its four focus areas: safety, capacity, efficiency, and environmental.

The success of the research is reflected in our ability to issue updated and new program guidance. For example, based on research and evaluation ARP issues performance specifications for bird radars and foreign object debris detection systems. Each research project is sponsored by an FAA headquarters engineer that prepares the research requirements, reviews the research plan, and approves the completed deliverables.

What benefits will be provided to the American Public through this request and why is this program necessary?

The ATR program provides extensive tangible and intangible benefits to the American Public in the four focus areas that advance the mission of ARP: safety, capacity, efficiency, and environmental.

Safety–related ATR programs provide fact-based assessments and complex analyses of safety and operational data to help the FAA and airport operators institute and maintain standard and proven practices at all NPIAS airports. In order to do so, the ATR program manages a number of research databases. In FY 2020, integration and support of the databases (bird strike, foreign object debris detection, Airport Pavement management systems) into one location will continue. This will ensure compliance with FAA standards, to improve the overall functionality of the databases, and promote public access and sharing of the data as well as enhancements to programs to advance public safety.

A key safety project with an environmental benefit is the ATR's work investigating ways to reduce or eliminate harmful chemicals that may pose either health or environmental hazards. Over the years there has been a growing concern about the potential health and environmental impact that aqueous film-forming foams (AFFF) used by aircraft rescue and firefighting departments can have at airports and surrounding communities. The main concern is certain chemicals that have been found to be toxic have accumulated in land and water around airports. This research will help test new kinds of AFFF for effectiveness without the harmful chemicals. In FY 2020, this multi-year research will continue through critical testing at a fire testing facility dedicated to this issue, which will ensure the new chemicals provide the same, if not increased, levels of fire suppression. The American public will benefit from the removal of toxins as well as the assurance that aircraft fire-fighting equipment is not compromised.

On the capacity side, ATR will continue to use its facilities to test and conduct research on new pavement design and new pavement materials. The FAA will use state-of-the-art material testing laboratory methods to establish material characterization of new pavement materials. Incorporating realistic material properties and specifications through this material research and testing will improve the pavement thickness design procedure and pavement life predictions thus reducing costs and increasing pavement life. On the efficiency side, the ATR program leads to airports using the same pavement design and construction standards all around the country, optimizing construction costs by helping companies of all sizes bid on airport projects. These increases in safety and efficiency netted positive impacts to the American public.

In FY 2020, an efficiency project with an environmental benefit will be the evaluation of solar lighting systems for airports. Historically there have been challenges to using photovoltaic (PV) technology to power lighting systems in airfield environments. Recent developments relating to light-emitting diode, commonly referred to as LED lighting and solar technology have made solar powered lighting systems a practical alternative in certain airfield environments. Solar technology advancements present an opportunity for airports to produce on-site electricity and reduce long-term energy costs. The effort will include initially gathering relevant information relating to use of PV lighting systems, which could be effectively installed and operated in General Aviation (GA) airport environments. PV lighting systems will then be installed at selected GA airports to assess the suitability and sustainability of these systems. Selection of GA Airports will be based on obtaining a wide spectrum of climate conditions for testing and evaluation. Testing and evaluation will be conducted over a sufficient period of time to account for seasonal solar irradiance and related battery charging ability.

Aircraft noise continues to be one of the principal obstacles to optimizing airport system capacity and reducing congestion and delays at the largest and busiest airports. In FY 2020, the ATR program will continue to research ways to reduce community noise impacts. Research projects include: the continuation of creating enhanced conceptual procedure layouts for performance based navigation operations; evaluating and improving the accuracy of noise level reduction testing to develop guidelines for industry standards; and collecting nationally representative data on the relationship between aircraft noise exposure and residential sleep disturbance. Public demand for a quieter environment is putting increasing pressures on our national system of airports that undermine their ability to expand and to accommodate modernization initiatives that will enhance safety, capacity and efficiency. Another potentially limiting factor for airport system capacity is air quality. About 30 percent of U.S. commercial service airports are in either non-attainment areas or maintenance areas for national air quality standards. ATR projects in these areas will provide distinct benefits to the American public, on the ground and in the air, with more efficient routes, quieter communities, and enhanced capacity.

The research initiatives supported by this funding are crucial to continued maintenance and enhancement of safety for the traveling public. Communities of every size throughout the nation benefit from increased accessibility and competitive access. Environmental quality benefits both the traveling public and neighboring communities by enabling airports to be well positioned to support critical infrastructure projects and by helping airports minimize their environmental effects on surrounding areas.

ATR's research portfolio for FY 2020 has been briefed to the FAA's Research, Engineering and Development Advisory Committee's Subcommittee on Airports (REDAC). The REDAC reviews the ATR Program every six months. The Subcommittee has members from airports, aircraft manufacturers, Air Line Pilots Association, and airport associations. The Subcommittee is briefed on both ongoing research and planned research and offers recommendations to ensure the research program is responsive to the needs of FAA and the airport community.

GRANTS-IN-AID FOR AIRPORTS

Airport Technology Research

($ in Thousands)

Item Title	Dollars	FTP	FTE
FY 2019 Annualized CR	**33,210**	**24**	**24.0**
Adjustments to Base			
1. One Additonal Compensable Day	14		
Total Adjustments to Base	**14**	**0**	**0.0**
1. Offsets to uncontrollable increases			
Total Other Adjustments	**0**	**0**	**0.0**
Discretionary Increases			
Total Discretionary Increases	**0**	**0**	**0.0**
FY 2020 Request	**33,224**	**24**	**24.0**

Detailed Justification for Airport Cooperative Research Program

FY 2020 Airport Cooperative Research Program ($000)

Program Activity	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted	FY 2020 Request
Salaries and Expenses	170	170	170	171
Program Costs	14,830	14,830	14,830	14,829
Total	**$ 15,000**	**$ 15,000**	**$ 15,000**	**$ 15,000**
FTE	**2**	**2**	**2**	**2**

What is this program and what does this funding level support?

The Airport Cooperative Research Program (ACRP) is an industry driven research program managed by the Transportation Research Board (TRB) of the National Academies of Sciences, Engineering, and Medicine. It was authorized by section 712 of Vision 100 – Century of Aviation Reauthorization Act. The Secretary of Transportation maintains a Memorandum of Agreement among DOT, FAA, and National Academy of Sciences to implement the ACRP. The Secretary also appoints the 13 members of the ACRP Oversight Committee.

The ACRP's mission is to develop near-term, practical solutions to problems faced by airport operators. ACRP uses contractors, selected in a competitive process, to conduct the research, which is overseen by industry experts and a designated FAA subject matter expert. The results of the research are published in the form of handbooks and best practices. To date, the vast library of publications includes areas of safety, airport management, airport financing, airport environmental quality, airport compliance, and airport planning. These publications are available to the general public on the ACRP website and for purchase in hard copy.

For FY 2020, the FAA requests $15 million for the program. Pay inflation will be absorbed within the requested level. As with previous years, approximately 15 research topics will be funded under this request in FY 2020. ACRP is designed to address needs that are not being addressed by other federal research programs and that cannot be undertaken cost-effectively by individual airports.

What benefits will be provided to the American Public through this request and why is this program necessary?

ACRP is a national resource for the airport industry, providing valuable information, guidance and practical tools to airport owners and operators (as well as consultants and contractors) by providing industry-driven research identified as critical or crucial by airport operators, industry, and users. This community has continually submitted over 100 topics for research each year. After 11 years in operation, ACRP has engaged thousands of public- and private-sector airport practitioners, academia, consultants, advocates, and students to address the airport industry's most pressing challenges.

The 13-member ACRP Oversight Committee reviews the topics selected each year. This Committee, appointed by the Secretary of Transportation meets every six months to review progress and select additional topics to fund. This assures the aviation tax dollar is utilized in the most efficient and beneficial manner to the American public, mitigating wasteful delays, unreasonable contract terms, and unneeded proposals. The ACRP Oversight Committee selects the highest rated topics, and ensures that proposed studies will not duplicate other federal research. 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's broad mission is to provide resources to support applied research on a wide variety of issues faced by airport practitioners, including all levels of professional staff within the airport community, from CEOs, airport managers, executive directors to mid-level managers, nonsupervisory technical and professional staff, trainees, students, and interns. These professionals represent airports, suppliers, public safety agencies, airlines, airport tenants, local and regional government authorities, industry associations, and many other stakeholders in the airport community. Each of these practitioners has different interests and responsibilities, and each is an integral part of this cooperative research effort.

In addition to publishing reports on industry-driven research priorities, ACRP works to ensure that these products reach those who need them most. These efforts have reached several thousand stakeholders through e-videos, webinars, workshops, speaker presentations, and publications on applied results. The benefits to the American public are a more cohesive and educated cadre of airport sponsors, armed with the knowledge and tools through ACRP's efforts, to implement the AIP more consistently and compliantly, which results in a safer and more efficient national system of airports.

GRANTS-IN-AID FOR AIRPORTS

Airport Cooperative Research

($ in Thousands)

Item Title	Dollars	FTP	FTE
FY 2019 Annualized CR	**15,000**	**2**	**2.0**
Adjustments to Base			
1. One Additional Compensable Day	1		
Total Adjustments to Base	**1**	**0**	**0.0**
Discretionary Increases/ Decreases			
1. Discretionary decrease	-1		
Total Discretionary Adjustments	**-1**	**0**	**0.0**
FY 2020 Request	**15,000**	**2**	**2.0**

Grants-in-Aid to Airports Planned Distribution
$000

	FY 2018 Actual		FY 2019 Annualized CR	FY 2020 Budget Request	
Formula Grants					
Primary Airports	862,372		864,372	864,372	**2/**
Cargo Service Airports	111,297		111,622	111,594	
Alaska	21,345		21,345	21,345	
States (General Aviation)	635,985		637,841	637,682	
Carryover (from Formula Grants)	718,219		707,400	710,552	**3/**
Subtotal, Formula Grants	2,349,218		2,342,580	2,345,545	
Discretionary Grants					
Discretionary Set-Aside: Noise Compatibility	104,610		110,181	108,865	
Discretionary Set-Aside: Reliever	1,973		2,078	2,053	
Discretionary Set-Aside: Military Airport Program	11,955		12,592	12,442	
C/S/S/N (Capacity/Safety/Security/Noise)	135,261		142,464	140,763	
Discretionary -- AATF	45,087		47,488	46,921	
Discretionary -- General Fun	995,000	**1/**	995,000	0	
Subtotal, Discretionary Grants	1,293,886		1,309,803	311,044	
Small Airport Fund	531,823		531,823	531,823	
Total Grants	**4,174,927**		**4,184,206**	**3,188,412**	

1/ FY-2018 Funding provided by the Consolidated Appropriations Act, 2018. This act provides Supplemental Discretionary funding of $995 million to Grants-in Aid for Airports and $5 million is retained for Airport Administration.

2/ FY-2020 Primary Entitlements reflect the same forecast activity levels for FY-2019, because we do not yet have sufficient updated information to warrant any significant change.

3/ FY 2020 carryover figures are estimated based on a five-year rolling average.

The FY 2020 Budget request assumes the Passenger Facility Charge (PFC) at current maximum allowable level of $4.50 per ticket sold, under Public Law 106-181, enacted in 2000.

Passenger Facility Charge (PFC) Approved Locations
As of December 31, 2017
(Whole Dollars)
PFC APPROVED LOCATIONS

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Anchorage	AK	Ted Stevens Anchorage International	ANC	M	$3.00	10/1/2000	12/1/2026	106,043,173
Fairbanks	AK	Fairbanks International	FAI	S	$3.00	10/1/2000	4/1/2004	
Fairbanks	AK	Fairbanks International	FAI	S	$4.50	4/1/2004	10/1/2026	38,413,252
Juneau	AK	Juneau International	JNU	N	$3.00	10/1/1998	2/1/2001	
Juneau	AK	Juneau International	JNU	N	$4.50	8/1/2001	7/1/2026	25,783,039
Ketchikan	AK	Ketchikan International	KTN	N	$3.00	2/1/1999	8/1/2001	
Ketchikan	AK	Ketchikan International	KTN	N	$4.50	8/1/2001	6/1/2018	5,630,359
Sitka	AK	Sitka Rocky Gutierrez	SIT	N	$4.50	7/1/2007	9/1/2013	
Sitka	AK	Sitka Rocky Gutierrez	SIT	N	$4.50	5/1/2018	5/1/2038	8,215,000
Birmingham	AL	Birmingham-Shuttlesworth International	BHM	S	$3.00	8/1/1997	11/1/2003	
Birmingham	AL	Birmingham-Shuttlesworth International	BHM	S	$3.00	12/1/2003	10/1/2008	
Birmingham	AL	Birmingham-Shuttlesworth International	BHM	S	$4.50	10/1/2008	2/1/2031	212,563,127
Dothan	AL	Dothan Regional	DHN	N	$3.00	2/1/1998	8/1/2001	
Dothan	AL	Dothan Regional	DHN	N	$4.50	8/1/2001	12/1/2020	5,515,948
Huntsville	AL	Huntsville International-Carl T Jones Field	HSV	S	$3.00	6/1/1992	9/1/2004	
Huntsville	AL	Huntsville International-Carl T Jones Field	HSV	S	$4.50	9/1/2004	8/1/2025	61,431,541
Mobile	AL	Mobile Regional	MOB	N	$3.00	12/1/1997	7/1/2004	
Mobile	AL	Mobile Regional	MOB	N	$3.00	3/1/2005	5/1/2013	
Mobile	AL	Mobile Regional	MOB	N	$3.00	6/1/2013	10/1/2017	
Mobile	AL	Mobile Regional	MOB	N	$4.50	10/1/2017	11/1/2020	19,431,999

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Montgomery	AL	Montgomery Regional (Dannelly Field)	MGM	N	$4.50	5/1/2005	1/1/2027	28,599,933
Muscle Shoals	AL	Northwest Alabama Regional	MSL	CS	$3.00	6/1/1992	10/1/2003	
Muscle Shoals	AL	Northwest Alabama Regional	MSL	CS	$3.00	12/1/2004	4/1/2009	
Muscle Shoals	AL	Northwest Alabama Regional	MSL	CS	$4.50	4/1/2009	7/1/2027	583,538
Fayetteville/Springdale/Rogers	AR	Northwest Arkansas Regional	XNA	S	$3.00	12/1/1998	4/1/2001	
Fayetteville/Springdale/Rogers	AR	Northwest Arkansas Regional	XNA	S	$4.50	4/1/2001	9/1/2047	119,872,895
Fayetteville	AR	Drake Field	FYV	GA	$3.00	1/1/1996	1/1/2001	2,221,887
Fort Smith	AR	Fort Smith Regional	FSM	N	$3.00	8/1/1994	2/1/2008	
Fort Smith	AR	Fort Smith Regional	FSM	N	$4.50	2/1/2008	6/1/2022	8,605,594
Little Rock	AR	Bill and Hillary Clinton National/Adams Field	LIT	S	$3.00	5/1/1995	9/1/2001	
Little Rock	AR	Bill and Hillary Clinton National/Adams Field	LIT	S	$4.50	9/1/2001	4/1/2020	114,146,711
Texarkana	AR	Texarkana Regional-Webb Field	TXK	N	$3.00	2/1/1995	9/1/2001	
Texarkana	AR	Texarkana Regional-Webb Field	TXK	N	$4.50	9/1/2001	3/1/2005	
Texarkana	AR	Texarkana Regional-Webb Field	TXK	N	$4.50	7/1/2008	5/1/2014	
Texarkana	AR	Texarkana Regional-Webb Field	TXK	N	$4.50	4/1/2015	11/1/2017	2,173,538
Pago Pago	AS	Pago Pago International	PPG	N	$3.00	7/1/1995	6/1/2000	
Pago Pago	AS	Pago Pago International	PPG	N	$4.50	9/1/2001	9/1/2005	
Pago Pago	AS	Pago Pago International	PPG	N	$4.50	6/1/2006	12/1/2020	7,563,954
Bullhead City	AZ	Laughlin/Bullhead International	IFP	N	$2.00	5/1/2008	10/1/2012	
Bullhead City	AZ	Laughlin/Bullhead International	IFP	N	$2.00	1/1/2014	1/1/2025	2,951,578
Flagstaff	AZ	Flagstaff Pulliam	FLG	N	$3.00	12/1/1992	9/1/2012	

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Flagstaff	AZ	Flagstaff Pulliam	FLG	N	$4.50	9/1/2012	1/1/2021	4,345,507
Phoenix	AZ	Phoenix-Mesa Gateway	IWA	S	$4.50	11/1/2008	3/1/2031	43,154,314
Peach Springs	AZ	Grand Canyon West	1G4	N	$3.00	9/1/2004	9/1/2006	
Peach Springs	AZ	Grand Canyon West	1G4	N	$3.00	6/1/2008	1/1/2024	9,922,946
Phoenix	AZ	Phoenix Sky Harbor International	PHX	L	$3.00	4/1/1996	4/1/2002	
Phoenix	AZ	Phoenix Sky Harbor International	PHX	L	$4.50	7/1/2002	10/1/2036	2,999,733,614
Tucson	AZ	Tucson International	TUS	S	$3.00	2/1/1998	10/1/2006	
Tucson	AZ	Tucson International	TUS	S	$4.50	10/1/2006	2/1/2027	179,290,015
Yuma	AZ	Yuma MCAS/Yuma International	NYL	N	$3.00	12/1/1993	10/1/2005	
Yuma	AZ	Yuma MCAS/Yuma International	NYL	N	$4.50	10/1/2005	4/1/2007	
Yuma	AZ	Yuma MCAS/Yuma International	NYL	N	$4.50	11/1/2007	1/1/2023	5,936,576
Arcata/Eureka	CA	California Redwood Coast-Humboldt County	ACV	N	$3.00	2/1/1993	3/1/1994	
Arcata/Eureka	CA	California Redwood Coast-Humboldt County	ACV	N	$3.00	11/1/1994	11/1/1997	
Arcata/Eureka	CA	California Redwood Coast-Humboldt County	ACV	N	$3.00	4/1/1998	6/1/2003	
Arcata/Eureka	CA	California Redwood Coast-Humboldt County	ACV	N	$4.50	6/1/2003	3/1/2005	
Arcata/Eureka	CA	California Redwood Coast-Humboldt County	ACV	N	$4.50	7/1/2005	10/1/2005	
Arcata/Eureka	CA	California Redwood Coast-Humboldt County	ACV	N	$4.50	12/1/2005	8/1/2011	
Arcata/Eureka	CA	California Redwood Coast-Humboldt County	ACV	N	$4.50	10/1/2011	5/1/2022	7,073,764
Bakersfield	CA	Meadows Field	BFL	N	$3.00	6/1/1995	5/1/2002	
Bakersfield	CA	Meadows Field	BFL	N	$4.50	5/1/2002	2/1/2024	13,781,709
Burbank	CA	Bob Hope	BUR	M	$3.00	9/1/1994	4/1/2003	
Burbank	CA	Bob Hope	BUR	M	$4.50	4/1/2003	8/1/2017	

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Burbank	CA	Bob Hope	BUR	M	$3.00	8/1/2017	12/1/2017	
Burbank	CA	Bob Hope	BUR	M	$4.50	12/1/2017	3/1/2021	234,444,647
Carlsbad	CA	McClellan-Palomar	CRQ	CS	$4.50	1/1/2009	2/1/2043	4,947,065
Chico	CA	Chico Municipal	CIC	GA	$3.00	12/1/1993	9/1/1998	
Chico	CA	Chico Municipal	CIC	GA	$3.00	6/1/1999	2/1/2001	
Chico	CA	Chico Municipal	CIC	GA	$3.00	11/1/2001	12/1/2009	
Chico	CA	Chico Municipal	CIC	GA	$4.50	12/1/2010	12/1/2014	707,290
Crescent City	CA	Jack McNamara Field	CEC	CS	$3.00	9/1/1998	6/1/2000	
Crescent City	CA	Jack McNamara Field	CEC	CS	$3.00	1/1/2001	6/1/2003	
Crescent City	CA	Jack McNamara Field	CEC	CS	$4.50	6/1/2003	10/1/2014	
Crescent City	CA	Jack McNamara Field	CEC	CS	$4.50	12/1/2014	2/1/2021	899,295
Fresno	CA	Fresno Yosemite International	FAT	S	$3.00	12/1/1996	12/1/2004	
Fresno	CA	Fresno Yosemite International	FAT	S	$4.50	12/1/2004	11/1/2024	67,377,951
Imperial	CA	Imperial County	IPL	CS	$4.50	4/1/2003	4/1/2030	892,781
Inyokern	CA	Inyokern	IYK	GA	$3.00	3/1/1993	3/1/2003	
Inyokern	CA	Inyokern	IYK	GA	$3.00	4/1/2004	10/1/2004	
Inyokern	CA	Inyokern	IYK	GA	$4.50	9/1/2006	2/1/2009	
Inyokern	CA	Inyokern	IYK	GA	$4.50	3/1/2009	3/1/2019	994,460
Long Beach	CA	Long Beach /Daugherty Field/	LGB	S	$3.00	8/1/2003	5/1/2008	
Long Beach	CA	Long Beach /Daugherty Field/	LGB	S	$4.50	5/1/2008	4/1/2034	178,418,777
Los Angeles	CA	Los Angeles International	LAX	L	$3.00	7/1/1993	1/1/1996	

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Los Angeles	CA	Los Angeles International	LAX	L	$3.00	2/1/1998	7/1/2003	
Los Angeles	CA	Los Angeles International	LAX	L	$4.50	7/1/2003	6/1/2024	
Los Angeles	CA	Los Angeles International	LAX	L	$3.00	6/1/2024	1/1/2025	
Los Angeles	CA	Los Angeles International	LAX	L	$4.50	1/1/2025	1/1/2029	4,267,378,368
Mammoth Lakes	CA	Mammoth Yosemite	MMH	N	$3.00	9/1/1995	9/1/2005	
Mammoth Lakes	CA	Mammoth Yosemite	MMH	N	$4.50	11/1/2009	9/1/2019	1,017,131
Modesto	CA	Modesto City County-Harry Sham Field	MOD	GA	$3.00	8/1/1994	3/1/2005	
Modesto	CA	Modesto City County-Harry Sham Field	MOD	GA	$4.50	8/1/2008	4/1/2015	1,034,802
Monterey	CA	Monterey Regional	MRY	N	$3.00	1/1/1994	7/1/2003	
Monterey	CA	Monterey Regional	MRY	N	$4.50	7/1/2003	4/1/2006	
Monterey	CA	Monterey Regional	MRY	N	$4.50	5/1/2006	12/1/2023	23,382,956
Oakland	CA	Metropolitan Oakland International	OAK	M	$3.00	9/1/1992	6/1/1999	
Oakland	CA	Metropolitan Oakland International	OAK	M	$3.00	9/1/1999	5/1/2003	
Oakland	CA	Metropolitan Oakland International	OAK	M	$4.50	5/1/2003	12/1/2035	907,425,991
Ontario	CA	Ontario International	ONT	M	$3.00	7/1/1993	12/1/1996	
Ontario	CA	Ontario International	ONT	M	$3.00	7/1/1998	11/1/2007	
Ontario	CA	Ontario International	ONT	M	$4.50	11/1/2007	1/1/2013	
Ontario	CA	Ontario International	ONT	M	$2.00	1/1/2013	4/1/2016	
Ontario	CA	Ontario International	ONT	M	$4.50	4/1/2016	11/1/2024	291,622,635
Oxnard	CA	Oxnard	OXR	GA	$4.50	1/1/2002	3/1/2011	631,115
Palm Springs	CA	Palm Springs International	PSP	S	$3.00	9/1/1992	1/1/2002	
Palm Springs	CA	Palm Springs International	PSP	S	$4.50	1/1/2002	10/1/2037	140,310,796
Redding	CA	Redding Municipal	RDD	N	$3.00	4/1/1997	4/1/2002	

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Redding	CA	Redding Municipal	RDD	N	$4.50	4/1/2002	4/1/2007	
Redding	CA	Redding Municipal	RDD	N	$4.50	8/1/2007	2/1/2025	4,719,848
Sacramento	CA	Sacramento International	SMF	M	$3.00	4/1/1993	1/1/2002	
Sacramento	CA	Sacramento International	SMF	M	$4.50	1/1/2002	2/1/2003	
Sacramento	CA	Sacramento International	SMF	M	$3.00	2/1/2003	9/1/2003	
Sacramento	CA	Sacramento International	SMF	M	$4.50	9/1/2003	11/1/2034	953,252,732
San Diego	CA	San Diego International	SAN	L	$3.00	10/1/1995	8/1/2003	
San Diego	CA	San Diego International	SAN	L	$4.50	8/1/2003	3/1/2039	1,549,293,933
San Francisco	CA	San Francisco International	SFO	L	$4.50	10/1/2001	3/1/2029	2,111,686,690
San Jose	CA	Norman Y Mineta San Jose International	SJC	M	$3.00	9/1/1992	4/1/2001	
San Jose	CA	Norman Y Mineta San Jose International	SJC	M	$4.50	4/1/2001	1/1/2030	1,067,932,847
San Luis Obispo	CA	San Luis County Regional	SBP	N	$3.00	2/1/1993	2/1/1995	
San Luis Obispo	CA	San Luis County Regional	SBP	N	$3.00	6/1/1995	9/1/2002	
San Luis Obispo	CA	San Luis County Regional	SBP	N	$4.50	9/1/2002	6/1/2011	
San Luis Obispo	CA	San Luis County Regional	SBP	N	$3.00	6/1/2011	6/1/2014	
San Luis Obispo	CA	San Luis County Regional	SBP	N	$4.50	6/1/2014	12/1/2022	16,945,162
Santa Ana	CA	John Wayne Airport-Orange County	SNA	M	$4.50	7/1/2006	1/1/2022	311,602,130
Santa Barbara	CA	Santa Barbara Municipal	SBA	N	$3.00	1/1/1998	11/1/2003	
Santa Barbara	CA	Santa Barbara Municipal	SBA	N	$4.50	11/1/2003	7/1/2039	36,388,365
Santa Maria	CA	Santa Maria Public/Capt G Allan Hancock Field	SMX	N	$4.50	10/1/2007	10/1/2028	5,380,346
Santa Rosa	CA	Charles M Schulz - Sonoma County	STS	N	$3.00	5/1/1993	4/1/2005	
Santa Rosa	CA	Charles M Schulz - Sonoma County	STS	N	$4.50	5/1/2008	4/1/2013	

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Santa Rosa	CA	Charles M Schulz - Sonoma County	STS	N	$4.50	7/1/2013	4/1/2026	10,494,854
South Lake Tahoe	CA	Lake Tahoe	TVL	GA	$3.00	8/1/1992	3/1/2007	169,838
Stockton	CA	Stockton Metropolitan	SCK	N	$4.50	2/1/2007	8/1/2009	
Stockton	CA	Stockton Metropolitan	SCK	N	$4.50	9/1/2009	9/1/2012	
Stockton	CA	Stockton Metropolitan	SCK	N	$4.50	9/1/2013	9/1/2025	7,281,668
Alamosa	CO	San Luis Valley Regional/Bergman Field	ALS	CS	$3.00	3/1/1997	7/1/2016	
Alamosa	CO	San Luis Valley Regional/Bergman Field	ALS	CS	$4.50	7/1/2016	7/1/2034	714,140
Aspen	CO	Aspen-Pitkin County/Sardy Field	ASE	N	$3.00	7/1/1995	5/1/2003	
Aspen	CO	Aspen-Pitkin County/Sardy Field	ASE	N	$4.50	5/1/2003	8/1/2004	
Aspen	CO	Aspen-Pitkin County/Sardy Field	ASE	N	$4.50	1/1/2005	6/1/2019	15,323,529
Colorado Springs	CO	City of Colorado Springs Municipal	COS	S	$3.00	3/1/1993	8/1/2016	
Colorado Springs	CO	City of Colorado Springs Municipal	COS	S	$4.50	8/1/2016	12/1/2021	89,661,330
Cortez	CO	Cortez Municipal	CEZ	CS	$3.00	11/1/1999	3/1/2008	
Cortez	CO	Cortez Municipal	CEZ	CS	$4.50	3/1/2008	12/1/2025	539,150
Denver	CO	Denver International	DEN	L	$3.00	7/1/1992	4/1/2001	
Denver	CO	Denver International	DEN	L	$4.50	4/1/2001	2/1/2029	3,217,485,200
Durango	CO	Durango-La Plata County	DRO	N	$3.00	2/1/1995	8/1/1997	
Durango	CO	Durango-La Plata County	DRO	N	$3.00	9/1/1997	3/1/2003	
Durango	CO	Durango-La Plata County	DRO	N	$4.50	6/1/2005	4/1/2011	
Durango	CO	Durango-La Plata County	DRO	N	$4.50	11/1/2011	8/1/2012	
Durango	CO	Durango-La Plata County	DRO	N	$4.50	9/1/2013	5/1/2029	18,941,895
Eagle	CO	Eagle County Regional	EGE	N	$3.00	9/1/1993	4/1/2001	

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Eagle	CO	Eagle County Regional	EGE	N	$4.50	4/1/2001	6/1/2009	
Eagle	CO	Eagle County Regional	EGE	N	$3.00	6/1/2009	7/1/2009	
Eagle	CO	Eagle County Regional	EGE	N	$4.50	7/1/2009	5/1/2036	22,869,216
Fort Collins/Loveland	CO	Northern Colorado Regional	FNL	GA	$3.00	10/1/1993	5/1/1999	
Fort Collins/Loveland	CO	Northern Colorado Regional	FNL	GA	$4.50	8/1/2004	12/1/2011	
Fort Collins/Loveland	CO	Northern Colorado Regional	FNL	GA	$4.50	2/1/2012	3/1/2015	1,593,522
Grand Junction	CO	Grand Junction Regional	GJT	N	$3.00	4/1/1993	9/1/2006	
Grand Junction	CO	Grand Junction Regional	GJT	N	$4.50	9/1/2006	10/1/2036	32,267,359
Gunnison	CO	Gunnison-Crested Butte Regional	GUC	N	$3.00	11/1/1993	4/1/2001	
Gunnison	CO	Gunnison-Crested Butte Regional	GUC	N	$4.50	4/1/2001	8/1/2023	4,214,518
Hayden	CO	Yampa Valley	HDN	N	$3.00	11/1/1993	7/1/2001	
Hayden	CO	Yampa Valley	HDN	N	$4.50	7/1/2001	3/1/2019	9,069,120
Montrose	CO	Montrose Regional	MTJ	N	$3.00	11/1/1993	8/1/2003	
Montrose	CO	Montrose Regional	MTJ	N	$4.50	8/1/2003	6/1/2006	
Montrose	CO	Montrose Regional	MTJ	N	$4.50	8/1/2006	8/1/2010	
Montrose	CO	Montrose Regional	MTJ	N	$4.50	11/1/2010	5/1/2020	6,771,780
Pueblo	CO	Pueblo Memorial	PUB	CS	$3.00	11/1/1993	12/1/2014	
Pueblo	CO	Pueblo Memorial	PUB	CS	$4.50	3/1/2015	4/1/2036	1,229,111
Steamboat Springs	CO	Steamboat Springs/Bob Adams Field	SBS	GA	$3.00	4/1/1993	6/1/1997	159,576
Telluride	CO	Telluride Regional	TEX	GA	$3.00	2/1/1993	4/1/2002	
Telluride	CO	Telluride Regional	TEX	GA	$4.50	4/1/2002	1/1/2019	7,047,037
New Haven	CT	Tweed-New Haven	HVN	N	$3.00	12/1/1993	4/1/1998	

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New Haven	CT	Tweed-New Haven	HVN	N	$4.50	10/1/2001	7/1/2005	
New Haven	CT	Tweed-New Haven	HVN	N	$4.50	5/1/2006	7/1/2020	4,159,214
Windsor Locks	CT	Bradley International	BDL	M	$3.00	10/1/1993	12/1/1995	
Windsor Locks	CT	Bradley International	BDL	M	$3.00	7/1/1996	1/1/1997	
Windsor Locks	CT	Bradley International	BDL	M	$3.00	9/1/1997	8/1/2000	
Windsor Locks	CT	Bradley International	BDL	M	$4.50	5/1/2001	3/1/2020	
Windsor Locks	CT	Bradley International	BDL	M	$3.00	3/1/2020	7/1/2020	
Windsor Locks	CT	Bradley International	BDL	M	$4.50	7/1/2020	12/1/2021	321,060,686
Wilmington	DE	New Castle	ILG	R	$4.50	7/1/2014	5/1/2025	1,810,089
Daytona Beach	FL	Daytona Beach International	DAB	N	$3.00	7/1/1993	8/1/2001	
Daytona Beach	FL	Daytona Beach International	DAB	N	$3.00	2/1/2002	11/1/2005	
Daytona Beach	FL	Daytona Beach International	DAB	N	$4.50	11/1/2005	3/1/2020	29,469,817
Fort Lauderdale	FL	Fort Lauderdale/Hollywood International	FLL	L	$3.00	1/1/1995	10/1/2005	
Fort Lauderdale	FL	Fort Lauderdale/Hollywood International	FLL	L	$4.50	10/1/2005	2/1/2032	1,901,125,162
Fort Myers	FL	Southwest Florida International	RSW	M	$3.00	11/1/1992	11/1/2003	
Fort Myers	FL	Southwest Florida International	RSW	M	$4.50	11/1/2003	1/1/2021	341,927,392
Gainesville	FL	Gainesville Regional	GNV	N	$3.00	7/1/2000	2/1/2002	
Gainesville	FL	Gainesville Regional	GNV	N	$4.50	1/1/2003	2/1/2013	
Gainesville	FL	Gainesville Regional	GNV	N	$4.50	1/1/2014	9/1/2015	
Gainesville	FL	Gainesville Regional	GNV	N	$4.50	3/1/2016	10/1/2023	13,743,869
Jacksonville	FL	Jacksonville International	JAX	M	$3.00	4/1/1994	5/1/2003	
Jacksonville	FL	Jacksonville International	JAX	M	$4.50	5/1/2003	3/1/2026	363,462,178
Key West	FL	Key West International	EYW	N	$3.00	3/1/1993	8/1/1996	
Key West	FL	Key West International	EYW	N	$3.00	12/1/1997	6/1/2003	
Key West	FL	Key West International	EYW	N	$4.50	6/1/2003	7/1/2005	

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Key West	FL	Key West International	EYW	N	$4.50	10/1/2005	7/1/2023	30,389,743
Marathon	FL	The Florida Keys Marathon International	MTH	GA	$3.00	3/1/1993	6/1/1998	390,001
Melbourne	FL	Melbourne International	MLB	N	$3.00	5/1/1997	12/1/2009	
Melbourne	FL	Melbourne International	MLB	N	$4.50	12/1/2009	5/1/2018	
Melbourne	FL	Melbourne International	MLB	N	$4.50	7/1/2018	4/1/2030	25,913,762
Miami	FL	Miami International	MIA	L	$3.00	11/1/1994	1/1/2002	
Miami	FL	Miami International	MIA	L	$4.50	1/1/2002	10/1/2037	2,597,130,503
Naples	FL	Naples Municipal	APF	GA	$3.00	2/1/1995	2/1/2001	
Naples	FL	Naples Municipal	APF	GA	$3.00	2/1/2002	5/1/2004	991,336
Orlando	FL	Orlando International	MCO	L	$3.00	2/1/1993	4/1/2007	
Orlando	FL	Orlando International	MCO	L	$4.50	4/1/2007	10/1/2040	4,092,024,398
Orlando	FL	Orlando Sanford International	SFB	S	$1.00	3/1/2001	12/1/2003	
Orlando	FL	Orlando Sanford International	SFB	S	$2.00	12/1/2003	9/1/2011	
Orlando	FL	Orlando Sanford International	SFB	S	$4.00	9/1/2011	10/1/2024	76,336,385
Panama City	FL	Northwest Florida Beaches International	ECP	S	$3.00	2/1/1994	5/1/2004	
Panama City	FL	Northwest Florida Beaches International	ECP	S	$4.50	5/1/2004	4/1/2039	48,700,720
Pensacola	FL	Pensacola International	PNS	S	$3.00	2/1/1993	12/1/2002	
Pensacola	FL	Pensacola International	PNS	S	$4.50	12/1/2002	10/1/2031	144,489,392
Punta Gorda	FL	Punta Gorda	PGD	S	$2.00	8/1/2017	1/1/2019	
Punta Gorda	FL	Punta Gorda	PGD	S	$4.50	1/1/2019	8/1/2020	5,298,817
Sarasota/Bradenton	FL	Sarasota/Bradenton International	SRQ	S	$3.00	9/1/1992	5/1/2002	
Sarasota/Bradenton	FL	Sarasota/Bradenton International	SRQ	S	$4.50	5/1/2002	2/1/2023	74,496,513

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St Petersburg-Clearwater	FL	St Pete-Clearwater International	PIE	S	$3.00	5/1/2005	11/1/2006	
St Petersburg-Clearwater	FL	St Pete-Clearwater International	PIE	S	$4.50	11/1/2006	2/1/2021	32,622,319
Tallahassee	FL	Tallahassee International	TLH	N	$3.00	2/1/1993	10/1/2002	
Tallahassee	FL	Tallahassee International	TLH	N	$4.50	10/1/2002	7/1/2028	56,306,718
Tampa	FL	Tampa International	TPA	L	$3.00	10/1/1993	6/1/2002	
Tampa	FL	Tampa International	TPA	L	$4.50	6/1/2002	10/1/2037	1,687,138,071
Valparaiso/Destin-Ft Walton Beach	FL	Eglin AFB/Destin-Ft Walton Beach	VPS	S	$3.00	1/1/2001	6/1/2002	
Valparaiso/Destin-Ft Walton Beach	FL	Eglin AFB/Destin-Ft Walton Beach	VPS	S	$4.50	6/1/2002	10/1/2027	47,010,379
West Palm Beach	FL	Palm Beach International	PBI	M	$3.00	4/1/1994	7/1/2008	
West Palm Beach	FL	Palm Beach International	PBI	M	$4.50	7/1/2008	6/1/2021	256,256,866
Albany	GA	Southwest Georgia Regional	ABY	N	$3.00	9/1/1995	6/1/1998	
Albany	GA	Southwest Georgia Regional	ABY	N	$3.00	6/1/1999	2/1/2003	
Albany	GA	Southwest Georgia Regional	ABY	N	$4.50	2/1/2003	2/1/2008	
Albany	GA	Southwest Georgia Regional	ABY	N	$4.50	7/1/2008	8/1/2016	
Albany	GA	Southwest Georgia Regional	ABY	N	$4.50	10/1/2017	3/1/2020	2,856,060
Athens	GA	Athens/Ben Epps	AHN	GA	$3.00	8/1/1997	1/1/2002	165,615
Atlanta	GA	Hartsfield - Jackson Atlanta International	ATL	L	$3.00	5/1/1997	4/1/2001	
Atlanta	GA	Hartsfield - Jackson Atlanta International	ATL	L	$4.50	4/1/2001	9/1/2027	5,118,105,905
Augusta	GA	Augusta Regional at Bush Field	AGS	N	$3.00	9/1/1999	7/1/2001	

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Augusta	GA	Augusta Regional at Bush Field	AGS	N	$4.50	7/1/2001	12/1/2028	32,792,767
Brunswick	GA	Brunswick Golden Isles	BQK	N	$3.00	5/1/2001	11/1/2003	
Brunswick	GA	Brunswick Golden Isles	BQK	N	$4.50	11/1/2003	4/1/2017	
Brunswick	GA	Brunswick Golden Isles	BQK	N	$4.50	4/1/2018	11/1/2026	3,093,612
Columbus	GA	Columbus	CSG	N	$3.00	12/1/1993	9/1/1995	
Columbus	GA	Columbus	CSG	N	$3.00	8/1/2000	6/1/2003	
Columbus	GA	Columbus	CSG	N	$4.50	6/1/2003	11/1/2006	
Columbus	GA	Columbus	CSG	N	$4.50	2/1/2010	4/1/2012	
Columbus	GA	Columbus	CSG	N	$4.50	8/1/2012	3/1/2015	
Columbus	GA	Columbus	CSG	N	$4.50	3/1/2016	6/1/2018	3,098,406
Macon	GA	Middle Georgia Regional	MCN	GA	$4.50	3/1/2002	5/1/2011	561,716
Savannah	GA	Savannah/Hilton Head International	SAV	S	$3.00	7/1/1992	4/1/2001	
Savannah	GA	Savannah/Hilton Head International	SAV	S	$4.50	4/1/2001	2/1/2010	
Savannah	GA	Savannah/Hilton Head International	SAV	S	$3.00	2/1/2010	5/1/2010	
Savannah	GA	Savannah/Hilton Head International	SAV	S	$4.50	5/1/2010	11/1/2028	148,358,515
Valdosta	GA	Valdosta Regional	VLD	N	$3.00	3/1/1993	10/1/1999	
Valdosta	GA	Valdosta Regional	VLD	N	$3.00	4/1/2000	6/1/2001	
Valdosta	GA	Valdosta Regional	VLD	N	$4.50	6/1/2001	9/1/2004	
Valdosta	GA	Valdosta Regional	VLD	N	$3.00	2/1/2006	5/1/2006	
Valdosta	GA	Valdosta Regional	VLD	N	$3.00	11/1/2006	1/1/2007	
Valdosta	GA	Valdosta Regional	VLD	N	$3.00	8/1/2009	7/1/2010	
Valdosta	GA	Valdosta Regional	VLD	N	$4.50	6/1/2011	1/1/2014	
Valdosta	GA	Valdosta Regional	VLD	N	$4.50	4/1/2014	4/1/2016	
Valdosta	GA	Valdosta Regional	VLD	N	$4.50	7/1/2016	11/1/2016	1,981,450
Guam	GU	Guam International	GUM	S	$3.00	2/1/1993	11/1/2002	
Guam	GU	Guam International	GUM	S	$4.50	11/1/2002	3/1/2025	258,370,758
Hilo	HI	Hilo International	ITO	S	$3.00	2/1/2007	11/1/2008	
Hilo	HI	Hilo International	ITO	S	$4.50	11/1/2008	1/1/2010	

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Hilo	HI	Hilo International	ITO	S	$4.50	2/1/2014	7/1/2032	18,271,399
Honolulu	HI	Daniel K Inouye International	HNL	L	$3.00	10/1/2004	11/1/2008	
Honolulu	HI	Daniel K Inouye International	HNL	L	$4.50	11/1/2008	7/1/2032	705,535,195
Kahului	HI	Kahului	OGG	M	$3.00	10/1/2004	11/1/2008	
Kahului	HI	Kahului	OGG	M	$4.50	11/1/2008	7/1/2032	191,747,455
Kailua/Kona	HI	Ellison Onizuka Kona International at Keahole	KOA	S	$3.00	10/1/2004	11/1/2008	
Kailua/Kona	HI	Ellison Onizuka Kona International at Keahole	KOA	S	$4.50	11/1/2008	7/1/2032	62,346,643
Lihue	HI	Lihue	LIH	S	$3.00	10/1/2004	11/1/2008	
Lihue	HI	Lihue	LIH	S	$4.50	11/1/2008	7/1/2032	45,290,215
Burlington	IA	Southeast Iowa Regional	BRL	CS	$3.00	7/1/1997	9/1/2001	
Burlington	IA	Southeast Iowa Regional	BRL	CS	$4.50	9/1/2001	11/1/2028	941,789
Cedar Rapids	IA	The Eastern Iowa	CID	S	$3.00	1/1/1995	6/1/2002	
Cedar Rapids	IA	The Eastern Iowa	CID	S	$4.50	6/1/2002	3/1/2004	
Cedar Rapids	IA	The Eastern Iowa	CID	S	$4.50	5/1/2004	9/1/2025	60,866,105
Des Moines	IA	Des Moines International	DSM	S	$3.00	3/1/1994	8/1/2001	
Des Moines	IA	Des Moines International	DSM	S	$4.50	8/1/2001	10/1/2026	102,744,219
Dubuque	IA	Dubuque Regional	DBQ	N	$3.00	1/1/1993	5/1/2001	
Dubuque	IA	Dubuque Regional	DBQ	N	$4.50	5/1/2001	2/1/2033	7,568,350
Fort Dodge	IA	Fort Dodge Regional	FOD	CS	$3.00	3/1/1995	9/1/2001	
Fort Dodge	IA	Fort Dodge Regional	FOD	CS	$4.50	1/1/2002	4/1/2011	414,736
Mason City	IA	Mason City Municipal	MCW	CS	$3.00	2/1/1996	10/1/2001	
Mason City	IA	Mason City Municipal	MCW	CS	$4.50	10/1/2001	4/1/2003	
Mason City	IA	Mason City Municipal	MCW	CS	$4.50	8/1/2003	12/1/2022	1,310,907
Sioux City	IA	Sioux Gateway/Col Bud Day Field	SUX	N	$3.00	6/1/1993	6/1/1994	

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Sioux City	IA	Sioux Gateway/Col Bud Day Field	SUX	N	$3.00	2/1/1995	3/1/2002	
Sioux City	IA	Sioux Gateway/Col Bud Day Field	SUX	N	$4.50	3/1/2002	1/1/2004	
Sioux City	IA	Sioux Gateway/Col Bud Day Field	SUX	N	$4.50	11/1/2004	7/1/2021	4,574,003
Spencer	IA	Spencer Municipal	SPW	GA	$3.00	9/1/1995	3/1/2006	77,638
Waterloo	IA	Waterloo Regional	ALO	N	$3.00	6/1/1994	6/1/1998	
Waterloo	IA	Waterloo Regional	ALO	N	$3.00	9/1/1999	7/1/2001	
Waterloo	IA	Waterloo Regional	ALO	N	$4.50	7/1/2001	11/1/2019	3,167,477
Boise	ID	Boise Air Terminal/Gowen Field	BOI	S	$3.00	8/1/1994	8/1/2001	
Boise	ID	Boise Air Terminal/Gowen Field	BOI	S	$4.50	8/1/2001	9/1/2015	109,930,856
Hailey	ID	Friedman Memorial	SUN	N	$3.00	9/1/1993	10/1/1994	
Hailey	ID	Friedman Memorial	SUN	N	$3.00	3/1/1995	6/1/2005	
Hailey	ID	Friedman Memorial	SUN	N	$4.50	6/1/2005	7/1/2028	6,987,776
Idaho Falls	ID	Idaho Falls Regional	IDA	N	$3.00	1/1/1993	1/1/1998	
Idaho Falls	ID	Idaho Falls Regional	IDA	N	$3.00	2/1/1998	4/1/2001	
Idaho Falls	ID	Idaho Falls Regional	IDA	N	$4.50	4/1/2001	11/1/2020	12,927,861
Lewiston	ID	Lewiston-Nez Perce County	LWS	N	$3.00	5/1/1994	5/1/2001	
Lewiston	ID	Lewiston-Nez Perce County	LWS	N	$4.50	5/1/2001	11/1/2018	
Lewiston	ID	Lewiston-Nez Perce County	LWS	N	$4.50	2/1/2019	4/1/2022	5,828,269
Pocatello	ID	Pocatello Regional	PIH	N	$3.00	9/1/1994	5/1/2001	
Pocatello	ID	Pocatello Regional	PIH	N	$4.50	5/1/2001	10/1/2022	3,015,043
Twin Falls	ID	Joslin Field - Magic Valley Regional	TWF	N	$3.00	11/1/1992	6/1/2001	
Twin Falls	ID	Joslin Field - Magic Valley Regional	TWF	N	$4.50	6/1/2001	6/1/2007	
Twin Falls	ID	Joslin Field - Magic Valley Regional	TWF	N	$4.50	7/1/2007	6/1/2022	3,390,352

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Belleville	IL	Scott AFB/Midamerica	BLV	N	$3.00	11/1/2005	3/1/2047	7,000,000
Bloomington/Normal	IL	Central IL Regional Airport at Bloomington-Normal	BMI	N	$3.00	11/1/1994	4/1/2001	
Bloomington/Normal	IL	Central IL Regional Airport at Bloomington-Normal	BMI	N	$4.50	4/1/2001	11/1/2030	29,245,583
Champaign/Urbana	IL	University of Illinois-Willard	CMI	N	$3.00	12/1/1995	2/1/2004	
Champaign/Urbana	IL	University of Illinois-Willard	CMI	N	$4.50	10/1/2005	5/1/2025	10,386,451
Chicago	IL	Chicago Midway International	MDW	L	$3.00	9/1/1993	1/1/2007	
Chicago	IL	Chicago Midway International	MDW	L	$4.50	1/1/2007	6/1/2060	2,507,672,657
Chicago	IL	Chicago O'Hare International	ORD	L	$3.00	9/1/1993	4/1/2001	
Chicago	IL	Chicago O'Hare International	ORD	L	$4.50	4/1/2001	7/1/2041	6,926,705,514
Decatur	IL	Decatur	DEC	CS	$4.50	6/1/2006	3/1/2019	732,628
Marion	IL	Veterans Airport of Southern Illinois	MWA	N	$4.50	9/1/2005	4/1/2019	509,499
Moline	IL	Quad City International	MLI	N	$3.00	12/1/1994	1/1/2002	
Moline	IL	Quad City International	MLI	N	$4.50	1/1/2002	7/1/2037	55,655,811
Peoria	IL	General Downing - Peoria International	PIA	N	$3.00	12/1/1994	7/1/2001	
Peoria	IL	General Downing - Peoria International	PIA	N	$4.50	7/1/2001	8/1/2008	
Peoria	IL	General Downing - Peoria International	PIA	N	$4.50	11/1/2008	9/1/2023	28,880,056
Quincy	IL	Quincy Regional-Baldwin Field	UIN	CS	$3.00	10/1/1994	7/1/1997	
Quincy	IL	Quincy Regional-Baldwin Field	UIN	CS	$3.00	11/1/1997	6/1/2005	
Quincy	IL	Quincy Regional-Baldwin Field	UIN	CS	$3.00	11/1/2005	1/1/2008	

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Quincy	IL	Quincy Regional-Baldwin Field	UIN	CS	$4.50	1/1/2008	3/1/2019	902,993
Chicago/Rockford	IL	Chicago/Rockford International	RFD	N	$3.00	10/1/1992	10/1/1996	
Chicago/Rockford	IL	Chicago/Rockford International	RFD	N	$3.00	5/1/1997	6/1/2007	
Chicago/Rockford	IL	Chicago/Rockford International	RFD	N	$4.50	6/1/2007	3/1/2038	16,080,225
Springfield	IL	Abraham Lincoln Capital	SPI	N	$3.00	6/1/1992	5/1/2002	
Springfield	IL	Abraham Lincoln Capital	SPI	N	$4.50	5/1/2002	7/1/2021	8,509,863
Evansville	IN	Evansville Regional	EVV	N	$4.50	8/1/2007	11/1/2008	
Evansville	IN	Evansville Regional	EVV	N	$4.50	12/1/2008	4/1/2026	13,705,101
Fort Wayne	IN	Fort Wayne International	FWA	N	$3.00	7/1/1993	12/1/2005	
Fort Wayne	IN	Fort Wayne International	FWA	N	$4.50	12/1/2005	4/1/2021	31,289,010
Indianapolis	IN	Indianapolis International	IND	M	$3.00	9/1/1993	4/1/2001	
Indianapolis	IN	Indianapolis International	IND	M	$4.50	4/1/2001	9/1/2022	
Indianapolis	IN	Indianapolis International	IND	M	$3.00	9/1/2022	10/1/2022	524,907,605
South Bend	IN	South Bend International	SBN	N	$3.00	11/1/1994	7/1/2011	
South Bend	IN	South Bend International	SBN	N	$4.50	7/1/2011	7/1/2029	40,172,802
Garden City	KS	Garden City Regional	GCK	N	$4.50	10/1/2013	10/1/2022	770,628
Hays	KS	Hays Regional	HYS	CS	$4.50	4/1/2015	5/1/2020	207,045
Manhattan	KS	Manhattan Regional	MHK	N	$3.00	10/1/1998	3/1/2002	
Manhattan	KS	Manhattan Regional	MHK	N	$4.50	3/1/2002	5/1/2025	4,499,903
Topeka	KS	Topeka Regional	FOE	CS	$4.50	8/1/2007	3/1/2023	823,720
Wichita	KS	Wichita Dwight D Eisenhower National	ICT	S	$3.00	12/1/1994	5/1/2005	
Wichita	KS	Wichita Dwight D Eisenhower National	ICT	S	$4.50	5/1/2005	6/1/2007	
Wichita	KS	Wichita Dwight D Eisenhower National	ICT	S	$4.50	7/1/2007	9/1/2009	

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Wichita	KS	Wichita Dwight D Eisenhower National	ICT	S	$4.50	11/1/2010	4/1/2046	199,528,281
Covington	KY	Cincinnati/Northern Kentucky International	CVG	M	$3.00	6/1/1994	8/1/2000	
Covington	KY	Cincinnati/Northern Kentucky International	CVG	M	$3.00	7/1/2001	8/1/2003	
Covington	KY	Cincinnati/Northern Kentucky International	CVG	M	$4.50	8/1/2003	5/1/2009	
Covington	KY	Cincinnati/Northern Kentucky International	CVG	M	$3.00	5/1/2009	1/1/2013	
Covington	KY	Cincinnati/Northern Kentucky International	CVG	M	$4.50	1/1/2013	3/1/2020	569,898,886
Lexington	KY	Blue Grass	LEX	S	$3.00	11/1/1993	6/1/2001	
Lexington	KY	Blue Grass	LEX	S	$4.50	6/1/2001	6/1/2003	
Lexington	KY	Blue Grass	LEX	S	$3.00	8/1/2003	12/1/2003	
Lexington	KY	Blue Grass	LEX	S	$4.50	12/1/2003	2/1/2038	100,206,268
Louisville	KY	Louisville International-Standiford Field	SDF	S	$3.00	5/1/1997	3/1/2006	
Louisville	KY	Louisville International-Standiford Field	SDF	S	$4.50	3/1/2006	10/1/2006	
Louisville	KY	Louisville International-Standiford Field	SDF	S	$3.00	10/1/2006	9/1/2008	
Louisville	KY	Louisville International-Standiford Field	SDF	S	$4.50	9/1/2008	10/1/2008	
Louisville	KY	Louisville International-Standiford Field	SDF	S	$3.00	10/1/2008	12/1/2010	
Louisville	KY	Louisville International-Standiford Field	SDF	S	$4.50	12/1/2010	8/1/2015	
Louisville	KY	Louisville International-Standiford Field	SDF	S	$3.00	8/1/2015	10/1/2016	
Louisville	KY	Louisville International-Standiford Field	SDF	S	$1.00	10/1/2016	10/1/2017	
Louisville	KY	Louisville International-Standiford Field	SDF	S	$3.00	10/1/2017	5/1/2019	114,863,021
Paducah	KY	Barkley Regional	PAH	N	$3.00	3/1/1994	5/1/2014	
Paducah	KY	Barkley Regional	PAH	N	$4.50	5/1/2014	8/1/2024	2,107,439
Alexandria	LA	Alexandria International	AEX	N	$3.00	5/1/1999	1/1/2002	

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Alexandria	LA	Alexandria International	AEX	N	$4.50	1/1/2002	12/1/2025	12,262,615
Baton Rouge	LA	Baton Rouge Metropolitan, Ryan Field	BTR	N	$3.00	12/1/1992	10/1/2005	
Baton Rouge	LA	Baton Rouge Metropolitan, Ryan Field	BTR	N	$4.50	10/1/2005	7/1/2031	81,359,236
Lafayette	LA	Lafayette Regional/Paul Fournet Field	LFT	N	$3.00	9/1/1995	9/1/1998	
Lafayette	LA	Lafayette Regional/Paul Fournet Field	LFT	N	$3.00	4/1/2001	4/1/2002	
Lafayette	LA	Lafayette Regional/Paul Fournet Field	LFT	N	$4.50	4/1/2002	1/1/2005	
Lafayette	LA	Lafayette Regional/Paul Fournet Field	LFT	N	$4.50	5/1/2005	4/1/2008	
Lafayette	LA	Lafayette Regional/Paul Fournet Field	LFT	N	$4.50	8/1/2008	12/1/2014	
Lafayette	LA	Lafayette Regional/Paul Fournet Field	LFT	N	$4.50	10/1/2017	1/1/2041	33,371,033
Lake Charles	LA	Lake Charles Regional	LCH	N	$3.00	3/1/2001	5/1/2005	
Lake Charles	LA	Lake Charles Regional	LCH	N	$4.50	5/1/2005	5/1/2017	
Lake Charles	LA	Lake Charles Regional	LCH	N	$4.50	2/1/2018	10/1/2022	4,557,531
Monroe	LA	Monroe Regional	MLU	N	$4.50	4/1/2003	9/1/2007	
Monroe	LA	Monroe Regional	MLU	N	$4.50	11/1/2008	6/1/2036	17,759,504
New Orleans	LA	Louis Armstrong New Orleans International	MSY	M	$3.00	6/1/1993	4/1/2002	
New Orleans	LA	Louis Armstrong New Orleans International	MSY	M	$4.50	4/1/2002	2/1/2026	
New Orleans	LA	Louis Armstrong New Orleans International	MSY	M	$3.00	2/1/2026	9/1/2043	965,553,986
Shreveport	LA	Shreveport Regional	SHV	N	$3.00	2/1/1994	11/1/2002	
Shreveport	LA	Shreveport Regional	SHV	N	$4.50	11/1/2002	9/1/2014	
Shreveport	LA	Shreveport Regional	SHV	N	$4.50	2/1/2015	2/1/2020	29,841,354
Boston	MA	General Edward Lawrence Logan International	BOS	L	$3.00	11/1/1993	10/1/2005	

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Boston	MA	General Edward Lawrence Logan International	BOS	L	$4.50	10/1/2005	12/1/2027	1,808,469,847
Hyannis	MA	Barnstable Municipal-Boardman/Polando Field	HYA	N	$2.00	3/1/2011	10/1/2024	2,573,600
Vineyard Haven	MA	Martha's Vineyard	MVY	N	$3.00	1/1/1998	2/1/1998	
Vineyard Haven	MA	Martha's Vineyard	MVY	N	$4.50	10/1/2017	7/1/2021	820,069
Nantucket	MA	Nantucket Memorial	ACK	N	$4.50	7/1/2014	5/1/2024	6,940,740
Worcester	MA	Worcester Regional	ORH	N	$3.00	10/1/1992	10/1/1997	
Worcester	MA	Worcester Regional	ORH	N	$3.00	9/1/1999	12/1/2011	1,635,753
Baltimore	MD	Baltimore/Washington International Thurgood Marshall	BWI	L	$3.00	10/1/1992	6/1/2002	
Baltimore	MD	Baltimore/Washington International Thurgood Marshall	BWI	L	$4.50	6/1/2002	6/1/2032	1,356,801,182
Hagerstown	MD	Hagerstown Regional-Richard A Henson Field	HGR	N	$3.00	8/1/1999	3/1/2002	
Hagerstown	MD	Hagerstown Regional-Richard A Henson Field	HGR	N	$4.50	3/1/2002	8/1/2007	429,244
Salisbury	MD	Salisbury-Ocean City Wicomico Regional	SBY	N	$3.00	2/1/2002	3/1/2008	
Salisbury	MD	Salisbury-Ocean City Wicomico Regional	SBY	N	$4.50	3/1/2008	5/1/2020	3,937,010
Cumberland Heights	MD	Greater Cumberland Regional	CBE	GA	$3.00	7/1/1994	7/1/1999	
Cumberland Heights	MD	Greater Cumberland Regional	CBE	GA	$3.00	10/1/1999	6/1/2006	144,345
Bangor	ME	Bangor International	BGR	N	$3.00	6/1/1995	9/1/2010	
Bangor	ME	Bangor International	BGR	N	$4.50	12/1/2010	5/1/2018	16,535,603
Portland	ME	Portland International Jetport	PWM	S	$3.00	2/1/1994	2/1/2009	
Portland	ME	Portland International Jetport	PWM	S	$4.50	2/1/2009	4/1/2040	165,807,186

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Presque Isle	ME	Northern Maine Regional Airport at Presque Isle	PQI	N	$4.50	9/1/2004	6/1/2009	
Presque Isle	ME	Northern Maine Regional Airport at Presque Isle	PQI	N	$4.50	8/1/2010	6/1/2018	
Presque Isle	ME	Northern Maine Regional Airport at Presque Isle	PQI	N	$4.50	2/1/2019	8/1/2029	1,053,437
Rockland	ME	Knox County Regional	RKD	N	$4.50	1/1/2012	8/1/2022	329,549
Alpena	MI	Alpena County Regional	APN	N	$3.00	8/1/2001	12/1/2005	
Alpena	MI	Alpena County Regional	APN	N	$4.50	12/1/2005	4/1/2022	632,191
Detroit	MI	Coleman A Young Municipal	DET	GA	$3.00	1/1/2000	3/1/2004	240,053
Detroit	MI	Detroit Metropolitan Wayne County	DTW	L	$3.00	1/1/1993	10/1/2001	
Detroit	MI	Detroit Metropolitan Wayne County	DTW	L	$4.50	10/1/2001	2/1/2034	3,134,966,084
Escanaba	MI	Delta County	ESC	N	$3.00	2/1/1993	11/1/1997	
Escanaba	MI	Delta County	ESC	N	$3.00	8/1/1998	7/1/2000	
Escanaba	MI	Delta County	ESC	N	$3.00	10/1/2001	3/1/2004	
Escanaba	MI	Delta County	ESC	N	$4.50	3/1/2004	1/1/2006	
Escanaba	MI	Delta County	ESC	N	$4.50	4/1/2006	1/1/2016	
Escanaba	MI	Delta County	ESC	N	$4.50	6/1/2018	10/1/2020	1,081,232
Flint	MI	Bishop International	FNT	N	$3.00	9/1/1993	10/1/2001	
Flint	MI	Bishop International	FNT	N	$4.50	10/1/2001	8/1/2020	42,304,023
Grand Rapids	MI	Gerald R Ford International	GRR	S	$3.00	12/1/1992	11/1/2005	
Grand Rapids	MI	Gerald R Ford International	GRR	S	$4.50	11/1/2005	1/1/2026	120,165,695
Hancock	MI	Houghton County Memorial	CMX	N	$3.00	7/1/1993	3/1/1996	
Hancock	MI	Houghton County Memorial	CMX	N	$3.00	7/1/1996	7/1/1999	

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Hancock	MI	Houghton County Memorial	CMX	N	$3.00	10/1/1999	7/1/2005	
Hancock	MI	Houghton County Memorial	CMX	N	$4.50	7/1/2005	8/1/2016	
Hancock	MI	Houghton County Memorial	CMX	N	$4.50	11/1/2018	8/1/2024	2,006,856
Iron Mountain Kingsford	MI	Ford	IMT	N	$3.00	9/1/1995	6/1/2004	178,243
Ironwood	MI	Gogebic-Iron County	IWD	CS	$3.00	8/1/1993	10/1/2006	
Ironwood	MI	Gogebic-Iron County	IWD	CS	$4.50	6/1/2007	6/1/2025	385,248
Kalamazoo	MI	Kalamazoo/Battle Creek International	AZO	N	$3.00	4/1/1997	6/1/2000	
Kalamazoo	MI	Kalamazoo/Battle Creek International	AZO	N	$3.00	1/1/2001	1/1/2005	
Kalamazoo	MI	Kalamazoo/Battle Creek International	AZO	N	$4.50	1/1/2005	8/1/2006	
Kalamazoo	MI	Kalamazoo/Battle Creek International	AZO	N	$4.50	10/1/2006	4/1/2008	
Kalamazoo	MI	Kalamazoo/Battle Creek International	AZO	N	$4.50	9/1/2008	3/1/2019	13,176,178
Lansing	MI	Capital Region International	LAN	N	$3.00	10/1/1993	7/1/2002	
Lansing	MI	Capital Region International	LAN	N	$4.50	7/1/2002	4/1/2028	30,496,100
Manistee	MI	Manistee Co-Blacker	MBL	GA	$4.50	6/1/2008	11/1/2040	388,986
Marquette	MI	Sawyer International	SAW	N	$3.00	12/1/1992	12/1/1996	
Marquette	MI	Sawyer International	SAW	N	$3.00	4/1/1998	7/1/2002	
Marquette	MI	Sawyer International	SAW	N	$4.50	7/1/2002	9/1/2006	
Marquette	MI	Sawyer International	SAW	N	$4.50	10/1/2006	5/1/2008	
Marquette	MI	Sawyer International	SAW	N	$4.50	8/1/2008	8/1/2011	
Marquette	MI	Sawyer International	SAW	N	$4.50	3/1/2012	3/1/2015	
Marquette	MI	Sawyer International	SAW	N	$4.50	5/1/2015	5/1/2017	3,414,096
Muskegon	MI	Muskegon County	MKG	N	$3.00	5/1/1994	5/1/2004	
Muskegon	MI	Muskegon County	MKG	N	$4.50	5/1/2004	11/1/2020	5,013,088

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Pellston	MI	Pellston Regional Airport of Emmet County	PLN	N	$3.00	3/1/1993	9/1/1997	
Pellston	MI	Pellston Regional Airport of Emmet County	PLN	N	$3.00	12/1/1997	7/1/2011	
Pellston	MI	Pellston Regional Airport of Emmet County	PLN	N	$4.50	7/1/2011	9/1/2019	2,251,435
Saginaw	MI	MBS International	MBS	N	$3.00	2/1/1997	7/1/2007	
Saginaw	MI	MBS International	MBS	N	$4.50	7/1/2007	4/1/2021	12,023,124
Sault Ste. Marie	MI	Chippewa County International	CIU	N	$4.50	11/1/2005	7/1/2020	1,050,115
Traverse City	MI	Cherry Capital	TVC	N	$3.00	1/1/1997	1/1/2002	
Traverse City	MI	Cherry Capital	TVC	N	$4.50	1/1/2002	12/1/2010	
Traverse City	MI	Cherry Capital	TVC	N	$4.50	2/1/2011	2/1/2016	
Traverse City	MI	Cherry Capital	TVC	N	$4.50	2/1/2017	6/1/2026	20,527,383
Bemidji	MN	Bemidji Regional	BJI	N	$3.00	11/1/1996	2/1/2002	
Bemidji	MN	Bemidji Regional	BJI	N	$4.50	2/1/2002	8/1/2005	
Bemidji	MN	Bemidji Regional	BJI	N	$4.50	6/1/2006	2/1/2022	2,158,956
Brainerd	MN	Brainerd Lakes Regional	BRD	N	$3.00	8/1/1993	7/1/2001	
Brainerd	MN	Brainerd Lakes Regional	BRD	N	$4.50	7/1/2001	8/1/2033	2,147,011
Duluth	MN	Duluth International	DLH	N	$3.00	10/1/1994	4/1/2002	
Duluth	MN	Duluth International	DLH	N	$4.50	4/1/2002	11/1/2004	
Duluth	MN	Duluth International	DLH	N	$4.50	4/1/2005	7/1/2020	12,501,378
Grand Rapids	MN	Grand Rapids/Itasca County Airport-Gordon Newstrom Field	GPZ	GA	$3.00	12/1/1997	10/1/2001	
Grand Rapids	MN	Grand Rapids/Itasca County Airport-Gordon Newstrom Field	GPZ	GA	$4.50	10/1/2001	1/1/2007	151,263
Hibbing	MN	Range Regional	HIB	N	$3.00	6/1/1996	7/1/2003	
Hibbing	MN	Range Regional	HIB	N	$4.50	7/1/2003	2/1/2029	1,322,734
International Falls	MN	Falls International-Einarson Field	INL	N	$3.00	12/1/1994	6/1/2002	

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International Falls	MN	Falls International-Einarson Field	INL	N	$4.50	6/1/2002	6/1/2005	
International Falls	MN	Falls International-Einarson Field	INL	N	$4.50	11/1/2005	3/1/2033	1,909,923
Minneapolis	MN	Minneapolis-St Paul International/Wold-Chamberlain	MSP	L	$3.00	6/1/1992	4/1/2001	
Minneapolis	MN	Minneapolis-St Paul International/Wold-Chamberlain	MSP	L	$4.50	4/1/2001	11/1/2021	1,747,864,449
Rochester	MN	Rochester International	RST	N	$3.00	5/1/1996	3/1/2002	
Rochester	MN	Rochester International	RST	N	$4.50	3/1/2002	4/1/2021	11,074,911
St. Cloud	MN	St. Cloud Regional	STC	N	$3.00	2/1/2000	7/1/2002	
St. Cloud	MN	St. Cloud Regional	STC	N	$4.50	7/1/2002	3/1/2060	4,375,081
Thief River Falls	MN	Thief River Falls Regional	TVF	CS	$4.50	6/1/2003	6/1/2023	636,828
Columbia	MO	Columbia Regional	COU	N	$4.50	11/1/2002	3/1/2016	
Columbia	MO	Columbia Regional	COU	N	$4.50	6/1/2016	1/1/2025	5,406,981
Joplin	MO	Joplin Regional	JLN	N	$4.50	4/1/2003	6/1/2026	2,117,227
Kansas City	MO	Kansas City International	MCI	M	$3.00	3/1/1996	8/1/2005	
Kansas City	MO	Kansas City International	MCI	M	$4.50	8/1/2005	8/1/2019	458,711,197
Springfield	MO	Springfield-Branson National	SGF	S	$3.00	11/1/1993	5/1/1997	
Springfield	MO	Springfield-Branson National	SGF	S	$3.00	7/1/1998	5/1/2001	
Springfield	MO	Springfield-Branson National	SGF	S	$4.50	5/1/2001	1/1/2004	
Springfield	MO	Springfield-Branson National	SGF	S	$4.50	5/1/2004	8/1/2005	
Springfield	MO	Springfield-Branson National	SGF	S	$4.50	9/1/2005	3/1/2006	
Springfield	MO	Springfield-Branson National	SGF	S	$4.50	1/1/2007	1/1/2036	96,200,309

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St. Louis	MO	St Louis Lambert International	STL	M	$3.00	12/1/1992	12/1/2001	
St. Louis	MO	St Louis Lambert International	STL	M	$4.50	12/1/2001	5/1/2025	
St. Louis	MO	St Louis Lambert International	STL	M	$3.00	5/1/2025	11/1/2026	1,097,771,352
Rota Island	MP	Benjamin Taisacan Manglona International	GRO	N	$4.50	1/1/2005	11/1/2023	1,945,506
Saipan Island	MP	Francisco C Ada/Saipan International	GSN	S	$4.50	1/1/2005	11/1/2023	33,264,083
Tinian Island	MP	Tinian International	TNI	N	$4.50	1/1/2005	11/1/2023	2,041,053
Columbus/W Point/Starkville	MS	Golden Triangle Regional	GTR	N	$3.00	8/1/1992	4/1/2001	
Columbus/W Point/Starkville	MS	Golden Triangle Regional	GTR	N	$4.50	4/1/2001	12/1/2019	4,151,108
Greenville	MS	Greenville Mid-Delta	GLH	CS	$3.00	10/1/1998	2/1/2003	
Greenville	MS	Greenville Mid-Delta	GLH	CS	$3.00	4/1/2003	4/1/2005	
Greenville	MS	Greenville Mid-Delta	GLH	CS	$4.50	4/1/2005	8/1/2011	
Greenville	MS	Greenville Mid-Delta	GLH	CS	$4.50	9/1/2012	7/1/2018	453,780
Gulfport	MS	Gulfport-Biloxi International	GPT	N	$3.00	7/1/1992	8/1/2001	
Gulfport	MS	Gulfport-Biloxi International	GPT	N	$3.00	12/1/2001	5/1/2003	
Gulfport	MS	Gulfport-Biloxi International	GPT	N	$4.50	5/1/2003	1/1/2028	66,424,061
Hattiesburg-Laurel	MS	Hattiesburg-Laurel Regional	PIB	N	$3.00	7/1/1992	6/1/2001	
Hattiesburg-Laurel	MS	Hattiesburg-Laurel Regional	PIB	N	$4.50	6/1/2001	12/1/2024	1,363,015
Jackson	MS	Jackson-Medgar Wiley Evers International	JAN	S	$3.00	5/1/1993	10/1/2003	
Jackson	MS	Jackson-Medgar Wiley Evers International	JAN	S	$4.50	10/1/2003	7/1/2036	95,217,497
Meridian	MS	Key Field	MEI	N	$3.00	11/1/1992	8/1/1996	
Meridian	MS	Key Field	MEI	N	$3.00	3/1/1997	12/1/2001	
Meridian	MS	Key Field	MEI	N	$4.50	12/1/2001	5/1/2004	

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Meridian	MS	Key Field	MEI	N	$4.50	10/1/2005	7/1/2024	2,213,664
Tupelo	MS	Tupelo Regional	TUP	N	$3.00	11/1/1994	4/1/2003	
Tupelo	MS	Tupelo Regional	TUP	N	$4.50	4/1/2003	7/1/2030	1,743,189
Billings	MT	Billings Logan International	BIL	N	$3.00	4/1/1994	9/1/2014	
Billings	MT	Billings Logan International	BIL	N	$3.00	11/1/2016	10/1/2019	22,501,074
Bozeman	MT	Bozeman Yellowstone International	BZN	S	$3.00	8/1/1993	3/1/2009	
Bozeman	MT	Bozeman Yellowstone International	BZN	S	$4.50	3/1/2009	7/1/2028	40,344,326
Butte	MT	Bert Mooney	BTM	N	$3.00	7/1/1994	6/1/2006	
Butte	MT	Bert Mooney	BTM	N	$3.00	7/1/2006	8/1/2007	
Butte	MT	Bert Mooney	BTM	N	$3.00	11/1/2007	3/1/2010	
Butte	MT	Bert Mooney	BTM	N	$4.50	3/1/2010	3/1/2036	4,358,765
Great Falls	MT	Great Falls International	GTF	N	$3.00	11/1/1992	7/1/2002	
Great Falls	MT	Great Falls International	GTF	N	$4.50	7/1/2002	2/1/2022	17,754,080
Helena	MT	Helena Regional	HLN	N	$3.00	4/1/1993	8/1/2002	
Helena	MT	Helena Regional	HLN	N	$4.50	8/1/2002	6/1/2023	7,980,758
Kalispell	MT	Glacier Park International	GPI	N	$3.00	12/1/1993	4/1/2005	
Kalispell	MT	Glacier Park International	GPI	N	$4.50	4/1/2005	1/1/2020	15,491,377
Missoula	MT	Missoula International	MSO	N	$3.00	9/1/1992	4/1/2001	
Missoula	MT	Missoula International	MSO	N	$4.50	4/1/2001	5/1/2038	59,763,526
West Yellowstone	MT	Yellowstone	WYS	N	$4.50	6/1/2011	6/1/2025	277,202
Asheville	NC	Asheville Regional	AVL	S	$3.00	12/1/1994	10/1/2002	
Asheville	NC	Asheville Regional	AVL	S	$4.50	10/1/2002	11/1/2006	
Asheville	NC	Asheville Regional	AVL	S	$4.50	4/1/2007	9/1/2007	
Asheville	NC	Asheville Regional	AVL	S	$4.50	10/1/2007	4/1/2024	29,552,251

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Charlotte	NC	Charlotte/Douglas International	CLT	L	$3.00	11/1/2004	8/1/2031	1,626,829,007
Fayetteville	NC	Fayetteville Regional/Grannis Field	FAY	N	$3.00	11/1/2000	2/1/2006	
Fayetteville	NC	Fayetteville Regional/Grannis Field	FAY	N	$4.00	7/1/2009	10/1/2012	
Fayetteville	NC	Fayetteville Regional/Grannis Field	FAY	N	$4.00	3/1/2013	6/1/2013	
Fayetteville	NC	Fayetteville Regional/Grannis Field	FAY	N	$4.00	5/1/2015	3/1/2019	8,213,759
Greensboro	NC	Piedmont Triad International	GSO	S	$4.50	9/1/2011	5/1/2022	43,872,158
Greenville	NC	Pitt-Greenville	PGV	N	$3.00	10/1/1997	4/1/2001	
Greenville	NC	Pitt-Greenville	PGV	N	$4.50	4/1/2001	1/1/2016	
Greenville	NC	Pitt-Greenville	PGV	N	$4.50	7/1/2016	8/1/2027	6,290,618
Jacksonville	NC	Albert J Ellis	OAJ	N	$3.00	1/1/1996	10/1/1998	
Jacksonville	NC	Albert J Ellis	OAJ	N	$3.00	9/1/1999	8/1/2000	
Jacksonville	NC	Albert J Ellis	OAJ	N	$3.00	3/1/2005	1/1/2009	
Jacksonville	NC	Albert J Ellis	OAJ	N	$3.00	2/1/2009	2/1/2012	
Jacksonville	NC	Albert J Ellis	OAJ	N	$4.50	2/1/2012	5/1/2028	11,329,661
New Bern	NC	Coastal Carolina Regional	EWN	N	$3.00	2/1/1997	11/1/2003	
New Bern	NC	Coastal Carolina Regional	EWN	N	$4.50	11/1/2003	10/1/2025	11,200,275
Raleigh/Durham	NC	Raleigh-Durham International	RDU	M	$3.00	4/1/2003	10/1/2004	
Raleigh/Durham	NC	Raleigh-Durham International	RDU	M	$4.50	10/1/2004	9/1/2032	772,690,405
Wilmington	NC	Wilmington International	ILM	N	$3.00	2/1/1994	9/1/1996	
Wilmington	NC	Wilmington International	ILM	N	$3.00	6/1/1998	5/1/2003	
Wilmington	NC	Wilmington International	ILM	N	$4.50	5/1/2003	8/1/2021	30,989,628
Bismarck	ND	Bismarck Municipal	BIS	N	$3.00	7/1/1996	7/1/1997	
Bismarck	ND	Bismarck Municipal	BIS	N	$3.00	6/1/1998	4/1/2002	
Bismarck	ND	Bismarck Municipal	BIS	N	$4.50	4/1/2002	6/1/2042	46,068,291

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Dickinson	ND	Dickinson - Theodore Roosevelt Regional	DIK	N	$4.50	4/1/2014	6/1/2020	714,384
Fargo	ND	Hector International	FAR	N	$3.00	1/1/1997	8/1/2002	
Fargo	ND	Hector International	FAR	N	$4.50	8/1/2002	3/1/2020	28,810,476
Grand Forks	ND	Grand Forks International	GFK	N	$3.00	2/1/1993	8/1/1996	
Grand Forks	ND	Grand Forks International	GFK	N	$3.00	5/1/1997	4/1/2001	
Grand Forks	ND	Grand Forks International	GFK	N	$4.50	4/1/2001	6/1/2003	
Grand Forks	ND	Grand Forks International	GFK	N	$4.50	5/1/2004	10/1/2008	
Grand Forks	ND	Grand Forks International	GFK	N	$4.50	1/1/2009	9/1/2020	10,251,697
Jamestown	ND	Jamestown Regional	JMS	N	$4.50	8/1/2018	5/1/2034	830,000
Minot	ND	Minot International	MOT	N	$3.00	3/1/1994	7/1/1998	
Minot	ND	Minot International	MOT	N	$3.00	3/1/1999	2/1/2002	
Minot	ND	Minot International	MOT	N	$4.50	2/1/2002	10/1/2020	16,760,900
Williston	ND	Sloulin Field International	ISN	N	$4.50	4/1/2013	7/1/2043	10,017,407
Grand Island	NE	Central Nebraska Regional	GRI	N	$3.00	2/1/1999	4/1/2001	
Grand Island	NE	Central Nebraska Regional	GRI	N	$4.50	5/1/2001	1/1/2030	5,248,737
Kearney	NE	Kearney Regional	EAR	CS	$4.00	11/1/2005	9/1/2007	
Kearney	NE	Kearney Regional	EAR	CS	$4.50	9/1/2007	7/1/2011	
Kearney	NE	Kearney Regional	EAR	CS	$4.50	10/1/2011	11/1/2037	1,749,744
Lincoln	NE	Lincoln	LNK	N	$4.50	11/1/2016	11/1/2025	5,411,638
Omaha	NE	Eppley Airfield	OMA	M	$4.50	2/1/2018	9/1/2023	43,013,145
Scottsbluff	NE	Western Nebraska Regional/William B Heilig Field	BFF	CS	$3.00	3/1/2000	3/1/2003	

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Scottsbluff	NE	Western Nebraska Regional/William B Heilig Field	BFF	CS	$4.50	7/1/2004	7/1/2024	1,299,534
Lebanon	NH	Lebanon Municipal	LEB	N	$3.00	8/1/1995	8/1/2002	
Lebanon	NH	Lebanon Municipal	LEB	N	$4.50	11/1/2003	5/1/2006	
Lebanon	NH	Lebanon Municipal	LEB	N	$4.50	10/1/2007	5/1/2014	
Lebanon	NH	Lebanon Municipal	LEB	N	$4.50	10/1/2014	10/1/2023	1,186,558
Manchester	NH	Manchester	MHT	S	$3.00	1/1/1993	1/1/2008	
Manchester	NH	Manchester	MHT	S	$4.50	1/1/2008	1/1/2023	198,491,244
Atlantic City	NJ	Atlantic City International	ACY	S	$3.00	10/1/1999	12/1/2005	
Atlantic City	NJ	Atlantic City International	ACY	S	$4.50	12/1/2005	8/1/2014	
Atlantic City	NJ	Atlantic City International	ACY	S	$4.50	9/1/2014	3/1/2025	57,765,575
Newark	NJ	Newark Liberty International	EWR	L	$3.00	10/1/1992	4/1/2006	
Newark	NJ	Newark Liberty International	EWR	L	$4.50	4/1/2006	6/1/2025	1,896,293,628
Trenton	NJ	Trenton Mercer	TTN	N	$3.00	1/1/2001	5/1/2004	
Trenton	NJ	Trenton Mercer	TTN	N	$4.50	5/1/2004	12/1/2019	10,042,238
Albuquerque	NM	Albuquerque International Sunport	ABQ	M	$3.00	7/1/1996	7/1/2011	
Albuquerque	NM	Albuquerque International Sunport	ABQ	M	$4.50	7/1/2011	1/1/2020	198,799,252
Farmington	NM	Four Corners Regional	FMN	CS	$3.00	6/1/2003	5/1/2023	661,102
Roswell	NM	Roswell International Air Center	ROW	N	$3.00	4/1/1999	2/1/2004	
Roswell	NM	Roswell International Air Center	ROW	N	$4.50	2/1/2004	6/1/2004	
Roswell	NM	Roswell International Air Center	ROW	N	$3.00	6/1/2004	6/1/2005	
Roswell	NM	Roswell International Air Center	ROW	N	$4.50	6/1/2005	2/1/2008	
Roswell	NM	Roswell International Air Center	ROW	N	$4.50	3/1/2008	3/1/2025	3,255,132
Elko	NV	Elko Regional	EKO	N	$3.00	9/1/1998	11/1/2003	

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Elko	NV	Elko Regional	EKO	N	$4.50	11/1/2003	2/1/2021	6,790,017
Las Vegas	NV	McCarran International	LAS	L	$3.00	6/1/1992	11/1/2004	
Las Vegas	NV	McCarran International	LAS	L	$4.50	11/1/2004	9/1/2006	
Las Vegas	NV	McCarran International	LAS	L	$3.00	9/1/2006	1/1/2007	
Las Vegas	NV	McCarran International	LAS	L	$4.00	1/1/2007	10/1/2008	
Las Vegas	NV	McCarran International	LAS	L	$4.50	10/1/2008	11/1/2053	4,563,146,058
Reno	NV	Reno/Tahoe International	RNO	S	$3.00	1/1/1994	2/1/2001	
Reno	NV	Reno/Tahoe International	RNO	S	$4.50	8/1/2001	6/1/2002	
Reno	NV	Reno/Tahoe International	RNO	S	$3.00	6/1/2002	2/1/2003	
Reno	NV	Reno/Tahoe International	RNO	S	$4.50	2/1/2003	10/1/2004	
Reno	NV	Reno/Tahoe International	RNO	S	$3.00	10/1/2004	4/1/2005	
Reno	NV	Reno/Tahoe International	RNO	S	$4.50	4/1/2005	7/1/2007	
Reno	NV	Reno/Tahoe International	RNO	S	$3.00	7/1/2007	12/1/2007	
Reno	NV	Reno/Tahoe International	RNO	S	$4.50	12/1/2007	2/1/2020	201,995,680
Albany	NY	Albany International	ALB	S	$3.00	3/1/1994	9/1/2009	
Albany	NY	Albany International	ALB	S	$4.50	9/1/2009	2/1/2020	116,740,338
Binghamton	NY	Greater Binghamton/Edwin A Link Field	BGM	N	$3.00	11/1/1993	9/1/2002	
Binghamton	NY	Greater Binghamton/Edwin A Link Field	BGM	N	$4.50	9/1/2002	2/1/2008	
Binghamton	NY	Greater Binghamton/Edwin A Link Field	BGM	N	$4.50	5/1/2008	12/1/2021	10,160,221
Buffalo	NY	Buffalo Niagara International	BUF	M	$3.00	8/1/1992	8/1/2007	
Buffalo	NY	Buffalo Niagara International	BUF	M	$4.50	8/1/2007	1/1/2024	248,253,528
Elmira/Corning	NY	Elmira/Corning Regional	ELM	N	$3.00	12/1/2004	1/1/2008	
Elmira/Corning	NY	Elmira/Corning Regional	ELM	N	$4.50	5/1/2008	8/1/2035	15,873,057
New York	NY	Long Island MacArthur	ISP	S	$3.00	12/1/1994	9/1/2005	
New York	NY	Long Island MacArthur	ISP	S	$4.50	9/1/2005	10/1/2023	81,814,271

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Ithaca	NY	Ithaca Tompkins Regional	ITH	N	$3.00	1/1/1993	3/1/2009	
Ithaca	NY	Ithaca Tompkins Regional	ITH	N	$4.50	3/1/2009	7/1/2022	8,990,405
Jamestown	NY	Chautauqua County/Jamestown	JHW	GA	$3.00	6/1/1993	8/1/2002	
Jamestown	NY	Chautauqua County/Jamestown	JHW	GA	$4.50	9/1/2004	3/1/2018	781,130
Massena	NY	Massena International-Richards Field	MSS	CS	$3.00	4/1/1996	4/1/2061	163,429
New York	NY	John F Kennedy International	JFK	L	$3.00	10/1/1992	4/1/2006	
New York	NY	John F Kennedy International	JFK	L	$4.50	4/1/2006	7/1/2025	2,597,929,162
New York	NY	Laguardia	LGA	L	$3.00	10/1/1992	4/1/2006	
New York	NY	Laguardia	LGA	L	$4.50	4/1/2006	7/1/2025	1,515,722,260
New York	NY	Stewart International	SWF	N	$3.00	11/1/1995	3/1/2002	
New York	NY	Stewart International	SWF	N	$4.50	3/1/2002	11/1/2005	
New York	NY	Stewart International	SWF	N	$4.50	5/1/2007	9/1/2007	
New York	NY	Stewart International	SWF	N	$4.50	7/1/2010	8/1/2026	22,254,000
Niagara Falls	NY	Niagara Falls International	IAG	N	$4.50	11/1/2017	12/1/2019	691,097
Ogdensburg	NY	Ogdensburg International	OGS	N	$3.00	4/1/1996	7/1/2016	
Ogdensburg	NY	Ogdensburg International	OGS	N	$4.50	7/1/2016	4/1/2022	865,512
Plattsburgh	NY	Plattsburgh International	PBG	N	$3.00	7/1/1993	3/1/2001	
Plattsburgh	NY	Plattsburgh International	PBG	N	$3.00	6/1/2001	4/1/2003	
Plattsburgh	NY	Plattsburgh International	PBG	N	$4.50	1/1/2009	12/1/2043	39,561,720
Rochester	NY	Greater Rochester International	ROC	S	$3.00	12/1/1997	9/1/2004	
Rochester	NY	Greater Rochester International	ROC	S	$4.50	9/1/2004	5/1/2033	159,989,895
Saranac Lake	NY	Adirondack Regional	SLK	CS	$3.00	8/1/1994	9/1/2007	
Saranac Lake	NY	Adirondack Regional	SLK	CS	$4.50	2/1/2011	6/1/2033	591,574

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Syracuse	NY	Syracuse Hancock International	SYR	S	$3.00	10/1/1995	1/1/2002	
Syracuse	NY	Syracuse Hancock International	SYR	S	$4.50	10/1/2002	8/1/2005	
Syracuse	NY	Syracuse Hancock International	SYR	S	$4.50	11/1/2005	2/1/2007	
Syracuse	NY	Syracuse Hancock International	SYR	S	$4.50	4/1/2007	8/1/2026	126,921,592
Utica	NY	Oneida County	UCA	GA	$3.00	8/1/1997	6/1/2010	119,867
Watertown	NY	Watertown International	ART	N	$4.50	4/1/2017	4/1/2023	605,205
White Plains	NY	Westchester County	HPN	S	$3.00	2/1/1993	12/1/2001	
White Plains	NY	Westchester County	HPN	S	$4.50	12/1/2001	5/1/2014	
White Plains	NY	Westchester County	HPN	S	$4.50	8/1/2016	3/1/2022	68,691,981
Akron	OH	Akron-Canton Regional	CAK	S	$3.00	9/1/1992	9/1/2002	
Akron	OH	Akron-Canton Regional	CAK	S	$4.50	9/1/2002	12/1/2030	83,958,123
Cleveland	OH	Cleveland-Hopkins International	CLE	M	$3.00	11/1/1992	3/1/2002	
Cleveland	OH	Cleveland-Hopkins International	CLE	M	$4.50	3/1/2002	9/1/2023	590,917,465
Columbus	OH	John Glenn Columbus International	CMH	M	$3.00	10/1/1992	4/1/2002	
Columbus	OH	John Glenn Columbus International	CMH	M	$4.50	4/1/2002	11/1/2020	353,675,428
Dayton	OH	James M Cox Dayton International	DAY	S	$3.00	10/1/1994	9/1/2001	
Dayton	OH	James M Cox Dayton International	DAY	S	$4.50	9/1/2001	2/1/2029	157,279,770
Toledo	OH	Toledo Express	TOL	N	$3.00	9/1/1993	9/1/1996	
Toledo	OH	Toledo Express	TOL	N	$3.00	7/1/1997	7/1/2001	
Toledo	OH	Toledo Express	TOL	N	$4.50	7/1/2001	1/1/2024	18,902,521
Youngstown/Warren	OH	Youngstown-Warren Regional	YNG	N	$3.00	5/1/1994	7/1/1996	
Youngstown/Warren	OH	Youngstown-Warren Regional	YNG	N	$3.00	8/1/1997	2/1/2002	

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Youngstown/Warren	OH	Youngstown-Warren Regional	YNG	N	$4.50	4/1/2007	12/1/2027	5,467,796
Lawton	OK	Lawton-Fort Sill Regional	LAW	N	$2.00	8/1/1992	1/1/1994	
Lawton	OK	Lawton-Fort Sill Regional	LAW	N	$3.00	1/1/1994	4/1/1996	
Lawton	OK	Lawton-Fort Sill Regional	LAW	N	$3.00	1/1/1998	8/1/2000	
Lawton	OK	Lawton-Fort Sill Regional	LAW	N	$4.50	6/1/2002	3/1/2004	
Lawton	OK	Lawton-Fort Sill Regional	LAW	N	$4.50	9/1/2004	10/1/2005	
Lawton	OK	Lawton-Fort Sill Regional	LAW	N	$4.50	11/1/2007	4/1/2019	4,150,041
Oklahoma City	OK	Will Rogers World	OKC	S	$3.00	7/1/1997	4/1/2010	
Oklahoma City	OK	Will Rogers World	OKC	S	$4.50	4/1/2010	10/1/2035	262,452,615
Tulsa	OK	Tulsa International	TUL	S	$3.00	8/1/1992	3/1/1996	
Tulsa	OK	Tulsa International	TUL	S	$3.00	1/1/1997	12/1/2010	
Tulsa	OK	Tulsa International	TUL	S	$4.50	12/1/2010	8/1/2033	199,417,324
Eugene	OR	Mahlon Sweet Field	EUG	S	$3.00	11/1/1993	6/1/2001	
Eugene	OR	Mahlon Sweet Field	EUG	S	$4.50	6/1/2001	10/1/2019	37,731,560
Klamath Falls	OR	Crater Lake-Klamath Regional	LMT	CS	$3.00	3/1/2000	4/1/2001	
Klamath Falls	OR	Crater Lake-Klamath Regional	LMT	CS	$4.50	4/1/2001	12/1/2011	
Klamath Falls	OR	Crater Lake-Klamath Regional	LMT	CS	$4.50	4/1/2012	10/1/2023	2,132,265
Medford	OR	Rogue Valley International - Medford	MFR	S	$3.00	7/1/1993	4/1/2001	
Medford	OR	Rogue Valley International - Medford	MFR	S	$4.50	4/1/2001	8/1/2027	36,490,438
North Bend	OR	Southwest Oregon Regional	OTH	N	$3.00	2/1/1994	8/1/2001	
North Bend	OR	Southwest Oregon Regional	OTH	N	$4.50	8/1/2001	8/1/2020	2,900,608

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Pendleton	OR	Eastern Oregon Regional at Pendleton	PDT	CS	$3.00	12/1/1995	10/1/2009	
Pendleton	OR	Eastern Oregon Regional at Pendleton	PDT	CS	$4.50	10/1/2009	5/1/2018	
Pendleton	OR	Eastern Oregon Regional at Pendleton	PDT	CS	$4.50	12/1/2018	2/1/2033	902,869
Portland	OR	Portland International	PDX	L	$3.00	7/1/1992	10/1/2001	
Portland	OR	Portland International	PDX	L	$4.50	10/1/2001	7/1/2036	1,200,914,626
Redmond	OR	Roberts Field	RDM	N	$3.00	10/1/1993	11/1/2001	
Redmond	OR	Roberts Field	RDM	N	$4.50	11/1/2001	12/1/2006	
Redmond	OR	Roberts Field	RDM	N	$4.50	3/1/2007	7/1/2040	33,531,050
Allentown	PA	Lehigh Valley International	ABE	N	$3.00	11/1/1992	2/1/2001	
Allentown	PA	Lehigh Valley International	ABE	N	$3.00	6/1/2001	11/1/2001	
Allentown	PA	Lehigh Valley International	ABE	N	$4.50	11/1/2001	1/1/2003	
Allentown	PA	Lehigh Valley International	ABE	N	$4.50	9/1/2003	8/1/2020	44,975,522
Altoona	PA	Altoona-Blair County	AOO	CS	$3.00	5/1/1993	2/1/1996	
Altoona	PA	Altoona-Blair County	AOO	CS	$3.00	1/1/1997	10/1/1999	
Altoona	PA	Altoona-Blair County	AOO	CS	$3.00	7/1/2000	12/1/2008	
Altoona	PA	Altoona-Blair County	AOO	CS	$4.50	12/1/2008	4/1/2021	716,045
Bradford	PA	Bradford Regional	BFD	CS	$3.00	8/1/1995	5/1/2003	
Bradford	PA	Bradford Regional	BFD	CS	$4.50	5/1/2003	6/1/2030	569,588
DuBois	PA	Dubois Regional	DUJ	CS	$3.00	6/1/1995	4/1/2001	
DuBois	PA	Dubois Regional	DUJ	CS	$4.50	4/1/2001	11/1/2003	
DuBois	PA	Dubois Regional	DUJ	CS	$4.50	4/1/2004	12/1/2030	988,067
Erie	PA	Erie International/Tom Ridge Field	ERI	N	$3.00	10/1/1992	6/1/1997	
Erie	PA	Erie International/Tom Ridge Field	ERI	N	$3.00	12/1/1997	5/1/2001	
Erie	PA	Erie International/Tom Ridge Field	ERI	N	$4.50	8/1/2003	1/1/2005	

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Erie	PA	Erie International/Tom Ridge Field	ERI	N	$4.50	7/1/2005	2/1/2025	15,928,448
Harrisburg	PA	Harrisburg International	MDT	S	$3.00	2/1/1997	1/1/2003	
Harrisburg	PA	Harrisburg International	MDT	S	$4.50	1/1/2003	7/1/2034	136,117,114
Johnstown	PA	John Murtha Johnstown-Cambria County	JST	CS	$3.00	11/1/1993	12/1/1996	
Johnstown	PA	John Murtha Johnstown-Cambria County	JST	CS	$3.00	12/1/1997	5/1/2001	
Johnstown	PA	John Murtha Johnstown-Cambria County	JST	CS	$4.50	5/1/2001	1/1/2007	
Johnstown	PA	John Murtha Johnstown-Cambria County	JST	CS	$4.50	7/1/2007	5/1/2023	1,085,952
Lancaster	PA	Lancaster	LNS	CS	$3.00	2/1/1995	2/1/2009	
Lancaster	PA	Lancaster	LNS	CS	$4.50	7/1/2013	2/1/2025	695,654
Latrobe	PA	Arnold Palmer Regional	LBE	N	$3.00	3/1/1996	8/1/2012	
Latrobe	PA	Arnold Palmer Regional	LBE	N	$4.50	8/1/2012	2/1/2022	6,515,818
Philadelphia	PA	Philadelphia International	PHL	L	$3.00	9/1/1992	4/1/2001	
Philadelphia	PA	Philadelphia International	PHL	L	$4.50	4/1/2001	2/1/2013	
Philadelphia	PA	Philadelphia International	PHL	L	$3.00	2/1/2013	3/1/2013	
Philadelphia	PA	Philadelphia International	PHL	L	$4.50	3/1/2013	6/1/2023	1,564,269,848
Pittsburgh	PA	Pittsburgh International	PIT	M	$3.00	10/1/2001	12/1/2004	
Pittsburgh	PA	Pittsburgh International	PIT	M	$4.50	12/1/2004	11/1/2030	503,924,164
Reading	PA	Reading Regional/Carl A Spaatz Field	RDG	GA	$3.00	12/1/1994	7/1/2008	1,006,653
State College	PA	University Park	UNV	N	$3.00	11/1/1992	11/1/2003	
State College	PA	University Park	UNV	N	$4.50	11/1/2003	7/1/2019	11,633,487
Wilkes-Barre/Scranton	PA	Wilkes-Barre/Scranton International	AVP	N	$3.00	12/1/1993	6/1/1997	
Wilkes-Barre/Scranton	PA	Wilkes-Barre/Scranton International	AVP	N	$3.00	12/1/1997	5/1/2001	
Wilkes-Barre/Scranton	PA	Wilkes-Barre/Scranton International	AVP	N	$4.50	5/1/2001	8/1/2025	25,905,796
Williamsport	PA	Williamsport Regional	IPT	N	$3.00	5/1/1997	11/1/1998	

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Williamsport	PA	Williamsport Regional	IPT	N	$4.50	11/1/2013	9/1/2028	1,857,488
Aguadilla	PR	Rafael Hernandez	BQN	N	$3.00	3/1/1993	5/1/1996	
Aguadilla	PR	Rafael Hernandez	BQN	N	$4.50	12/1/2005	4/1/2015	9,828,476
Ponce	PR	Mercedita	PSE	N	$3.00	3/1/1993	9/1/1998	866,000
San Juan	PR	Luis Munoz Marin International	SJU	M	$3.00	3/1/1993	12/1/2005	
San Juan	PR	Luis Munoz Marin International	SJU	M	$4.50	12/1/2005	9/1/2027	594,010,551
Providence	RI	Theodore Francis Green State	PVD	S	$3.00	2/1/1994	9/1/2006	
Providence	RI	Theodore Francis Green State	PVD	S	$4.50	9/1/2006	7/1/2028	261,935,756
Charleston	SC	Charleston AFB/International	CHS	S	$4.50	3/1/2010	7/1/2039	189,546,679
Columbia	SC	Columbia Metropolitan	CAE	S	$3.00	11/1/1993	12/1/2001	
Columbia	SC	Columbia Metropolitan	CAE	S	$4.50	12/1/2001	10/1/2028	70,528,884
Florence	SC	Florence Regional	FLO	N	$3.00	12/1/1995	11/1/1999	
Florence	SC	Florence Regional	FLO	N	$3.00	12/1/1999	2/1/2000	
Florence	SC	Florence Regional	FLO	N	$4.50	12/1/2014	6/1/2019	1,752,407
Hilton Head Island	SC	Hilton Head	HXD	N	$3.00	2/1/1994	6/1/2000	
Hilton Head Island	SC	Hilton Head	HXD	N	$3.00	12/1/2000	10/1/2007	
Hilton Head Island	SC	Hilton Head	HXD	N	$4.50	5/1/2012	4/1/2022	5,934,148
Myrtle Beach	SC	Myrtle Beach International	MYR	S	$3.00	10/1/1996	8/1/2001	
Myrtle Beach	SC	Myrtle Beach International	MYR	S	$4.50	8/1/2001	8/1/2007	
Myrtle Beach	SC	Myrtle Beach International	MYR	S	$4.50	6/1/2010	1/1/2032	119,254,552
Aberdeen	SD	Aberdeen Regional	ABR	N	$3.00	1/1/2000	1/1/2002	
Aberdeen	SD	Aberdeen Regional	ABR	N	$4.50	1/1/2002	10/1/2023	2,282,913

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Pierre	SD	Pierre Regional	PIR	N	$4.50	2/1/2003	7/1/2009	
Pierre	SD	Pierre Regional	PIR	N	$4.50	9/1/2009	4/1/2042	2,070,789
Rapid City	SD	Rapid City Regional	RAP	N	$3.00	8/1/1997	1/1/2000	
Rapid City	SD	Rapid City Regional	RAP	N	$3.00	6/1/2000	6/1/2006	
Rapid City	SD	Rapid City Regional	RAP	N	$4.50	6/1/2006	6/1/2033	34,628,990
Sioux Falls	SD	Joe Foss Field	FSD	S	$4.50	1/1/2017	4/1/2025	17,612,920
Bristol/Johnson /Kingsport	TN	Tri-Cities	TRI	N	$3.00	2/1/1997	7/1/2007	
Bristol/Johnson /Kingsport	TN	Tri-Cities	TRI	N	$4.50	7/1/2007	8/1/2019	16,707,107
Chattanooga	TN	Lovell Field	CHA	S	$3.00	7/1/1994	4/1/2001	
Chattanooga	TN	Lovell Field	CHA	S	$4.50	4/1/2001	11/1/2004	
Chattanooga	TN	Lovell Field	CHA	S	$3.00	11/1/2004	2/1/2005	
Chattanooga	TN	Lovell Field	CHA	S	$4.50	2/1/2005	10/1/2020	30,775,915
Jackson	TN	McKellar-Sipes Regional	MKL	CS	$4.50	10/1/2002	6/1/2025	332,248
Knoxville	TN	McGhee Tyson	TYS	S	$3.00	1/1/1994	10/1/2003	
Knoxville	TN	McGhee Tyson	TYS	S	$4.50	10/1/2003	9/1/2023	103,771,921
Memphis	TN	Memphis International	MEM	S	$3.00	8/1/1992	1/1/1997	
Memphis	TN	Memphis International	MEM	S	$4.50	9/1/2018	5/1/2029	152,778,627
Nashville	TN	Nashville International	BNA	M	$3.00	1/1/1993	12/1/2009	
Nashville	TN	Nashville International	BNA	M	$4.50	12/1/2009	9/1/2010	
Nashville	TN	Nashville International	BNA	M	$3.00	9/1/2010	5/1/2015	
Nashville	TN	Nashville International	BNA	M	$4.50	5/1/2015	3/1/2020	402,643,161
Abilene	TX	Abilene Regional	ABI	N	$3.00	1/1/1998	9/1/2002	
Abilene	TX	Abilene Regional	ABI	N	$4.50	9/1/2002	10/1/2022	7,176,261
Amarillo	TX	Rick Husband Amarillo International	AMA	N	$4.50	1/1/2009	8/1/2023	19,200,000
Austin	TX	Austin-Bergstrom International	AUS	M	$2.00	11/1/1993	2/1/1994	

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Austin	TX	Austin-Bergstrom International	AUS	M	$3.00	2/1/1994	2/1/1995	
Austin	TX	Austin-Bergstrom International	AUS	M	$3.00	7/1/1995	4/1/2004	
Austin	TX	Austin-Bergstrom International	AUS	M	$4.50	4/1/2004	11/1/2034	831,089,379
Beaumont/Port Arthur	TX	Jack Brooks Regional	BPT	N	$3.00	9/1/1994	3/1/2002	
Beaumont/Port Arthur	TX	Jack Brooks Regional	BPT	N	$4.50	3/1/2002	3/1/2029	4,901,113
Brownsville	TX	Brownsville/South Padre Island International	BRO	N	$3.00	10/1/1997	5/1/2003	
Brownsville	TX	Brownsville/South Padre Island International	BRO	N	$4.50	5/1/2003	2/1/2024	8,178,196
College Station	TX	Easterwood Field	CLL	N	$3.00	7/1/1996	4/1/2001	
College Station	TX	Easterwood Field	CLL	N	$4.50	4/1/2001	12/1/2028	8,067,085
Corpus Christi	TX	Corpus Christi International	CRP	N	$3.00	3/1/1994	3/1/2003	
Corpus Christi	TX	Corpus Christi International	CRP	N	$4.50	3/1/2003	1/1/2027	49,700,114
Dallas	TX	Dallas Love Field	DAL	M	$3.00	2/1/2008	2/1/2010	
Dallas	TX	Dallas Love Field	DAL	M	$4.50	2/1/2010	7/1/2024	
Dallas	TX	Dallas Love Field	DAL	M	$3.00	7/1/2024	2/1/2025	365,106,697
Dallas-Fort Worth	TX	Dallas-Fort Worth International	DFW	L	$3.00	5/1/1994	6/1/1996	
Dallas-Fort Worth	TX	Dallas-Fort Worth International	DFW	L	$3.00	2/1/1997	7/1/2002	
Dallas-Fort Worth	TX	Dallas-Fort Worth International	DFW	L	$4.50	7/1/2002	10/1/2038	5,655,256,130
Del Rio	TX	Del Rio International	DRT	GA	$4.50	2/1/2010	6/1/2020	403,739
El Paso	TX	El Paso International	ELP	S	$3.00	1/1/1997	8/1/2010	
El Paso	TX	El Paso International	ELP	S	$4.50	8/1/2010	5/1/2013	
El Paso	TX	El Paso International	ELP	S	$4.50	6/1/2013	12/1/2024	147,935,120
Harlingen	TX	Valley International	HRL	N	$3.00	11/1/1998	12/1/2007	

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Harlingen	TX	Valley International	HRL	N	$4.50	12/1/2007	7/1/2009	
Harlingen	TX	Valley International	HRL	N	$4.50	8/1/2009	11/1/2024	31,083,290
Houston	TX	William P Hobby	HOU	M	$3.00	11/1/2006	3/1/2015	
Houston	TX	William P Hobby	HOU	M	$4.50	3/1/2015	9/1/2038	736,300,640
Houston	TX	George Bush Intercontinental/Houston	IAH	L	$3.00	12/1/2008	3/1/2015	
Houston	TX	George Bush Intercontinental/Houston	IAH	L	$4.50	3/1/2015	1/1/2028	1,372,445,143
Fort Hood/Killeen	TX	Robert Gray AAF	GRK	N	$3.00	1/1/1993	11/1/1994	
Fort Hood/Killeen	TX	Robert Gray AAF	GRK	N	$3.00	4/1/1995	5/1/2001	
Fort Hood/Killeen	TX	Robert Gray AAF	GRK	N	$4.50	5/1/2001	8/1/2003	
Fort Hood/Killeen	TX	Robert Gray AAF	GRK	N	$4.50	12/1/2003	1/1/2006	
Fort Hood/Killeen	TX	Robert Gray AAF	GRK	N	$4.50	6/1/2006	5/1/2023	13,394,354
Laredo	TX	Laredo International	LRD	N	$3.00	10/1/1993	6/1/2009	
Laredo	TX	Laredo International	LRD	N	$4.50	6/1/2009	4/1/2040	20,779,276
Longview	TX	East Texas Regional	GGG	N	$3.00	9/1/1996	4/1/2002	
Longview	TX	East Texas Regional	GGG	N	$3.00	9/1/2002	9/1/2012	
Longview	TX	East Texas Regional	GGG	N	$4.50	9/1/2012	9/1/2023	2,350,343
Lubbock	TX	Lubbock Preston Smith International	LBB	S	$3.00	10/1/1993	2/1/2005	
Lubbock	TX	Lubbock Preston Smith International	LBB	S	$2.00	2/1/2005	2/1/2007	
Lubbock	TX	Lubbock Preston Smith International	LBB	S	$3.00	2/1/2007	6/1/2008	
Lubbock	TX	Lubbock Preston Smith International	LBB	S	$4.50	6/1/2008	9/1/2033	71,845,049
McAllen	TX	McAllen Miller International	MFE	N	$3.00	4/1/1998	6/1/2011	
McAllen	TX	McAllen Miller International	MFE	N	$4.50	6/1/2011	6/1/2023	30,517,304

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Midland	TX	Midland International Air And Space Port	MAF	S	$3.00	1/1/1993	9/1/2004	
Midland	TX	Midland International Air And Space Port	MAF	S	$4.50	9/1/2004	1/1/2014	
Midland	TX	Midland International Air And Space Port	MAF	S	$3.00	1/1/2014	11/1/2014	
Midland	TX	Midland International Air And Space Port	MAF	S	$4.50	11/1/2014	3/1/2022	51,534,192
San Angelo	TX	San Angelo Regional/Mathis Field	SJT	N	$3.00	5/1/1993	4/1/2002	
San Angelo	TX	San Angelo Regional/Mathis Field	SJT	N	$4.50	4/1/2002	1/1/2030	8,010,053
San Antonio	TX	San Antonio International	SAT	M	$3.00	11/1/2001	10/1/2007	
San Antonio	TX	San Antonio International	SAT	M	$4.50	10/1/2007	8/1/2032	463,710,203
Tyler	TX	Tyler Pounds Regional	TYR	N	$3.00	3/1/1994	9/1/2003	
Tyler	TX	Tyler Pounds Regional	TYR	N	$4.50	9/1/2003	10/1/2037	11,668,802
Victoria	TX	Victoria Regional	VCT	GA	$3.00	12/1/1994	8/1/1998	
Victoria	TX	Victoria Regional	VCT	GA	$3.00	1/1/1999	1/1/2002	
Victoria	TX	Victoria Regional	VCT	GA	$4.50	1/1/2002	8/1/2016	828,792
Waco	TX	Waco Regional	ACT	N	$3.00	11/1/1995	10/1/2001	
Waco	TX	Waco Regional	ACT	N	$4.50	10/1/2001	7/1/2019	5,531,685
Wichita Falls	TX	Sheppard AFB/Wichita Falls Municipal	SPS	N	$4.50	10/1/2008	8/1/2058	9,607,509
Cedar City	UT	Cedar City Regional	CDC	N	$4.50	2/1/2007	10/1/2011	
Cedar City	UT	Cedar City Regional	CDC	N	$4.50	2/1/2012	2/1/2021	496,704
Salt Lake City	UT	Salt Lake City International	SLC	L	$3.00	12/1/1994	4/1/2001	
Salt Lake City	UT	Salt Lake City International	SLC	L	$4.50	4/1/2001	10/1/2035	2,067,702,396
St. George	UT	St George Regional	SGU	N	$3.00	5/1/1998	9/1/2002	

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
St. George	UT	St George Regional	SGU	N	$4.50	6/1/2003	6/1/2031	6,604,984
Wendover	UT	Wendover	ENV	GA	$3.00	8/1/1996	10/1/1999	142,300
Arlington	VA	Ronald Reagan Washington National	DCA	L	$3.00	11/1/1993	5/1/2001	
Arlington	VA	Ronald Reagan Washington National	DCA	L	$4.50	5/1/2001	2/1/2023	1,019,820,276
Dulles	VA	Washington Dulles International	IAD	L	$3.00	1/1/1994	5/1/2001	
Dulles	VA	Washington Dulles International	IAD	L	$4.50	5/1/2001	12/1/2038	2,442,302,508
Charlottesville	VA	Charlottesville-Albemarle	CHO	N	$2.00	9/1/1992	10/1/1993	
Charlottesville	VA	Charlottesville-Albemarle	CHO	N	$3.00	4/1/1995	1/1/2005	
Charlottesville	VA	Charlottesville-Albemarle	CHO	N	$4.50	1/1/2005	1/1/2010	
Charlottesville	VA	Charlottesville-Albemarle	CHO	N	$4.50	8/1/2010	12/1/2020	18,510,788
Lynchburg	VA	Lynchburg Regional/Preston Glenn Field	LYH	N	$3.00	7/1/1995	7/1/1996	
Lynchburg	VA	Lynchburg Regional/Preston Glenn Field	LYH	N	$3.00	9/1/2000	6/1/2002	
Lynchburg	VA	Lynchburg Regional/Preston Glenn Field	LYH	N	$4.50	6/1/2002	9/1/2031	8,364,446
Newport News	VA	Newport News/Williamsburg International	PHF	N	$3.00	10/1/2006	7/1/2007	
Newport News	VA	Newport News/Williamsburg International	PHF	N	$4.50	7/1/2010	5/1/2031	26,821,415
Norfolk	VA	Norfolk International	ORF	S	$3.00	5/1/1997	1/1/2010	
Norfolk	VA	Norfolk International	ORF	S	$4.50	9/1/2010	1/1/2022	134,247,810
Richmond	VA	Richmond International	RIC	S	$3.00	5/1/1994	1/1/2005	
Richmond	VA	Richmond International	RIC	S	$4.50	1/1/2005	3/1/2031	224,133,065

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Roanoke	VA	Roanoke-Blacksburg Regional/Woodrum Field	ROA	N	$3.00	9/1/1998	12/1/2001	
Roanoke	VA	Roanoke-Blacksburg Regional/Woodrum Field	ROA	N	$4.50	12/1/2001	6/1/2019	24,406,775
Staunton/Waynesboro/Harrisonburg	VA	Shenandoah Valley Regional	SHD	CS	$3.00	12/1/2001	12/1/2006	
Staunton/Waynesboro/Harrisonburg	VA	Shenandoah Valley Regional	SHD	CS	$4.50	6/1/2007	9/1/2022	642,846
Charlotte Amalie	VI	Cyril E King	STT	S	$3.00	3/1/1993	8/1/1995	
Charlotte Amalie	VI	Cyril E King	STT	S	$3.00	12/1/1995	12/1/2002	
Charlotte Amalie	VI	Cyril E King	STT	S	$3.00	8/1/2004	4/1/2012	
Charlotte Amalie	VI	Cyril E King	STT	S	$4.50	4/1/2012	8/1/2019	40,794,518
Christiansted	VI	Henry E Rohlsen	STX	N	$3.00	3/1/1993	4/1/1996	
Christiansted	VI	Henry E Rohlsen	STX	N	$3.00	12/1/1996	7/1/2003	
Christiansted	VI	Henry E Rohlsen	STX	N	$3.00	10/1/2011	7/1/2016	9,339,163
Burlington	VT	Burlington International	BTV	S	$3.00	4/1/1997	9/1/2003	
Burlington	VT	Burlington International	BTV	S	$4.50	9/1/2003	10/1/2009	
Burlington	VT	Burlington International	BTV	S	$4.50	12/1/2009	8/1/2021	52,013,046
Bellingham	WA	Bellingham International	BLI	N	$3.00	7/1/1993	8/1/1998	
Bellingham	WA	Bellingham International	BLI	N	$3.00	3/1/1999	7/1/2002	
Bellingham	WA	Bellingham International	BLI	N	$4.50	7/1/2002	7/1/2010	
Bellingham	WA	Bellingham International	BLI	N	$4.50	10/1/2010	10/1/2027	38,188,548
Friday Harbor	WA	Friday Harbor	FHR	N	$3.00	2/1/2001	7/1/2016	
Friday Harbor	WA	Friday Harbor	FHR	N	$4.50	4/1/2018	5/1/2020	607,715
Moses Lake	WA	Grant County International	MWH	GA	$3.00	3/1/1999	11/1/2005	
Moses Lake	WA	Grant County International	MWH	GA	$4.50	11/1/2005	2/1/2017	162,124
Pasco	WA	Tri-Cities	PSC	N	$3.00	11/1/1993	10/1/2001	

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Pasco	WA	Tri-Cities	PSC	N	$4.50	10/1/2001	11/1/2036	58,406,668
Port Angeles	WA	William R Fairchild International	CLM	GA	$3.00	8/1/1993	5/1/1995	
Port Angeles	WA	William R Fairchild International	CLM	GA	$3.00	9/1/1996	10/1/2011	
Port Angeles	WA	William R Fairchild International	CLM	GA	$3.00	7/1/2012	4/1/2022	1,000,156
Pullman	WA	Pullman/Moscow Regional	PUW	N	$3.00	6/1/1994	2/1/1996	
Pullman	WA	Pullman/Moscow Regional	PUW	N	$3.00	2/1/2000	1/1/2002	
Pullman	WA	Pullman/Moscow Regional	PUW	N	$4.50	1/1/2002	9/1/2013	
Pullman	WA	Pullman/Moscow Regional	PUW	N	$4.50	11/1/2013	1/1/2070	11,352,608
Seattle	WA	Seattle-Tacoma International	SEA	L	$3.00	11/1/1992	10/1/2001	
Seattle	WA	Seattle-Tacoma International	SEA	L	$4.50	10/1/2001	1/1/2043	3,841,864,375
Spokane	WA	Spokane International	GEG	S	$3.00	6/1/1993	4/1/2003	
Spokane	WA	Spokane International	GEG	S	$4.50	4/1/2003	11/1/2020	152,400,263
Walla Walla	WA	Walla Walla Regional	ALW	N	$3.00	11/1/1993	10/1/2001	
Walla Walla	WA	Walla Walla Regional	ALW	N	$4.50	10/1/2001	10/1/2019	3,745,775
Wenatchee	WA	Pangborn Memorial	EAT	N	$3.00	8/1/1993	10/1/1995	
Wenatchee	WA	Pangborn Memorial	EAT	N	$3.00	6/1/1998	7/1/2002	
Wenatchee	WA	Pangborn Memorial	EAT	N	$4.50	7/1/2002	2/1/2003	
Wenatchee	WA	Pangborn Memorial	EAT	N	$4.50	5/1/2003	4/1/2010	
Wenatchee	WA	Pangborn Memorial	EAT	N	$4.50	5/1/2010	11/1/2019	4,454,625
Yakima	WA	Yakima Air Terminal/McAllister Field	YKM	N	$3.00	2/1/1993	2/1/1999	
Yakima	WA	Yakima Air Terminal/McAllister Field	YKM	N	$3.00	5/1/1999	4/1/2011	
Yakima	WA	Yakima Air Terminal/McAllister Field	YKM	N	$4.50	4/1/2011	9/1/2020	5,830,251

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Appleton	WI	Appleton International	ATW	N	$3.00	7/1/1994	6/1/2006	
Appleton	WI	Appleton International	ATW	N	$4.50	6/1/2006	4/1/2008	
Appleton	WI	Appleton International	ATW	N	$3.00	4/1/2008	9/1/2008	
Appleton	WI	Appleton International	ATW	N	$4.50	9/1/2008	8/1/2036	41,406,402
Eau Claire	WI	Chippewa Valley Regional	EAU	N	$3.00	2/1/1996	12/1/2001	
Eau Claire	WI	Chippewa Valley Regional	EAU	N	$4.50	12/1/2001	1/1/2006	
Eau Claire	WI	Chippewa Valley Regional	EAU	N	$4.50	8/1/2006	6/1/2024	2,147,974
Green Bay	WI	Green Bay-Austin Straubel International	GRB	N	$3.00	3/1/1993	3/1/2002	
Green Bay	WI	Green Bay-Austin Straubel International	GRB	N	$4.50	3/1/2002	10/1/2020	46,299,787
La Crosse	WI	La Crosse Regional	LSE	N	$3.00	7/1/1994	4/1/2001	
La Crosse	WI	La Crosse Regional	LSE	N	$4.50	4/1/2001	4/1/2028	12,741,825
Madison	WI	Dane County Regional-Truax Field	MSN	S	$3.00	9/1/1993	11/1/2001	
Madison	WI	Dane County Regional-Truax Field	MSN	S	$4.50	11/1/2001	10/1/2023	92,211,569
Milwaukee	WI	General Mitchell International	MKE	M	$3.00	5/1/1995	11/1/2012	
Milwaukee	WI	General Mitchell International	MKE	M	$4.50	11/1/2012	2/1/2020	
Milwaukee	WI	General Mitchell International	MKE	M	$3.00	2/1/2020	4/1/2028	394,620,217
Mosinee	WI	Central Wisconsin	CWA	N	$3.00	11/1/1993	9/1/2007	
Mosinee	WI	Central Wisconsin	CWA	N	$4.50	9/1/2007	9/1/2026	15,628,943
Rhinelander	WI	Rhinelander-Oneida County	RHI	N	$3.00	1/1/1994	4/1/1996	
Rhinelander	WI	Rhinelander-Oneida County	RHI	N	$3.00	6/1/1996	9/1/2001	
Rhinelander	WI	Rhinelander-Oneida County	RHI	N	$4.50	9/1/2001	3/1/2022	2,750,883
Beckley	WV	Raleigh County Memorial	BKW	GA	$4.50	8/1/2017	8/1/2039	285,965

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Charleston	WV	Yeager	CRW	N	$3.00	8/1/1993	11/1/2001	
Charleston	WV	Yeager	CRW	N	$4.50	11/1/2001	3/1/2021	25,641,516
Clarksburg	WV	North Central West Virginia	CKB	N	$3.00	4/1/1994	10/1/1995	
Clarksburg	WV	North Central West Virginia	CKB	N	$4.50	4/1/2001	8/1/2002	
Clarksburg	WV	North Central West Virginia	CKB	N	$4.50	5/1/2004	5/1/2054	3,101,233
Huntington	WV	Tri-State/Milton J Ferguson Field	HTS	N	$3.00	12/1/1995	12/1/2008	
Huntington	WV	Tri-State/Milton J Ferguson Field	HTS	N	$3.00	5/1/2009	6/1/2012	
Huntington	WV	Tri-State/Milton J Ferguson Field	HTS	N	$4.50	7/1/2012	11/1/2019	6,490,372
Lewisburg	WV	Greenbrier Valley	LWB	CS	$4.50	4/1/2011	1/1/2025	1,104,958
Morgantown	WV	Morgantown Municipal-Walter L Bill Hart Field	MGW	CS	$2.00	12/1/1992	1/1/1994	
Morgantown	WV	Morgantown Municipal-Walter L Bill Hart Field	MGW	CS	$2.00	12/1/1994	1/1/2002	
Morgantown	WV	Morgantown Municipal-Walter L Bill Hart Field	MGW	CS	$4.50	1/1/2002	3/1/2008	
Morgantown	WV	Morgantown Municipal-Walter L Bill Hart Field	MGW	CS	$4.50	6/1/2009	1/1/2026	1,170,454
Parkersburg	WV	Mid-Ohio Valley Regional	PKB	CS	$3.00	5/1/1999	8/1/2002	
Parkersburg	WV	Mid-Ohio Valley Regional	PKB	CS	$4.50	8/1/2003	10/1/2027	798,612
Casper	WY	Casper/Natrona County International	CPR	N	$3.00	9/1/1993	4/1/2001	
Casper	WY	Casper/Natrona County International	CPR	N	$4.50	4/1/2001	3/1/2012	
Casper	WY	Casper/Natrona County International	CPR	N	$3.00	3/1/2012	10/1/2021	6,506,449
Cheyenne	WY	Cheyenne Regional/Jerry Olson Field	CYS	GA	$3.00	11/1/1993	4/1/2001	
Cheyenne	WY	Cheyenne Regional/Jerry Olson Field	CYS	GA	$4.50	4/1/2001	9/1/2012	

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Cheyenne	WY	Cheyenne Regional/Jerry Olson Field	CYS	GA	$4.50	9/1/2014	9/1/2024	1,804,637
Cody	WY	Yellowstone Regional	COD	N	$3.00	8/1/1997	7/1/2001	
Cody	WY	Yellowstone Regional	COD	N	$4.50	7/1/2001	4/1/2005	
Cody	WY	Yellowstone Regional	COD	N	$4.50	9/1/2005	6/1/2018	
Cody	WY	Yellowstone Regional	COD	N	$4.50	7/1/2018	2/1/2020	2,269,020
Gillette	WY	Gillette-Campbell County	GCC	N	$3.00	9/1/1993	12/1/2001	
Gillette	WY	Gillette-Campbell County	GCC	N	$4.50	12/1/2001	6/1/2004	
Gillette	WY	Gillette-Campbell County	GCC	N	$4.50	1/1/2005	5/1/2020	2,196,785
Jackson	WY	Jackson Hole	JAC	N	$3.00	8/1/1993	4/1/2001	
Jackson	WY	Jackson Hole	JAC	N	$4.50	4/1/2001	9/1/2041	39,749,014
Laramie	WY	Laramie Regional	LAR	N	$3.00	8/1/1996	10/1/2000	
Laramie	WY	Laramie Regional	LAR	N	$3.00	12/1/2000	8/1/2001	
Laramie	WY	Laramie Regional	LAR	N	$4.50	12/1/2006	4/1/2013	
Laramie	WY	Laramie Regional	LAR	N	$4.50	6/1/2013	2/1/2024	847,142
Riverton	WY	Riverton Regional	RIW	CS	$3.00	5/1/1995	4/1/2001	
Riverton	WY	Riverton Regional	RIW	CS	$4.50	4/1/2001	3/1/2045	1,754,285
Rock Springs	WY	Southwest Wyoming Regional	RKS	N	$3.00	4/1/1995	4/1/2006	
Rock Springs	WY	Southwest Wyoming Regional	RKS	N	$4.50	4/1/2006	11/1/2023	2,009,268
Sheridan	WY	Sheridan County	SHR	N	$3.00	3/1/1996	12/1/2001	
Sheridan	WY	Sheridan County	SHR	N	$4.50	12/1/2001	9/1/2008	
Sheridan	WY	Sheridan County	SHR	N	$4.50	10/1/2008	8/1/2035	1,388,712
Worland	WY	Worland Municipal	WRL	GA	$4.50	1/1/2003	3/1/2008	
Worland	WY	Worland Municipal	WRL	GA	$4.50	8/1/2008	7/1/2022	265,060
Anchorage	AK	Ted Stevens Anchorage International	ANC	M	$3.00	10/1/2000	12/1/2026	106,043,173
Fairbanks	AK	Fairbanks International	FAI	S	$3.00	10/1/2000	4/1/2004	

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Fairbanks	AK	Fairbanks International	FAI	S	$4.50	4/1/2004	10/1/2026	38,413,252
Juneau	AK	Juneau International	JNU	N	$3.00	10/1/1998	2/1/2001	
Juneau	AK	Juneau International	JNU	N	$4.50	8/1/2001	7/1/2026	25,783,039
Ketchikan	AK	Ketchikan International	KTN	N	$3.00	2/1/1999	8/1/2001	
Ketchikan	AK	Ketchikan International	KTN	N	$4.50	8/1/2001	6/1/2018	5,630,359
Sitka	AK	Sitka Rocky Gutierrez	SIT	N	$4.50	7/1/2007	9/1/2013	
Sitka	AK	Sitka Rocky Gutierrez	SIT	N	$4.50	5/1/2018	5/1/2038	8,215,000
Birmingham	AL	Birmingham-Shuttlesworth International	BHM	S	$3.00	8/1/1997	11/1/2003	
Birmingham	AL	Birmingham-Shuttlesworth International	BHM	S	$3.00	12/1/2003	10/1/2008	
Birmingham	AL	Birmingham-Shuttlesworth International	BHM	S	$4.50	10/1/2008	2/1/2031	212,563,127
Dothan	AL	Dothan Regional	DHN	N	$3.00	2/1/1998	8/1/2001	
Dothan	AL	Dothan Regional	DHN	N	$4.50	8/1/2001	12/1/2020	5,515,948
Huntsville	AL	Huntsville International-Carl T Jones Field	HSV	S	$3.00	6/1/1992	9/1/2004	
Huntsville	AL	Huntsville International-Carl T Jones Field	HSV	S	$4.50	9/1/2004	8/1/2025	61,431,541
Mobile	AL	Mobile Regional	MOB	N	$3.00	12/1/1997	7/1/2004	
								$104,660,197,825

unique locations approved 399

NOTES:

Total PFC approved includes all the collections at the location

Letter of Intent (LOI) Commitments by Fiscal Year

State	City	Airport Name	Discretionary 2019	Entitlement 2019	Discretionary 2020	Entitlement 2020
CA	Los Angeles	Los Angeles International	11,000,000	0	0	0
FL	Fort Lauderdale	Fort Lauderdale/Hollywood International	20,000,000	0	20,000,000	0
IL	Chicago	Chicago O'Hare International (Ph 1)	20,000,000	0	20,000,000	0
IL	Chicago	Chicago O'Hare International (Ph 2)	45,000,000	0	45,000,000	0
OH	Cleveland	Cleveland-Hopkins International	0	2,045,253	0	2,059,960
TX	Dallas-Fort Worth	Dallas-Fort Worth International	15,000,000	0	15,000,000	9,000,000
		Total	111,000,000	2,045,253	100,000,000	11,059,960

Letter of Intent (LOI) Commitments by Fiscal Year (Cont'd)

State	City	Airport Name	Discretionary 2021	Entitlement 2021	Discretionary 2022	Entitlement 2022
CA	Los Angeles	Los Angeles International	0	0	0	0
FL	Fort Lauderdale	Fort Lauderdale/Hollywood International	20,000,000	0	10,000,000	0
IL	Chicago	Chicago O'Hare International (Ph 1)	0	0	0	0
IL	Chicago	Chicago O'Hare International (Ph 2)	25,000,000	0	30,000,000	0
OH	Cleveland	Cleveland-Hopkins International	0	2,074,885	0	400,248
TX	Dallas-Fort Worth	Dallas-Fort Worth International	15,000,000	9,000,000	25,000,000	9,000,000
		Total	60,000,000	11,074,885	65,000,000	9,400,248

Letter of Intent (LOI) Commitments by Fiscal Year (Cont'd)

State	City	Airport Name	Discretionary 2023	Entitlement 2023	Discretionary 2024	Entitlement 2024
CA	Los Angeles	Los Angeles International	0	0	0	0
FL	Fort Lauderdale	Fort Lauderdale/Hollywood International	0	0	0	0
IL	Chicago	Chicago O'Hare International (Ph 1)	0	0	0	0
IL	Chicago	Chicago O'Hare International (Ph 2)	30,000,000	0	30,000,000	0
OH	Cleveland	Cleveland-Hopkins International	0	0	0	0
TX	Dallas-Fort Worth	Dallas-Fort Worth International	25,000,000	9,000,000	25,000,000	9,000,000
		Total	55,000,000	9,000,000	55,000,000	9,000,000

Letter of Intent (LOI) Commitments by Fiscal Year (Cont'd)

State	City	Airport Name	Discretionary 2025	Entitlement 2025	Discretionary 2026	Entitlement 2026
CA	Los Angeles	Los Angeles International	0	0	0	0
FL	Fort Lauderdale	Fort Lauderdale/Hollywood International	0	0	0	0
IL	Chicago	Chicago O'Hare International (Ph 1)	0	0	0	0
IL	Chicago	Chicago O'Hare International (Ph 2)	30,000,000	0	20,000,000	0
OH	Cleveland	Cleveland-Hopkins International	0	0	0	0
TX	Dallas-Fort Worth	Dallas-Fort Worth International	0	0	0	0
		Total	30,000,000	0	20,000,000	0

Letter of Intent (LOI) Commitments by Fiscal Year (Cont'd)

State	City	Airport Name	Discretionary Beyond	Entitlement Beyond
CA	Los Angeles	Los Angeles International	0	0
FL	Fort Lauderdale	Fort Lauderdale/Hollywood International	0	0
IL	Chicago	Chicago O'Hare International (Ph 1)		
IL	Chicago	Chicago O'Hare International (Ph 2)	0	0
OH	Cleveland	Cleveland-Hopkins International	0	0
TX	Dallas-Fort Worth	Dallas-Fort Worth International		
		Total	0	0

Letter of Intent (LOI) Commitments by Fiscal Year (Cont'd)

State	City	Airport Name			Discretionary Total	Entitlement Total
CA	Los Angeles	Los Angeles International			22,000,000.00	0
FL	Fort Lauderdale	Fort Lauderdale/Hollywood International			90,000,000.00	0
IL	Chicago	Chicago O'Hare International			360,000,000.00	0
OH	Cleveland	Cleveland-Hopkins International			0	0
		Total			472,000,000.00	8,611,107.00

ADMINISTRATIVE SERVICES FRANCHISE FUND

Program and Financing
(in millions of dollars)

Identification code: 69-4562-0-4-402		FY 2018 Actual	FY 2019 Estimate	FY 2020 Estimate
	Obligations by program activity:			
0801	Accounting Services	42	48	50
0804	Information Services	125	227	155
0806	Multi Media	4	3	3
0807	FLLI (formerly CMEL/Training)	9	8	8
0808	International Training	4	4	3
0810	Logistics	280	227	249
0811	Aircraft Maintenance	61	64	53
0812	Acquisition	4	4	4
0900	Total new obligations, unexpired accounts	529	585	525
	Budgetary Resources:			
	Unobligated balance:			
1000	Unobligated balance brought forward, Oct 1	261	221	244
1021	Recoveries of prior year unpaid obligations	35	36	36
1050	Unobligated balance (total)	296	257	280
	Budget authority:			
	Spending authority from offsetting collections, discretionary:			
1700	Collected	454	572	509
1930	Total budgetary resources available	750	829	789
	Memorandum (non-add) entries:			
1941	Unexpired unobligated balance, end of year	221	244	264
	Change in obligated balances:			
	Unpaid obligations:			
3000	Unpaid obligations, brought forward, Oct 1	196	191	185
3010	New obligations, unexpired accounts	529	585	525
3020	Outlays (gross)	-499	-555	-525
3040	Recoveries of prior year unpaid obligations unexpired	-35	-36	-36
3050	Unpaid obligations, end of year	191	185	149
	Memorandum (non-add) entries:			
3100	Obligated balance, start of year	196	191	185
3200	Obligated balance, end of year	191	185	149
	Budget authority and Outlays, net:			
	Discretionary:			
4000	Budget authority, gross	454	572	509
	Outlays gross:			
4010	Outlays from new discretionary authority	371	389	346
4011	Outlays from discretionary balances	128	166	179
4020	Outlays, gross (total)	499	555	525
	Offsets against gross budget authority and outlays:			
	Offsetting collections (collected) from:			
4030	Federal sources	-452	-570	-507
4033	Non-Federal sources	-2	-2	-2
4040	Offsets against gross budget authority and outlays (total)	-454	-572	-509
4080	Outlays, net (discretionary)	45	-17	16
4180	Budget authority, net (total)	....	....	....
4190	Outlays, net (total)	45	-17	16

In 1997, the Federal Aviation Administration (FAA) established a franchise fund to finance operations where the costs for goods and services provided are charged to the users on a fee-for-service 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, travel, duplicating services, multi-media services, information technology, materiel management (logistics), and aircraft maintenance.

Object Classification
(in millions of dollars)

Identification code: 69-4562-0-4-402		FY 2018 Actual	FY 2019 Estimate	FY 2020 Estimate
	Reimbursable obligations:			
11.1	Personnel compensation: Full-time permanent	131	143	135
12.1	Civilian personnel benefits	47	51	47
21.0	Travel and transportation of persons	6	6	6
22.0	Transportation of things	11	6	6
23.3	Communications, utilities, and miscellaneous charges	11	13	12
25.2	Other services from non-Federal sources	219	259	231
26.0	Supplies and materials	97	98	79
31.0	Equipment	7	7	7
42.0	Insurance claims and indemnities	....	2	2
99.9	Total new obligations, unexpired accounts	529	585	525

Employment Summary

Identification code: 69-4562-0-4-402		FY 2018 Actual	FY 2019 Estimate	FY 2020 Estimate
2001	Reimbursable civilian full-time equivalent employment	1,550	1,594	1,607

ADMINISTRATIVE SERVICES FRANCHISE FUND

EXHIBIT III-1

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

	FY 2018 ACTUAL	FY 2019 ENACTED	FY 2020 REQUEST	CHANGE FY 2019-2020
Accounting Services	41,038	41,702	42,000	298
Information Services	119,252	134,475	135,000	525
Multi Media	3,471	3,051	3,100	49
FAA Leadership & Learning Institute	9,277	10,393	10,000	-393
International Training	3,537	2,540	2,500	-40
Logistics	263,401	254,837	255,000	-163
Aircraft Maintenance	55,877	62,128	55,000	-7,128
Acquisition	4,199	4,054	4,000	-54
TOTAL	$500,052	$513,180	$506,600	-$6,580
FTEs				
Direct Funded	0	0	0	0
Reimbursable, allocated, other	1,550	1,594	1,607	13

Detailed Justification for the Administrative Services Franchise Fund

FY 2020 – Administrative Services Franchise Fund – Budget Request
($000)

Program Activity	FY 2018 Actual	FY 2019 Enacted	FY 2020 Request
Salaries and Expenses	177,540	180,772	175,846
Program Costs	322,512	332,408	330,754
Total	**$500,052**	**$513,180**	**$506,600**
FTE	**1,550**	**1,594**	**1,607**

What is this program and what does this funding level support?

The Department of Transportation and Related Agencies Appropriation Act of 1997 authorized the FAA to establish an Administrative Services Franchise Fund (Franchise Fund). Franchise law requires the Franchise Fund to be fully self-supporting. As such, the FAA Franchise Fund does not receive direct appropriated funds.

Service offerings and pricing are driven by customer requirements. The cost of providing goods and services are funded through customer reimbursable agreements. As a result, future budget estimates are heavily dependent on the active communication and accuracy of customers' future requirements.

Through the Franchise Fund, the FAA is able to competitively provide a wide variety of support services to various government entities. This results in the consolidation and shared use of like functions and promotes economies of scale. All of these measures help the government use its resources more efficiently.

The FAA's Franchise Fund is comprised of six programs through which it offers diverse services:

<u>FAA Enterprise Services Center (ESC)</u>

ESC provides administrative services to ESC customers which include all DOT administrations and bureaus, as well as a number of agencies external to DOT. There are three components of the ESC:

- Enterprise System—configuration and support of application software and databases
- Financial Operations—transaction processing, financial reporting, and analysis services
- Information Technology—hosting, telecommunications, information system security, and end-user support services.

ESC provides services to over 41 Federal agencies including the 13 Department of Transportation agencies and 28 customers external to the Department. ESC supports over 11,000 Delphi/Prism users and 20,400 wireless devices.

In FY 2005, the Office of Management and Budget (OMB) selected ESC as a Financial Management Center of Excellence (COE). As a COE, the ESC has the ability to compete to provide financial management services for other government agencies.

In January 2009, OMB named the ESC one of only four government-wide information systems security shared-service providers. In May 2014, OMB designated the ESC one of four government-wide financial management shared service providers to provide core accounting and other services to federal agencies. Using a financial management shared service provider helps customer agencies reduce the risks inherent in new system implementation, allows for faster and less expensive technological innovation, and provides long-term cost savings. A shared service provider allows customer agencies to focus resources directly on mission-related efforts.

FAA Logistics Center

The FAA Logistics Center provides comprehensive logistics support and a highly sophisticated level of maintenance and repair services to ensure the safety of the flying public, to satisfy the critical needs of the nation's airspace system, and to meet related requirements. Services include materiel management (e.g., provisioning, cataloging, acquisition, inventory management, inventory supply), reliable and cost-effective depot-level repair of line replaceable units, life cycle and performance cost analysis, logistics automation, distribution services, disposal of items no longer required, and technical support to repair and maintain the nation's airspace and related equipment.

The Logistics Center also maintains the Department of Homeland Security's (DHS) U.S. Customs and Border Protection border surveillance systems, including more than 80 mobile surveillance systems and fixed towers. It provides supply chain support, depot maintenance support, engineering, and other systems support to the DHS. The FAA Logistics Center also offers services to the Department of Defense and the United States Forestry Service. In FY 2019, the FAA Logistics center estimates the delivery of 756,349 parts and 337,702 service hours.

In FY 2020, the Logistics Center operations will realign from the Office of Finance and Management (AFN) to the Air Traffic Organization (ATO) to centralize decision making authority, ownership, and supply chain elements within one organization. Aligning the Logistics Center within the ATO provides operational and organizational line of sight, clear ownership and accountability for the supply chain and logistics enterprise, and enhanced transparency and organizational focus.

Flight Program Operations

Flight Program Operations provides total aircraft support, including maintenance, quality assurance, and overall program management, for the FAA's uniquely equipped flight inspection aircraft fleet, as well as other customer aircraft, including the U.S. Marshals Service. Preventative services, aircraft repair, overhaul, and modification services are provided, in addition to reliability and maintainability studies. Flight Program Operations has the flexibility to provide either full or partial support, depending upon customer requirements, ranging from short-term preventative maintenance or one-time engineering tasks to more involved activities, such as a full complement of maintenance services, complete with quality assurance and engineering support. Flight Program Operations consistently executes to maintain over a 93% aircraft dispatch reliability.

FAA Leadership and Learning Institute

The FAA Leadership and Learning Institute (FLLI) provides non-technical training in support of the FAA mission. This institute designs and delivers face-to-face centralized training onsite, at field locations, and also offers web based training. The federal, professional, and local communities also recognize the FLLI as a premier resource for leadership and teambuilding training. In FY 2019, FLLI estimates the delivery of 160 instructor led courses, 13,000 web based courses and 3,200 student throughput.

International Training

The International Training Division (ITD) delivers technical assistance and training to enhance international aviation safety and security while promoting U.S. aviation system technologies, products, and services overseas. The products and services of the ITD include training program management, instructional services, training design, development, and revision, technical training evaluations, and consulting services tailored to meet the specifically defined needs of the FAA and its international customers. In FY 2019, International Training estimates the delivery of training at 66 foreign countries.

Acquisition Services

The Franchise Fund also houses a branch of acquisition services that supports the acquisition activities of the Franchise Fund service providers. Acquisition anticipates supporting $380 million of activity in FY 2019.

What benefits will be provided to the American public through this request and why is this program necessary?

The FAA Franchise Fund does not receive direct appropriated funds. All costs are funded through customer reimbursable agreements.

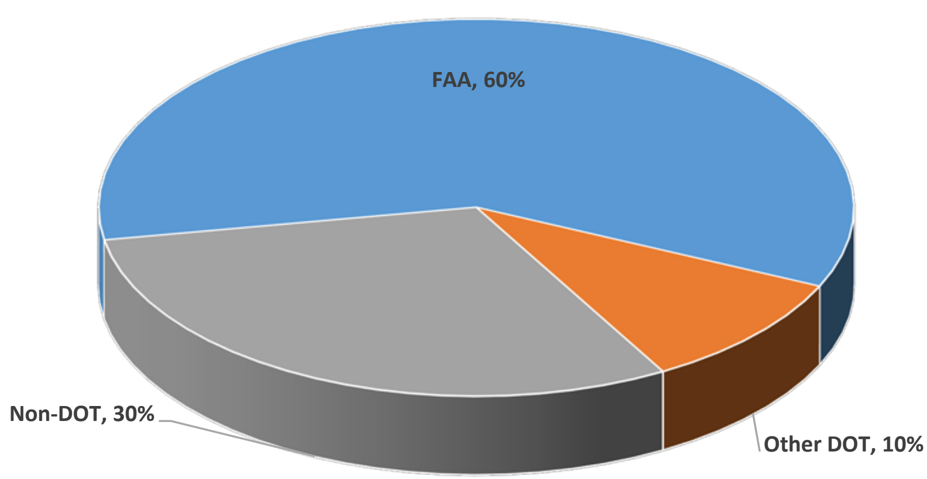
Using the shared service model, the Franchise Fund offers customers lower costs, greater efficiency, and opportunities for improved productivity. These benefits are gained through economies of scale, efficient business operations, and process knowledge gained through focused operations. The cost and time savings realized by the customers provide them the opportunity to direct more resources toward direct mission operations.

The FAA Franchise Fund uses a mix of federal and contractor labor resources. Through this mix of resources, service providers can nimbly adapt to upturns and downturns in customer demand in a cost effective manner, while retaining crucial corporate knowledge to provide quality service.

Each customer shares in labor and system fixed costs. The spreading of these costs across all customers puts downward pressure on all customer costs. This enhances the FAA mission by allowing FAA to direct more funds to FAA core activities and goals. This same benefit is realized by all customers.

Per Franchise Law, the Franchise Fund is also allowed to retain limited amounts of revenue (deemed no-year funds) for the replacement or upgrade of assets. Service Providers determine the multi-year planned asset requirements, and each customer contributes proportionately to the accumulation of funds needed for the purchase or upgrade of assets. The spreading of these capital reserve needs among customers decreases the amount of funding required individually from customers. In addition, funding assets through incremental funding also encourages the levelling of customers' annual budget requirements.

FY19 Franchise Estimated Customer Base



Payment to Grants-in-Aid for Airports

Program and Financing
(in millions of dollars)

Identification code: 069-2813-0-1-402		FY 2018 Actual	FY 2019 Estimate	FY 2020 Request
	Obligations by program activity:			
0001	Direct Program Activity	1,000	1,000	....
0900	Total new obligations, unexpired accounts (object class 94.0)	1,000	1,000	....
	Budgetary resources:			
	Budget Authority:			
	Appropriations, discretionary:			
1100	Appropriation	1,000	1,000	....
1930	Total budgetary resources available	1,000	1,000	....
	Change in obligated balance:			
	Unpaid obligations:			
3010	New Obligations, unexpired accounts	1,000	1,000	....
3020	Outlays (gross)	-1,000	-1,000	....
	Budget authority and outlays, net:			
	Discretionary:			
4000	Budget authority, gross	1,000	1,000	....
	Outlay, gross:			
4010	Outlays from new discretionary authority	1,000	1,000	....
4180	Budget authority, net (total)	1,000	1,000	....
4190	Outlays, net (total)	1,000	1,000	....

The Consolidated Appropriations Act of 2018 provided $1.0 billion of supplemental funding for Grants-in-Aid for Airports. Funds are appropriated from the General Fund of the U.S. Treasury and are available for obligation through September 30, 2020. Discretionary grants are being awarded to qualified airports, with priority consideration given to projects that meet the criteria for small and rural airports as defined in the appropriations act.

AVIATION USER FEES

Special and Trust Fund Receipts
(in millions of dollars)

Identification code: 69-5422-0-2-402		FY 2018 Actual	FY 2019 Estimate	FY 2020 Estimate
0100	Balance, start of year	12	12	12
	Receipts:			
	Current Law:			
1110	Aviation User Fees, Overflight Fees	134	145	151
1130	Property Disposal or Lease Proceeds, Aviation User Fee	7	.....	.....
1130	Settlements and Miscellaneous Receipts, Aviation User Fee	3	.....	.....
1199	Total Current Law Receipts	144	145	151
1999	Total Receipts	144	145	151
2000	Total: Balances and Receipts	156	157	163
	Appropriations:			
	Current Law:			
2101	Aviation User Fees	-153	-155	-151
2132	Essential Air Service and Rural Airport Improvement Fund	9	10	.....
2199	Total current law appropriations	-144	-145	-151
2999	Total appropriations	-144	-145	-151
5099	Balance, end of year	12	12	12

Program and Financing
(in millions of dollars)

Identification code: 69-5422-0-2-402		FY 2018 Actual	FY 2019 Estimate	FY 2020 Estimate
	Obligations by program activity:			
0001	Other Collections	1	......	......
0100	Direct program activities, subtotal	1	......	......
0900	Total new obligations (object class 25.2)	1	......	......
	Budgetary resources:			
	Unobligated balance:			
1000	Unobligated balance brought forward, Oct 1	14	23	23
1201	Appropriations (special or trust fund)	153	155	151
1220	Appropriations Transferred to other accounts [069-5423]	-143	-155	-151
1260	Appropriations, mandatory (total)	10	......	......
1900	Budget authority (total)	10	.....	......
1930	Total budgetary resources available	24	23	23
	Memorandum (non-add) entries:			
1941	Unexpired unobligated balance, end of year	23	23	23
	Change in obligated balance:			
	Unpaid obligations:			
3000	Unpaid Obligations, brought forward, Oct 1	2	2	2
3010	New Obligations, unexpired accounts.	1	......	......
3020	Outlays (gross)	-1	......	......
3050	Unpaid Obligations, end of the year	2	2	2
	Memorandum (non-add) entries:			
3100	Obligated balance, start of the year	2	2	2
3200	Obligated balance, end of the year	2	2	2
	Budget authority and outlays, net:			
	Mandatory:			

4090	Budget authority, gross …………………………………………………..	10	……	……
	Outlays, gross:			
4101	Outlays from mandatory balances ……………………………………..	1	……	……
4180	Budget authority, net (total) ……………………………………………..	10	……	……
4190	Outlays, net (total) …………………………………………………………..	1	……	……

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 Federal Aviation Administration to aircraft that neither take off nor land in the United States, commonly known as overflight fees. The Budget estimates that $151 million in overflight fees will be collected in FY 2020.

AVIATION INSURANCE REVOLVING FUND

Program and Financing
(in millions of dollars)

Identification code: 69-4120-0-3-402		FY 2018 Actual	FY 2019 Estimate	FY 2020 Request
	Obligations by program activity:			
0801	Program administration	1	1	1
0900	Total new obligations, unexpired accounts	1	1	1
	Budget resources:			
	Unobligated balance:			
1000	Unobligated balance brought forward, Oct. 1	2,203	2,231	2,299
	Budget authority:			
	Spending authority form offsetting collections, mandatory:			
1800	Collected	29	69	78
1930	Total budgetary resources available	2,232	2,300	2,377
	Memorandum (non-add) entries:			
1941	Unexpired unobligated balance, end of year	2,231	2,299	2,376
	Change in obligated balance:			
	Unpaid obligations:			
3000	Unpaid obligations, brought forward, Oct. 1	2	2	2
3010	New Obligations, unexpired accounts	1	1	1
3020	Outlays (gross)	-1	-1	-1
3050	Unpaid obligations, end of year	2	2	2
	Memorandum (non-add) entries:			
3100	Obligated balance, start of year	2	2	2
3200	Obligated balance, end of year	2	2	2
	Budget authority and outlays net:			
	Mandatory:			
4090	Budget authority, gross	29	69	78
	Outlay, gross:			
4100	Outlays from new mandatory authority	1	1	1
	Offsets against gross budget authority and outlays:			
	Offsetting collections (collected) from:			
4121	Interest on Federal securities	-29	-69	-78
4180	Budget authority, net (total)	......	......	......
4190	Outlays, net (total)	-28	-68	-77
	Memorandum (non add) entries:			
5000	Total investments, SOY: Federal securities: Par value	2,210	2,250	2,267
5001	Total investments, EOY: Federal securities: Par value	2,250	2,267	2,421

The fund provides direct support for the aviation insurance program (chapter 443 of title 49, U.S. Code). In December 2014, Congress sunset part of the aviation insurance program. Specifically, Congress returned U.S. air carriers to the commercial aviation market for all of their war risk insurance coverage by ending the FAA's authority to provide war risk insurance for a premium. Pursuant to 49 USC 44305, the FAA may provide aviation insurance not available commercially, without premium, at the request of the Secretary of Defense or the head of a department, agency, or instrumentality designated by the President when the Secretary of Defense or the designated agency head agrees to indemnify the Secretary of Transportation against all losses covered by the insurance. The "non-premium" aviation insurance program is authorized through December 31, 2019.

Employment Summary

Identification code: 69-4120-0-3-402		FY 2018 Actual	FY 2019 Estimate	FY 2020 Request
2001	Reimbursable Civilian full-time equivalent employment ..	3	4	4

AIRPORT AND AIRWAY TRUST FUND

Program and Financing
(in millions of dollars)

Identification code: 69-8103-0-7-402		FY 2018 Actual	FY 2019 Estimate	FY 2020 Estimate
	Memorandum (non add) entries:			
5000	Total investments, start of year: Federal securities: Par value	13,404	14,212	14,715
5001	Total investments, end of year: Federal securities: Par value	14,212	14,715	15,274

Section 9502 of Title 26, U.S. Code, provides for amounts equivalent to the funds received in the U.S. 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, Federal Aviation Administration facilities and equipment, research, operations, payment to air carriers, and for the Bureau of Transportation Statistics Office of Airline Information.

Status of Funds (in millions of dollars)

Identification code: 69-8103-0-7-402		FY 2018 Actual	FY 2019 Estimate	FY 2020 Estimate
	Unexpended balance, start of year:			
0100	Balance, start of year	15,088	16,982	17,731
0999	Total balance, start of year	15,088	16,982	17,731
	Cash Income during the year:			
	Current law:			
	Receipts			
1110	Excise Taxes, Airport and Airway Trust Fund	15,793	16,309	17,176
1130	Grants-in-aid for Airports (Airport and Airway Trust Fund)....	1	1	1
1130	Facilities and Equipment (Airport and Airway and Airport Trust Fund)	81	52	52
1150	Interest, Airport and Airway Trust Fund	0	0	0
1150	Interest, Airport and Airway Trust Fund	288	382	471
1160	General Fund Payment, Grant-in-Aid for Airports	1,000	1,000	.....
1160	Grant-in-Aid for Airports (Airport and Airway Trust Fund)......	1	.....	......
1160	Facilities and Equipment (Airport and Airway Trust Fund)......	39	52	52
1160	Research, Engineering and Development (Airport and Airway Trust Fund)	9	11	11
1199	Income under present law	17,212	17,807	17,763
1999	Total cash income	17,212	17,807	17,763
	Cash outgo during year:			
	Current law:			
2100	Payments to Air Carriers (021-04-8304-0)	-154	-150	-137
2100	Trust Fund Share of FAA Activities (Airport and Airway Trust Fund) (021-12-8104-0)........	-9,129	-8,886	-9,364
2100	Grants-in-aid for Airports (Airport and Airway Trust Fund) (021-12-8106-0)	-3,190	-4,146	-4,296
2100	Facilities and Equipment (Airport and Airway Trust Fund) (021-12-8107-0)	-2,683	-3,652	-3,626

2100	Research, Engineering and Development (Airport and Airway Trust Fund) (021-12-8108-0)	-160	-224	-196
2199	Outgo under current law (-)	-15,316	-17,058	-17,619
2999	Total Cash outgo (-)	-15,316	-17,058	-17,619
	Surplus Deficit:			
3110	Excluding interest	1,608	367	-327
3120	Interest	288	382	471
3199	Subtotal, surplus or deficit	1,896	749	144
	Manual Adjustments:			
3298	Reconciliation adjustment	-2	.....	.....
3299	Total adjustments	-2	.....	.....
3999	Total change in balance	1,894	749	144
	Unexpended balance, end of year:			
4100	Uninvested balance (net), end of year	2,770	3,016	2,601
4200	Airport and Airway Trust Fund	14,212	14,715	15,274
4999	Total balance, end of year	16,982	17,731	17,875

TRUST FUND SHARE OF FAA ACTIVITIES
(AIRPORT AND AIRWAY TRUST FUND)

Program and Financing
(in millions of dollars)

Identification code: 69-8104-0-7-402		FY 2018 Actual	FY 2019 Estimate	FY 2020 Estimate
	Obligations by program activity:			
0001	Payment to Operations	8,886	8,851	9,364
0900	Total new obligations (object class 94.0)	8,886	8,851	9,364
	Budgetary resources:			
	Appropriations, discretionary:			
	Budge authority:			
1101	Appropriations (special or trust fund)	8,886	8,851	9,364
1930	Total budgetary resources available	8,886	8,851	9,364
	Change in obligated balance:			
	Unpaid obligations:			
3000	Unpaid obligations, brought forward, Oct 1	278	35	....
3010	New obligations, unexpired accounts	8,886	8,851	9,364
3020	Outlays (gross)	-9,129	-8,886	-9,364
3050	Unpaid obligations, end of year	35	....	....
	Memorandum (non-add) entries:			
3100	Obligated balance, start of year	278	35	....
3200	Obligated balance, end of year	35	....	....
	Budget authority and outlays, net:			
	Discretionary:			
4000	Budget authority, gross	8,886	8,851	9,364
	Outlays, gross:			
4010	Outlays from new discretionary authority	8,851	8,851	9,364
4011	Outlays from discretionary balances	278	35	....
4020	Outlays, gross (total)	9,129	8,886	9,364
4180	Budget authority, net (total)	8,886	8,851	9,364
4190	Outlays, net (total)	9,129	8,886	9,364

The 2020 Budget proposes $10.340 billion for Federal Aviation Administration Operations, of which $9.364 billion would be provided from the Airport and Airway Trust Fund.

FAA Administrative Provisions - Requested

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 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 funding from the Facilities & Equipment (F&E) account. This provision ensures that the F&E account is reimbursed from the over-flight fees collected and is needed in order to continue the practice in FY 2020.

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 in this Act shall be available for paying premium pay under subsection 5546(a) of title 5, United States Code, to any Federal Aviation Administration employee unless such employee actually performed work during the time corresponding to such premium pay.

- 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 retaining this provision as a GP that would apply to all FAA accounts. FAA also recommends keeping this provision for FY 2020 in order to minimize potential payroll liability.

Sec. 113. 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. FAA recommends retaining this provision as a GP that would apply to all FAA accounts.

Sec. 114. None of the funds in this Act may be obligated or expended for retention bonuses for an employee of the Federal Aviation Administration without the prior written approval of the Assistant Secretary for Administration of the Department of Transportation.

- The FY 2020 budget proposes to retain the provision that all FAA retention bonuses continue to be approved by the Assistant Secretary for Administration.

SEC. 115. Notwithstanding any other transfer restriction under this Act, not to exceed 10 percent of any appropriation made available for the current fiscal year for the Federal Aviation Administration by this Act or provided by previous appropriations Acts may be transferred between such appropriations for the Federal Aviation Administration, but no such appropriation except as otherwise specifically provided, shall be increased by more than 10 percent by any such transfer: Provided, That funds transferred under this section shall be treated as a reprogramming of funds under section 404 of this Act and shall not be available for obligation unless the Committees on Appropriations of the Senate and the House of Representatives are notified 15 days in advance of such transfer: Provided further, That any transfer from an amount made available for obligation as discretionary grants-in-aid for airports pursuant to section 47117(f) of title 49, United States Code shall be deemed as obligated for grants-in-aid for airports under part B of subtitle VII of title 49, United States Code for the purposes of complying with the limitation on incurring obligations in this appropriations Act or any other appropriations Act under the heading "Grants-in-Aid for Airports."

- The FY 2020 budget requests additional budget flexibility. While the FAA has long benefited from the ability to seek congressional approval to reprogram limited amounts within budget accounts contained in Section 404(a), there has traditionally been no flexibility at the account level. This new authority in Section 404(b) will allow the FAA to request the transfer of up to 10 percent of any appropriation across accounts, provided that no account is increased by more than 10 percent. Such a transfer would be subject to approval by both congressional Committees on Appropriations.

FEDERAL AVIATION ADMINISTRATION

OPERATIONS

ESTIMATES		APPROPRIATIONS	
2010	[1]9,335,798,000	2010	[2,3]9,351,400,000
2011	[4]9,793,000,000	2011	[5]9,516,172,000
2012	[6]9,823,000,000	2012	[7]9,653,395,000
2013	[8]9,517,948,000	2013	[9]9,653,395,000
		2013 Sequester (P.L.112-240)	[10]-485,623,489
		2013 Rescission (P.L. 113-6)	[11]-19,307,790
2014	[12]9,707,000,000	2014	[13]9,651,422,000
2015	[14]9,750,000,000	2015	[15]9,740,700,000
2016	[16]9,915,000,000	2016	[17]9,909,724,000
2017	[18]9,994,352,000	2017	[19]10,025,852,000
2018	[20]9,890,886,000	2018	[21]10,211,754,000
		2018 Supplemental (P.L. 115-123)	[22]35,000,000
2019	[23]9,931,312,000	2019	[24]10,410,758,000
2020	[25]10,340,000,000		

[1] Includes $6,207,798,000 from the Airport and Airway Trust Fund.
[2] Includes $4,000,000,000 from the Airport and Airway Trust Fund.
[3] Includes $1,300,000 transfer from the U.S. Department of State.
[4] Includes $6,064,000,000 from the Airport and Airway Trust Fund
[5] Reflects a rescission of $19,066,000 per P.L. 112-55. Includes $4,549,882,000 from Airport and Airway Trust Fund. Also includes $2.3 million transfer from the U.S. Department of State
[6] Includes $4,958,000,000 from the Airport and Airway Trust Fund
[7] Includes $5,060,694,000 from the Airport and Airway Trust Fund
[8] Includes $6,721,000,000 from the Airport and Airway Trust Fund
[9] Reflects funding at the FY 2012 funding level pursuant to P.L. 113-6, Consolidated and Further Continuing Appropriations Act, 2013.
[10] FY 2013 funds sequestered pursuant to the Budget Control Act of 2011 as Amended by The American Taxpayer Relief Act of 2012 (P.L. 112-240).
[11] Reflects a 0.20 percent across-the-board rescission per P.L. 113-6.
[12] Includes $6,484,000,000 from the Airport and Airway Trust Fund
[13] Includes $6,495,208,000 from the Airport and Airway Trust Fund.
[14] Includes $9,040,850,000 from the Airport and Airway Trust Fund.
[15] Includes $8,595,000,000 from the Airport and Airway Trust Fund.
[16] Includes $8,547,000,000 from the Airport and Airway Trust Fund.
[17] Includes $7,922,000,000 from the Airport and Airway Trust Fund.
[18] Includes $7,608,000,000 from the Airport and Airway Trust Fund.
[19] Includes $9,173,000,000 from the Airport and Airway Trust Fund.
[20] Includes $8,100,000,000 from the Airport and Airway Trust Fund
[21] Includes $8,886,000,000 from the Airport and Airway Trust Fund
[22] Supplemental funding from the Further Additional Supplemental Appropriations for Disaster Relief Requirements Act, 2018 (P.L. 115-123)
[23] Includes $8,632,721,000 from the Airport and Airway Trust Fund
[24] Includes $9,833,400,000 from the Airport and Airway Trust Fund
[25] Includes $9,364,085,000 from the Airport and Airway Trust Fund.

FEDERAL AVIATION ADMINISTRATION

FACILITIES AND EQUIPMENT (AIRPORT AND AIRWAY TRUST FUND)

ESTIMATES		APPROPRIATIONS	
2010	2,925,202,000	2010	[1]2,928,315,000
2011	2,970,000,000	2011	[2]2,730,731,000
2012	[3]3,120,000,000	2012	2,730,731,074
2013	2,850,000,000	2013	[4]2,730,731,074
		2013 Supplemental (P.L. 113-2)	[5]30,000,000
		2013 Sequester (P.L.11-240)	[6]-141,642,505
		2013 Rescission (P.L. 113-6)	[7]-5,461,462
2014	2,777,798,000	2014	2,600,000,000
2015	2,603,700,000	2015	2,600,000,000
2016	2,855,000,000	2016	2,855,000,000
2017	2,838,000,000	2017	2,855,000,000
2018	2,766,200,000	2018	3,250,000,000
		2018 Supplemental (P.L. 115-123)	[8]79,600,000
2019	2,766,572,000	2019	3,000,000,000
2020	3,295,000,000		

[1] Reflects $7,888,294 rescission of prior year authority per P.L. 111-226.
[2] Reflects a rescission of $5,472,000 per P.L. 112-55.
[3] Includes $250,000,000 of mandatory General Fund from the Administration's Infrastructure proposal.
[4] Reflects funding at the FY 2012 funding level pursuant to P.L. 113-6, Consolidated and Further Continuing Appropriations Act, 2013.
[5] Hurricane Sandy Emergency Supplemental, P.L. 113-2
[6] FY 2013 funds sequestered pursuant to the Budget Control Act of 2011 as Amended by The American Taxpayer Relief Act of 2012 (P.L. 112-240). Includes $2,770,000 in offsetting collections.
[7] Reflects a 0.20 percent across-the-board rescission per P.L. 113-6.
[8] Supplemental funding from the Further Additional Supplemental Appropriations for Disaster Relief Requirements Act, 2018 (P.L. 115-123)

FEDERAL AVIATION ADMINISTRATION

RESEARCH, ENGINEERING, AND DEVELOPMENT (AIRPORT AND AIRWAY TRUST FUND)

ESTIMATES		APPROPRIATIONS	
2010	180,000,000	2010	190,500,000
2011	190,000,000	2011	[1]169,660,000
2012	190,000,000	2012	167,556,000
2013	180,000,000	2013	[2]167,556,000
		2013 Sequester (P.L.112-240)	[3]-8,429,072
		2013 Rescission (P.L. 113-6)	[4] -335,112
2014	166,000,000	2014	158,792,000
		2014 Rescission	[5]-26,183,998
2015	156,750,000	2015	156,750,000
2016	166,000,000	2016	166,000,000
2017	167,500,000	2017	176,500,000
2018	150,000,000	2018	188,926,000
2019	74,406,000	2019	191,000,000
2020	120,000,000		

[1] Reflects a $340,000 rescission per P.L. 112-55.
[2] Reflects funding at the FY 2012 funding level pursuant to P.L. 113-6, Consolidated and Further Continuing Appropriations Act, 2013.
[3] FY 2013 funds sequestered pursuant to the Budget Control Act of 2011 as Amended by The American Taxpayer Relief Act of 2012 (P.L. 112-240).
[4] Reflects a 0.20 percent across-the-board rescission per P.L. 113-6.
[5] Reflects a $26,183,998 rescission, per P.L. 113-76.

FEDERAL AVIATION ADMINISTRATION

GRANTS-IN-AID FOR AIRPORTS
(LIQUIDATION OF CONTRACT AUTHORIZATION)
(AIRPORT AND AIRWAY TRUST FUND)

ESTIMATES

2010	3,000,000,000
2011	3,550,000,000
2012	3,600,000,000
2013	3,400,000,000
2014	3,200,000,000
2015	3,200,000,000
2016	3,500,000,000
2017	3,500,000,000
2018	3,000,000,000
2019	3,000,000,000
2020	3,000,000,000

APPROPRIATIONS

2010	3,000,000,000
2011	3,550,000,000
2012	3,435,000,000
2013	3,435,000,000
2014	3,200,000,000
2015	3,200,000,000
2016	3,600,000,000
2017	3,750,000,000
2018	3,350,000,000
2018 Supplemental	[1] 1,000,000,000
2019	3,350,000,000
2019 Supplemental	[2] 500,000,000

[1] FY 2018 Consolidated Appropriations Act (P.L. 115-141) supplemental AIP grant funding from the General Fund.
[2] FY 2019 Consolidated Appropriations Act (P.L. 116-6) supplemental AIP grant funding from the General Fund.

FEDERAL AVIATION ADMINISTRATION

GRANTS-IN-AID FOR AIRPORTS
LIMITATION ON OBLIGATIONS
(AIRPORT AND AIRWAY TRUST FUND)

ESTIMATES		APPROPRIATIONS	
2010	(3,515,000,000)	2010	(3,515,000,000)
2011	(3,515,000,000)	2011	(3,515,000,000)
2012	(2,424,000,000)	2012	(3,350,000,000)
2013	(2,424,000,000)	2013	[1](3,343,300,000)
2014	(2,900,000,000)	2014	(3,350,000,000)
2015	(2,900,000,000)	2015	(3,350,000,000)
2016	(2,900,000,000)	2016	(3,350,000,000)
2017	(2,900,000,000)	2017	(3,350,000,000)
2018	(3,350,000,000)	2018	(3,350,000,000)
2019	(3,350,000,000)	2019	(3,350,000,000)
2020	(3,350,000,000)		

1 Reflects funding at the FY 2012 funding level pursuant to P.L. 113-6, Consolidated and Further Continuing Appropriations Act, 2013, minus the 0.20% across-the-board rescission.

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EXHIBIT IV-1
RESEARCH, DEVELOPMENT & TECHNOLOGY
DEPARTMENT OF TRANSPORTATION
BUDGET AUTHORITY
(in Thousands of dollars)

Account	Program	Line Item	Classification (R,D, F, or A)	FY 2018 Enacted	FY 2019 Annualized	FY 2019 Enacted	FY 2020 Request	Annual Modal Research Plan
Research, Engineering and Development				**188,926**	**188,926**	**191,100**	**120,000**	
	A11	**Improve Aviation Safety**		**117,960**	**117,960**	**117,708**	**86,821**	
	a.	Fire Research and Safety	R	7,200	7,200	7,200	7,562	X
	b.	Propulsion and Fuel Systems	R	2,100	2,100	2,100	3,708	X
	c.	Advanced Materials/Structural Safety	R	10,500	10,500	14,720	1,799	X
	d.	Aircraft Icing/Digital System Safety	R	9,253	9,253	9,253	7,450	X
	e.	Continued Airworthiness	R	11,269	11,269	11,269	10,006	X
		Aircraft Catastrophic Failure Prevention Research	R	1,570	1,570	1,570	0	
	f.	Flightdeck/Maintenance/System Integration Human Factors	R	7,305	7,305	7,305	5,973	X
	g.	System Safety Management	R	5,500	5,500	5,500	4,309	X
	h.	Air Traffic Control/Technical Operations Human Factors	R	5,800	5,800	5,800	5,474	X
	I.	Aeromedical Research	R	9,080	9,080	9,080	9,575	X
	j.	Weather Program	R	15,476	15,476	15,476	6,391	X
	k.	Unmanned Aircraft Systems Research	R	24,035	24,035	24,035	7,546	X
		NextGen - Alternative Fuels for General Aviation	R	7,000	7,000	1,900	0	
	l.	Commercial Space Transportation Safety	R	1,872	1,872	2,500	5,971	X
	m.	NextGen - Wake Turbulence	R				3,697	X
	n.	NextGen - Air Ground Integration Human Factors	R				1,717	X
	o.	NextGen - Weather Technology in the Cockpit	R				1,963	X
	p.	Information Technology/Cyber Security	R				2,675	
	q.	NextGen - Flight Data Exchange	R				1,005	X
	A12	**Improve Efficiency**		**18,232**	**18,232**	**19,499**		
		NextGen - Wake Turbulence		6,831	6,831	6,831		
		NextGen - Air Ground Integration Human Factors		6,757	6,757	6,757		
		NextGen - Weather Technology in the Cockpit		3,644	3,644	3,644		
		NextGen - Flight Data Exchange		0	0	1,035		
		Information/Cyber Security		1,000	1,000	1,232		
	A13	**Reduce Environmental Impact**		**47,187**	**47,187**	**47,187**	**27,603**	
	a.	Environment and Energy	R	18,013	18,013	18,013	15,103	X
	b.	NextGen - Environmental Research - Aircraft Technologies, Fuels, and Metrics	R	29,174	29,174	29,174	12,500	X
	A14	**Mission Support**		**5,547**	**5,547**	**6,706**	**5,576**	
	a.	System Planning and Resource Management	R	2,135	2,135	2,135	2,717	X
	b.	William J. Hughes Technical Center Laboratory Facility	R	3,412	3,412	4,571	2,859	X
Facilities & Equipment				**222,600**	**267,300**	**251,300**	**334,800**	
	a.	Advanced Technology Development and Prototype	D	26,800	33,000	33,000	40,900	X
	b.	Plant	F	39,000	36,000	36,000	35,000	
	c.	Center for Advanced Aviation System Development (CAASD)	D	57,000	57,000	57,000	57,000	X
	d.	NextGen Research & Development	D	99,800	141,300	125,300	201,900	X
Grants-In-Aid for Airports				**48,210**	**48,210**	**48,210**	**48,224**	
	a.	Airport Technology Research	R	33,210	33,210	33,210	33,224	X
	b.	Airport Cooperative Research	R	15,000	15,000	15,000	15,000	X
Operations			A	**10,640**	**4,494**	**11,297**	**7,236**	
	Subtotal, Applied Research		R	**237,136**	**237,136**	**239,310**	**168,224**	
	Subtotal, Development Research		D	**183,600**	**231,300**	**215,300**	**299,800**	
	Subtotal, Research and Development Facilities		F	**39,000**	**36,000**	**36,000**	**35,000**	
	Subtotal, Administration		A	**10,640**	**4,494**	**11,297**	**7,236**	
	Total FAA			**470,376**	**508,930**	**501,907**	**510,260**	

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Section 5.
Information Technology

Federal Aviation Administration

Information Technology Budget Narrative

(Budget Authority in Thousands)

Budget Account	**FY 2018 Enacted**	**FY 2019 President's Budget**	**FY 2020 Request**
Operations	**$1,411,450**	**$1,526,930**	**$1,577,060**
Commodity IT SS WCF	*$9,061*	*$11,167*	*$11,755*
Programmatic IT SS WCF	*$0*	*$0*	*$0*
Programmatic IT	*$1,402,389*	*$1,515,763*	*$1,565,305*
Facilities & Equipment (F&E)	**$1,868,910**	**$1,469,260**	**$1,708,890**
Commodity IT SS WCF	*$0*	*$0*	*$0*
Programmatic IT SS WCF	*$0*	*$0*	*$0*
Programmatic IT	*$1,868,910*	*$1,469,260*	*$1,708,890*
Total	**$3,280,360**	**$2,996,190**	**$3,285,950**

The Federal Aviation Administration (FAA) is requesting **$3,286 million** in FY 2020 for information technologies that support the full spectrum of FAA safety programs as well as the Department's initiative to transform and consolidate the management of certain IT solutions centrally by the Office of the Chief Information Officer (OCIO).

The FAA IT portfolio includes 130 program investments requesting FY 2020 funding. The portfolio includes investments supporting the National Airspace System (NAS) modernization including NextGen and general IT services that support the agency mission areas. The majority of funding, **$2,532 million** is for program investments supporting NAS modernization. **$754 million** is for general IT (Non-NAS) investments. Funding is included in both budget accounts for contracts and government FTEs.

Commodity IT Shared Services through the WCF

OCIO will continue to provide FAA commodity IT shared services in FY 2020. FAA's share was based on actual commodity IT consumption in prior years as well as planned future consumption. OCIO, in collaboration with FAA, assumed a one-to-one cost estimate to transition all commodity IT to OCIO. FAA will only be charged for services rendered.

- **Commodity IT Shared Services** – FAA requests **$11.755 million** from the Operations account for its share of Department investments in Cybersecurity and commodity information technology including voice, cable, and networks, desktop services, server operations, directory and messaging services, enterprise licensing and enterprise dashboards.

Programmatic IT Investments

The following **Programmatic IT** investments will be maintained by FAA in FY 2020:

- **En Route Automation Modernization (ERAM)** – FAA requests **$266.140 million** for the critical replacement of equipment that is approaching the end-of-life and hardware being discontinued by the manufacturer. This will sustain the safety critical Air Traffic operations as well as lower system life cycle cost.

- **Automatic Dependent Surveillance-Broadcast (ADS-B)** – FAA requests **$197.880 million** for continued implementation and operation of this technology's baseline applications, which reduce delays and enhance safety. Funding will also support the sustainment and operational enhancement of ADS-B services.

- **Standard Terminal Automation Replacement System (STARS)** – FAA requests **$195.460 million** to replace key elements of STARS that have reached their end-of-life (EOL) and are no longer compatible with current commercial offerings. STARS is a fully digital system that 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.

- **FAA Telecommunications Infrastructure (FTI)** – FAA requests **$147.580 million** for the infrastructure sustainment and upgrade of the telecommunications services that are required by the FAA, which are essential to the operations of the National Airspace System (NAS) and the FAA.

- **Terminal Flight Data Manager (TFDM)** – FAA requests **$140.550 million** for the implementation and continued system development of the program's two software build approach (Build 1 and Build 2), which focuses on gaining efficient flow and management of aircraft on the surface at selected metroplex airports and the complex terminal airspaces within the NAS.

- **Information Technology System Support** – FAA requests **$2,326 million** for maintenance of nearly 300 Federal Information Security Management Act (FISMA) reportable systems, which include 72 mission critical (40 NAS and 32 Non-NAS) systems. Funding will also be used to migrate and modernize legacy systems to provide risk management, security, and common information management capabilities and services across the FAA; to include the airspace, navigation facilities and airports of the United States along with their associated information, services, rules, regulations, policies, procedures, personnel and equipment.

Next Generation Air Transportation System (NextGen)

For FY 2020, the FAA is requesting a total of $1.374 billion for the Next Generation Air Transportation System. The FY 2020 request will allow FAA to continue efforts towards full Trajectory Based Operations, while enhancing NAS infrastructure and addressing new entrants and technology into the NAS.

Introduction

NextGen is critical to ensuring that the National Airspace System (NAS) can safely accommodate anticipated growth and new types of aircraft as well as protect aviation's $1.5 trillion contribution to the U.S. economy. NextGen is not a single program, rather a transformative change in the management and operation of how we fly. NextGen encompasses many programs, systems, and procedures, at different levels of maturity, and supports investments to develop new capabilities and infrastructure. The FAA is working closely with the NextGen Advisory Committee (NAC), made up of industry stakeholders, to bring the NextGen vision to pass.

NextGen is in an exciting phase of its development in that many of the technologies and procedures are in place to begin fully realizing benefits. One of the primary goals of NextGen is the transformation of the air traffic management system to make flight operations more efficient and predictable, while maintaining operational flexibility. The concept to accomplish this goal is known as Trajectory Based Operations (TBO). TBO is an Air Traffic Management (ATM) method for strategically planning, managing, and optimizing flights throughout the operation by using time-based management, information exchange between air and ground systems, and the aircraft's ability to fly precise paths in time and space. TBO leverages the NextGen investments made in Performance-Based Navigation (PBN), surveillance, communications, and automation systems for decision support, flight data management, and information sharing.

TBO is being implemented in a continuum of evolutionary stages. The initial implementation is happening today, which includes the deployment of the basic capabilities and procedures deployed at a limited number of sites. During this phase, the FAA will ensure appropriate integration of capabilities and procedures while ensuring that all NAS stakeholders are informed and trained to accomplish the transformation. The next stage (Full TBO) includes additional capabilities and procedures providing the ability to automate the integration of time-based management data and tools in order to improve strategic planning and execution. This stage includes additional sites and geographical areas. The final stage (Dynamic TBO) includes the deployment of more capabilities and procedures that will make use of advanced aircraft and ground automation to enable flight-specific, time-based solutions for reroutes, aircraft sequencing and aircraft-based pairwise trajectory solutions. This stage includes the deployment of all planned sites and geographical areas.

The table below shows the Budget Line Items (BLIs) under each account that comprise the FAA's NextGen program. Detailed funding and program requirements for these line items can be found in the budget narrative, Section 3.

NextGen Program Summary
(Dollars in Millions)

	FY 2018 Actual	FY 2019 Annualized CR	FY 2019 Enacted*	FY 2020 Request
Facilities and Equipment	**$1,086.5**	**$998.6**	**$913.3**	**$1,220.2**
NextGen - Separation Management Portfolio	13.5	16.0	16.0	33.5
NextGen – Traffic Flow Management Portfolio	10.8	17.0	14.0	27.5
NextGen - On Demand NAS Portfolio	12.0	28.5	21.0	10.5
NextGen - NAS Infrastructure Portfolio	17.5	22.5	20.0	17.0
NextGen – Support (NIEC, Test Bed) Portfolio	12.0	12.8	12.8	13.0
NextGen - System Safety Management Portfolio	16.2	15.7	14.2	19.5
NextGen – Unmanned Aircraft System (UAS)	25.0	25.0	25.0	68.4
NextGen – Enterprise, Concept Development, Human Factors and Demonstration Portfolio	9.0	19.5	16.5	32.0
Performance Based Navigation and Metroplex Portfolio	20.0	20.0	20.0	5.0
Unmanned Aircraft Systems(UAS) Implementation	0	0	0	58.4
Implementation of Flight Object Exchange and Enterprise	0	0	0	35.0
NextGen - Communications in Support of NextGen	294.1	153.9	118.9	136.2
En Route Automation Modernization (ERAM) - System Enhancements	91.7	126.1	115.3	106.0
System - Wide Information Management (SWIM)	50.1	60.3	55.3	101.0
ADS - B NAS Wide Implementation	150.3	143.7	139.2	174.4
Collaborative Air Traffic Management (CATMT) Portfolio	9.0	17.7	17.7	0
Air Traffic Management Implementation Portfolio	0.0	0.0	0	77.1
Terminal Flight Data Manager (TFDM)	90.4	119.3	119.3	135.5
Tactical Time Based Flow Management (TBFM)	40.5	28.2	28.2	30.7
Next Generation Weather Processor (NWP)	45.5	33.7	28.7	31.3
NAS Voice System (NVS)	68.8	43.2	43.2	0
SBS Advanced Surveillance Enhanced Procedural Separation	24.4	25.0	17.5	32.3
Aeronautical Information Management Program (AIM)	15.0	5.0	5.0	5.3
Cross Agency NextGen Management	1.0	1.0	1.0	0
Activity 5 F&E PCBT - NextGen Staffing*	70.0	64.8	64.8	70.7
Research Engineering and Development (RE&D)	**$78.4**	**$78.4**	**$74.6**	**$31.1**
NextGen - Alternative Fuels for General Aviation	7.0	7.0	1.9	0
NextGen – Flight Deck Data Exchange Requirements	0	0	1.0	1.0
NextGen- Information Technology / Cyber Security Program	1.0	1.0	1.2	2.7
NextGen - Wake Turbulence	6.8	6.8	6.8	3.7
NextGen - Air Ground Integration	6.8	6.8	6.8	1.7
NextGen - Weather in the Cockpit	3.6	3.6	3.6	2.0
NextGen - Environmental Research, Aircraft Technologies and Fuels	29.2	29.2	29.2	12.5
Unmanned Aircraft Systems Research	24.0	24.0	24.0	7.5
Operations	**$103.3**	**$103.3**	**$112.5**	**$122.7**
NextGen Staffing	38.4	38.4	38.4	38.7
NextGen Unmanned Aircraft System	51.1	51.1	56.0	63.1
Performance Based Navigation (PBN) Activities	13.8	13.8	18.1	20.9
Total NextGen Programs (Totals may not add due to rounding)	**$1,268.2**	**$1,180.3**	**$1,100.4**	**$1,374.0**

*Enacted levels for FY 2019 are for informational purposes. The FY 2020 budget request was developed before a final appropriations act was enacted for FY 2019, and the request assumes a year-long continuing resolution for FY 2019.

NextGen Planned Accomplishments – Building on Investments

The FAA's modernization effort encompasses innovative and transformative technologies with programs segmented under the following groupings: Automation, Communication, Navigation, Surveillance, Integration and Information Management, and Weather. A high-level description of the technologies and planned accomplishments are listed below.

Automation

- Terminal Flight Data Manager (TFDM) - Streamlines the sequencing of aircraft on the airport surface and improves efficiency of departing aircraft. Tower air traffic controllers are the primary users of this system. The deployment of TFDM will begin in FY 2020. The FAA will receive and analyze technical transfer artifacts from NASA's Air Traffic Management Demonstration 2 (ATD-2), which will serve as a risk mitigation for the successful integration of information from TBFM, TFMS and TFDM.

- Time Based Flow Management (TBFM) - Improves efficiency and optimizes capacity by assisting air traffic controllers to sequence and space aircraft using time-based metering during arrival and departure operations. In FY 2020, the FAA will continue to implement the latest TBFM tool known as the Terminal Sequencing and Spacing (TSAS) decision support tool for use in airport terminal environments.

- En Route Automation Modernization (ERAM) – Functions as the primary automation system to manage and separate aircraft used by En Route air traffic controllers. In FY 2020 ERAM will undergo technology refresh activities in terms of hardware and software in order to maintain operations and accommodate additional tools for NextGen services.

- Traffic Flow Management System (TFMS) – Enables air traffic managers to make flight and flow decision in the NAS to improve efficiency of operations. In FY 2020, artifacts will be developed in support of Final Investment Decision for future capabilities.

Communications

- Data Communications (Data Comm) - Enables controllers and pilots to communicate using digitally delivered messages, rather than relying solely on radio voice communications. In FY 2020, the Data Comm Program will deploy Initial En Route Services, enabling many common air traffic controller messages to be sent to aircraft. This capability will decrease time of information delivery and response and minimize the possibility of message interpretation errors.

Navigation

- NextGen Distance Measuring Equipment (DME) – Provides a resilient navigation service to enable commercial aircraft to continue PBN operations during Global Navigation Satellite System (GNSS) disruptions. The program will add DMEs to the existing network to eliminate single points of failure and fill coverage gaps to enable aircraft without Inertial Reference Unit (IRU) to continue PBN operations. In FY 2020 the NextGen DME Program will procure several new DME systems and acquire real property in support of implementing additional sites.

Surveillance

- Automatic Dependent Surveillance-Broadcast (ADS-B) – Serves as the successor to radar. It uses Global Positioning Systems satellites for the determination of an aircraft's location, ground speed, and other data. ADS-B ground stations have been fully deployed in the NAS. By January 2020, aircraft operators are mandated to equip their aircraft with ADS-B. Applications for ADS-B In will be in development during this timeframe.

Integration and Information Management

- System Wide Information Management (SWIM) - Enables stakeholders to share information in real time to improve flight operations. Shared information includes flight data and other aeronautical information such as weather, special activity airspace restrictions, etc. Deployment of enhanced aeronautical and weather data over the SWIM network will continue through FY 2020.

- Aeronautical Information Management Modernization (AIMM) - Provides users with digital aeronautical information to NAS consumers involved in NAS decision support, flight planning, and pilot briefing. In 2020, post Final Investment Decision (FID) development activities will be underway for the deployment of additional flight information.

- Aviation Safety Information Analysis and Sharing (ASIAS) – Provides the ability to share and analyze data among flight operators and other NAS stakeholders to proactively discover safety concerns before accidents or incidents occur, leading to timely mitigation, prevention, and monitoring efforts. In FY 2020 ASIAS will add updated models to automate the generation of safety risks. Advanced visualization tools for safety analysis along with Text mining tools will be added to ASIAS. ASIAS will evaluate the safety impact of NextGen system changes.

Weather

- NextGen Weather Processor (NWP) - Provides weather products, the translation of the products, and a display for aviation weather users. The NWP replaces legacy weather processor systems (e.g., Weather and Radar Processor, Integrated Terminal Weather System, Corridor Integrated Weather System). NWP combines the products from all these legacy systems into a single controller display known as the Aviation Weather Display. NWP- enhanced weather products include: 1) 0 to 8-hour aviation weather products 2) Real-time weather radar information, 3) Convective Weather Avoidance Fields, and 4) Wind Shear Alerts. The Common Support Services Weather (CSS-Wx) System enables the NAS systems (e.g., ERAM), Advanced Technologies and Oceanic Procedures) to access high-resolution, aviation weather data from a variety of producing systems. FY 2020 activities include definition of enhancements in NWP as well as continued International coordination of aviation weather products.

- Common Support Services – Weather (CSS-Wx) – Provides a means to publish weather products on the SWIM for dissemination to other NAS decision support tools (e.g., TFMS, TBFM and Terminal Flow Data Management) as well as to external stakeholders. FY 2020 activities include definition of enhancements in CSS-Wx as well as continued International coordination of aviation weather products.

NextGen Pre-Implementation

NextGen includes pre-implementation activities that are conducted through several investment portfolios. These portfolios include Separation Management, Traffic Flow Management, NAS Infrastructure, On Demand NAS Information and Enterprise Concept Development which directly support the work efforts within each major program. Portfolio activities include the mission shortfall validation, initial investment analyses, pre-acquisition engineering, human-in-the-loop simulations and demonstrations. Future TBO stages are planned as a part of the pre-implementation activities.

UAS NAS Integration

Pre-implementation activities include those to integrate UASs in NAS operations. Over the past several years, the FAA has been highly engaged in the safe and efficient integration of the UAS in the NAS, regardless of whether the operations are recreational or commercial in nature. NextGen is involved in multiple areas of research and collaboration with other government agencies (e.g., NASA, Homeland Security), industry, international partners to accomplish this goal. FY 2020 activities include completing the UAS shortfall analysis and generating operational requirements in preparation for a Concept and Requirements Definition Readiness Decision (CRDRD) for UAS NAS integration. Other activities include the development of a proposal for an Unmanned Traffic Management (UTM) system in support of small UASs.

Industry Partnership and Commitments

The FAA and the aviation industry work together through the NextGen Advisory Committee (NAC) to identify high-benefit, high-readiness NextGen capabilities for implementation in the near term. In 2014, this government/industry partnership identified four focus areas 1) Multiple Runway Operations, Performance Based Navigation (PBN), Surface Operations and Data Sharing and Data Comm. The FAA and industry monitor progress against these commitments through the NAC and jointly agree to adjust commitments to better suit the NAS' needs. The FAA and the NAC are working to together to define future stages of TBO and how to better serve the North East Corridor initiative with improved technology and procedures.

Next Generation Air Transportation System (NextGen)
Budget Narrative Reference Guide
NextGen Index of Programs

Specific funding and program requirements can be found as indicated below in Table 2.

		Amount ($M)	Page
	Facilities and Equipment (F&E)		**Section 3B**
1A04	NextGen – Separation Management Portfolio	$33.5	22
1A05	NextGen – Traffic Flow Management Portfolio	$27.5	25
1A06	NextGen – On Demand NAS Portfolio	$10.5	28
1A07	NextGen – NAS Infrastructure Portfolio	$17.0	30
1A08	NextGen – Support Portfolio	$13.0	32
1A09	NextGen – Unmanned Aircraft System (UAS)	$68.4	34
1A10	Enterprise, Concept Development, Human Factors and Demonstration Portfolio	$32.0	36
2A01	En Route Automation Modernization System Enhancements and Tech Refresh	$106.0	38
2A09	System-Wide Information Management (SWIM)	$101.0	50
2A10	ADS-B NAS Wide Implementation (ADS-B)	$174.4	52
2A12	Air Traffic Management Implementation Portfolio	$77.1	56
2A13	Time Based Flow Management (TBFM) Portfolio	$30.7	59
2A14	Next Generation Weather Processor (NWP)	$31.3	61
2A16	Data Communications in Support of NextGen	$136.2	64
2A18	Reduced Oceanic Separation	$32.3	68
2B09	Terminal Flight Data Manager (TFDM)	$135.5	86
2B10	Performance Based Navigation and Metroplex Portfolio	$5.0	89
2B11	Unmanned Aircraft Systems (UAS) Implementation	$58.4	90
2B15	Implementation of Flight Objects Exchange Enterprise	$35.0	99
3A09	NextGen – System Safety Management Portfolio	$19.5	148
4A09	Aeronautical Information Management Program (AIM)	$5.3	169
5A01	Personnel and Related Expenses - NextGen Staffing	$70.7	170
	Total, Facilities and Equipment	**$1,220.2**	
	Research, Engineering, and Development		**Section 3C**
A11k	Unmanned Aircraft Systems Research	$7.5	43
A11m	NextGen – Wake Turbulence	$3.7	48
A11n	NextGen – Air/Ground Integration Human Factors	$1.7	51
A11o	NextGen – Weather Technology in the Cockpit	$2.0	54
A11p	NextGen – Information Technology / Cyber Security Program	$2.7	58
A11q	NextGen - Flight Deck Data Exchange Requirements	$1.0	60
A13b	NextGen – Environmental Research, Aircraft Technologies and Fuels	$12.5	66
	Total, Research, Engineering, and Development	**$31.1**	
	Operations		**Section 3A**
	NextGen Staffing	$38.7	ANG/ATO
	NextGen Unmanned Aircraft Systems	$63.1	ANG/ATO
	Performance Based Navigation (PBN) Metroplex Activities	$20.9	ANG/ATO
	Total, Operations	**$122.7**	
	Total, NextGen Programs	**$1,374.0**	

(Totals may not add due to rounding)

Federal Aviation Administration
Abbreviated National Airspace System Capital Investment Plan
for Fiscal Years 2020–2024

Background

The Consolidated Appropriations Act, 2019 became Public Law 116-9 on February 15, 2019 and provides the appropriation amounts and other direction for the Federal Aviation Administration within DIVISION G — TRANSPORTATION, HOUSING AND URBAN DEVELOPMENT, AND RELATED AGENCIES APPROPRIATIONS ACT, 2019 under Title I—Department of Transportation. For FAA's Facilities and Equipment (F&E) appropriation, the following direction was provided regarding the Five Year Capital Investment Plan for the National Airspace System for FY 2020-2024:

Provided further, That no later than March 31, the Secretary of Transportation shall transmit to the Congress an investment plan for the Federal Aviation Administration which includes funding for each budget line item for fiscal years 2020 through 2024, 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.

To comply with the Congressional direction above, this Abbreviated National Airspace System (NAS) Capital Investment Plan (CIP) for Fiscal Years (FY) 2020-2024 has been included within the FAA's FY 2020 President's Budget.

Summary

The Abbreviated five-year NAS CIP fulfills the Secretary's commitment, complies with the language in the Consolidated Appropriations Act, 2019, and addresses the following topics:

- Strategic Goals and the CIP;
- Important Factors Affecting Planning for the Future and Key Considerations in Capital Planning;
- Modernizing and Sustaining Systems and Infrastructure;
- Planning for the Future through Next Generation Air Transportation System (NextGen) Investments;
- Five-year F&E funding table by budget line item for FY 2020 through FY 2024; and
- Information for Major Capital Programs.

Following submission of the FY 2020 President's Budget with the Abbreviated CIP, the annual CIP Overview for FY 2020-2024 will be published at http://www.faa.gov/air_traffic/publications/cip.

Strategic Goals and the CIP

FAA's capital programs are aligned and contribute to the four strategic goals in the Department of Transportation's (DOT) 2018 Strategic Plan. The four DOT Strategic Goals for the capital programs are:

- **SAFETY: Reduce Transportation-Related Fatalities and Serious Injuries Across the Transportation System.**
  - Safety has consistently been DOT's top strategic and organizational goal. To improve transportation safety, DOT seeks to work effectively with State, local, Tribal, and private partners; address human behaviors to reduce safety risks; improve safety data analysis to guide decisions; continue to employ safety countermeasures; ensure that automation brings significant safety benefits; and pursue performance-based rather than prescriptive regulations.
- **INFRASTRUCTURE: Invest in Infrastructure to Ensure Safety, Mobility and Accessibility and to Stimulate Economic Growth, Productivity and Competitiveness for American Workers and Businesses.**

  - DOT seeks to work effectively with State, local, Tribal, and private partners to guide investments that stimulate economic growth, improve the condition of transportation infrastructure, and enable the efficient and safe movement of people and goods.

- **INNOVATION: Lead in the Development and Deployment of Innovative Practices and Technologies that Improve the Safety and Performance of the Nation's Transportation System.**
  - Emerging technologies are transforming our transportation system. DOT seeks to continue its leadership role guiding research investments and facilitating the deployment of beneficial transportation technologies. By engaging with the private and public sectors, DOT can leverage Federal resources to support technology transfer and ensure the safety and security of new technologies.

- **ACCOUNTABILITY: Serve the Nation with Reduced Regulatory Burden and Greater Efficiency, Effectiveness and Accountability.**
  - DOT will streamline regulations and improve organizational effectiveness of the Department. DOT will raise accountability standards that improve the efficient use of taxpayer funds. By streamlining business processes and investing in workforce development, DOT will enhance its responsiveness and adaptability to the demands of a rapidly evolving industry.

Important Factors Affecting Planning for the Future

Access to a reliable worldwide aviation network is essential to the health of the U.S. economy. Both domestic and international commerce rely heavily on ready access to aviation services for carrying passengers and freight to the cities around the world, which helps to sustain economic growth. According to the most recent available study on *The Economic Impact of Civil Aviation on the U.S. Economy* [1], economic activity attributed to civil aviation-related goods and services during 2014 totaled $1.6 trillion, generating 10.6 million jobs, and $447 billion in earnings. In total, U.S. aviation contributed 5.1 percent to the U.S. Gross Domestic Product. Other aviation related economic activity highlighted in the November 2016 report includes:

- Air carriers operating in U.S. airspace transported 871.8 million passengers with over 1,230.8 billion revenue passenger miles.

- In support of commercial activities, more than 64.1 billion revenue ton-miles of freight passed through U.S. airports.

- It is estimated that commercial airline operations enabled $310 billion of visitor expenditures on goods and services.

- Civil aircraft manufacturing, a top U.S. net exporter, had a positive trade balance of $59.9 billion.

Key Considerations in Capital Planning

The development of the CIP requires significant time to plan, define, and prioritize expected program outcomes for review and approval by decision makers. Maintaining a balanced portfolio of FAA's capital investments is critical to the long-term sustainment and modernization of the NAS to meet projected demand, deliver new services and capabilities, and improve system efficiency. Program offices and sponsors must develop a business case to justify the need for the program, define the technical approach and requirements, develop a lifecycle cost and schedule estimate, and identify interdependencies with other programs.

In accordance with FAA's Acquisition Management System, proposed capital investments are presented to the Joint Resources Council for review and approval to initiate the program. Once approved, a program will enter the investment analysis process, be added to the Enterprise Architecture and the CIP, and be included in the President's Budget to request funds from Congress. Once funds are appropriated, program offices must then manage risk

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[1] Sources: Air Traffic Organization, Office of Performance Analysis, "The Impact of Civil Aviation on the U.S. Economy," November 2016; Matthew Russell, "Economic Productivity in the Air Transportation Industry: Multifactor and Labor Productivity Trends, 1990-2014," *Monthly Labor Review*, March 2017.

during program execution to deliver planned outcomes on schedule and on budget. In addition, new systems or capabilities must demonstrate compliance with all applicable FAA reliability and safety standards before receiving final approval to operate in the NAS.

Addressing real-time changes in air traffic demand and anticipated future growth may require increases in available NAS capacity, efficiency, reliability, and system flexibility. Other variables affecting capital planning include periodic changes in economic conditions, scheduled expansion projects at major airports, and ongoing sustainment needs for mission critical Air Traffic Control (ATC) systems, facilities, and other NAS infrastructure. By statute, each year of the CIP must balance to the most recent F&E funding target for that year as issued to FAA by the Office of Management and Budget. In the CIP development process the FAA allocates funding to capital programs to support ongoing development and deployment of NextGen, programs sustaining and modernizing current NAS systems and infrastructure, and mission support. This approach to planning ensures that current NAS performance and safety standards are maintained throughout the transition to NextGen.

Modernizing and Sustaining Systems and Infrastructure

The air traffic control of the NAS is a complex system made up of several thousand components to control and separate air traffic during all ground and flight operations. ATC infrastructure includes 21 Air Route Traffic Control Centers housing the automation equipment used by air traffic controllers to control en route air traffic, over 500 Air Traffic Control Towers, and over 150 Terminal Radar Approach Control facilities. This daily flow of air traffic is dependent upon several hundred surveillance and weather radars, navigation systems for en route and airport approach guidance and thousands of radios that allow pilots and air traffic controllers to stay in contact during all phases of an aircraft's flight.

The air traffic control system requires automation, communication, navigation, surveillance, and weather systems to maintain safe separation of aircraft operating in controlled airspace and on the airport surface. Each of these systems has a high degree of redundancy to support system reliability and availability to minimize risk of service disruptions. Before these systems reach the end of their service life, planning for their replacement must be well underway to reduce the risk of performance degradation or outages in the event that replacement parts become obsolete or are otherwise difficult to obtain.

NextGen is the ongoing transition of the NAS to ensure the FAA is prepared to meet future capacity, safety, and environmental requirements and is supported by many capital programs. By combining new technologies for surveillance, navigation, weather, and communications with automation system enhancements, workforce training, procedural changes, and airfield development, NextGen will fundamentally change the way air traffic is managed.

NextGen will incrementally replace and upgrade much of this equipment as new technologies and procedures are introduced to improve efficiency in air traffic control. Some legacy equipment, such as communication and surveillance systems must remain in operation to supplement or backup NextGen capabilities. Many current buildings that house existing ATC equipment will also be needed for NextGen systems. To sustain the high level of NAS reliability and availability required to ensure the safety and efficiency of flight, continued investment in modernizing and sustaining systems and infrastructure is required.

Key investments include:

- **En route Automation** – The En Route Automation Modernization (ERAM) platform will require technology refresh to replace a large subset of system equipment that is near the end of its service life;
- **Terminal Automation** – Older Standard Terminal Automation Replacement Systems (STARS) have reached their end-of-life and key components must be replaced to maintain the operation of the systems;
- **Navigation/Landing** – The Wide Area Augmentation System will continue to augment the Global Positioning System to support the implementation of improved procedures that are dependent on satellite navigation capabilities. Aging Instrument Landing Systems, Navaids, and other visusal Navaids will be replaced if systems become unsupportable due to parts obsolescence; and
- **Surveillance/Weather** – Modernization of en route, and terminal primary and secondary surveillance radars, and weather sensing and processing equipment will be implemented to upgrade or replace older, unsupportable systems.

Planning for the Future through NextGen Investments

NextGen advances will enable precise monitoring of aircraft both on the ground and in flight; optimize routes for travel between cities; improve decision support to strategically manage traffic flows on busy routes; and leverage precision navigation to improve utilization of existing airspace and runway capacity. More information concerning the vision, benefits, and details on NextGen and can be found at http://www.faa.gov/nextgen/.

With capital funding NextGen will continue to deliver benefits and implement the remaining base infrastructure. Future NextGen applications will increase capacity and efficiency and provide greater access and flexibility for users to choose route options that best meet their needs.

Major NextGen programs include:

- **En Route Automation Modernization (ERAM) –** ERAM Enhancements include improvements in separation management, trajectory prediction, and human interface capabilities to improve the delivery of air traffic services today and to continue the evolution of NextGen Trajectory-Based Operations (BLI 2A01).

- **System Wide Information Management (SWIM)** – SWIM provides the standards, hardware and software to enable information management and data sharing required to support NextGen and provides for additional infrastructure and capabilities to strengthen the overall NAS information system security posture (BLI 2A09).

- **Automatic Dependent Surveillance – Broadcast (ADS-B) NAS Wide Implementation (ADS-B)** – ADS-B provides more accurate and timely surveillance data needed to allow direct routing and conflict free routes and supports services that provide ADS-B surveillance data for aircraft operating in a large area without access to traditional radar coverage (BLI 2A10).

- **Air Traffic Management Implementation Portfolio –** Traffic Flow Management System enhancements will improve the demand predictions to determine whether there is sufficient NAS resource capacity, as well as provide controller tools to assist with routing departures given convective weather and traffic volume constraints (BLI 2A12).

- **Time Based Flow Management (TBFM) –** TBFM Enhancements focuses on expanding the airspace in which controllers can use the Integrated Departure/Arrival Capability and implementing Terminal Sequencing and Spacing to provide efficient sequencing and runway assignment as well as deliver additional benefits of time-based metering across the NAS (BLI 2A13).

- **NextGen Weather Processor (NWP) –** NWP will establish a common weather processing platform which will provide improved weather products and support more efficient operations and replace the legacy FAA weather processor systems (BLI 2A14).

- **Data Communications in support of NextGen** – Data Comm provides data link communications between controller and pilot to facilitate information transfer, reduce workload, and minimize potential errors in communication of flight plan adjustments (BLI 2A16).

- **Terminal Flight Data Manager (TFDM)** – TFDM is the surface management solution for NextGen. TFDM will deliver NextGen decision support capabilities for the airport surface, integrating flight, surface surveillance, and traffic management information in order to improve operational predictability and efficiency at airports (BLI 2B09).

- **Unmanned Aircraft Systems (UAS)** – To improve the UAS registration service and increase authorization and notification processes the FAADroneZone and Small UAS Implementation programs have deployed initial capabilities into the NAS. The FAADroneZone is a cloud-based IT platform that hosts several Beta applications providing the supporting infrastructure to improve the user experience of public interactions and increases efficiency of internal business processes required for the operation of small Unmanned Aircraft Systems. Under the Small UAS Implementation program, efforts to enhance and expand services provided by the Low Altitude Authorization and Notification Capability will improve the administrative capability for facility Air Traffic Managers to authorize UAS operations in controlled airspace (2B11).

- **Aeronautical Information Management (AIM) Programs –** AIM provides digital aeronautical information to NAS users. Future AIM Enhancements will incorporate additional types of aeronautical information in a digital format for machine-to-machine exchange with NAS automation systems (BLI 4A09).

Conclusion

The FAA's FY 2020-2024 CIP provides a balanced portfolio of capital programs for the modernization and sustainment of systems and critical NAS infrastructure, integration of UAS operations into the NAS, and continued transition to NextGen.

Estimated Funding by Budget Line Item (dollars in Millions)

The following table shows funding by BLI with dollars in millions for the capital programs in the FY 2020 to FY 2024 time frame. The FY 2020 funding amounts in this table are consistent with this budget submission. The FY 2021 through FY 2024 total year funds are constrained to the F&E targets issued by the Office of Management and Budget.

BLI Number	Capital Budget Line Item (BLI) Program	FY 2020 Budget	FY 2021 Est.	FY 2022 Est.	FY 2023 Est.	FY 2024 Est.
	Activity 1: Engineering, Development, Test and Evaluation	**$277.8**	**$201.6**	**$208.4**	**$213.9**	**$214.0**
1A01	Advanced Technology Development and Prototyping (ATDP)	$40.9	$40.5	$40.2	$40.1	$40.1
1A02	William J. Hughes Technical Center Laboratory Sustainment	$20.0	$20.0	$20.0	$20.0	$20.0
1A03	William J. Hughes Technical Center Infrastructure Sustainment	$15.0	$10.0	$10.0	$10.0	$10.0
1A04	NextGen – Separation Management Portfolio	$33.5	$31.6	$39.2	$49.5	$43.0
1A05	NextGen – Traffic Flow Management (TFM) Portfolio	$27.5	$12.0	$15.0	$14.0	$14.0
1A06	NextGen – On Demand NAS Portfolio	$10.5	$14.5	$15.0	$12.3	$12.5
1A07	NextGen – NAS Infrastructure Portfolio	$17.0	$15.0	$16.0	$16.0	$18.4
1A08	NextGen – Support Portfolio	$13.0	$11.0	$11.0	$11.0	$12.0
1A09	NextGen – Unmanned Aircraft Systems (UAS)	$68.4	$32.0	$27.0	$26.0	$27.0
1A10	NextGen – Enterprise, Concept Development, Human Factors, & Demonstrations Portfolio	$32.0	$15.0	$15.0	$15.0	$17.0
	Activity 2: Procurement and Modernization of Air Traffic Control Facilities and Equipment	**$2,051.4**	**$2,087.6**	**$2,088.2**	**$2,077.4**	**$2,107.3**
	A. En Route Programs	$914.4	$747.3	$758.0	$737.6	$755.6
2A01	NextGen – En Route Automation Modernization (ERAM) – System Enhancements and Technology Refresh	$106.0	$87.0	$111.1	$114.3	$120.0
2A02	En Route Communications Gateway (ECG)	$2.7	$2.9	$0.0	$0.0	$0.0
2A03	Next Generation Weather Radar (NEXRAD)	$3.0	$6.1	$5.4	$7.5	$7.5
2A04	Air Route Traffic Control Center (ARTCC) & Combined Control Facility (CCF) Building Improvements	$96.9	$110.1	$111.7	$106.6	$109.6
2A05	Air/Ground Communications Infrastructure	$7.9	$8.0	$8.1	$7.9	$6.9
2A06	Air Traffic Control En Route Radar Facilities Improvements	$5.3	$6.4	$6.5	$6.3	$6.3
2A07	Oceanic Automation System	$15.9	$15.0	$17.0	$14.0	$13.0
2A08	Next Generation Very High Frequency Air/Ground Communications System	$50.0	$50.0	$50.0	$50.0	$43.5
2A09	NextGen – System-Wide Information Management (SWIM)	$101.0	$38.5	$33.4	$29.0	$41.6
2A10	NextGen – Automatic Dependent Surveillance - Broadcast (ADS-B) NAS Wide Implementation	$174.4	$163.0	$165.0	$199.0	$170.0
2A11	Wind Shear Detection Service (WSDS)	$1.0	$4.0	$3.0	$2.0	$0.0
2A12	NextGen – Air Traffic Management Implementation Portfolio	$77.1	$62.2	$57.0	$36.3	$37.8
2A13	NextGen – Time Based Flow Management (TBFM) Portfolio	$30.7	$40.8	$50.9	$31.6	$30.0
2A14	NextGen – Next Generation Weather Processor (NWP)	$31.3	$15.2	$25.0	$25.0	$25.0
2A15	Airborne Collision Avoidance System X (ACAS X)	$6.9	$5.1	$0.0	$0.0	$0.0

BLI Number	Capital Budget Line Item (BLI) Program	FY 2020 Budget	FY 2021 Est.	FY 2022 Est.	FY 2023 Est.	FY 2024 Est.
2A16	NextGen – Data Communication in support of NextGen	$136.2	$95.1	$84.0	$85.1	$120.4
2A17	Non-Continental United States (Non-CONUS) Automation	$1.0	$0.0	$0.0	$0.0	$0.0
2A18	NextGen – Reduced Oceanic Separation	$32.3	$15.0	$12.0	$7.0	$12.0
2A19	En Route Improvements	$2.0	$2.0	$2.0	$2.0	$2.0
2A20	Commercial Space Integration	$33.0	$21.0	$16.0	$14.0	$10.0
	B. Terminal Programs	$620.4	$681.0	$703.2	$717.0	$698.7
2B01	Terminal Doppler Weather Radar (TDWR)	$2.2	$7.0	$10.0	$10.0	$10.0
2B02	Standard Terminal Automation Replacement System (STARS)	$41.3	$51.9	$58.4	$64.0	$73.0
2B03	Terminal Automation Program	$6.5	$9.0	$9.0	$10.0	$5.1
2B04	Terminal Air Traffic Control Facilities – Replace	$24.3	$85.0	$97.0	$140.0	$140.0
2B05	Air Traffic Control Tower (ATCT)/Terminal Radar Approach Control (TRACON) Facilities – Improve	$96.2	$103.9	$100.6	$84.5	$84.3
2B06	NAS Facilities OSHA and Environmental Standards Compliance	$40.4	$37.2	$42.0	$42.0	$42.0
2B07	Integrated Display System (IDS)	$24.0	$35.2	$45.0	$45.0	$50.0
2B08	Remote Monitoring and Logging System (RMLS)	$14.4	$15.6	$16.7	$5.0	$5.0
2B09	NextGen – Terminal Flight Data Manager (TFDM)	$135.5	$78.7	$47.9	$39.4	$50.8
2B10	NextGen – Performance Based Navigation & Metroplex Portfolio	$5.0	$8.0	$8.0	$8.0	$9.7
2B11	NextGen – Unmanned Aircraft Systems (UAS) Implementation	$58.4	$31.6	$31.3	$25.0	$10.0
2B12	Airport Ground Surveillance Portfolio	$19.0	$19.5	$25.0	$27.0	$21.0
2B13	Terminal and En Route Surveillance Portfolio	$68.5	$79.8	$78.3	$69.1	$58.5
2B14	Voice Communications Systems Portfolio	$49.8	$83.1	$94.4	$104.0	$105.3
2B15	NextGen – Implementation of Flight Object Exchange Services and Enterprise Information Management	$35.0	$35.5	$39.6	$44.0	$34.0
	C. Flight Service Programs	$26.8	$17.9	$14.7	$13.3	$12.8
2C01	Aviation Surface Weather Observation System	$4.0	$5.0	$11.0	$10.0	$9.0
2C02	Future Flight Services Program (FFSP)	$19.2	$9.0	$0.0	$0.0	$0.0
2C03	Alaska Flight Service Facility Modernization (AFSFM)	$2.7	$2.9	$3.0	$2.8	$2.8
2C04	Juneau Airport Wind System (JAWS) – Technology Refresh	$1.0	$1.0	$0.7	$0.5	$1.0
	D. Landing and Navigation Aids Programs	$158.7	$196.8	$193.8	$199.0	$224.2
2D01	VHF Omnidirectional Radio Range (VOR) Minimum Operating Network (MON)	$18.0	$22.3	$19.4	$19.4	$19.4
2D02	Wide Area Augmentation System (WAAS) for GPS	$90.0	$94.0	$98.5	$96.8	$92.1
2D03	Instrument Flight Procedures Automation (IFPA)	$1.1	$0.0	$0.0	$0.0	$0.0
2D04	Runway Safety Areas – Navigation Mitigation	$1.4	$0.0	$0.0	$0.0	$0.0
2D05	Landing and Lighting Portfolio	$48.2	$80.5	$75.9	$82.8	$112.8

BLI Number	Capital Budget Line Item (BLI) Program	FY 2020 Budget	FY 2021 Est.	FY 2022 Est.	FY 2023 Est.	FY 2024 Est.
	E. Other ATC Facilities Programs	$330.9	$444.8	$418.7	$410.7	$416.2
2E01	Fuel Storage Tank Replacement and Management	$26.4	$32.4	$33.0	$28.0	$32.0
2E02	Unstaffed Infrastructure Sustainment	$36.8	$58.7	$56.7	$56.7	$52.7
2E03	Aircraft Related Equipment Program	$10.9	$12.0	$9.0	$9.0	$9.0
2E04	Airport Cable Loop Systems – Sustained Support	$10.0	$10.0	$10.0	$10.0	$10.0
2E05	Alaskan Satellite Telecommunication Infrastructure (ASTI)	$4.3	$4.0	$0.0	$0.0	$0.0
2E06	Facilities Decommissioning	$9.0	$10.0	$10.0	$10.0	$10.0
2E07	Electrical Power Systems – Sustain/Support	$150.0	$177.3	$170.0	$170.0	$170.0
2E08	Energy Management and Compliance (EMC)	$6.4	$6.9	$3.0	$5.0	$5.0
2E09	Child Care Center Sustainment	$1.5	$1.0	$1.0	$1.0	$0.0
2E10	FAA Telecommunications Infrastructure	$48.5	$57.5	$51.0	$56.0	$49.0
2E11	Data, Visualization, Analysis and Reporting System (DVARS)	$7.1	$4.5	$4.5	$4.5	$4.5
2E12	Time-Division Multiplexing to Internet Protocol (TDM-to-IP) Migration	$20.0	$25.0	$25.0	$25.0	$25.0
2E13X	Flight Program Fleet Modernization	$0.0	$42.0	$42.0	$32.0	$42.0
2E14X	Independent Operational Assessment	$0.0	$3.5	$3.5	$3.5	$7.0
	Activity 3: Non-Air Traffic Control Facilities and Equipment	**$203.4**	**$225.7**	**$210.9**	**$203.7**	**$181.3**
	A. Support Programs	$184.4	$210.7	$195.9	$188.7	$166.3
3A01	Hazardous Materials Management	$20.0	$27.4	$31.0	$31.0	$31.0
3A02	Aviation Safety Analysis System (ASAS)	$19.7	$21.5	$22.0	$19.1	$20.0
3A03	National Airspace System (NAS) Recovery Communications (RCOM)	$12.0	$12.0	$12.0	$12.0	$12.0
3A04	Facility Security Risk Management	$15.1	$21.8	$20.1	$22.0	$22.0
3A05	Information Security	$33.3	$18.5	$18.2	$17.0	$17.0
3A06	System Approach for Safety Oversight (SASO)	$23.1	$26.8	$35.4	$40.0	$32.0
3A07	Aviation Safety Knowledge Management Environment (ASKME)	$5.3	$8.4	$9.8	$12.0	$0.0
3A08	Aerospace Medical Equipment Needs (AMEN)	$13.8	$30.0	$7.0	$2.0	$0.0
3A09	NextGen – System Safety Management Portfolio	$19.5	$16.0	$15.0	$15.0	$15.0
3A10	National Test Equipment Program	$3.0	$3.0	$3.0	$3.0	$3.0
3A11	Mobile Assets Management Program	$1.8	$2.1	$2.0	$2.0	$2.0
3A12	Aerospace Medicine Safety Information System (AMSIS)	$13.8	$21.5	$18.9	$11.5	$9.8
3A13	Logistics Support System and Facilities (LSSF)	$4.0	$1.7	$1.5	$2.1	$2.5
	B. Training, Equipment and Facilities	$19.0	$15.0	$15.0	$15.0	$15.0
3B01	Aeronautical Center Infrastructure Modernization	$18.0	$14.0	$14.0	$14.0	$14.0
3B02	Distance Learning	$1.0	$1.0	$1.0	$1.0	$1.0

BLI Number	Capital Budget Line Item (BLI) Program	FY 2020 Budget	FY 2021 Est.	FY 2022 Est.	FY 2023 Est.	FY 2024 Est.
	Activity 4: Facilities and Equipment Mission Support	**$237.7**	**$239.1**	**$238.5**	**$249.0**	**$241.4**
4A01	System Engineering and Development Support	$38.0	$38.0	$38.0	$38.0	$35.0
4A02	Program Support Leases	$48.0	$50.0	$50.0	$50.0	$50.0
4A03	Logistics and Acquisition Support Services	$11.8	$12.0	$12.0	$12.0	$12.0
4A04	Mike Monroney Aeronautical Center Leases	$20.6	$21.1	$21.5	$22.0	$22.4
4A05	Transition Engineering Support	$21.0	$20.0	$19.0	$19.0	$19.0
4A06	Technical Support Services Contract (TSSC)	$28.0	$28.0	$28.0	$28.0	$28.0
4A07	Resource Tracking Program (RTP)	$8.0	$8.0	$8.0	$8.0	$8.0
4A08	Center for Advanced Aviation System Development (CAASD)	$57.0	$57.0	$57.0	$57.0	$57.0
4A09	NextGen – Aeronautical Information Management Program	$5.3	$5.0	$5.0	$15.0	$10.0
	Activity 5: Personnel Compensation, Benefits and Travel	**$524.7**	**$541.0**	**$549.0**	**$551.0**	**$551.0**
5A01	Personnel and Related Expenses	$524.7	$541.0	$549.0	$551.0	$551.0
	Note: BLI numbers with X represent outyear programs not requested in the FY 2020 President's Budget.					
	Total Year Funding	$3,295.0	$3,295.0	$3,295.0	$3,295.0	$3,295.0
	Targets	$3,295.0	$3,295.0	$3,295.0	$3,295.0	$3,295.0

Information for Major Capital Programs

Due to the criticality of on-budget and on-time acquisitions to the efficient transition to NextGen, the Government Accountability Office (GAO) was directed to determine the status of Air Traffic Organization's performance in acquiring ATC systems.

In response to a prior GAO recommendation to identify regular reporting to Congress and the public on FAA's overall performance in acquiring ATC systems, the table below provides the most recent information on FAA's major capital programs.

FAA's major programs are typically programs defined as those classified as Acquisition Category (ACAT) 1, 2, 3, or are of strategic importance to the agency. These are typically programs with total F&E costs greater than $100 million and/or those that have significant impact, complexity, risk, sensitivity, safety, or security issues. For more information on ACATs see: http://fast.faa.gov/NFFCA_Acquisition_Categories.cfm

Programs that have completed their acquisition phase since the last publication of the CIP appear on the final page of this section, Major Programs with Completed or Cancelled acquisition phase, but will not be shown in subsequent years.

FAA Capital Programs
Current Information for Major Programs

Programs	Original Baseline			Rebaseline			Current Estimate*		Comments
	Original APB Date	Completion Date	Budget $M	Rebaseline APB Date	Revised Completion Date	Revised Budget $M	Completion Date	Budget $M	
Automatic Dependent Surveillance Broadcast (ADS-B) – Baseline Services & Applications ACAT 1	May-12	Sep-20	$960.4				Sep-20	$987.2	**Current Estimate vs. Original Baseline:** The cost increase of $26.8M (-2.8% variance) is associated with additional funds provided to support the General Aviation (GA) aircraft incentive program to address "key barriers" to ADS-B out equipage identified by the Equip 2020 team, changes to scope and new requirements for Airport Surface Surveillance Capability (ASSC).
Common Support Services Weather (CSS-Wx) ACAT 1	Mar-15	Aug-22	$120.1				Aug-22	$164.1	**Current Estimate vs Original Baseline:** The program is working with the vendor to validate the schedule and cost estimates for completing the remaining work. These estimates are preliminary and will be updated over the next year. The cost increase of $44.0M (-36.6% variance) is associated with underestimating software development efforts, interface changes, vendor performance on development and test, and additional equipment.
Data Communications (Data Comm) Segment 1, Phase 1 (S1P1) ACAT 1	May-12	May-19	$741.4				May-19	$723.7	**Current Estimate vs. Original Baseline:** The FAA completed the Controller Pilot Data Link Communications (CPDLC) Departure Clearance (DCL) deployment waterfall in Dec-16, 29 months ahead of the original baseline of May 2019 and under budget. There are remaining activities to be performed under this phase of the Data Comm program, to include: executing the remaining portion of the equipage initiative, delivering pre-planned air traffic control and flight deck enhancements, and continuing industry outreach and coordination.
Data Communications (Data Comm) Segment 1, Phase 2 (S1P2), Full En Route Services ACAT 1 New Investment	Aug-16	Dec-23	$421.4				Dec-23	$401.3	
Data Communications (Data Comm) Segment 1, Phase 2 (S1P2), Initial En Route Services ACAT 1 New Investment	Oct-14	Feb-21	$816.7				Feb-21	$816.7	
En Route Automation Modernization (ERAM) Enhancements 2 ACAT 1	Dec-16	Dec-23	$253.6	Dec-18	Dec-24	$192.9	Dec-24	$192.9	**Rebaseline vs. Original Baseline:** The schedule delay of 12 months (-14.3% variance) is associated with budget uncertainty and reductions, technical changes, and adjusting priorities. The cost under run of $60.7M (23.9% variance) is due to reduced scope as a result of a reprioritization of enhancements to include only mature capabilities validated through engineering and development activities.

*The current estimates provided in this table are as of December 2018, the impacts of the recent FAA shutdown are still under review.

FAA Capital Programs
Current Information for Major Programs

Programs	Original Baseline: Original APB Date	Original Baseline: Completion Date	Original Baseline: Budget $M	Rebaseline: Rebaseline APB Date	Rebaseline: Revised Completion Date	Rebaseline: Revised Budget $M	Current Estimate*: Completion Date	Current Estimate*: Budget $M	Comments
ERAM Sustainment 2 ACAT 4TR	Dec-16	Sep-20	$279.2				Sep-20	$279.2	
Facility Security and Risk Management (FSRM) Sustainment 2 ACAT 2	Jun-11	Sep-22	$182.5				Sep-22	$182.5	
Logistics Center Support System (LCSS) ACAT 2	Apr-10	Apr-14	$67.4	Apr-14	Apr-16	$79.4	Mar-20	$104.1	**Rebaseline vs. Original Baseline:** The schedule delay of 24 months (-50% variance) and cost increase of $12M (-17.8% variance) is associated with the following factors: 1) Business processes developed during the Business Process Reengineering (BPR) phase did not address system interactions between functional areas; 2) delays in developing interfaces with legacy systems; 3) complexity of the tool integration required for interfaces; and 4) changes in contract and program management. In Apr-14, the JRC approved a Baseline Change Decision (BCD) for LCSS. **Current Estimate vs Rebaseline:** The program is working to validate the schedule and cost estimates. These estimates are preliminary and will be updated over the next year. The program is projected to be completed in Mar-20 (-65.3% variance) with an estimated cost at completion of $104.1M (-31.1% variance). The schedule and cost increases are associated with: 1) user and system requirements that were identified after the Initial Operational Capability (IOC) remain to be developed; 2) workarounds as a result of unmet requirements that did not have documentation to support the remaining development; 3) related work processes and system interfaces that were not fully defined or documented that resulted in additional requirements to be developed to meet user needs; and 4) efforts to stabilize defects found during initial production.
Next Generational Weather Processor (NWP) ACAT 1	Mar-15	Aug-22	$189.3				Aug-22	$206.3	**Current Estimate vs Original Baseline:** The cost increase of $17M (-9% variance) is mainly associated with prime contractor rate changes due to a corporate reorganization. In addition impacts due to interface changes and Integrated Logistics Support Transition.
Next Generation Air to Ground Communication System (NEXCOM) Phase 2 ACAT 2 NI	Aug-17	Dec-26	$334.2				Dec-26	$334.2	

*The current estimates provided in this table are as of December 2018, the impacts of the recent FAA shutdown are still under review.

FAA Capital Programs
Current Information for Major Programs

Programs	Original Baseline: Original APB Date	Original Baseline: Completion Date	Original Baseline: Budget $M	Rebaseline: Rebaseline APB Date	Rebaseline: Revised Completion Date	Rebaseline: Revised Budget $M	Current Estimate*: Completion Date	Current Estimate*: Budget $M	Comments
Runway Status Lights (RWSL) ACAT 1	Jan-10	Oct-15	$327.4	Jul-13	Sep-17	$366.7	Jun-19	$366.7	**Rebaseline vs. Original Baseline:** In Jul-13 the JRC approved a BCD for the RWSL program. The JRC determined to minimize the cost exposure to the baseline, deployment will be limited to the 16 airports that have been fully committed and San Francisco International for a total of 17 airports. This results in a reduction of 6 airports (26.1% variance) from the original 23 airports approved at the FID in Jan-10. The cost increase ($39.3M, -12% variance) and schedule delay (23 months, -26.1% variance) are attributed to the following factors: 1) construction plans changed due to costlier techniques by Airport Authorities; 2) limited runway/taxiway surface availability to meet installation schedules; 3) requirement changes that included increases in the light count, the switch from incandescent lights to LED, and the increased supportability for these requirements; 4) costly duct bank and shelter installations; 5) under estimation of site and depot spares costs; and (6) additional engineering development for supportability enhancements. **Current Estimate vs. Rebaseline:** The 21 month schedule delay (-18.9%) is attributed to the addition of Boston, Dallas/Ft. Worth, and San Deigo Airports to the baseline. These 3 locations currently have prototype systems and were included in the original baseline. These airports have committed to a work share agreement with the FAA to upgrade the prototypes to baseline systems. The work share agreements will allow the FAA to complete the work at the 3 airports with no impact to the rebaseline budget.
System Approach for Safety Oversight (SASO) Phase 3 ACAT 3 NI	Feb-16	May-23	$135.7				May-23	$135.7	
System Wide Information Management (SWIM) Segment 2B ACAT 2	Oct-15	Sep-21	$119.6				Sep-21	$120.9	**Current Estimate vs. Original Baseline:** The cost increase of $1.3M (-1.1% variance) is associated with under estimated costs for Transitioning to Operations & Maintenance (TOM).
Standard Terminal Automation Replacement System (STARS) Sustainment 1 ACAT 2	Sep-12	Feb-20	$531.5				Feb-20	$531.5	
Standard Terminal Automation Replacement System (STARS) Sustainment 2 ACAT 4TR	Sep-17	May-22	$102.1				May-22	$102.1	

*The current estimates provided in this table are as of December 2018, the impacts of the recent FAA shutdown are still under review.

FAA Capital Programs
Current Information for Major Programs

Programs	Original Baseline			Rebaseline			Current Estimate*		Comments
	Original APB Date	Completion Date	Budget $M	Rebaseline APB Date	Revised Completion Date	Revised Budget $M	Completion Date	Budget $M	
Terminal Automation Modernization and Replacement (TAMR), Phase 4 ACAT 2	Sep-12	Aug-19	$462.5				Aug-19	$496.8	**Current Estimate vs. Original Baseline:** The cost increase of $34.3M (-7.4% variance) is associated with the impact of higher prime contractor costs.
Terminal Flight Data Manager (TFDM) ACAT 1 NI	Jun-16	Sep-28	$795.2				Sep-28	$795.2	
Time Based Flow Management (TBFM) Enhancement 1 ACAT 3NI	Apr-15	Sep-22	$188.3				Sep-22	$188.3	
Traffic Flow Management System (TFMS) Enhancement 4 ACAT 3 New Investment (NI)	Jun-17	Sep-22	$78.6				Mar-23	$85.1	**Current Estimate vs. Original Baseline:** The program is working to validate the schedule and cost estimates. These estimates are preliminary and will be updated over the next year. The schedule delay of 6 months (-9.5% variance) and cost increase of $6.5M (-8.3% variance) is due to delaying the Impact Demand Prediction (IDP) enhancement in order to address near term issues related to the TFMS architecture and system stability.
Wide Area Augmentation System (WAAS) Phase 4A ACAT 1	May-14	Sep-19	$603.2				Sep-19	$603.2	

*The current estimates provided in this table are as of December 2018, the impacts of the recent FAA shutdown are still under review.

FAA Capital Programs

Major Programs - Completed or Cancelled

Programs	Original Baseline			Rebaseline			Actual Results		Comments
	Original APB Date	Completion Date	Budget $M	Rebaseline APB Date	Revised Completion Date	Revised Budget $M	Completion Date	Budget $M	
Next Generation Air-to-Ground Communication System (NEXCOM) Segment 2, Phase 1 ACAT 2	Sep-11	Sep-18	$285.9				Feb-18	$285.9	**Actual Result vs. Original Baseline:** The program completed 7 months early (8.3% variance) and on budget.
NAS Voice System (NVS) Demonstration and Qualification Phase ACAT 1	Sep-14	Mar-20	$294.2				N/A	N/A	**Current Estimate vs Original Baseline:** The FAA has cancelled the contract with the vendor and cancelled the program.

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