

**United States Department of Transportation**  
**Annual Modal Research Plans**  
**Fiscal Year 2018**

*Federal Highway Administration (FHWA)*

*May 1, 2017*  
*Revised October 18, 2017*

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## **Executive Summary**

The Federal Highway Administration (FHWA) addresses current issues and emerging challenges, creates efficiencies in the highway and transportation sector, and provides information to support policy decisions as part of the Research and Technology (R&T) Programs. Through the R&T programs, the FHWA conducts advanced and applied research, facilitates national and international coordination and collaboration to leverage knowledge, and develops and delivers solutions to address highway transportation needs. The FHWA is in a unique leadership position to identify and address highway issues that require high-risk, long-term research, and research on emerging issues of national significance, as well as to build effective partnerships and to maximize the total federal government research and technology highway investment.

The primary goal of the FHWA R&T programs is to deliver research and development addressing critical knowledge gaps that are not effectively addressed by other highway research sponsors and to accelerate implementation of technologies to meet current and future highway transportation needs. These programs seek to generate new solutions; provide better decision-support data, information, and tools; and build more effective partnerships that will allow our Nation to make optimal investments in the transportation system. The FHWA R&T programs cover the entire innovation life cycle, including agenda setting, conduct of research and development, technology testing and evaluation, and the deployment and evaluation of market-ready technologies and innovations.

The FHWA has a long history of strong partnerships with the States, Federal agencies, academia, and private industry. The FHWA R&T programs are coordinated with R&T conducted through the University Transportation Center (UTC) research program, the Transportation Research Board's National Cooperative Highway Research Program (NCHRP), and State-based R&T initiatives. In addition, FHWA develops joint strategies to address U.S. Department of Transportation (USDOT) goals with modal stakeholders, including Federal Transit Administration (FTA), Federal Railroad Administration (FRA), National Highway Traffic Safety Administration (NHTSA), Federal Aviation Administration (FAA), and Federal Motor Carrier Safety Administration (FMCSA).

FHWA's Office of Research, Development, and Technology (RD&T) is located at the Turner-Fairbank Highway Research Center (TFHRC), a federally owned and operated national research facility in McLean, Virginia. The TFHRC houses more than 20 laboratories and support facilities, and conducts advanced and applied research. The TFHRC staff administers the majority of FHWA's research and development activities in the areas of infrastructure, operations, and safety. In addition, research in areas of Intelligent Transportation Systems (ITS), policy, innovative finance, planning, operations, and the environment is conducted or administered by FHWA offices located at USDOT Headquarters. The deployment of research products is led by the subject area program offices at USDOT headquarters and through the headquarter-based Center for Accelerating Innovation in cooperation with Technical Service Teams based in the FHWA Resource Center.

FHWA's core Research and Development (R&D) programs improve safety, enhance the transportation infrastructure, reduce congestion, provide data and analysis to transportation decision-makers, and improve infrastructure designs to enhance connectivity throughout communities.

- The Safety research area addresses the causes of deaths and injuries related to roadway design, construction and maintenance, and develop robust data analysis tools that enable transportation professionals to match crash causes with cost-effective countermeasures.
- The Infrastructure area engages in forward-looking research that supports safety, durability, resilience, environmental sustainability and asset management while modernizing bridges and roads through improved test methods and specifications, innovative materials, new construction techniques, and improved quality assurance processes.
- The Operations area develops innovative technologies and processes that lead to system-wide improvements in how FHWA and its State and local partners manage and increase the reliability of the National Highway System (NHS).
- The Policy area evaluates the impacts of a broad range of policy options and analyzes current and emerging issues that will affect the way transportation systems are built, maintained, and used.
- The Planning and Environment area assesses new tools and processes that consider the complex relationships among individuals, communities, the economy, and the environment, to enable better decisions and lead to improved outcomes.
- The Exploratory Advanced Research program conducts longer-term, higher-risk research in all the research areas above. These research products have the potential for dramatic breakthroughs in transportation.

The deployment efforts under the R&T program aim to accelerate the adoption of proven innovative practices and technologies as standard practices to significantly improve safety, system efficiency, infrastructure health, reliability and performance, and livable/sustainable communities.

- *Every Day Counts Program (EDC)*: EDC identifies under-utilized market-ready technologies with high pay-offs and accelerates their deployment and acceptance throughout the Nation.
- *Accelerated Innovation Deployment (AID) Demonstration Program*: Provides incentive funding for eligible entities to accelerate the implementation and adoption of innovation in highway transportation.
- *State Transportation Innovation Council (STIC) Incentive Program*: Offers technical assistance and up to \$100,000 per STIC per year to support the costs of standardizing innovative practices in a State Department of Transportation (DOT) or other public sector STIC stakeholder.
- *Memorandum of Understanding (MOU) with American Association of State Highway Transportation Officials (AASHTO)*: AASHTO Innovation Initiative (AII) and the FHWA Center for Accelerating Innovation (CAI). The MOU is supported by a

cooperative agreement between AII and CAI for: AII to service as AASHTO point of contact for stakeholder engagement in EDC; All to collaborate on the deployment of EDC and foster the EDC innovation pipeline.

- *Accelerated deployment of pavement technologies*: The FAST Act extends the designation of \$12 million per fiscal year to promote, demonstrate, support, and document the application of innovative pavement technologies, practices, performance, and benefits.

Additionally, the USDOT's ITS program focuses on intelligent vehicles, intelligent infrastructure and the creation of an intelligent transportation system through integration with and between these two components. The Federal ITS program is administered by the FHWA and supports the overall advancement of ITS through investments in major research initiatives, exploratory studies and a deployment support program including technology transfer and training.

The FHWA has partnered with the ITS program, and used the Exploratory Advanced Research (EAR) Program, to conduct cross-cutting research in innovative technologies that can significantly benefit the traveling public. Two examples are:

- **Automated vehicles**: FHWA is conducting research to characterize the evolving performance and assess the deployment potential for automated vehicles, to improve the performance of automated vehicles (including trucks) through cooperation between vehicles and with the infrastructure, and to prepare FHWA for deployment readiness.
- **Accessible Transportation Technologies Research Initiative (ATTRI)**: FHWA has partnered with FTA and the National Institute on Disability, Independent Living, and Rehabilitation Research to develop wayfinding and other navigational aids that will lead to transformational changes and revolutionary advances in accessible transportation, personal mobility, and independent travel for all travelers.

**Section 1 – Program Descriptions, FY 2018**  
**FY 2018 RD&T Program Funding Details**

RD&T Program Name	FY 2018 Pres. Budget (\$000)	FY 2018 Basic (\$000)	FY 2018 Applied (\$000)	FY 2018 Development (\$000)	FY 2018 Technology (\$000)
<b>HRD and TIDP <sup>(1)</sup></b>					
Bridges and Structures	11,000		7,800	2,000	1,200
Pavement and Materials	12,000		2,500	700	8,800
Construction and Program Administration	2,000		1,250	750	
Transp. Performance Management (TPM)	10,000		7,500	2,500	
Safety	13,500		7,800	3,800	1,900
Freight and Operations	14,000		8,900	2,700	2,400
Planning and Environment	12,500		6,900	2,500	3,100
Policy	8,000		5,400	1,500	1,100
Innovative Program Delivery	2,500		1,000	1,500	
Exploratory Advanced Research	6,000		6,000		
Performance Management Data Support	5,000		3,500	1,500	
Surface Transp. Funding Alternatives (STSFA)	20,000				20,000
Corporate and Communications	7,500		5,000		2,500
Every Day Counts	8,000				8,000
State Transp. Innov. Council (STIC) Incentives	6,000				6,000
Accelerated Innov. Deployment (AID) Demos	10,000				10,000
Accelerating Market Readiness	3,500				3,500
Accelerated Deployment of Pavement Technologies (ADPT) (non-add) <sup>(2)</sup>	(12,000)				
Advanced Transp. and Congestion Management Program (ATCMTD) <sup>(1)</sup>	39,000				39,000
Small Business Innovation Research (SBIR) <sup>(3)</sup>	2,000		1,850	150	
<b>Intelligent Transportation Systems (ITS) <sup>(1)</sup></b>					
Connected Vehicles	25,000				
Automated Vehicles	8,000				
Emerging Technology	15,000				
Enterprise Data	5,400				
Interoperability	8,300				
Accelerating Deployment	15,300				
ATCMTD <sup>(1)</sup>	21,000				
SBIR <sup>(3)</sup>	2,000				
<b>Administrative Costs</b>	19,852		11,167	3,722	4,963
<b>TOTAL</b>	<b>312,352</b>		<b>154,917</b>	<b>24,972</b>	<b>132,463</b>

*Note: amounts are estimates only, subject to changing priorities, and do not reflect reductions due to annual obligation limitation, which is typically around 5%.*

*<sup>(1)</sup> The ATCMTD program is funded out of HRD (\$20M), TIDP (\$19M), and ITS (\$21M).*

*<sup>(2)</sup> The ADPT designation is funded out of the Pavement and Materials program and the AID Demos program.*

*<sup>(3)</sup> The SBIR program is funded out of two programs: HRD (\$2M) and ITS (\$2M).*

## FY 2018 RD&T Program Budget Request by Critical Transportation Topic Area

RD&T Program Name	FY 2018 Pres. Budget (\$000)	PROMOTING SAFETY (\$000)	IMPROVING MOBILITY (\$000)	IMPROVING INFRASTRUCTURE (\$000)	PRESERVING THE ENVIRONMENT (\$000)
<b>HRD and TIDP <sup>(1)</sup></b>					
Bridges and Structures	11,000	4,000	3,000	4,000	0
Pavement and Materials	12,000	2,000	2,000	4,000	4,000
Construction & Program Admin.	2,000	500	750	750	0
TPM	10,000	500	1,500	6,000	2,000
Safety	13,500	11,475	675	675	675
Freight and Operations	14,000	2,100	11,200		700
Planning and Environment	12,500	625	3,750	625	7,500
Policy	8,000	1,200	3,800	1,840	1,160
Innovative Program Delivery	2,500		500	2,000	0
Exploratory Advanced Research	6,000	2,000	1,500	2,000	500
Perf. Management Data Support	5,000		2,500	2,500	0
STSFA	20,000		20,000		0
Corporate and Communications	7,500	1,500	2,300	1,500	2,200
Every Day Counts	8,000	2,000	1,600	2,400	2,000
STIC Incentives	6,000	1,800	1,200	1,800	1,200
AID Demos	10,000	2,400	2,000	3,600	2,000
Accelerating Market Readiness	3,500	1,000	800	1,000	700
ADPT (non-add) <sup>(2)</sup>	(12,000)				0
ATCMTD <sup>(1)</sup>	39,000	6,700	10,700	9,900	11,700
SBIR <sup>(3)</sup>	2,000	500	1,000		500
<b>ITS <sup>(1)</sup></b>					
Connected Vehicles	25,000				
Automated Vehicles	8,000				
Emerging Technology	15,000				
Enterprise Data	5,400				
Interoperability	8,300				
Accelerating Deployment	15,300				
ATCMTD <sup>(1)</sup>	21,000				
SBIR <sup>(3)</sup>	2,000				
Administrative Costs	19,852	3,972	5,955	3,970	5,955
<b>TOTAL</b>	<b>312,352</b>	<b>83,908</b>	<b>108,662</b>	<b>54,256</b>	<b>65,526</b>

*Note: amounts are estimates only, subject to changing priorities, and do not reflect reductions due to annual obligation limitation, which is typically around 5%.*

*<sup>(1)</sup> The ATCMTD program is funded out of HRD (\$20M), TIDP (\$19M), and ITS (\$21M).*

*<sup>(2)</sup> The ADPT designation is funded out of the Pavement and Materials program and the AID Demos program.*

*<sup>(3)</sup> The SBIR program is funded out of two programs: HRD (\$2M) and ITS (\$2M).*

## **Bridges and Structures**

**\$11,000,000**

### **Program Description:**

The FHWA's bridge and structures R&D produces technologies and methodologies, guidelines and specifications for the design, construction, evaluation, assessment, and preservation of bridges, tunnels, culverts, geotechnical constructions (e.g., walls, slopes, cuts, and fills) and other highway structures (e.g., sign structures); and hydraulic engineering guidance; design and mitigation guidance for extreme events (e.g., hurricanes, flooding and scour); advanced materials and structural systems; technologies and methodologies for condition assessment and monitoring of highway structures; and data-driven performance management and preservation tools.

### **Program Objectives:**

- To improve the safety and durability, and extend the life of highway bridges and structures.
- To develop and deliver guidance, methodologies and technologies to improve the resilience of transportation infrastructure to natural and human-induced hazards.
- To advance new and innovative technologies to support more rapid, cost effective and sustainable construction of highway bridges and structures.
- Identify and quantify the interaction between infrastructure and emerging technologies such as Connected and Automated Vehicles (CAV)

### **Anticipated Program Activities:**

1. Bridge Hydraulics – Further improve the tools and guidance currently provided to predict and mitigate flooding and scour on all bridges over waterways and address sea-level rise, storm surge and tsunami effects on coastal bridges.
2. Geotechnical Engineering – Provide advances in the state of the practice in design, construction and performance of bridge foundations and geotechnical structures.
3. Bridges and Structures – Drive innovation in structural design, construction, and maintenance through the development of best practice guidance and novel solutions to present and emerging challenges in bridges, tunnels, and ancillary structures.
4. Extreme Events – Address hurricanes, floods, wind and other extreme events to improve the state of the practice and develop resilient and adaptable systems to mitigate the impact of such hazards on bridges and other structures.

### **Expected Program Outcomes:**

- Enhanced quality and durability of bridges, tunnels, and other highway structures.
- Improved highway performance under all conditions.
- Minimized impact of construction on traffic.
- Next generation building materials and applications for transportation infrastructure.

- Resilient infrastructure with minimal impact to livelihood, and economy following a hazard event.
- Highway infrastructure policies and practice and CAV technology implementations evolve and adapt in concert to maximize public benefit.

#### **FY 2018 Collaboration Partners (Internal USDOT)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
Bridges and Structures	<b>Federal Railroad Administration, National Highway Traffic Safety Administration, Maritime Administration, Federal Transit Administration on corrosion research.</b>

#### **FY 2018 Collaboration Partners (External)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (External)</b>
Bridges and Structures	<p><b>Oregon DOT</b> – Bridge weigh in motion</p> <p><b>NY State DOT, Alaska DOT, Caltrans, Washington State DOT, Oregon DOT</b> – Multi-hazard bridge design guidelines</p> <p><b>NY City DOT, Caltrans, Utah DOT</b> – Post hazard bridge assessment</p> <p><b>Virginia DOT</b> - corrosion research</p> <p>FHWA partners with 41 States through the Transportation Pooled Fund Program to conduct Bridges and Structures research</p>

#### **How does the Program meet statutory requirements?**

This program is authorized in sections 502 and 503 of title 23, United States Code, which require the Secretary to carry out highway research, development, and technology deployment activities covering a broad range of topic areas in order to improve highway safety, improve infrastructure integrity, strengthen transportation planning and environmental decision-making, reducing congestion, and enhancing freight productivity, among others.

#### **Describe how public and stakeholder input have been utilized in the development of this research program:**

The FHWA regularly engages in both formal and informal interactions with a variety of stakeholder groups including AASHTO, State DOTs and various industry groups.



## **Pavements and Materials**

**\$12,000,000**

### **Program Description:**

The FHWA is engaged in forward-looking research and development to improve the durability, economy, environmental sustainability and safety characteristics of highway pavements. This includes research and development addressing pavement structural design and analysis, pavement materials selection, evaluation and mixture design, work toward more sustainable pavement materials and practices, and pavement and materials specifications, construction and quality assurance practices.

### **Program Objectives:**

- Optimize pavement structural design to achieve a desired performance based on specific loading, environment and functional requirements.
- Optimize material selection, analysis and mixture design to achieve required performance characteristics.
- Improve the sustainability of highway pavements through effective use of reclaimed or recycled materials, industrial by-products, and innovative materials.
- Identify and quantify the interaction between infrastructure and emerging technologies such as CAV.

### **Anticipated Program Activities:**

1. Pavement Structural Design - Advance understanding and improvement of pavement Life Cycle Cost procedures, and improve design methods for pavement preservation, maintenance and rehabilitation.
2. Pavement Materials - Enhance and optimize mixture design, testing, and specifications that support pavement performance for mixtures using both virgin and recycled/reclaimed materials and industrial byproducts.
3. New and Innovative Materials - Explore the use of new and innovative materials and practices that minimize environmental impacts.

### **Expected Program Outcomes:**

- Highway agencies will have access to analytical tools and guidance to that support optimization of pavement structural design to achieve desired performance targets.
- Highway agencies will be able to select and design mixtures to achieve required performance characteristics.
- Highway pavements will be more sustainable.
- Highway infrastructure policies and practice and CAV technology implementations evolve and adapt in concert to maximize public benefit.

### FY 2018 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Pavement and Materials	<b>Federal Aviation Administration</b> on pavement materials, construction, and preservation.

### FY 2018 Collaboration Partners (External)

Program Name	Name of Collaboration Partner(s) (External)
Pavement & Materials	<p><b>Colorado DOT, Kansas DOT, Maine DOT, North Carolina DOT, Missouri DOT, Illinois Tollway Authority</b> – pavement performance related specifications</p> <p><b>Caltrans, Georgia DOT, Idaho DOT, Illinois DOT, Nevada DOT, New York DOT, Pennsylvania DOT, South Carolina DOT, Virginia DOT</b> – network level pavement structural evaluation</p> <p><b>Indiana DOT, Washington DOT, Texas DOT, Florida DOT</b> –continuous pavement friction and macrotexture measurement</p> <p><b>Texas DOT, Florida DOT, Utah DOT and New Jersey DOT</b> – porous graded asphalt</p> <p><b>Maine DOT and North Dakota DOT</b> – flooded pavement analysis</p> <p><b>NIST</b> - concrete &amp; alternative cementitious materials (ACM) research</p> <p><b>Army Corp of Engineers</b> - geotechnical research</p> <p><b>AASHTO and State Agencies</b> - asphalt, aggregate, and concrete research</p> <p><b>Oklahoma State University and Oregon State University</b> - concrete research</p> <p><b>Clarkson University</b> - concrete research</p> <p><b>ChemCrete</b> - Alternative Cementitious Materials research</p> <p><b>Swedish Road Authority</b> - asphalt research</p> <p><b>University of Cantabria (Spain)</b> - asphalt research</p>

	FHWA partners with 48 States plus Puerto Rico, through the Transportation Pooled Fund Program to conduct Pavement & Materials research
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### **How does the Program meet statutory requirements?**

This program is authorized in sections 502 and 503 of title 23, United States Code, which require the Secretary to carry out highway research, development, and technology deployment activities covering a broad range of topic areas in order to improve highway safety, improve infrastructure integrity, strengthen transportation planning and environmental decision-making, reducing congestion, and enhancing freight productivity, among others.

### **Describe how public and stakeholder input have been utilized in the development of this research program:**

The FHWA regularly engages in both formal and informal interactions with stakeholder groups including AASHTO and various industry groups. Additionally, FHWA has formed a number of expert task groups which include representatives from government agencies, academia and industry. These groups provide technical input as well as help FHWA carrying out technical work to facilitate deployment of pavement innovations.

## Construction and Program Administration

\$2,000,000

### Program Description:

The FHWA is working to advance construction, preservation and program administration technologies and practices that reduce onsite construction time, improve the quality of end product, and optimize investment of federal, state and local agency resources in providing effective oversight at all stages of the project delivery process. This includes work to advance automated construction technologies and e-construction, as well as development and delivery guidance concerning handling of utilities in the project right-of-way, alternative project delivery methods, risk-based stewardship and oversight, and design.

### Program Objectives:

To accelerate on-site phases of highway construction while improving as-constructed quality and enhance the overall effectiveness and efficiency of the Federal-Aid program.

### Anticipated Program Activities:

1. Construction – Further efforts to advance e-construction, construction automation and other technologies to accelerate and/or improve construction quality and performance-based construction standards.
2. Infrastructure Preservation – Further efforts to advance the timely and appropriate application of effective treatments to preserve infrastructure in a state of good repair.
3. Program Administration- Development and delivery of guidance and best practices to enhance the efficiency and effectiveness of federal investments in highway infrastructure, and risk-based stewardship and oversight.
4. Design – Development and delivery of guidance and best practices to advance performance-based practical design.

### Expected Program Outcomes:

- Accelerated project delivery
- Improved infrastructure quality
- More effective investment of federal resources in program stewardship and oversight
- More optimal investment of Federal-aid program funds

### FY 2018 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Construction and Program Administration	None

### FY 2018 Collaboration Partners (External)

Program Name	Name of Collaboration Partner(s) (External)
Construction & Program Administration	<p><b>AASHTO, Association of General Contractors (AGC), American Road and Transportation Builders Association (ARTBA)</b> – construction research coordination</p> <p><b>Colorado DOT, Montana DOT, Washington DOT, AASHTO</b> – index based cost estimation</p> <p><b>Wisconsin DOT, Virginia DOT, New York DOT, Utah DOT, Missouri DOT</b> – 3D models in construction case studies</p> <p><b>Pennsylvania DOT, Florida DOT, Texas DOT, Michigan DOT</b> – e-construction return on investment analysis</p> <p><b>Pennsylvania DOT, Caltrans, Minnesota DOT, Ontario Ministry of Transportation</b> – snow plow guidance system</p> <p><b>Transportation Research Board (TRB)</b> – Civil Integrated Management (CIM) coordination</p> <p>FHWA partners with 45 States through the Transportation Pooled Fund Program to conduct Construction and Program Administration research</p>

#### How does the Program meet statutory requirements?

This program is authorized in sections 502 and 503 of title 23, United States Code, which require the Secretary to carry out highway research, development, and technology deployment activities covering a broad range of topic areas in order to improve highway safety, improve infrastructure integrity, strengthen transportation planning and environmental decision-making, reducing congestion, and enhancing freight productivity, among others.

#### Describe how public and stakeholder input have been utilized in the development of this research program:

The FHWA receives stakeholder input through a variety of both formal and informal interactions with AASHTO Committees and various industry groups and considers the information received in developing its programs.

## **Transportation Performance Management (TPM)**

**\$10,000,000**

### **Program Description:**

The FHWA is working to advance implementation of the MAP-21 mandates, continued in the FAST Act, to implement Transportation Performance Management (TPM) and the supporting Asset Management requirements. This includes development and delivery of technologies, analytical tools, supporting guidance and training for FHWA, state and local agency personnel; and supporting communication and outreach efforts. In support of advancing the long-term effectiveness of TPM, FHWA is continuing research to advance the understanding of infrastructure performance through long term pavement and bridge performance research.

### **Program Objectives:**

FHWA's objective is to achieve and sustain effective implementation of TPM, and the supporting Asset Management requirements, toward improvement in the overall return on highway transportation investments.

### **Anticipated Program Activities:**

1. Implementation of Transportation Performance Management – FHWA will develop and deploy web-based analytical tools, and develop and deliver guidance, training and technical assistance to support state and local agencies in meeting the requirements of the Transportation Performance Management and Asset management rules.
2. Next Generation Inspection and Performance Measurement – FHWA will conduct research and development toward identification of improved infrastructure condition assessment technologies and performance measures for use in Transportation Performance Management.
3. Long Term Infrastructure Performance Programs – FHWA will continue the Long Term Pavement Performance (LTPP) and Long Term Bridge Performance (LTBP) Programs to advance understanding of infrastructure performance and provide the foundation for well-founded decisions concerning their management. By the end of 2018, FHWA will have established a fully integrated approach to managing and conducting these programs to enable economies in common data collection and management needs.

### **Expected Program Outcomes:**

- An increased capability for State DOTs and Metropolitan Planning Organizations (MPOs) to comply with new regulatory requirements.
- Enhanced understanding of infrastructure performance and the factors that affect it.
- Improved investment decision making focused on national goals and state and metropolitan performance targets.

- Increased transparency in the performance aspects of the Federal-aid Highway program.

#### **FY 2018 Collaboration Partners (Internal USDOT)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
Transportation Performance Management	<p><b>Federal Transit Administration, National Highway Traffic Safety Administration and Office of the Secretary of Transportation</b> regarding regulations.</p> <p><b>Federal Transit Administration and Office of the Secretary of Transportation</b> on the development of a web-based tool for viewing and analyzing data.</p>

#### **FY 2018 Collaboration Partners (External)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (External)</b>
Transportation Performance Management	<p><b>Maryland DOT, Washington DOT</b> – remaining service interval</p> <p><b>All States, AASHTO, State DOTs, Road Profile Users' Group, FWD User Group, National Asphalt Pavement Association (NAPA), Asphalt Institute, American Concrete Pavement Association (ACPA), and the National Center for Pavement Preservation</b> - the Long Term Pavement Performance Research</p> <p><b>National Academies Sciences/Transportation Research Board</b> - consensus input on the LTPP and LTBP Research</p> <p><b>National Steel Bridge Alliance (NSBA) and National Concrete Bridge Alliance (NCBC)</b> - Input into LTBP research activities</p> <p>FHWA partners with 19 States through the Transportation Pooled Fund Program to conduct Transportation Performance Management research</p>

#### **How does the Program meet statutory requirements?**

This program is authorized in sections 502 and 503 of title 23, United States Code, which require the Secretary to carry out highway research, development, and technology deployment activities covering a broad range of topic areas in order to improve highway safety, improve infrastructure integrity, strengthen transportation planning and

environmental decision-making, reducing congestion, and enhancing freight productivity, among others.



**Describe how public and stakeholder input have been utilized in the development of this research program:**

FHWA receives stakeholder input through a variety of both formal and informal interactions with AASHTO Committees and various industry groups and considers the information received in developing its programs. Stakeholder groups meet at least quarterly to share best practices and to receive feedback on implementation for both Transportation Performance Management (TPM Roundtable) and Asset Management (Transportation Asset Management Expert Task Group). A TRB-managed stakeholder group, the TRB Long Term Infrastructure Committee is used as a forum to obtain consensus stakeholder input to inform the management of the LTPP and LTBP programs.

## **Safety**

**\$13,500,000**

### **Program Description:**

The FHWA's safety research, development and technology program addresses the contributing factors of roadway deaths and injuries related to roadway design, construction, and maintenance. This program develops robust data analysis tools that enable transportation professionals to match crash causes with cost-effective countermeasures. With safety resources aimed at targeted safety problems, state and local agencies can deliver significant safety improvements to the public.

### **Program Objectives:**

- Reduce fatalities and serious injuries for all users on all public roadways
- Foster scientific, data driven approach to safety decision making
- Implement a performance driven Highway Safety Improvement Program

### **Anticipated Program Activities:**

1. **Data and Analysis:** Develop data analysis tools that can mine very large and diverse data sets like the Highway Safety Information System and available state safety data repositories in order to identify potential new safety countermeasures. Expand the Roadway Safety and Analysis Toolbox to include new analytical capabilities prioritized by the community of practice and the release of version 2 of the Highway Safety Manual. Refine geographic information system-based analyses that leverage the second Strategic Highway Research Program (SHRP2) Roadway Inventory Database to develop new safety countermeasures.
2. **Intersections:** Explore the potential for Connected Vehicle technology, and tests performed by other organizations, to interpret how intersection safety is improved through vehicle-to-infrastructure safety. Evaluate geometric and traffic control treatments at intersections that may enhance safety for pedestrians and bicycles, including retrofits to existing intersections and alternative intersection designs. Study the risk characteristics associated with motorcycle crashes at intersections, and document possible infrastructure-based strategies that may reduce these crashes. Develop tools that foster a performance-based approach to planning and designing intersections.
3. **Pedestrians/Bicyclists:** Determine the feasibility for developing Crash Modification Factors for Separated Bike Lane facilities along roadways through data gathering and analysis. Work with states and localities to conduct a field evaluation of novel retrofit approaches for pedestrians and bicyclists at intersections.
4. **Roadway Departure (RwD):** Apply the second SHRP2 Naturalistic Driving Study to develop predictions of when vehicles cross the center line to develop safety countermeasures of head-on crashes. Continued work with the states to develop low cost strategies and countermeasures to reduce the number and severity of RwD

crashes. Develop guidelines for states to reduce the number of tree related crashes by demonstrating crash dynamics of various roadside vegetation options.

5. **Connected Vehicles:** Leverage connected vehicle programs to extract potential safety benefits. Support the refinement of safety focused vehicle-to-infrastructure applications and testing.
6. **Human Factors:** Test and implement virtual reality tools for conducting human factors assessments of pedestrians and other vulnerable, non-motorized road users. Develop concepts for methods in which the Human Factors laboratories can connect with other simulators. Determine which concepts will enable scenario testing for many participants in remote locations to operate in the same virtual environment. Conduct testing to support Roadway Departure activities related to Older Users and Roadside Objects, and other support related to Automated Vehicle user acceptance.
7. **Highway Safety Improvement Program (HSIP):** Provide guidance to states on noteworthy practices for developing State HSIPs. Provide technical assistance and delivery of peer-to-peer exchanges among states to improve the practice of program development. Promote systemic approach to safety. Enhance the capabilities of the Roadway Safety Data Dashboard to increase value and to accommodate the data requirements for safety performance measures and to communicate with the HSIP online reporting tool.
8. **Local and Rural Roads:** Provide national leadership in identifying, developing, and delivering safety programs and products to agencies, elected officials, governments and other stakeholders to improve safety on local and rural roads. Develop and promote resources, such as guides and case studies, to address local and rural road safety needs. Promote the value of local and rural roads safety investment.

### **Expected Program Outcomes:**

- Better highway, intersection, roadside, pedestrian, and bicyclist safety design on all roads, guided by data driven safety analysis.
- Improved safety through reduction of crash frequency and severity.
- Prevention of crashes and attenuation of negative consequences of crashes that do occur.
- Improved safety through use and widespread deployment of new technologies, and training those deploying the technologies.
- Accelerated implementation and acceptance of new innovations and proven safety countermeasures.
- Human-centered countermeasures that apply Naturalistic Driving Study data of vehicle operators interacting with the roadway environment.

### FY 2018 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Connected Vehicle	<b>Federal Railroad Administration and Federal Motor Carrier Safety Administration</b> - collaborates on intelligent transportation systems R&D.
Human Factors	<p><b>National Highway Traffic Safety Administration</b> – Safety program staff evaluate Coordinated Automated Cruise Control applications.</p> <p><b>U.S. Department of Transportation’s Human Factors Coordinating Committee</b> – representatives from various modal agencies of DOT meet on a monthly basis to coordinate activities and provide updates on human factors projects.</p>
DOT Traffic Records Coordinating Committee (DOT TRCC) (associated with the Data and Analysis program activities)	<b>Federal Motor Carrier Safety Administration, National Highway Traffic Safety Administration (NHTSA), Office of the Secretary</b> - This multi-modal group works to improve the collection, management, and analysis of traffic safety data at the State and Federal level. FHWA’s Safety Performance Measures Management Final Rule (23 CFR 490) and NHTSA’s Uniform Procedures for State Highway Safety Grants Program Interim Final Rule (23 CFR 1300) establish a single, national definition for States to report serious injuries per the Model Minimum Uniform Crash Criteria (MMUCC) 4th Edition.
Pedestrians and Bicyclists	<b>National Highway Traffic Safety Administration and Federal Motor Carrier Safety Administration</b> – Active participants in a working group focused on reducing pedestrian and bicyclist fatalities.
Crashworthiness (associated with the Roadway Departure program activities)	<b>National Highway Traffic Safety Administration</b> - Collaborates on developing and conducting crash simulation models.
Speeding (associated with the Roadway Departure program activities)	<b>National Highway Traffic Safety Administration and Federal Motor Carrier Safety Administration</b> - The three agencies have an intermodal speed team that meets periodically to share project information and occasionally to more formally collaborate on joint projects.

### FY 2018 Collaboration Partners (External)

Program Name	Name of Collaboration Partner(s) (External)
All Safety Program Areas	<p><b>American Association of State Highway and Transportation Officials (AASHTO)</b> –Collaborates on research problem statements.</p> <p><b>Transportation Research Board</b> – Coordinates on research problem statements. Safety program staff participates on various safety related research projects and committees.</p> <p><b>National Association of County Engineers</b> – Collaborates on projects to address safety on local and rural roads.</p> <p>FHWA partners with 46 States and the District of Columbia through the Transportation Pooled Fund Program to conduct Safety research</p>

#### How does the Program meet statutory requirements?

This program is authorized in sections 502 and 503 of title 23, United States Code, which require the Secretary to carry out highway research, development, and technology deployment activities covering a broad range of topic areas in order to improve highway safety, improve infrastructure integrity, strengthen transportation planning and environmental decision-making, reducing congestion, and enhancing freight productivity, among others.

#### How does the Program incorporate public and stakeholder input into the research planning process?

FHWA seeks both formal and informal participation from a variety of stakeholder groups. The safety research, development and technology program collaborates with the AASHTO Standing Committee on Highway Traffic Safety (SCOHTS) and relies heavily on input and feedback from the State DOTs. This program conducts numerous training and outreach sessions throughout the country with stakeholders at the state and local level and engages stakeholder public agencies through pooled fund studies. Staff members are actively involved with TRB committees on safety related topics.

## Freight and Operations

\$14,000,000

### Program Description:

Highway reliability affects our ability to visit family, get to work, deliver products to customers, live our lives, and grow the economy. The FHWA's freight and operations research is developing innovative technology and processes that lead to system-wide improvements in how FHWA and its state and local partners and other stakeholders manage and increase the reliability of the National Highway System and the movement of people and goods throughout the transportation networks.

These innovations target the daily operations of transportation agencies and other stakeholders, and their planning for operations. Research areas include performance management, efficient goods movement that enable freight to move where and when it needs to go, active transportation and demand management strategies, guidance for transportation management for scheduled or unscheduled events, and improved traffic analysis techniques. Research into new technologies and noteworthy management practices provides state and local agencies and other operations and freight entities with additional tools to implement the institutional changes that will allow them to meet operational challenges.

### Program Objectives:

- To develop, test, and provide tools to decision-makers that enable more effective and sustained transportation systems management & operations (TSMO) actions and programs to improve regional transportation system safety, efficiency, reliability, and options for people & goods movement.
- To make highways safer and more efficient by reducing the impacts of the causes of congestion.
- To deploy technologies that support safer, more efficient, and improved people & goods movement.
- To lead towards automation in transportation through connected and automated vehicles research

### Anticipated Program Activities:

1. Organizing for Reliability - State action plans: develop and deliver tools, technical assistance, and training to state and regional transportation agencies to create and improve business processes for TSMO analysis, planning, and implementation.
2. Work zone management: Conduct and manage applied research to develop new approaches to work zone traffic control and work zone performance management.
3. Road weather / Special events / Emergency management: Develop implementation guides, tool kits, and training materials for road weather management, special events transportation management, and transportation agency responses to emergency events.

4. Traffic incident management: Develop and deliver tools to assist responders in all phases of traffic incident management to efficiently and safely address traffic incident response, management of traffic, and restoration of highway capacity.
5. Organizing / Planning for Operations / ITS: Develop next generation traffic management systems and models through researching specific technologies, including ITS, that can improve the performance of the system's services to support freight productivity and economic competitiveness of the United States.
6. Freight operations / technology: Provide products and technical assistance to improve freight movement, reduce freight-related congestion, evaluate impacts of vehicle size and weight on infrastructure & operations, address specific infrastructure challenges related to truck parking & mobility at intermodal facilities, and develop freight performance measurement & management systems
7. Connected / automated vehicle research: Conduct connected and automated vehicle research to develop and test applications and technologies to assess the impacts of connected/automated technology deployments on transportation and freight operations, and to understand the technologies' policy implications.
8. Operations and freight performance management and measurement (includes portion of travel time data purchase):
  - a. Advance performance measures and data to analyze the effectiveness of TSMO strategies and track progress toward meeting operations objectives
  - b. Continue acquisition and application of travel time data for operations and freight performance management and measurement by FHWA, the States, and MPOs.
9. Freight and traffic analysis tools: Develop and improve freight and traffic analysis tools such as Freight Analysis Framework (FAF).
10. Active transportation / demand management: Develop and deliver tools, technical assistance, and training to stakeholders in various aspects of active transportation and demand management, such as integrated corridor management, arterial systems, congestion pricing, and real-time information to improve the safety, reliability, and efficiency of moving people and goods.
11. Model Uniform Traffic Control Devices (MUTCD): Research related to traffic control devices and their applications as related to the MUTCD.
12. Communications / outreach: Communicate with stakeholders and outreach leveraging all methods and organizations, including the National Operations Center of Excellence.

### **Expected Program Outcomes:**

- Improved decision-making tools used by transportation entities to address congestion and its causes to improve traffic flow.
- Increased regional transportation collaboration and improved routine traffic operations across all facilities to provide more reliable travel experiences for all highway users.
- Decreased congestion and improved reliability during planned and unplanned disruptive events.

- Improved safety, security, efficiency, reliability, and resiliency of multimodal freight transportation through the use of innovation and advanced technology.
- Improved understanding by transportation entities of the potential use of connected and automated vehicle technologies to improve transportation operations.  
Improved short- and long-distance movement of goods.
- Improved flexibility of states to support multi-state corridor planning, and multi-state organizations to increase the ability of states to address multimodal freight connectivity.

### FY 2018 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Freight and Operations	<p><b>Federal Transit Administration</b> on programs with multimodal implications, such as Active Transportation and Demand Management and Integrated Corridor Management.</p> <p><b>National Highway Traffic Safety Administration, Office of the Secretary of Transportation, Federal Motor Carrier Safety Administration</b> on Connected and Automated Vehicle research and ITS research.</p> <p><b>Federal Railroad Administration</b> collaborates on intelligent transportation systems R&amp;D.</p> <p><b>Maritime Administration and Federal Railroad Administration</b> on improving the efficiency of intermodal freight connections.</p> <p><b>Maritime Administration and Federal Railroad Administration, Federal Aviation Administration and Bureau of Transportation Statistics</b> – regular teleconferences on emerging freight issues, major projects and events, and Office of the Secretary (OST) initiatives, including FAST Act implementation.</p> <p><b>Federal Motor Carrier Safety Administration</b> - Work zones, road weather, events management. and the impacts and implications to safety of trucks hauling longer, heavier and/or overweight loads.</p>



### FY 2019 Collaboration Partners (External)

Program Name	Name of Collaboration Partner(s) (External)
Freight and Operations	<b>Transportation Research Board</b> to identify research gaps and opportunities to share research results  <b>American Association of State Highway and Transportation Officials</b> (particularly through Vehicle-to-Infrastructure Coalition) engages stakeholders who identify operational problems and opportunities to work collaboratively to deploy innovative technologies and practices  <b>Department of Defense, Aberdeen Test Center</b> to develop test procedures for connected and automated vehicles

#### How does the Program meet statutory requirements?

This program is authorized in sections 502 and 503 of title 23, United States Code, which require the Secretary to carry out highway research, development, and technology deployment activities covering a broad range of topic areas in order to improve highway safety, improve infrastructure integrity, strengthen transportation planning and environmental decision-making, reducing congestion, and enhancing freight productivity, among others.

#### Describe how public and stakeholder input have been utilized in the development of this research program:

Operations and freight programs have developed internal and external stakeholder groups or leveraged stakeholder associations to engage the various transportation and program area communities and modal partners in gathering input through methods such as in-person meetings, peer exchanges, virtual meetings, or web-based events.

## **Planning and Environment**

**\$12,500,000**

### **Program Description:**

Professionals must consider the complex relationships among a variety of factors affecting individuals, communities, the economy, and the environment when advancing transportation projects. The FHWA's Office of Planning, Environment, and Realty research supports this work by assessing new programs, processes, and tools that produce better decisions, leading to improved outcomes.

The FHWA provides resources, technical assistance, proven processes, and data so States, MPOs and local agencies can perform effective project planning, environmental, and realty decision making. Enhanced coordination across disciplines leads to more efficient project delivery and better resource conservation. The result is a safer, more reliable, and accessible transportation system that is environmentally sound and responsive to the public's needs.

### **Program Objectives:**

To develop a better understanding of the complex relationship between surface transportation and the environment, and to promote more informed transportation decision making that improves transportation planning, programming, operations, and coordination.

### **Anticipated Program Activities:**

1. Planning - Focuses on providing quality data, analysis and information to transportation partners and decision-makers. This program develops and implements programs, and activities that advance and support comprehensive international, interstate, State, metropolitan, rural, regional, multi-modal, and tribal planning processes. Other planning research initiatives support the performance based planning process and linking planning data to the National Environmental Policy Act (NEPA) process, environmental justice and public engagement, transportation safety planning, forecasting transportation demand and system changes, smart growth, and transportation land use.
2. Air Quality and Highway Noise - Conducts comprehensive research to support the development and implementation of programs and activities including the Congestion Mitigation and Air Quality Improvement (CMAQ) program, transportation conformity, air quality analysis and assessment and highway traffic noise. Research activities include: advancing the practice of near-road air quality modeling applications and analysis, enhancements to the CMAQ public access system functions, and updating and supporting the Traffic Noise Model applications and guidance while exploring the potential of roadside structures and vegetation to reduce traffic related air quality and noise impacts.
3. Adaptation, Sustainability and Climate Change - Focuses on development and deployment of techniques, strategies and methodologies for greenhouse gas

reduction from surface transportation modes. The research products include enhancing tools and techniques for assessing the sustainability of transportation plans, projects and programs along with the development of tools and techniques to assess the vulnerability of transportation infrastructure to the effects of climate change and strategies to enhance resilience and reduce risk to climate and extreme weather events.

4. **Livability** - Develops and implements programs and activities to improve the human environment through the advancement of programs which consider human interaction with transportation systems. Research supports improving livability through funding activities that integrate community and transportation considerations. Research is done to promote pedestrian and bicycle networks, environmental justice, context sensitive solutions, and initiatives to support the integration of the human environment and community considerations with transportation planning and project development.
5. **National Highway Systems (NHS)** - Supports NHS that meets current and future travel needs; and supports national and regional economic competitiveness and economic development. The focus is on supporting a highway system that minimizes disruption and meets the environmental and economic needs of communities. Research is conducted to improve the official record of the NHS and to examine how the NHS meets travel needs for goods and people, and the economic development impacts of highways.
6. **Accelerating Project Delivery** - Seeks to improve decision-making that considers potential impacts on the human and natural environment while meeting the public's need for safe and efficient transportation improvements. This effort supports improving the National Environmental Policy Act environmental review process to accelerate project delivery. The FHWA works to improve the coordination and communication between Federal and State agencies, as well as the general public, to create efficiencies in project review. This program area supports work to accelerate project delivery through interagency collaboration, capacity building for environmental practitioners, integrating planning and environmental processes, and disseminating information about environmental programs and processes.
7. **Project Mitigation** - Focus is on accelerating project delivery while improving the environmental review processes. This program supports work to coordinate with resource agencies to develop tools to meet environmental laws and regulations in the Federal-aid highway program project delivery. The FHWA develops tools for natural resources and cultural resources analyses and activities, including programmatic approaches for project reviews and interagency coordination.
8. **Realty** - Seeks to increase the effectiveness and efficiency of acquisition and management of highway real property interests and real property appraisal practices. The Realty Office develops methodologies, technology, and systems to streamline right-of-way and outdoor advertising control activities. The research efforts focus on evaluating appraisal issues, encouraging local scale effectiveness and national scale relevance for the acquisition and management of highway real property interests; developing methodology, technology and systems appropriate for right of way agencies and advancing technological innovations of property management routines such as integrated database resources and internet access.

This is particularly important for outdoor advertising control and access management concerns. As part of the research effort, survey data may also be used in the program to gather input from relocates and others affected by realty activities.

### Expected Program Outcomes:

- Improved state of the practice regarding the impact of transportation on the environment.
- Improved sustainability of the highway infrastructure.
- Enhanced knowledge of strategies to improve transportation in rural areas and small communities.
- Improved pedestrian and bicycle networks that provide functional connections and transportation choices.
- Resources that ensure compliance with environmental justice and Title VI.
- Improved evidence-based highway decisions.
- Decreased congestion; improved environmental conditions.
- Improved planning, operation, and management of surface transportation systems and rights of way.
- Strengthened and advanced State, local, and tribal capabilities regarding surface transportation and the environment.
- Accelerated project delivery.
- Improved transportation decision-making and coordination across borders.
- Improved community connectivity.
- Carried out short and long-term sustainability initiatives.
- Minimized negative impacts from transportation investments on natural and human environment.

### FY 2018 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Air Quality Models	<b>Volpe National Transportation Systems Center</b> on R&D on the applications of emissions and air quality models on transportation.
Congestion Mitigation and Air Quality Improvement (CMAQ) Program	<b>Volpe National Transportation Systems Center, Federal Transit Administration</b> on research efforts to support the implementation of the CMAQ program including the completion of a set of cost-effectiveness tables to assist project sponsors in selecting projects for CMAQ fund, and the implementation of the CMAQ performance plan and measures. Development is underway of a tool to help project sponsors to calculate potential emissions benefits of CMAQ funded projects

Connected Vehicles and Autonomous Vehicles Research	<b>Federal Transit Administration</b> to disseminate information resulting from case studies and pilot programs to planning practitioners for the planning and future implementation of connected vehicles and autonomous vehicles.
Environmental Justice (EJ)	<b>Office of the Secretary of Transportation, Federal Transit Administration, Federal Railroad Administration, Federal Motor Carrier Safety Administration, Pipeline and Hazardous Materials Safety Administration, and Maritime Administration</b> on OST-led Environmental Justice (EJ) working group to support research and technology deployment related to EJ analysis in transportation planning and project development.
Pedestrian and Bicycle Activities	<b>Office of the Secretary of Transportation, Federal Transit Administration, Federal Railroad Administration, and National Highway Traffic Safety Administration</b> on OST-led Pedestrian and Bicycle Coordinating Committee and to support pedestrian and bicycle research and technical assistance. FHWA leads on topics related to infrastructure and programmatic topics; NHTSA leads for safety education. FHWA and NHTSA fund the Pedestrian and Bicycle Information Center.
Performance Based Planning and Programming – Report to Congress	<b>Federal Transit Administration and Volpe National Transportation Systems Center</b> to extract information from surveys, case studies, and review planning processes and products to determine the state of practice of performance based planning and programming and its effectiveness as a tool for guiding transportation investments at State DOTs and MPOs.
Rails-with-Trails	<b>Federal Railroad Administration, Federal Transit Administration, and National Highway Traffic Safety Administration</b> on Rails-with-Trails Effective Practices research to improve trail safety and accommodation along rail and transit corridors. FRA's Safety office and FHWA's Recreational Trails Program are funding the study through the Volpe Center.
Scenario Planning – Report to Congress	<b>Federal Transit Administration and Volpe National Transportation Systems Center</b> to extract information from surveys, case studies, and review planning processes and products to determine the status of implementation of

	scenario planning by MPOs including an assessment of the benefits and costs associated with scenario planning as part of developing the metropolitan transportation plan and the technical and financial capacity of the MPO needed to develop scenarios.
Health in Transportation	<b>Federal Transit Administration, National Highway Traffic Safety Administration, Office of the Secretary of Transportation, and Volpe National Transportation Systems Center</b> on the Health in Transportation Working Group to improve leadership and communications across the Department on issues related to transportation and health and to collaborate on research activities.
Climate Change, Planning and Environment	<b>Federal Transit Administration, Federal Railroad Administration, Maritime Administration and the Office of the Secretary (research) and the Center for Climate Change and Environmental Forecasting</b> on planning and environmental work.
Highway Noise	<b>Volpe National Transportation Systems Center</b> on R&D on the noise emissions and support for TNM 3.0 development.
Sustainability	<b>Volpe National Transportation Systems Center</b> on developing tools and methods to enhance the sustainability of transportation decision-making.

### FY 2018 Collaboration Partners (External)

Program Name	Name of Collaboration Partner(s) (External)
Environmental Justice	<b>Environmental Protection Agency, Department of Housing and Urban Development, and Transportation Research Board</b> to support research and technology deployment related to environmental justice and community impact assessment in transportation planning and project development.
National Highway Systems	<b>DOD's Military Surface Deployment and Distribution Command Transportation Engineering Agency (SDDCTEA)</b> on maintaining the Strategic Highway Network designation.

National Highway Systems	<b>American Association of State Highway and Transportation Officials</b> – on implementing Strategic Highway Research Program 2 (SHRP2) economic development products as part of the EconWorks effort.
National Highway Systems	<b>Transportation Research Board</b> – on joint areas of interest with the TRB Committee on Transportation and Economic Development, including the periodic International Transportation and Economic Development conference.
Near Road Dispersion Modeling Enhancements	<b>Environmental Protection Agency</b> on evaluating the state of practice to model the impacts of traffic emissions on near road air quality impacts. The objective of the collaboration is to assess the current capabilities of dispersion models to accurately predict near road air quality and identify appropriate enhancements.
Pedestrian and Bicycle Activities	<b>American Association of State Highway and Transportation Officials, National Association of City Transportation Officials and Transportation Research Board</b> to support the identification of future pedestrian and bicycle research needs.
Sustainability	<b>Arizona DOT, Atlanta Regional Commission MPO, MetroPlan Orlando MPO, North Central Texas Council of Governments, Pennsylvania DOT, St. Joseph Area (MO) Transportation Study Organization, and Tennessee DOT</b> on sustainability tool implementation and deployment.
Planning and Environment	FHWA partners with 30 States and the District of Columbia through the Transportation Pooled Fund Program to conduct Planning and Environment research

### How does the Program meet statutory requirements?

This program is authorized in sections 502 and 503 of title 23, United States Code, which require the Secretary to carry out highway research, development, and technology deployment activities covering a broad range of topic areas in order to improve highway safety, improve infrastructure integrity, strengthen transportation planning and environmental decision-making, reducing congestion, and enhancing freight productivity, among others.

## **How does the Program incorporate public and stakeholder input into the research planning process?**

FHWA seeks input from the general public and stakeholders on a regular basis, through their participation in conferences, meetings, peer exchanges and webinars. A variety of input and opportunities for collaboration arise for all these research program areas.

Advice and input is routinely solicited from Federal agencies, State and local governments, and transportation and environmental stakeholders. The FHWA also seeks input from division specialists, State and local transportation agencies, potential vendors and other stakeholders. The FHWA makes an effort to leverage funds for research programs by seeking input and resources from potential funding partners on collaborative research opportunities.

There are numerous Federal agencies with a strong interest in transportation planning including: Housing and Urban Development, the Environmental Protection Agency and the Centers for Disease Control and Prevention. Within the USDOT, FHWA partners with the Federal Transit Administration, Federal Railroad Administration, Maritime Administration and the Office of the Secretary (research) and the Center for Climate Change and Environmental Forecasting on planning and environmental work. Other stakeholders include the Association of Metropolitan Planning Organizations, AASHTO, and TRB.



## **Policy**

**\$8,000,000**

### **Program Description:**

Policy decisions made today will shape the highway transportation system of tomorrow. FHWA's policy research program focuses on a) analyzing current and emerging issues in the context of broad policy options that will affect the way transportation systems are built, maintained, and used and b) collecting and disseminating national transportation data for the entire transportation community and c) developing new analytical tools and procedures which support informed analysis and decision making on policy needs, alternatives, and outcomes.

Understanding transportation needs and the effects of proposed legislation and policy decisions requires a foundation of quality transportation knowledge and information. The FHWA policy research program aggregates and analyzes transportation data to support policy development and evaluation, informed planning and performance measurement. Data and information are also used to support an improved understanding of the characteristics, distribution, and level of travel demand for proactive transportation planning and investment.

By improving the understanding of transportation trends, FHWA helps its stakeholders and partners identify future transportation needs. The FHWA's policy research program develops and evaluates policy options and strategies to address emerging transportation challenges and opportunities. The research program also refines and updates current methods and tools to evaluate the performance, cost-effectiveness, and societal and economic impacts of highway infrastructure investments and options for delivering and funding these investments. Through policy research studies that explore transportation topics pertinent to state, local, and tribal governments, the FHWA helps these entities identify and cooperatively address issues that may have budgetary and legislative implications. The FHWA also promotes interagency collaboration and the sharing of program innovations by facilitating information exchanges between the United States, other countries, and international organizations.

### **Program Objectives:**

The primary objectives of the FHWA policy research program are to:

- Identify and evaluate current and emerging issues that will affect surface transportation performance.
- Identify and evaluate broad policy gaps, alternatives, and outcomes in the context of changing transportation revenue, investment needs, supply, and demand.
- Facilitate development and implementation of FHWA's strategic goals and objectives in light of emerging risks and opportunities.
- Collect and process comprehensive national highway transportation data
- Promote data sharing, and utilization among states and MPOs to improve highway management and investment decisions;

- Research intergovernmental issues between states, cities, and tribal governments that impact transportation policy decisions, budgetary processes, and legislative recommendations; and
- Promote the exchange of highway technology and program innovations between the United States and foreign countries and organizations.

### **Anticipated Program Activities:**

#### **1. International Programs**

The FHWA's Office of International Programs (OIP) leads agency efforts to keep up with international highway technologies and practices. The office promotes knowledge exchange by leveraging partnerships, and establishing and managing cooperative arrangements with other government agencies and professional organizations worldwide. These efforts help provide direction for U.S. collaboration on highway research and practice and broaden the depth of knowledge in given priority areas. OIP efforts address areas of national significance that deliver a clear public benefit (to the U.S.), tackle current or emerging needs, seek to fill gaps in research, and focus on priorities of FHWA and the U.S. transportation community.

Planned activities include:

- Global Benchmarking Program (GBP): Conduct a GBP study to obtain information on proven foreign highway innovations with the prospect of successful application in the U.S.; additionally, information collection on specific innovative technologies and practices of high interest to the agency.
- World Road Association (WRA): Support the FHWA Executive Director's participation in WRA; translation of National Reports for the WRA 2019 Congress; supplemental contribution in the development of the Road Safety and Road Network Operations/Intelligent Transportation Systems Manuals.
- Brazil- Professional exchanges on funding financing projects.
- Korea: Joint Geo-hazards and resiliency to extreme weather project(s) engineering assessments, in accord with established work plan.
- Sweden: Professional exchanges on urban freight/livability issues (as follow-up to a successful TRB workshop), in cooperation with the Office of Environment, Planning, and Realty (HEP) and the Office of Safety (HSA).
- Netherlands: Professional exchanges on Infrastructure Resilience pilot projects and the use of bicycles.
- Innovation: International workshop on funding financing; and subsequent report on the workshop's outcomes.
- Japan: US-Japan Bridge workshop will be conducted, continuation of a successful annual activity that has been ongoing for 30+ years. Specific topics are yet to be determined.

#### **2. Legislative Analysis and Policy Communications**

This program focuses on legislative analysis, highway authorization, and intergovernmental relationships. Planned activities include support for National Tribal Transportation Conference, and support for an electronic congressional database service to facilitate the identification of emerging legislative issues.

### 3. National Transportation Data Collection, Reporting and Processing

This program covers the collection of motor vehicle registration, licensed drivers, fuel, travel and traffic condition and behavior, truck weight, pavement condition, roadway inventory, finance, and fuel taxation on a regular basis. These data provide the needed information for FHWA/USDOT to assess investment needs and administer the Federal-aid highway program. In addition, these data serve as the foundation for the entire transportation community.

### 4. Data Collection Methods, Processing Techniques, and Guidance

This program focuses on: 1) ensuring data methods and data are consistent among all State DOTs where data can be compared and contrasted for national trend and program usage, 2) modifying procedures, methods, and practices for data collection and processing as a result of needs change, technology changes, industry practice advancement, and budget changes, and 3) developing new processes and procedures to support emerging needs, such as multimodal travel behavior and long distance travel.

### 5. Comprehensive Utilization of National Transportation Data

This program is to ensure all collected raw data can be easily and readily linked, used and interpreted. Focus areas include: 1) compiling data in an effective manner ensuring timeliness release, 2) developing value added data through data modeling techniques, 3) forecasting future trends on key parameters such as travel demand (miles and hours), fuel consumption and others, 4) integrating data and providing effective visualization tools.

### 6. Impact of Investment on Transportation Performance & the Economy

This program focuses on assessing the relationship between highway investment and current and future conditions and performance of the Nation's highways and bridges, as well as the impact of such investment on the broader national economy. This program: 1) Supports decisions concerning current and future highway capital investments at all levels of government by developing and utilizing engineering/economics models and related tools to assess current and future conditions and performance of the Nation's highways and bridges; 2) Provides insights to decision makers about the contributions of highway capital spending and infrastructure investments to the economy and private sector economic performance; 3) Communicates research results to our stakeholders and customers via mechanisms such as the joint FHWA/FTA biennial "Status of the Nation's Highways, Bridges and Transit: Conditions and Performance" report to Congress (C&P report), white papers, and issue briefs.

### 7. Policy Studies, Analysis and Outreach

The Policy Studies, Analysis and Outreach program provides corporate strategic planning and research on current and emerging issues as they relate to national transportation policy. Research conducted includes quantitative analysis, policy evaluations, and the application of analytic models to assess the relationship between changes in social, demographic, economic, and technological trends on the characteristics, distribution, and level of travel demand. Key components of this program include: 1) Strategic and performance-based planning and management through corporate risk assessment, strategic planning, implementation and outcome/performance measurement and dashboard reporting and managerial accounting practices, 2) Qualitative and quantitative analysis to assess policy gaps, alternatives and outcomes in the context of emerging socio-demographic, economic, technological and geographic trends and changes in travel demand, preferences, and needs; 3) Development of analytical tools and related products to quantify the relationship between existing and proposed policy and benefits and costs to transportation programs, system users, and infrastructure; 4) Identification and assessment of current and potential revenue sources for transportation investments; and (5) Evaluation of the alignment of current policies, programs, and practices with future transportation needs and opportunities and identifying options for addressing any significant barriers, gaps, or inefficiencies.

### **Expected Program Outcomes:**

Expected outcomes of the FHWA policy research program include:

- Expedited information delivery for timely policy decisions to address current transportation issues.
- Expanded U.S. knowledge base for improved decision-making tools.
- Enhanced foreign knowledge of U.S. technologies and products.
- Improved international collaboration.
- Improved decision tools and context for Federal, State, and local policymakers.
- Proactive planning and policy making for emerging transportation technologies, users, and use.
- Improved understanding of travel trends, travel behavior, and travel demand - past, present, and future.
- Improved understanding of the impact of transportation investments on transportation performance, the economy, and society; as well as options for selecting, paying for, and delivering transportation investments.
- Opportunity for FHWA and other policy decision-makers to explore emerging policy needs and options.
- Meaningful guidance for state agencies and the communities on how data can be collected, processed, and reported ensuring consistency and comparability crossing jurisdictional lines.
- Ensured data availability for the Federal-aid program including apportionment and performance management.
- Delivery of the 23rd edition of the biennial Conditions & Performance Report to the Congress.

- Delivery of an FHWA Strategic Plan; an update to the 2018/2019 Strategic Implementation Plan (SIP); and quarterly and annual performance reports to FHWA and USDOT leadership.
- Delivery of a range of policy studies and symposia.
- Delivery of the 2016/2017 national travel behavior data (why, how and when we travel).

### FY 2018 Collaboration Partners (Internal USDOT)

<b><u>Program Name</u></b>	<b><u>Name of Collaboration Partner(s)</u> <u>(Internal USDOT)</u></b>
Impact of Investment on Transportation Performance & the Economy	<b>Federal Transit Administration</b> –FHWA and FTA staff meet weekly to coordinate the planning and writing of a key joint product of the research program, the biennial “Status of the Nation’s Highways, Bridges and Transit: Conditions and Performance” report to Congress (C&P report).
Impact of Investment on Transportation Performance & the Economy	<b>Volpe National Transportation Systems Center</b> –economists at the Volpe Center conduct R&D for FHWA relating to the ongoing development of the Highway Economic Requirements System (HERS) and the customized highway-oriented version of the United States General Equilibrium Model (USAGE-Hwy).
Policy Studies, Analysis and Outreach – Transportation Policy Symposia	<b>Office of the Secretary</b> – FHWA and OST collaborate to bring together internal and external stakeholders to discuss transportation policy and performance in the context of salient transportation issues.
Future Travel Demand Forecasting	<b>Volpe National Transportation Systems Center</b> – FHWA and VOLPE staff has been working in a close team fashion in developing both a national and state level vehicle mile travelled models to project future travel demand as a result of future social, economic, and demographic changes. In addition, the team is also actively engaged in developing a travel time estimate model for the entire nation. The result of the research has been filling this national data and information gap in understanding national travel demand.
Global Technology Exchange Program	<b>OST, FMCSA, FTA, NHTSA</b> : Participate in development and implementation of work plans, through both remote/virtual means and occasional in person activities.
International Travel	<b>OST</b> : Collaboration on the approval processes

International Visitors Program	<b>OST, FRA, NHTSA, FTA:</b> Infrequent participation in presentations to foreign visitors in instances where the topics requested call for it.
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### FY 2018 Collaboration Partners (External)

<b><u>Program Name</u></b>	<b><u>Name of Collaboration Partner(s)</u> <u>(External)</u></b>
Policy Studies, Analysis and Outreach – Transportation Policy Symposiums	<b>Transportation Research Board</b> – FHWA and TRB are partnering to conduct an expert symposium on emerging trends in transportation with a focus on industry, worker, and job trends and changing transportation system needs.
National Transportation Data Collection	<b>State DOTs and MPOs</b> – FHWA partners with several State DOTs and MPOs in the collection of household travel data for the national household travel survey. This program and collaboration maximized the utility of the information collected and supports analysis across states, regions, as well as national comparisons.
Global Technology Exchange Program	<b>Foreign Ministries of Transport and related official entities, European Commission , foreign embassies, industry/professional associations, other Federal agencies, academia, TRB:</b> Participate in and collaboration on development and implementation of work plans, through both remote/virtual means and occasional in person activities.
World Road Association	<b>AASHTO, TRB:</b> Participate in and collaboration on development of strategies and participation in technical aspects of US participation in WRA.  <b>Foreign Ministries of Transport and related official entities, International financial institutions, other international road associations:</b> collaboration related to development of management and technical aspects of the WRA.
Global Benchmarking Program	<b>AASHTO, State DOTs:</b> Participate in studies, exchanges with foreign experts and follow on implementation of key findings.  Foreign points of contact in counterpart agencies—provide information and expertise and meet with US representatives in response to focused inquiries from US.

International Travel	<b>US Department of State:</b> Country clearances and occasional coordination for delegations where US Embassies are participating. Infrequent coordination with other US Federal agencies when joint participation in activities is called for. Foreign governments regarding details of travel itineraries/arrangements.
International Visitors Program	<b>Foreign entities</b> who request visits to FHWA, governmental, academic and private sector.
Policy Research	FHWA partners with 28 States through the Transportation Pooled Fund Program to conduct Policy research

### **How does the Program meet statutory requirements?**

This program is authorized in sections 502 and 503 of title 23, United States Code, which require the Secretary to carry out highway research, development, and technology deployment activities covering a broad range of topic areas in order to improve highway safety, improve infrastructure integrity, strengthen transportation planning and environmental decision-making, reducing congestion, and enhancing freight productivity, among others. The Infrastructure Investment Needs Report is a requirement under section 503(b)(8) of title 23, United States Code.

### **Describe how public and stakeholder input have been utilized in the development of this research program:**

The FHWA's Office of International Programs coordinates the international research planning process within the USDOT, involving FHWA program offices, other operating administrations, and OST to ensure that the agency's international work supports USDOT and FHWA priorities. Direct coordination with other federal agencies and state, academic, and private sector partners garners support and buy-in for the efforts.

The FHWA's Office of Highway Policy Information works directly with state highway agencies, MPOs, and local governmental agencies to identify data-related issues and challenges. In addition, the office conducts a monthly webinar on issues related to data and information where all interested parties throughout the community are invited to present and participate with the goal of sharing innovation and knowledge, identifying both long term and short terms issues to resolve. The office is also actively working with various TRB committees to identify issues and challenges and solutions. Internally within USDOT, the office conducts periodic discussions and briefings with other offices and modes to ensure concerns are addressed.

The FHWA's Office of Transportation Policy Studies sponsors workshops and symposia with external transportation policy and research organizations, to identify emerging policy issues warranting future research. The Office also convenes technical review panels to

comment on analytical tools developed in support of policy research efforts, and to recommend potential future research to enhance them.



## **Innovative Program Delivery**

**\$2,500,000**

### **Program Description:**

Innovative Program Delivery provides training, tools, and expertise in innovative finance that support the transportation community's exploration and implementation of innovative financial, procurement and project management strategies to deliver costly and complex infrastructure projects. FHWA's efforts in this area are primarily led by the Center for Innovative Finance Support (CIFS). CIFS's research and technology deployment efforts focus on revenue generation (tolling), procurement (public-private partnerships), and innovative finance (GARVEEs and SIBs). Support for our partners include (1) capacity building and outreach, (2) technical assistance for project implementation, and (3) technical resources, guidebooks, and analytical tools.

### **Program Objectives:**

- Conduct research in the areas of financial stewardship and innovative finance.
- Support innovative financing approaches that promote efficient, accelerated project delivery.
- Develop innovative procurement and revenue generation tools and technical resources.
- Build technical expertise at the federal, state and local levels in the use and stewardship of innovative finance methods and programs.

### **Anticipated Program Activities:**

1. Researching public policy issues in Public-Private Partnerships (P3) program administration, e.g., best practices in the public procurement of a private partner to design, build, finance, operate and maintain a facility under a long-term concession.
2. Training public sponsors to apply Value for Money analysis that incorporates benefit-cost principles, using FHWA's P3-VALUE 2.0 as the educational platform
3. Providing ongoing capacity building opportunities to state and local project finance partners.
4. Research how FHWA right-of-way laws can support value capture opportunities to rebuild aging highways and support communities.

Each of these activities will require extensive collaboration with other USDOT operating administrations, coordinated through the Office of the Secretary's Build America Bureau as authorized in the FAST Act. The principles of P3 project delivery and innovative finance apply across multiple transportation modes, and FHWA's research will be valuable to organizations throughout the USDOT.

External partners have a substantial stake and interest in this research. In previous years, FHWA research projects such as the P3 Model Contract Guide and the P3 Best Practices

Report required extensive collaboration with the private transportation industry and elicited wide-ranging public comment from stakeholders.

### **Expected Program Outcomes:**

The IPD research program seeks the following short-term outcomes:

- To provide the U.S. transportation community with the most complete, up-to-date body of knowledge on P3s.
- To improve awareness of innovative finance opportunities and challenges.
- To improve the statutory and policy framework enabling and supporting P3s, innovative finance and tolling.
- To increase consideration of the P3 delivery option for major projects.
- To support the accrual of P3 knowledge by industry practitioners and advisors in the areas of planning/evaluation, procurement, and monitoring/oversight.

The IPD research program seeks the following medium-to-long-term outcomes:

- An improved environment for P3 use within states (i.e., new or expanded P3 policy or support programs).
- Greater consideration among states of alternative project revenue options such as user fees and value capture.
- Improved P3 and innovative finance decision-making capabilities.
- Better alignment of the P3 delivery option with appropriate transportation projects.

### **FY 2018 Collaboration Partners (Internal USDOT)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
Innovative Program Delivery	<b>Office of the Secretary of Transportation</b> – provide research products to the Office of the Secretary’s Build America Bureau which include a multimodal perspective. Collaborate with the Bureau to update the Center’s various web resources to reflect a multimodal perspective.

### **FY 2018 Collaboration Partners (External)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (External)</b>
Innovative Program Delivery	<b>American Association of State Highway and Transportation Officials (AASHTO)</b> –AASHTO members review CIFS research products to provide the public owners’ real-world perspective on the challenges and opportunities of P3s.

	<p><b>American Road and Transportation Builders Association (ARTBA), Public Private Partnership (P3) Division</b> – Members of the ARTBA P3 Division include construction and legal firms that participate extensively in the US market. Similar to how it uses the public owners represented by AASHTO, the CIFS uses this industry group to review research products and provide real-world perspective from the private side.</p> <p>FHWA partners with 15 States through the Transportation Pooled Fund Program to conduct Innovative Program Delivery research</p>
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### **How does the Program meet statutory requirements?**

This program is authorized in sections 502 and 503 of title 23, United States Code, which require the Secretary to carry out highway research, development, and technology deployment activities covering a broad range of topic areas in order to improve highway safety, improve infrastructure integrity, strengthen transportation planning and environmental decision-making, reducing congestion, and enhancing freight productivity, among others.

### **Describe how public and stakeholder input have been utilized in the development of this research program:**

Public and stakeholder input is central to the research planning process. The CIFS Research Roadmap is directly shaped by stakeholder focus groups and regular discussions with research interests such as the TRB Revenue and Finance Committee. This stakeholder input continually helps to refine and update the research agenda.

## **Exploratory Advanced Research**

**6,000,000**

### **Program Description:**

The Exploratory Advanced Research program (EAR) conducts higher-risk, longer-term research with the potential for dramatic breakthroughs in surface transportation.

### **Program Objectives:**

To develop potentially transformational solutions to improve the durability, efficiency, environmental impact, productivity, and safety aspects of highway and intermodal transportation systems.

### **Anticipated Program Activities:**

Current Areas of Interest include:

1. Connected Highway and Vehicle System Concepts —This focus area emphasizes the longer term needs to reach critical FHWA safety and mobility goals by developing the theory for and assessing the feasibility of systems that leapfrog current technological approaches for linking infrastructure with future vehicle and personal mobility technology.
2. Breakthrough Concepts in Material Science —This focus area leverages new approaches in materials science to produce innovative new highway materials with characteristics that enable enhanced functionality (including multi functionality), constructability, sustainability, cost effectiveness or operating characteristics of highway infrastructure and system monitoring sensors to enhance highway safety, reliability, and resilience.
3. Human Behavior and Travel Choices —This focus area leverages research concepts from the social sciences, including psychology and economics, along with more traditional research for improving safety, reducing congestion, and improving the livability of the Nation's communities.
4. Technology for Assessing Performance — This focus area seeks novel approaches and breakthrough technology that will revolutionize the use of performance management in the highway sector.
5. New Technology and Advanced Policies for Energy and Resource Conservation — This focus area cuts across infrastructure, operations, and societal and complex natural systems that support innovative methods for reducing highway industry costs and move toward sustainability.

### **Expected Program Outcomes:**

- Potential breakthrough solutions in all areas of highway transportation.
- Improvements in planning, building, renewing, and operating safe, congestion-free, and environmentally sound transportation facilities.
- Follow-on research topic areas resulting from exploratory research projects.

### FY 2018 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Exploratory Advanced Research	<p><b>Federal Motor Carrier Safety Administration, Federal Transit Administration, and National Highway Traffic Safety Administration</b> in the area of connected highway and vehicle systems concepts with.</p> <p><b>Bureau of Transportation Statistics, Federal Motor Carrier Safety Administration, Federal Railroad Administration, and Pipeline and Hazardous Materials Safety Administration</b> for research in the area of Human Behavior and Travel Choices on long distance freight and passenger travel.</p>

### FY 2018 Collaboration Partners (External)

Program Name	Name of Collaboration Partner(s) (External)
Exploratory Advanced Research	<p><b>US Department of Defense, US Department of Energy, National Institute of Standards and Technology (NIST), University Transportation Centers (UTCs), State DOTs, and industry</b> in the areas of data analytics and simulation.</p>

#### How does the Program meet statutory requirements?

This program is authorized in section 503(b)(6) of title 23, United States Code.

#### Describe how public and stakeholder input have been utilized in the development of this research program:

Broad scientific participation and extensive coverage of advanced ideas and new technologies are secured by engaging stakeholders throughout the EAR program's processes – not only in identifying and scoping topics, but also in ensuring the technical quality of sponsored research through expert panels and in communicating research results.

## Performance Management Data Support

5,000,000

### Program Description:

Per the FAST Act, up to \$10 million for each of FYs 2016 through 2020 may be used to carry out this program. This initiative will develop, use, and maintain data sets and data analysis tools to assist metropolitan planning organizations, States, and the FHWA in carrying out performance management analyses.

### Program Objectives:

To improve data collection for performance analysis by enhancing existing data systems and tools, collecting missing data, and developing and implementing new methods for data analysis and visualization.

### Anticipated Program Activities:

*Note: many of the activities outlined below are provisionally planned, subject to funding availability or allocation to this program beyond currently budgeted amount.*

1. Probe data and analytics: Provides uniform and consistent national freight and passenger vehicle probe based travel time data set to State DOTs and MPOs for use in performance management, planning, and national performance measures purposes.
2. Performance Management: This system and suite of tools focus on performance management of the Federal-aid system and include:
  - a. National Performance Reporting System - will provide access to data, performance outcomes, and progress reports at a local, regional, and national level on a publicly available website. The information on the site is envisioned to be used by State DOTs and MPOs to review performance trends across the country and by industry associations and advocacy groups interested in analyzing and understanding the performance of the system and changes in its performance over time.
  - b. State Performance Reporting Tool – to be used by State DOTs in generating a performance report that is required to be submitted to FHWA on a biennial basis. This report will document performance trends and progress they have made toward the achievement of targets.
  - c. Performance Analysis Tools - for use by State DOTs and MPOs to analyze trends, understand investment impacts to performance outcomes, and to develop targets of future performance related to the MAP-21 National Performance Measures. These may include tools and data to support the evaluation of investment strategies, cost benefit or cost effectiveness analysis, congestion analysis, and bridge and pavement impacts.
  - d. Performance Management System - an internal system to assist States and MPOs in the evaluation of performance and in the setting of targets for the National Highway Performance Program and the Highway Safety

Improvement Program and to assess progress in applying performance-based principles to planning and programming decision making.

3. Travel behavior data: This data provides the why, when, and how we travel. The behavior data will cover both long distance crossing jurisdictional and state boundary travel, and local commuting travel. The data will provide travel behavior information for states and MPOs to improve their modeling and simulation capacity in assessing multimodal future travel needs, offering external-to-internal, external-to-external, and internal-to-external travel data. The FHWA's current National Household Travel Survey (NHTS) lacks coverage on long distance travel and it has no fixed data collection schedule. Past cycles were ranged from 5 years to more than 8 years. The new plan is to enhance the current NHTS data collection in a timelier manner and adding the interregional long distance component to the overall behavior data. In addition, new on-line data analytics will be developed and deployed for public to access and analyze behavior data.
4. Freight Analysis Tools and Auxiliary Data: These tools and data provide States and MPOs assistance in analyzing projects for MAP-21 and FAST freight opportunities and project planning and performance measurement requirements, completing the analytical elements of the State Freight Plans, undertaking performance management and system planning, and in determining and designating freight corridors to be part of the freight network. These include:
  - a. FAF - integrates data from a variety of sources to create a comprehensive picture of freight movement among states and major metropolitan areas by all modes of transportation. FAF is used by State DOTs and MPOs in development of Freight and Long Range Transportation Plans, as well as a key input for a variety of specialized freight studies. Developing the next generation FAF is critical for states and regions to understand their major trading partners with the volumes and sources of through traffic at a corridor level.
  - b. Fluidity Analysis and Supply Chain and Cost Surveys - Suite of data and analytical tools that will provide information on multi-modal freight trip performance, costs of freight transportation (one of the most commonly requested data sets of FHWA from States and MPOs) and information on key regional and national supply chains that impact particular States.
  - c. Domestic Transport of International Trade - will provide State DOTs, MPOs and USDOT with an understanding of transportation movement for the domestic freight movement leg of imports and exports - current data does not provide this information.
5. Highway Policy Information Data and Analytical Tools: These data are used in the development of highway legislation at both the federal and state levels. These data are also used in preparing legislatively required reports to Congress; determining current and future highway system conditions and performance; calculating and evaluating Federal-aid apportionments; keeping the federal and state governments informed; and in general, as an aid to highway planning, programming, budgeting, forecasting, and fiscal management. The Highway Policy Information data programs include:



- a. Traffic Monitoring and Analysis System (TMAS) – TMAS collects traffic volume data on a monthly basis. TMAS is also the system that produces the Monthly Traffic Volume Trend (TVT) report where vehicle mile travelled is being analyzed and published. The TVT is the most sought after publication among all FHWA publications.
- b. Highway Performance and Monitoring System (HPMS) – HPMS collects roadway inventory, travel, and pavement data on an annual basis. HPMS data is the foundation for Federal-aid apportionment, safety analysis, pavement condition analysis, freight analysis, financial analysis, and performance management.
- c. Motor Fuels and Financial Analysis System for Highways (Fuels & FASH) – FASH is a system collects and analyzes finance (federal, state and local) and fuel consumption data. While the finance side of the system performs annual data collection, fuel subsystem performs monthly data capturing duties. The system also handles driver license, vehicle registration, and other 500 Series data.
- d. Data Portal (Fuels & FASH v4.0) – New form based access point for state agencies to report toll, mileage certification, 500 series and Performance Management Data.
- e. Integrated Transportation Information Platform (ITIP) – An online system that is used to deliver data and information in an easy to understand and comprehend manner, style, and format.
- f. Purchase proprietary data for policy and program analysis – Annually purchase R.L. Polk vehicle data and Omen Bid Tabulation data.
- g. Automate vehicle registration data table production. This effort is to design an automated process for vehicle registration data compilation, data quality control, and final data publication. Once the process is developed, it will be implemented in the Data Portal.
- h. Explore the feasibility of collecting state vehicle identification number (VIN) data for all registered motor vehicles and trailers. This would eventually replace the reporting of similar aggregate data, which tends to be inconsistent from state to state.
- i. Data Portal – Training state and FHWA staff on how to use the system for reporting and analyzing state performance management, 500 series, and toll data. Finalize development of workflow, analytic procedures, and reporting requirements for all forms.
- j. Explore expanding the collection of driver license data to include age group and gender totals for motorcycle, commercial driver's license (CDL), and provisional/restricted licenses.
- k. Conclude project to move HPMS data validations and analytics to cloud.

### **Expected Program Outcomes:**

- Improved decision-making tools to evaluate the effects of project investments on performance.



- Improve the reliability of data sets and data analysis tools for performance management analysis.
- Release of a new Transportation Performance Website that will increase transparency in the performance aspects of the Federal-aid highway program.
- Train data providers and FHWA staff on data requirements.
- Publish the results of various research and outreach efforts including final decision on collecting VIN data and proposed method for collecting detailed driver license data.
- Improved understanding of freight movement and impacts of congestion and delay or events.

#### **FY 2018 Collaboration Partners (Internal USDOT)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
Performance Management Data Support	<p><b>Federal Transit Administration and Office of the Secretary of Transportation</b> in the performance management area on performance reporting and analysis tools development and providing access to data.</p> <p>The FHWA Offices of Highway Policy Information, Program Performance Management, Transportation Management, and Freight Management &amp; Operations collaborate on data support.</p>

#### **FY 2018 Collaboration Partners (External)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (External)</b>
Performance Management Data Support	None

#### **How does the Program meet statutory requirements?**

This program is authorized in section 6028 of the FAST Act, Public Law 114-94.

#### **Describe how public and stakeholder input have been utilized in the development of this research program:**

Approaches to incorporate stakeholder input include:

- Regular and periodic stakeholder engagement via:
  - Conference calls
  - Presentations and briefings

- Stakeholder Groups – An informal stakeholder group including organizations that represent a wide range of stakeholders meet quarterly to share implementation efforts and receive feedback on work products.
- On the travel behavior data front, FHWA has been working with states DOTs and MPOs and the public on a continuous basis through both a formal task force established through TRB, the on-line training and webinars, and several formal workshops.
- Coordination with the private sector for freight movement data and analysis, as well as supporting the Department of Commerce Advisory Committee on Supply Chain Effectiveness and data and analysis at the Bureau of Transportation Statistics and the Census Bureau.
- Posting research roadmaps and planned activities to FHWA program websites
- Releasing regulatory policy and guidance for public comment to Federal Register

## **Surface Transportation System Funding Alternatives**

**\$20,000,000**

### **Program Description:**

As required by the FAST Act, this program will provide grants to States to demonstrate user-based revenue mechanisms that utilize a user fee structure to maintain the long-term solvency of the Highway Trust Fund.

### **Program Objectives:**

Activities carried out under this program must meet the following goals:

- To test the design, acceptance, and implementation of 2 or more future user-based alternative revenue mechanisms.
- To improve the functionality of such user-based alternative revenue mechanisms.
- To conduct outreach to increase public awareness regarding the need for alternative funding sources for surface transportation programs and to provide information on possible approaches.
- To provide recommendations regarding adoption and implementation of user-based alternative revenue mechanisms.
- To minimize the administrative cost of any potential user-based alternative revenue mechanisms.

### **Anticipated Program Activities:**

In FY 2017, the FHWA solicited applications from States or groups of States to initiate new projects to demonstrate user based alternative revenue mechanisms that utilize a user fee structure to maintain the long-term solvency of the Highway Trust Fund. Results from the FY 2017 solicitation process will inform the awardee selection and funding decisions corresponding to FYs 2018-2020.

Grantees will utilize the funds to test the design, implementation, and acceptance of functional future user-based alternative revenue mechanisms that minimize administrative costs, increase public awareness of the need for and possible approaches for alternative funding sources for surface transportation programs, and to provide recommendations on various approaches.

### **Expected Program Outcomes:**

Improved functionality of user-based alternative revenue mechanisms.

Increased public awareness regarding the need for alternative funding sources for surface transportation programs.

### **FY 2018 Collaboration Partners (Internal USDOT)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
Surface Transportation System Funding Alternatives (STSFA)	<b>Office of the Secretary of Transportation</b> to coordinate FAST Act Implementation.

### **FY 2018 Collaboration Partners (External)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (External)</b>
STSFA	<b>Round One STSFA State Partners: California DOT; Delaware DOT; Hawaii DOT; Minnesota DOT; Missouri DOT; Oregon DOT; and Washington DOT</b> – research on alternative funding mechanisms to carry out program objectives.

#### **How does the Program meet statutory requirements?**

This program is authorized in section 6020 of the FAST Act, Public Law 114-94.

#### **Describe how public and stakeholder input have been utilized in the development of this research program:**

The program conducted an introductory webinar with stakeholders and prospective applicants after the release of the FY 2016 solicitation to describe the program and its goals to help applicants plan their proposals. The recipients provide annual reports on meeting their expected outcomes and lessons learned for future deployment of alternative revenue mechanisms that utilize a user fee structure, and may be used in shaping any future program solicitations.

## Corporate and Communications

\$7,500,000

### Program Description:

The FHWA plays a vital leadership role in developing and implementing a coordinated highway research and technology agenda that addresses national needs, meets future demands, and maximizes the strengths of all research entities. This R&T agenda is stakeholder driven, with partners engaged throughout the entire innovation lifecycle process, from agenda setting and planning, through the research, technology development, and innovation deployment phases, to the implementation and assessment stages.

The FHWA R&T Program supports the goals of the USDOT to invest strategically in transportation infrastructure, promote safe and secure transportation, enhance our environment, and create new alliances between the nation's transportation and technology industries.

The TFHRC is committed to this mission of research and innovation. Communication, coordination, and collaboration are crucial to conducting the right research, doing it well, and delivering solutions when and where they are needed. Communication strategies address the needs of internal and external audiences and cover the depth and breadth of the federal effort for highway research and technology, displaying prudent use of government resources, advancing the state of the practice, and building a case for continued and future funding.

### Program Objectives:

- To provide leadership, coordination, and support in the development of a national highway research agenda.
- To foster and promote enhanced coordination of highway research among all stakeholders;
- To communicate, publish, market, and disseminate research results to appropriate audiences
- To operate the Turner-Fairbank Highway Research Center, a federally-owned and operated research facility in McLean, Virginia that supports:
  - the conduct of highway research and development relating to emerging highway technology;
  - the development of understandings, tools, and techniques that provide solutions to complex technical problems through the development of economical and environmentally sensitive designs, efficient and quality-controlled construction practices, and durable materials;
  - the development of innovative highway products and practices; and
  - the conduct of long-term, high-risk research to improve the materials used in highway infrastructure.

## **Anticipated Program Activities:**

1. **Communications, Publishing, and Marketing:**
  - FHWA Research Library: conducts literature searches and provides technical information, documents, bibliography preparation, electronic resources, and provides knowledge management services of FHWA research reports.
  - Publications, periodicals, and technical reports: Plans, edits, and prepares technical reports and documents for publishing in print or on the web, and publishes the Public Roads magazine. Develops outreach materials to communicate research results to State DOTs and other stakeholders.
  - Develops, manages, and maintains the TFHRC website, which provides public access to program policy, on-going and completed research, laboratory information, and connects you to experts as well as invites visitors to tour the facility and laboratories.
2. **TFHRC Laboratory Capacity Building:** Supports the technical and scientific needs of researchers, such as installing special hardware or software, maintaining scientific laboratory instruments. Supports the repair or replacement of research equipment resulting from failure or replacement of obsolete or end-of-service-life equipment, enhanced capabilities for existing laboratories.
3. **Partnerships:**
  - Transportation Pooled Fund (TPF) Program: When significant or widespread interest is shown in solving transportation-related problems, research, planning, and technology transfer activities may be jointly funded by several federal, State, regional, and local transportation agencies, academic institutions, foundations, or private firms as a pooled fund study. The FHWA-administered TPF Program allows federal, state, and local agencies and other organizations to combine resources to support transportation research studies.
  - National partnerships: FHWA actively seeks cooperation with stakeholders. FHWA participates in TRB standing committees and in the AASHTO Research Advisory Committee. The FHWA sponsors transportation stakeholder events such as the TRB annual meeting.
  - International partnerships: International cooperation to conduct research of interest to multiple countries is achieved through a partnership with the Forum of European Highway Research Laboratories (FEHRL) and through other agreements with foreign countries.
  - R&T Evaluations Program: The R&T Evaluation Program has been designed to further TFHRC's transparency, accessibility, and responsiveness of R&T for stakeholders. The program conducts retrospective and prospective program evaluations of selected FHWA research programs and projects. The results will be published periodically.
4. **Knowledge Management:** Supports 140 websites to address critical business topics by conducting day-to-day business and sharing knowledge within FHWA and with external partners including State DOTs and private organizations.

**Expected Program Outcomes:**

- A coordinated, comprehensive research and technology program that takes into account stakeholder and partner input.
- Improved coordination, planning, and dissemination of research and technology activities.

**FY 2018 Collaboration Partners (Internal USDOT)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
Corporate and Communications	<b>Office of the Secretary of Transportation</b> on budget and legislative matters.  <b>Office of the Secretary of Transportation</b> on international research collaboration issues.  <b>Office of the Secretary of Transportation and National Highway Traffic Safety Administration</b> to twin selected projects of common interest with the European Commission's Horizon 2020.

**FY 2018 Collaboration Partners (External)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (External)</b>
Corporate and Communications	<b>TRB and AASHTO</b> - Research program coordination  <b>State DOTs</b> – Transportation Pooled Fund Program  <b>Forum of European Highway Research Laboratories (FEHRL)</b> – Coordination of international research opportunities  FHWA partners with 33 States through the Transportation Pooled Fund Program to conduct Corporate and Communications research

## **How does the Program meet statutory requirements?**

This program is authorized in sections 502 and 503 of title 23, United States Code, which require the Secretary to carry out highway research, development, and technology deployment activities covering a broad range of topic areas in order to improve highway safety, improve infrastructure integrity, strengthen transportation planning and environmental decision-making, reducing congestion, and enhancing freight productivity, among others.

## **Describe how public and stakeholder input have been utilized in the development of this research program:**

The TRB Research and Technology Coordinating Committee (RTCC), has served as an independent adviser on national and federal highway research for 30 years. The RTCC provides tactical advice on highway research topics, funding, and research management. The RTCC periodically issues reports assessing the state of highway research at national and federal levels and highlighting strategic issues of importance to policy makers.

The FHWA created the FHWA R&T Agenda process and website in an effort to better present and communicate the objectives and reasons of FHWA's R&T program. It was created to improve accessibility & transparency of the R&T program, and increase input from a broader stakeholder community. It also encourages stakeholders to help address national-level research needs and complement our federal R&T. Stakeholders are able to provide input to the Agenda through the FHWA R&T agenda website: <https://www.fhwa.dot.gov/research/fhwaresearch/agenda/index.cfm>.

In 2015, FHWA initiated the Top Three initiative, which solicited input from the FHWA Division Offices in consultation with the State DOTs to identify the top three issues or needs that each State is facing. The input was analyzed to determine if new research ideas could solve these issues, and 20 research activities were identified and added to FHWA's R&T program roadmaps. FHWA will continue seeking input from the State DOTs through similar initiatives in the future.

*Public Roads* is a bimonthly magazine designed to report on the advances and innovations in highway/traffic research and technology, critical national transportation issues, important activities and achievements of FHWA and others in the highway community, specific FHWA program areas, and subjects of interest to highway industry professionals. The magazine also emphasizes the continuing commitment of FHWA to be a world leader in promoting highway research and technology transfer. Its stakeholders include all FHWA employees; international, national, state, and local transportation officials; members of highway-related professional societies and associations; researchers at technical libraries and technology transfer centers; professors and students of engineering and traffic management; members of appropriate congressional committees; and others interested in highway research and technology and in FHWA policies and programs. Stakeholders are able to submit articles for consideration into the magazine via the *Public Roads* website: <http://www.fhwa.dot.gov/publications/publicroads/author.cfm>.



## Every Day Counts Program

\$8,000,000

### Program Description:

Every Day Counts (EDC) is a state-based initiative to identify and rapidly deploy proven, yet underutilized innovations to shorten the project delivery process, enhance roadway safety, reduce congestion and improve environmental sustainability. Under EDC, technical assistance, training, and other resources are provided to state, local, and tribal transportation agencies to support the implementation and widespread adoption of the promoted innovations. In short, EDC identifies underutilized, market-ready technologies with high pay-offs and accelerates their deployment and acceptance throughout the nation. The FAST Act recognizes the success of the EDC initiative and adds it as a required program.

### Program Objectives:

To accelerate the deployment and adoption of proven innovative practices and technologies.

### Anticipated Program Activities:

Through the EDC model, FHWA works with transportation stakeholders to identify a new collection of innovations to champion every two years. Innovations are selected collaboratively by stakeholders, taking into consideration market readiness, impacts, benefits and ease of adoption of the innovation. After selecting the EDC technologies for deployment, transportation leaders from across the country gather at regional summits to discuss the innovations. Transportation agencies then select the innovations that make the most sense for their unique program needs, establish performance goals and commit to finding opportunities to get those innovations into practice over the next two years. Throughout the two-year deployment cycle, FHWA deployment teams provide technical support and specifications, best practices, lessons learned and relevant data are shared among stakeholders through case studies, webinars, demonstration projects, newsletters, etc.

#### FY 2018 Anticipated Activities:

- EDC-4 Innovation Deployment (FHWA technical assistance and support) (started in 2017- completed in 2018)
- Solicit suggestions and identify innovations for EDC-5

### Expected Program Outcomes:

Accelerated deployment of the promoted innovations and enhancement of the culture of innovation within the highway community.

Reduced project development and delivery times, enhanced safety, reduced congestion, improved environmental sustainability, and enhanced infrastructure integrity through accelerated deployment of innovations.

Increased support of all USDOT and FHWA goals and objectives through accelerated implementation of promoted innovations and the associated benefits of those technologies and processes.

#### **FY 2018 Collaboration Partners (Internal USDOT)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
Every Day Counts	None

#### **FY 2018 Collaboration Partners (External)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (External)</b>
Every Day Counts	<p><b>Key stakeholders and collaborators include:</b></p> <p><b>American Association of State Highway and Transportation Officials;</b></p> <p><b>American Council of Engineering Companies;</b></p> <p><b>American Road &amp; Transportation Builders Association;</b></p> <p><b>American Society of Civil Engineers;</b></p> <p><b>American Public Works Association;</b></p> <p><b>Associated General Contractors of America;</b></p> <p><b>Association of Metropolitan Planning Organizations;</b></p> <p><b>National Association of County Engineers;</b></p> <p><b>American Traffic Safety Services Association;</b></p> <p><b>Institute of Transportation Engineers;</b></p> <p><b>National Association of Regional Councils; and</b></p> <p><b>National Local Technical Assistance Program Association</b></p> <p>– coordination on identifying and vetting innovative technologies and practices for potential deployment through EDC.</p>

**How does the Program meet statutory requirements?**

This program is authorized in section 1444 of the FAST Act, Public Law 114-94.

**Describe how public and stakeholder input have been utilized in the development of this research program:**

Through the EDC model, FHWA works with transportation stakeholders to identify a new collection of innovations to champion every two years. A public solicitation of innovation suggestions for deployment through EDC is first conducted and the innovations are then selected by FHWA collaboratively with transportation stakeholders, taking into consideration market readiness, impacts, benefits and ease of adoption of the innovation. Transportation stakeholder input is obtained through formal correspondence (emails, letters, etc.) as well as an annual face-to-face meeting to discuss the EDC initiative. Meetings are also held with each stakeholder association on an annual basis to discuss opportunities for further collaboration on deployment efforts. Stakeholders also regularly support and assist FHWA deployment teams with technology transfer activities.

Representatives from the External Collaboration Partners regularly provide input and support the EDC initiative.

## State Transportation Innovation Council Incentive Program

\$6,000,000

### Program Description:

The State Transportation Innovation Council (STIC) Incentive program provides resources to help STICs foster a culture for innovation and make innovations standard practice in their States. Through the program, funding up to \$100,000 per state per federal fiscal year is made available to support or offset the costs of standardizing innovative practices in a state transportation agency or other public sector STIC stakeholder.

### Program Objectives:

To accelerate the adoption of proven innovative practices and technologies as standard practices.

### Anticipated Program Activities:

Provide incentive funding to STICs to conduct internal assessments; build capacity; develop guidance, standards, and specifications; implement system process changes; organize peer exchanges; offset implementation costs; or conduct other activities the STIC identifies to foster a culture of innovation or to make an innovation a standard practice.

### Expected Program Outcomes:

Increased deployment and adoption of innovations and enhancement of the culture of innovation within the highway community through incentive-funding support of STIC projects.

### FY 2018 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
STIC Incentives	None

### FY 2018 Collaboration Partners (External)

Program Name	Name of Collaboration Partner(s) (External)
STIC Incentives	<b>Individual State STICs</b> – on identifying and integrating innovative practices into State DOT or other public sector STIC stakeholder business practices.

### How does the Program meet statutory requirements?

This program is authorized in section 503(c)(2)(B)(iii) of title 23, United States Code, which require the Secretary to develop improved tools and methods to accelerate the adoption of proven innovative practices and technologies as standard practices.

**Describe how public and stakeholder input have been utilized in the development of this research program:**

A STIC or other equivalent task force, committee or group is intended to bring together public and private transportation stakeholders to evaluate innovations and spearhead their deployment in each state. As such, each STIC serves as the vehicle to engage stakeholders in the identification and deployment of innovations that best fit the unique needs of their respective highway program. The STIC Incentive program supports the projects identified by STICs to enhance the culture of innovation and to adopt selected innovations as a standard practice.

## **Accelerated Innovation Deployment (AID) Demonstration Program**

**\$10,000,000**

### **Program Description:**

The Accelerated Innovation Deployment (AID) Demonstration Program provides incentive funding to State DOTs, federal land management agencies, tribal governments, metropolitan planning organizations, and local governments to offset the risks associated with deployment of an innovation on a project. Funds are available to cover the full cost of implementation of an innovation on a project, up to the maximum amount of \$1 million, in areas such as planning, financing, operations, pavements, structures, materials, environment, and construction.

### **Program Objectives:**

To accelerate the deployment and adoption of proven innovative practices and technologies.

### **Anticipated Program Activities:**

Provide incentive funding to support the pilot/demonstration of innovations on projects by State DOT, federal land management agencies, tribal governments, metropolitan planning organizations, and local governments. Funding recipient reports on experiences and lessons learned from each innovation deployment will be shared via the program web site to provide technology transfer.

### **Expected Program Outcomes:**

Increased deployment and adoption of innovations.

Enhanced technology transfer.

### **FY 2018 Collaboration Partners (Internal USDOT)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
AID Demos	None

### **FY 2018 Collaboration Partners (External)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (External)</b>
AID Demos	<b>State DOTs, federal land management agencies, tribal governments. Metropolitan planning organizations and local governments</b> – identifying and deploying innovative technologies and practices to improve project delivery, safety, congestion and environmental sustainability.

### **How does the Program meet statutory requirements?**

This program is authorized in section 503(c)(2)(B)(i) of title 23, United States Code, which requires the Secretary to establish and carry out demonstration programs.

**Describe how public and stakeholder input have been utilized in the development of this research program:**

State DOTs, federal land management agencies, tribal governments, metropolitan planning organizations, and local governments submit applications for funding to support deployment of innovations on projects of their choosing. FHWA evaluates the applications in accordance with published criteria for the program which was established through a Notice of Funding Opportunity (NOFO) published on September 1, 2016, continuing the AID Demonstration program under the Fixing America's Surface Transportation (FAST) Act (Pub. L. No. 114-94). Applications for the AID Demonstration program are accepted under Opportunity Number FHWA-2016-21063 through Grants.gov.

## Accelerating Market Readiness (AMR) Program

\$3,500,000

### Program Description:

The Accelerating Market Readiness (AMR) program supports promising new or underutilized innovations that have the potential to be considered for accelerated deployment under the EDC initiative. The program provides funding to support the testing, evaluation, or validation of innovations to obtain more comprehensive performance information. Other activities may include the development of product specifications, operating guidelines, standards, or procedures to accelerate the market readiness of the innovation and support future deployment efforts. The FHWA is considering extending the program to innovations and technologies earlier in the market readiness stage.

### Program Objectives:

To accelerate the market readiness of promising innovations for future promotion and deployment by FHWA through the EDC initiative or other programs. Market readiness indicates: market research has been conducted to ensure that the innovation is mature and is readily available; the innovation has been sufficiently piloted and evaluated in the U.S. highway community and has documented performance results; technical specifications and/or standards exist to guide implementation; technical expertise exists within FHWA to lead deployment activities; and industry support and early adopters of this innovation exist.

### Anticipated Program Activities:

Provide funding to FHWA offices to support the testing, evaluation, or validation of innovations and other related activities to obtain more comprehensive performance information and accelerate the market readiness of the innovations for future promotion and deployment.

### Expected Program Outcomes:

Accelerated market readiness of promising innovations for future promotion and deployment by FHWA through the EDC initiative or other programs.

### FY 2018 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Accelerating Market Readiness	None



### FY 2018 Collaboration Partners (External)

Program Name	Name of Collaboration Partner(s) (External)
Accelerating Market Readiness	<b>National STIC Network and AASHTO</b> – identifying and field testing innovative technologies and practices for potential deployment through EDC or otherwise made available to State and local transportation agencies.

#### How does the Program meet statutory requirements?

This program is authorized in section 503(c)(2)(B)(iii) of title 23, United States Code, which requires the Secretary to develop improved tools and methods to accelerate the adoption of proven innovative practices and technologies as standard practices.

#### Describe how public and stakeholder input have been utilized in the development of this research program:

Innovations are suggested for EDC deployment through the public and stakeholder solicitation process which were determined to be promising, but not yet market ready are considered by FHWA for further testing and evaluation through the Accelerated Market Readiness program.

## **Accelerated Deployment of Pavement Technologies**

*\$12,000,000 Non-Add*

### **Program Description:**

The FAST Act extends this MAP-21 designated program to promote, demonstrate, support, and document the application of innovative pavement technologies, practices, performance, and benefits. More than 50 percent of highway funding is spent on pavements. To ensure the greatest return on these investments and accelerate the process of delivering safe, smooth, durable pavements in a state of good repair, the Accelerated Deployment of Pavement Technologies (ADPT) program focuses on prompt implementation of innovative pavement technologies, products, and processes.

Activities are funded as part of the Pavement and Materials program, the AID program, and the EDC initiative.

### **Program Objectives:**

To promote, implement, deploy, demonstrate, support, and document the application of innovative pavement technologies, practices, performance, and benefits.

### **Anticipated Program Activities:**

1. Increased asphalt in-place density for longer pavement life and related pavement production and placement procedures.
2. Implement performance specifications and tests for concrete pavement mixtures.
3. Effective testing, analysis and construction procedures to evaluate and encourage the use of recycle and reclaimed materials into pavements.
4. Review of state agency quality assurance programs for regulatory compliance, and provide guidance and tools for effectiveness and innovation.
5. Improved materials physical tests and non-destructive procedures that predict pavement performance and reduce the likelihood of inadequate performance.
6. Advance sustainable technologies and practices for adoption by state highway agencies.

### **Expected Program Outcomes:**

- Enhanced pavement durability;
- Effective and efficient pavement design and construction;
- Innovative and balanced state highway agency materials standards and construction specifications;
- Increased use of recycled and industrial by products into pavements;
- Establishment of effective state material quality assurance programs.

### **FY 2018 Collaboration Partners (Internal USDOT)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
Pavement Technologies Deployment	<b>Federal Railroad Administration, National Highway Traffic Safety Administration, Maritime Administration, Federal Transit Administration</b> – on corrosion research.

### **FY 2018 Collaboration Partners (External)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (External)</b>
Pavement Technologies Deployment	<b>AASHTO, National STIC Network; National Asphalt Pavement Association; American Concrete Pavement Association, National Center for Asphalt Technology, and other paving associations</b> – on the deployment of pavement technologies.

#### **How does the Program meet statutory requirements?**

This program is authorized in section 503(c)(3) of title 23, United States Code, which requires the Secretary to establish and implement a program to promote, implement, deploy, demonstrate, showcase, support, and document the application of innovative pavement technologies, practices, performance, and benefits.

#### **Describe how public and stakeholder input have been utilized in the development of this research program:**

The FHWA has formed a number of expert task groups which include representatives from government agencies, academia and industry. These groups provide technical input as well as help FHWA carrying out technical work to facilitate deployment of pavement innovations.

## **Intelligent Transportation Systems (ITS) Connected Vehicles**

**\$25,000,000**

### **Program Description:**

As our environments become more connected, Intelligent Transportation Systems (ITS) play a key role in ensuring the economic vitality and quality of life for citizens in our cities, towns, suburbs, and rural communities. The transportation system can best serve vital national needs to move people and goods reliably and safely when technology enables transportation system managers to effectively “connect the dots” combining information from multiple sources to deal with challenging conditions (e.g., severe weather, high demand, multi-vehicle incidents, and other unanticipated emergencies). ITS, connected vehicles, and automated vehicles are the logical steps in developing a robust interoperable connected and automated transportation infrastructure to demonstrate what is possible when communities use technology to connect transportation assets into an interactive network. Connected Vehicle (CV) technology is an essential core mechanism that allows wireless communications among vehicles, mobile devices, and roadside infrastructure. This connectivity has the potential to dramatically improve traveler safety while advancing personal mobility and boosting national economic productivity.

The USDOT’s top priority is the safety of all users of the transportation system. In keeping with this objective, the ITS Joint Program Office (JPO) in coordination with USDOT’s modal entities and in collaboration with state officials, industry, car manufacturers, academia, and other organizations, created a technology-driven framework to advance CV development. The CV Program is the keystone of ITS JPO’s research and engagement process aligned with USDOT’s mission of advancing safety innovations in transportation. Capabilities leveraging these safety innovations also have demonstrated capability to provide new levels of personal mobility and dramatically improve the efficiency of goods movement.

The CV program is a catalyst moving emerging technologies from isolated testbeds to large-scale deployed systems. The flagship deployment effort of the program is the CV Pilot Deployment Program, funding large-scale CV system implementation efforts led by the New York City Department of Transportation (NYCDOT); the Tampa Hillsborough Expressway Authority (THEA); and the Wyoming Department of Transportation (WYDOT). Similar, interoperable technologies are being used differently in three sites to improve safety in environments as diverse as dense urban grid networks and isolated high-plains interstates. The three sites piloted a deployment planning process that is transferrable to other regions in the US. All sites are currently completing a design/test/build phase before moving on to an operational phase in 2018.

The CV technologies, applications, guidance, and supporting systems are also being leveraged in the agency’s Smart City Challenge efforts and FAST Act Advanced Transportation and Congestion Management Technologies Deployment Program grants. Collectively, these early deployment efforts illustrate how CV technologies address critical

local issues (e.g., reducing collisions, injuries, and fatalities) and spur nationwide deployment of interoperable CV products and coordinated CV systems.

### **Program Objectives:**

To advance knowledge of Connected Vehicle (CV) systems (Research); to collect benefits and costs and implementation lessons learned information from high priority CV applications (Development); and to support State and local, and transit agency integrating CV environment deployments (Adoption).

### **Anticipated Program Activities:**

1. Operate Connected Vehicle Pilot sites in New York City, Tampa, FL and Wyoming.
2. Conduct evaluation to support Connected Vehicle Pilot deployment.
3. Operate Security Credential Management System (SCMS) for connected vehicle deployment sites.
4. Develop on-board requirements and certification procedures for V2V systems (from NHTSA Crash Avoidance Metrics Partners, LLC (CAMP) Systems Engineering task).
5. Develop minimum performance requirements and characteristic effectiveness for haptic driver-vehicle interfaces for crash warning systems (from NHTSA Haptic Warning project).

### **Expected Program Outcomes:**

- Demonstrations of CV environments that fit into real-world environments of today.
- Real-time and real-world data to help with transportation planning and transportation system operations.
- Increase in safety, mobility, system efficiency and access to resources for disadvantaged groups, and decreases in vehicle emissions.
- Increased opportunities to partner with non-government groups, such as private industry and universities.
- Reduction of fatalities through weather-related safety, infrastructure-based, and other applications.

### **FY 2018 Collaboration Partners**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
CV Pilots	FTA, FMCSA, NHTSA and Volpe work with the JPO to conduct evaluations of the safety, mobility, environmental and public agency efficiency impacts from the CV Pilot sites and on the CV Pilots Phase 2 which is the Design/Build/Test Phase for CV technologies.
Connected Vehicle Policy	FHWA, FTA and NHTSA work with the JPO to better understand the relationships between connected and automated vehicle systems and to develop a connected vehicle certification governance structure.

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
Mobility on Demand (MOD)	FTA will work with the JPO to evaluate and analyze Mobility on Demand (MOD) approaches and demonstrations.
Connected Vehicle	NHTSA, FTA and OST-R work with the JPO to evaluate the as-built Security Credential Management System (SCMS) and to provide continuing security credential management services to early connected vehicle deployments.
Connected Vehicle	FTA, FRA and NHTSA work with the JPO to enable the V2I Deployment Coalition to work collaboratively with industry, state and local governments, academia and USDOT to achieve the goal of deploying and operating a functioning CV environment.
Connected Vehicle	FTA works with the JPO to ensure the Vehicle-to-Infrastructure (V2I) and Vehicle-to-Everything (V2X) infrastructure components are accurately addressed.

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (External)</b>
CV Pilots	None
Connected Vehicle Policy	None
Mobility on Demand (MOD)	None
Connected Vehicle	None

### **How does the Program meet statutory requirements?**

This program is authorized in sections 512 to 518 of Title 23, United States Code.

### **How does the Program incorporate public and stakeholder input?**

The 2015-2019 ITS Strategic Plan incorporated public and stakeholder (including external and internal partners) input from over 700 stakeholders: the JPO hosted three series of webinars; over 286 different organizations participated in the development of the plan; public meetings for stakeholder input were held at numerous national annual meetings, including the National Rural ITS Annual Meeting (NRITS), the Institute for Transportation Engineers Annual Meeting (ITE), ITS American Annual Meeting, IEEE (formally known as the Institute for Electrical and Electronics Engineers) and the Connected Vehicle Trade Association (CVTA). The ITS Strategic Plan has had 8,500 visitors since it was published online in 2014.

Additionally, the research program managers and the professional capacity building and communications staff routinely host a multitude of webinars; utilize social media (email and Twitter); issue publications; and speak at conferences and events.

Connected Vehicle Pilots: In 2015 and 2016, the ITS JPO held 12 public webinars and four webinars that were open only to the 3 pilot sites. Since 2014, the ITS JPO has held more than 18 webinars on CV Pilots.

## Automated Vehicles

\$8,000,000

### Program Description:

The development of Automated Vehicle (AV) technology is occurring at a rapid pace, with industry investing billions of dollars a year. Several states have enacted legislation regarding AV and testing is currently occurring on public roads. Partially automated vehicles are available in the market today and heavy vehicle automation technologies are approaching commercialization.

Recognizing the importance of these advancements, the USDOT is playing a significant role in addressing the key technological and institutional barriers that have emerged. The ITS JPO automation research program promotes policy and technical research to reduce risks and produce positive outcomes. The program seeks to “enable safe, efficient, and equitable integration of automation into the transportation system.” ITS JPO program research is conducted by ITS JPO staff and stakeholders in collaboration with other USDOT modal agencies in keeping with the ITS JPO’s coordination role. The ITS JPO works closely with NHTSA, FTA, FMCSA, and Maritime Administration (MARAD) to address key technical and policy challenges for automation.

In the 2016 Smart City Challenge the topic of urban automation was the highest of twelve priority areas. The development and adoption of safe vehicle automation through real-world pilot projects like the Smart City Challenge and the FAST Act Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) Program grants should assist as the USDOT engages with other national and international activities. A key component of our Smart City Challenge includes investigating the impact of automated vehicle technology for promoting safety, improving mobility, improving infrastructure, preserving the environment.

### Program Objectives:

To define the core elements and the performance criteria for automation (Research); to test automation components in the Smart City Challenge and FAST Act Advanced Transportation and Congestion Management Technologies Deployment Program grants, as well as in other test situations (Development); and to define the Federal role in facilitating and encouraging deployment of automated systems (Adoption).

### Anticipated Program Activities:

1. Prepare technical finding briefs and reports of simulator experiments of driver acceptance of level 1 automation.
2. Complete naturalistic study of Level 2 (L2) automated vehicle functions in over-the-road driving, including longer engagement trips, and report results.
3. Advance the state-of-the-practice for understanding the impacts of AVs on congestion, personal mobility, and travel behavior.



4. Assess the mobility and equity impacts of automated vehicle deployment.
5. Conduct a study of driver expectations for control errors, engagement, and crash avoidance in automated mixed function vehicles and report results.
6. Conduct a study of automated vehicle intent and status communication with other road users and report results.
7. Conduct a study on automated vehicle needs during adverse weather and report the results.
8. Coordinate foundational research and research with field test collaborators to jointly further the understanding of broad impacts from automated driving, with an initial focus on the assessment of safety impacts.
9. Identify research and deployment state of the practice for low-speed automated shuttles to improve the quality of publicly-funded pilots, and to disseminate findings quickly to a broad audience.
10. Identify policy areas that require Federal government involvement and where policies may need to be revised or developed to support the safe deployment of automated vehicles.

#### **Expected Program Outcomes:**

- Provide guidance to state and local agencies to help the understanding of impacts of automated vehicles on the assets they manage.
- Expand the reach of transportation modes to disabled and older users and provide “first mile/last mile” connectivity services for all users.
- Reduce the number and severity of crashes caused by drivers or by other conditions (e.g. weather, pedestrians, and roadway conditions).

#### **FY 2018 Collaboration Partners**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
Automated Vehicles (AV)	NHTSA conducts research for JPO on AV human factors, functional safety, test procedures, and cybersecurity.
Automated Vehicles	FMCSA provides requirements and oversight to JPO research on AV implications for Federal Motor Carrier Safety Regulations and prototype port applications.
Automated Vehicles	FTA provides requirements and oversight to JPO on first mile/last mile service and other Smart City AV applications.
Automated Vehicles	Volpe Center conducts AV policy and benefits research for JPO and provides program management and internal collaboration support.

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (External)</b>
Automated Vehicles (AV)	None

### **How does the Program meet statutory requirements?**

This program is authorized in sections 512 to 518 of Title 23, United States Code.

### **How does the Program incorporate public and stakeholder input?**

The 2015-2019 ITS Strategic Plan incorporated public and stakeholder (including external and internal partners) input from over 700 stakeholders: the JPO hosted three series of webinars; over 286 different organizations participated in the development of the plan; public meetings for stakeholder input were held at numerous national annual meetings, including the National Rural ITS Annual Meeting (NRITS), the Institute for Transportation Engineers Annual Meeting (ITE), ITS American Annual Meeting, IEEE (formally known as the Institute for Electrical and Electronics Engineers) and the Connected Vehicle Trade Association (CVTA). The ITS Strategic Plan has had 8,500 visitors since it was published online in 2014.

Additionally, the research program managers and the professional capacity building and communications staff routinely host a multitude of webinars; utilize social media (email and Twitter); issue publications; and speak at conferences and events.

## **Emerging Technology**

**\$15,000,000**

### **Program Description:**

The Emerging Technology program focuses on cultivating the next generation of transportation systems. As the scale of ITS increases, vehicle manufacturers, infrastructure providers, innovators, and entrepreneurs discover new opportunities to use technology and the data that will be generated. These technological advances, new functionality, new applications, new operational concepts, and disruptive innovations need to be tracked by the USDOT to determine technological, market, and demographic trends throughout the globe and across industries to seek, evaluate and sometimes incubate emerging capabilities that demonstrate the potential to transform transportation. As this happens, the USDOT will be positioned and engaged as a partner to guide research, development, and technology adoption in a systematic manner.

An example of a major initiative in the Emerging Capabilities program is the Smart City Challenge. The Smart City Challenge was launched in December 2015 as an innovative competition for cities to reshape their transportation systems harnessing the power of technology, data, and creativity to reimagine how people and goods move. The challenge called on cities to use USDOT leadership in transportation research to do more than merely introduce new technologies onto their streets, requiring them to boldly envision new solutions that would change the face of transportation by closing the gap between rich and poor; capturing the needs of both young and old; and bridging the digital divide through smart design so that the future of transportation meets the needs of all residents.

Seventy-eight cities submitted entries to the competition, and in March 2016, seven finalists were selected. The finalists included Austin, Columbus, Denver, Kansas City, Pittsburgh, Portland, and San Francisco. Each finalist was awarded \$100,000 to develop detailed applications that captured their plans to conduct a federally funded Smart City Demonstration in their jurisdiction. In June 2016, Columbus was selected as the winner of the Smart City Challenge.

### **Program Objectives:**

To establish ways to use new technologies and decision support tools for real-time needs, and to meet longer-term public policy objectives (Research); and to integrate the operational characteristics of new technologies into CV, AV, and legacy systems and applications (Development).

### **Anticipated Program Activities:**

1. Conduct a demonstration and evaluation with Columbus, Ohio to test, evaluate and demonstrate the benefits of connected city concepts.
2. Identify truck port staging, queuing and access technology applications and approaches for the ITS MARAD Program.

**Expected Program Outcomes:**

- Forge stronger relationships and partnerships with private industry and universities.
- Increase ability to adapt existing or upcoming program to accommodate new ITS technologies.
- Stimulate economic growth through innovation and technological leadership.

**FY 2018 Collaboration Partners**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
Smart City Challenge	OST, FTA, FMCSA, NHTSA, MARAD, FRA work with the JPO to conduct the demonstration and evaluation of the Smart City winner to test, evaluate and demonstrate the benefits of connected city concepts.
ITS MARAD	MARAD and FMCSA works with the JPO in a three-phased effort to incorporate maritime port ITS needs into current and existing ITS JPO research, including a project related to low speed automated truck queuing at ports and warehouses.
ATTRI	FTA works in coordination with the ITS JPO to research, develop, and implement transformative solutions, applications, and systems to help all people, particularly those with disabilities, effectively plan and execute their travel, addressing individual mobility needs.

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (External)</b>
Smart City Challenge	The city of Columbus, Ohio on identifying and deploying innovations on their transportation systems that harness the power of technology, data, and creativity to reimagine how people and goods move.
ITS MARAD	None
ATTRI	None

**How does the Program meet statutory requirements?**

This program is authorized in sections 512 to 518 of Title 23, United States Code.

**How does the Program incorporate public and stakeholder input?**

The 2015-2019 ITS Strategic Plan incorporated public and stakeholder (including external and internal partners) input from over 700 stakeholders: the JPO hosted three series of

webinars; over 286 different organizations participated in the development of the plan; public meetings for stakeholder input were held at numerous national annual meetings, including the NRITS Annual Meeting, the ITE Annual Meeting, ITS American Annual Meeting, IEEE and the Connected Vehicle Trade Association (CVTA). The ITS Strategic Plan has had 8,500 visitors since it was published on line in 2014.

Additionally, the research program managers and the professional capacity building and communications staff routinely host a multitude of webinars; utilize social media (email and Twitter); issue publications; and speak at conferences and events.

## **Enterprise Data**

**\$5,400,000**

### **Program Description:**

Methods to collect, share, and use data are needed for management and operations of ITS, and state and local governments will need to have the capacity – and motivation – to implement these new methods nationwide to enable interoperability of the future transportation system and effective privacy protection for travelers. This program seeks to develop a better understanding of critical uses for these data, their value for the public, private, and academic sectors, and the potential Federal role in enabling these data to be collected and shared to unlock the full potential societal value of deploying these new technologies.

The program focuses on enabling effective data capture from ITS-enabled technologies, including Connected Vehicles (CV) (automobiles, transit, and commercial vehicles), Automated Vehicles, Smart Cities, mobile devices, and infrastructure in ways that protect the privacy of users while exchanging and utilizing real-time data. In addition, these activities focus on the creation of open source data environments that enable integration and sharing of open and protected data from multiple sources for use in transportation research, management, and performance measurement.

These efforts aim to establish a foundation for agility, data sharing, and privacy protection for the future transportation system by helping early deployers of these technologies to adopt modern information technology (IT) and data management best practices.

Concurrently, the program will investigate demand for accessing streaming data from the CV environment and other emerging ITS data sources as well as archiving these data for future research and other uses.

### **Program Objectives:**

To integrate new data sets with other legacy data management systems (Research); to identify a model for data management and ownership (Development); and to enable new business relationships between the public and private sector to ensure privacy protection.

### **Anticipated Program Activities:**

1. Operationalize the ITS Operational Data Environment (ODE), Basic Safety Message (BSM) Privacy Algorithm, ITS Data Policy Playbook, drive their adoption in deployment projects, and hand off maintenance to the user community.
2. Enable at least one regional-level ODE, or equivalent, with multiple local ODEs contributing and receiving data to meet one or more real-world operational needs.
3. Cut down latency of distributing ITS research data to the community through updated data sharing procedures and systems.
4. Enable new third-party research projects or applications using ITS research data and conduct one or more data challenges to promote these activities.

5. Train local agencies to adopt modern IT best practices, such as agile methodologies, that support ITS deployment.
6. Engage with internal and external stakeholders to establish a National ITS Data Strategy that identifies use cases and roadmaps for enabling cross-jurisdictional data sharing.

**Expected Program Outcomes:**

- Increase adoption of efficient and secure data sharing architectures within ITS deployments
  - Increase adoption of modern IT and digital best practices to increase agility, innovation, and data utility
  - Operationalize privacy-positive principles to enable responsible sharing of ITS data
  - Share ITS research data to fuel third-party research and application development
- Provide strategic direction for the ITS community

**FY 2018 Collaboration Partners**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
Connected Data Systems (CDS)	FTA works with the JPO to provide specialized technical support to the CDS Program in the area of modern software development tools and methods.
Connected Data Systems (CDS)	OST and FTA work with the JPO to jumpstart the ecosystem of third party development around the data made available through the USDOT's Smart City Challenge.
Connected Data Systems (CDS)	FTA and Bureau of Transportation Statistics (BTS) will work with the JPO to conduct national/regional workshops (and supporting virtual events/activities) to elicit stakeholder needs related to data sharing, identify potential approaches to federate data among operational data environments, and summarize findings.

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (External)</b>
Connected Data Systems (CDS)	None.

**How does the Program meet statutory requirements?**

This program is authorized in sections 512 to 518 of Title 23, United States Code.

### **How does the Program incorporate public and stakeholder input?**

The 2015-2019 ITS Strategic Plan incorporated public and stakeholder (including external and internal partners) input from over 700 stakeholders: the JPO hosted three series of webinars; over 286 different organizations participated in the development of the plan; public meetings for stakeholder input were held at numerous national annual meetings, including the NRITS Annual Meeting, the ITE Annual Meeting, ITS American Annual Meeting, IEEE and the CVTA. The ITS Strategic Plan has had 8,500 visitors since it was published on line in 2014.

Additionally, the research program managers and the professional capacity building and communications staff routinely host a multitude of webinars; utilize social media (email and Twitter); issue publications; and speak at conferences and events.



## **Interoperability**

**\$8,300,000**

### **Program Description:**

As ITS evolves from primarily infrastructure systems – for example traffic signal coordination or ramp metering – towards a nationwide or preferably North American, complex “system of systems” including connected and automated vehicles, secure system-wide interoperability becomes far more critical. Incorporating vehicles via Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) – collectively Connected Vehicle (CV) - capabilities offers great promise to improve safety and mobility. However, once vehicles, which can easily travel across North America, become part of the ITS system, multi-regional interoperability becomes a requirement rather than merely a benefit.

The ITS JPO supports interoperability via funding and program execution in cross-modal cooperation within FHWA on V2I deployment, the NHTSA on V2V research, as well as, with other surface transportation modes and with state, local, international, industry and academic partners.

The Interoperability budget funds key technical research to advance ITS architecture and standards, cyber security, certification/testing and human factors guidelines that support efficient, secure large-scale deployment of ITS technologies. Interoperability programs support test beds and pilot deployments and serve to assure a broad, competitive marketplace for ITS equipment and services. The goal of this research is to ensure effective connectivity from the device level to the transportation system level.

### **Program Objectives:**

To develop and evolve a comprehensive National ITS reference system architecture to support large scale interoperable ITS infrastructure, connected vehicle, and connected automation deployments across the nation – especially across borders with Canada and Mexico (Development); to develop and maintain an inventory of candidate interfaces for standardization and support standards development efforts for interfaces where there is greatest public interest and benefit, including those interfaces required to support regulatory activity (Development); to cooperate internationally, leveraging common interests to reduce US resource requirements, access broader expertise, speed development and harmonize architecture and standards to support an international marketplace for US vendors (Adoption); and to facilitate availability of testing and certification processes and procedures to ensure required interoperability and regulatory compliance (Adoption).

### **Anticipated Program Activities:**

1. Release of second version 2 of the integrated ITS reference architecture and toolset to support large-scale infrastructure and connected vehicle deployments.  
Architecture evolution to continue to remain consistent with ITS infrastructure,

connected vehicle and connected automation technological advancements, inclusive of and stakeholder input, and leveraging international cooperation when in the public interest.

2. Complete detailed IT and ITS standards recommendations for all interfaces within the connected vehicle portion of the system architecture, identify remaining gaps to be addressed. Work is conducted in resource-sharing collaboration with Australia and Europe; leveraging common interests to minimize cost to US while accessing international expertise.
3. Evaluate and initiate internationally cooperative effort to further enhance support for full-scale connected vehicle developments by adding detailed test and certification recommendations for key interfaces within the connected vehicle portion of the architecture. Work planned to be conducted in resource-sharing collaboration with Australia and Europe; leveraging common interests to minimize cost to US while accessing international expertise.
4. Building on the successful completion of V2V standards to support initial operating capability, development and updates of key V2I standards to support connected vehicle deployment, leveraging international cooperation when in the public interest.
5. Ongoing support for interoperable architectures with Mexico and Canada to permit North American interoperability for all ITS services and efficient cross-border movement of people and goods.
6. Self-sustaining certification capability for key connected vehicle capabilities.

#### **Expected Program Outcomes:**

- Nationwide—preferably North American—interoperability for all participants in the ITS system inclusive of vehicles, infrastructure, and mobile devices and applications, efficient ITS-supported cross border movement of people and goods.
- Architecture and standards tools and solutions that facilitate efficient, effective and secure interoperable ITS infrastructure, connected vehicle and connected automation deployments.
- Efficient, standardized sharing of relevant information across transportation network operators, users and stakeholders as well as archiving of information to support transportation planning and other analyses.
- Greater adoption rates with reduced anxiety over obsolescence.
- Increased harmonization between U.S. and other global ITS architectures and standards, resulting in broader, more efficient markets for vehicles, infrastructure and services.
- Maintenance and updates of published standards as needed to assure suitability for intended purposes, security and required forward/backward compatibility to support optimizing performance and life-cycle cost.

### FY 2018 Collaboration Partners

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Interoperability	NHTSA and ITS JPO cooperate to develop, maintain and evolve standards required to support Vehicle-to-Vehicle safety broadcast and associated rulemaking actions.
Interoperability	NHTSA, FHWA, FTA, FRA, FMCSA, Saint Lawrence Seaway Development Corporation (SLSDC), MARAD, Pipeline and Hazardous Materials Safety Administration (PHMSA) and ITS JPO to incorporate all modal stakeholder needs in developing and evolving the integrated National ITS Architecture and software tools to support large scale, interoperable deployment of ITS, connected vehicle and connected automation technology.
Interoperability	NHTSA and ITS JPO to cooperate in developing heavy-vehicle <u>cybersecurity</u> case studies and best practices.
Interoperability	ITS JPO and the Volpe Center to collaborate on development of a cybersecurity five-year program plan and roadmap.
Interoperability	ITS JPO and NHTSA to cooperate on support to an industry-based certification lab consortium to develop certification test procedures.
Interoperability	ITS JPO and NHTSA to advance human-machine interface guidelines for cooperative ITS technologies.

Program Name	Name of Collaboration Partner(s) (External)
Interoperability	European Commission (EC) and Transport Certification Australia (TCA) on standards recommendations, gap analyses and testing/certification recommendation across connected vehicle architectures.
Interoperability	Canadian and Mexican governments on region-wide and cross border interoperability.

### How does the Program meet statutory requirements?

This program is authorized in sections 512 to 518 of Title 23, United States Code.

### How does the Program incorporate public and stakeholder input?

The 2015-2019 Strategic Plan incorporated public and stakeholder (including external and internal partners) input from over 700 stakeholders: the JPO hosted three series of webinars; over 286 different organizations participated in the development of the plan; public meetings for stakeholder input were held at numerous broadly attended events including those sponsored by AASHTO, American Public Transportation Association

(APTA), IEEE, ITE, ITS America, Society of Automotive Engineers (SAE) International. The ITS Strategic Plan has had 8,500 visitors since it was published on line in 2014. The ITS Architecture program has conducted numerous public workshops to gather input on the architecture and provide deployment support and accepts input via electronic means. The ITS standards program participates in numerous ITS standards working groups comprised of interested stakeholders. In accordance with legislative direction – and good practice – ITS standards development is conducted in cooperation with multiple standards development organizations (SDOs) including IEEE, SAE International, the ITE, National Electrical Manufacturers Association (NEMA), the International Organization for Standardization (ISO) via processes open to all interested stakeholders in order to leverage broad expertise and assure the development of broadly acceptable, complete and correct standards. Reference architecture development and evolution activities are conducted with broad stakeholder input obtained via multiple means, leveraging inputs and cooperation from multiple stakeholders and international partners with common interests.

Additionally, the research program managers and the professional capacity building and communications staff routinely host webinars; utilize social media (email and Twitter); issue publications; and speak at conferences and events.

## Accelerating Deployment

\$15,300,000

### Program Description:

As new ITS technologies and systems evolve into market-ready products, the ITS Accelerating Deployment Program is addressing questions associated with adoption and deployment. The goal of the Accelerating Deployment program is to speed up the transformation of ITS research and prototypes into market-ready technologies that are commercially viable and adopted by the transportation community. This program provides communication and education support to facilitate awareness, understanding, acceptance, adoption, and deployment of ITS technologies across stakeholder groups; and ensures effective partnerships are fostered and developed at various levels – executive, program, and project. The ITS JPO seeks to spur adoption of technology, and help stakeholders and localities deploy maturing ITS systems. The program provides knowledge transfer, and supports technical assistance, training, outreach, program evaluation, and other stakeholder engagement. The program supports advancing ITS research, to initial adoption, and subsequently on to wider scale deployment in coordination with other stakeholders at the federal, state, regional and local levels. The program key areas are discussed in the following:

- Training – As CAV technologies progress, the workforce will need new knowledge, skills, and abilities to drive implementation, the ITS Professional Capacity Building (PCB) program will continue developing courses to advance the ITS workforce.
- Technical Assistance – The CV deployment test bed/technical assistance program and CV pilot program will continue development of an agile platform to deliver support to test sites remotely using a help desk model with targeted in-person testing capabilities and coordination between early deployers.
- Stakeholder outreach through workshops and webinars – The PCB program will offer ITS knowledge and lessons learned from CV deployments to stakeholder's in-person and then package these materials for a wider audience through an economical and scalable platform.
- The Communications Program updates and maintains the ITS JPO website and develops microsites on selected topics of interest such as CV basics and connected vehicle deployment.
- The ITS JPO supports knowledge and technology transfer in key areas with key stakeholders such as the FHWA's V2I Deployment as well as the AASHTO, ITE, and ITSA effort to engage stakeholder through the V2I Deployment Coalition.
- The ITS Evaluation program supports CV pilot deployment and smart city evaluation efforts, conduct the ITS Deployment Tracking Survey, document benefits, costs, and lessons learned from ITS deployments, and conduct studies of ITS program effectiveness.
- The Communications program provides support for any ITS JPO-funded research project. This includes presentations, articles, and fact sheets about connected vehicle, automated vehicle and all other ITS activities. These materials are used to

educate the public and provide stakeholders with the tools they need to promote deployment of ITS technology.

### **Program Objectives:**

To define collaboration and communication mechanisms and targets to encourage public and private investment (Research); to develop comprehensive cost benefits and analytic tools that allow deployers to understand the financial and operational benefits of new technologies and systems (Development); and to establish the tools that support the new user base (Adoption).

### **Anticipated Program Activities:**

1. Prepare publications in Technical Journals for CV outreach support.
2. Conduct CV and AV workshops to increase technical knowledge of connected vehicle and automated vehicle deployers.
3. Create Emerging Technologies outreach and training activities.
4. Develop University ITS & Community College ITS Workshops to facilitate deployment of ITS-CV-AV teaching within higher education venues.
5. Conduct stakeholder outreach through workshops and webinars including peer-to-peer events.
6. Provide active technical assistance to early deployers of CV and other emerging ITS technologies.

### **Expected Program Outcomes:**

- Provide deployment support by assisting with transition planning, training, transition plans, timelines and milestone development.
- Provide communication and education support to facilitate awareness, understanding, acceptance, adoption, and deployment of ITS technologies across all stakeholder groups. Ensure effective partnerships are fostered and developed at various levels – executive, program and project.
- Develop partnerships encompassing a wide range of public and private partners.

### **FY 2018 Collaboration Partners**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
Professional Capacity Building (PCB) Program	NHI (FHWA) and TSI (OST) develop and offer courses on ITS Awareness, ITS National Architecture, Connected Vehicles and other topics.
PCB Program	FTA, MARAD, and FMCSA provide subject matter experts to review training materials and offer course instruction for PCB classes and webinars.
PCB Program	Volpe Center conducts transit standards course development, provides technical assistance for Talking Technology and Transportation (T3) webinar series, and

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
	provides program management and internal collaboration support.
Evaluation Program	Volpe Center conducts evaluation research for JPO.
Mobility Services for All Americans (MSAA)	FTA conducts research, reviews publications, and assists with executing best practices workshops for MSAA.
Communications	OST-R, NHTSA and FTA to work with the JPO to develop a redesigned, interactive website that engages external audiences such as ITS stakeholders, interested members of the public, policymakers, and media, and uses new and social media in a graphically appealing and engaging manner to convey the latest information on old ITS technologies.
Communications	All USDOT modes will continue to have a booth presence at key trade shows.
CV Pilot - Deployment Technical Assistance	FHWA and JPO work with the JPO to provide active technical assistance to early deployers of connected vehicle (CV) and other emerging ITS technologies.
CV Pilot - Deployment Technical Assistance	NHTSA and FTA work with the JPO to ensure that policy is appropriately represented within the emerging certification test procedures, this project continues the work of the Test Labs and provides the Policy Program and modal partners with an opportunity to ensure the evolving test procedures are in line with policy.

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (External)</b>
Professional Capacity Building (PCB) Program	ITE, Intelligent Transportation Society of America (ITSA), Association of Metropolitan Planning Organizations (AMPO), National Association of Regional Councils (NARC) and others will work with the PCB Program to provide feedback on document review and outreach to respective members through training and peer exchange opportunities.
Evaluation Program	
Mobility Services for All Americans (MSAA)	
Communications	
CV Pilot - Deployment Technical Assistance	

### **How does the Program meet statutory requirements?**

This program is authorized in sections 512 to 518 of Title 23, United States Code.

### **How does the Program incorporate public and stakeholder input?**

The 2015-2019 Strategic Plan incorporated public and stakeholder (including external and internal partners) input from over 700 stakeholders: the JPO hosted three series of webinars; over 286 different organizations participated in the development of the plan; public meetings for stakeholder input were held at numerous national annual meetings, including the National Rural ITS Annual Meeting (NRITS), the ITE, ITS American Annual Meeting, IEEE and the Connected Vehicle Trade Association (CVTA). The ITS Strategic Plan has had 8,500 visitors since it was published on line in 2014.

The ITS Professional Capacity Building (PCB) Program's CV Training and Education Implementation Plan FY2016 – 2020 incorporated input from nearly 200 individual stakeholders on CV training needs.

Additionally, the research program managers and the professional capacity building and communications staff routinely host a multitude of webinars; utilize social media (email and Twitter); issue publications; and speak at conferences and events.



## **Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD)**

**\$60,000,000**

### **Program Description:**

The FAST Act directs the USDOT to establish an advanced transportation and congestion management technologies deployment initiative to provide grants to eligible entities to develop model deployment sites for large-scale installation and operation of advanced transportation technologies to improve safety, efficiency, system performance, and infrastructure return on investment. FHWA will enter into agreements with eligible entities to establish model technology deployment sites.

Per the FAST Act, the \$60 million required for this program are carved out of three existing programs in the following amounts: Highway Research and Development (\$20 million), Technology and Innovation Deployment (\$19 million), and Intelligent Transportation Systems (\$21 million) (amounts are estimates subject to change).

### **Program Objectives:**

The technology deployments funded under this program will: reduce costs & improve return on investments; deliver environmental benefits that alleviate congestion & streamline traffic flow; measure & improve the operational performance of the applicable transportation network; reduce the number & severity of traffic crashes & increase driver, passenger, & pedestrian safety; use real-time transportation-related information to improve mobility, reduce congestion, & provide for more efficient & accessible transportation; monitor transportation assets to improve infrastructure management, reduce maintenance costs, prioritize investment decisions, & ensure a state of good repair; deliver economic benefits by reducing delays, improving system performance, & providing for the efficient & reliable movement of goods & services; or accelerate the deployment of vehicle-to-vehicle, vehicle-to-infrastructure, autonomous vehicles, & other technologies.

### **Anticipated Program Activities:**

Each fiscal year, FHWA will make no fewer than 5 and no more than 10 awards of up to \$12 million individually. Focus areas are identified for each year's solicitation and may include: transportation elements associated with Smart Cities; multimodal Integrated Corridor Management (ICM); installation of connected vehicle technologies at intersections and pedestrian crossing locations; Freight Community System; technologies to support connected communities; infrastructure maintenance, monitoring, and condition assessment; and rural technology deployments.

### **Expected Program Outcomes:**

These model technology deployments will demonstrate how emerging transportation technologies, data, and their applications can be effectively deployed and integrated with existing systems to address transportation challenges.

### **FY 2018 Collaboration Partners (Internal USDOT)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
ATCMTD	<b>Office of the Secretary of Transportation, Maritime Administration, and Federal Transit Administration</b> on identification of technology focus areas and on evaluation of proposals.

#### **How does the Program meet statutory requirements?**

This program is authorized in section 6004 of the FAST Act, Public Law 114-94, which requires the Secretary to establish an advanced transportation and congestion management technologies deployment initiative.

#### **Describe how public and stakeholder input have been utilized in the development of this research program:**

The program conducts introductory webinars with stakeholders and prospective applicants after the release of the annual solicitation to describe the program, goals, and the focus areas to help applicants plan their proposals. The technology deployments provide annual reports on meeting their expected outcomes that are used in shaping future program solicitations.

## **Small Business Innovation Research (SBIR)**

**\$4,000,000; funded from HRD (\$2,000,000) and ITS (\$2,000,000)**

### **Program Description:**

The SBIR program is a highly competitive, awards-based program that encourages domestic small businesses to engage in research and development addressing high priority research areas within USDOT. The SBIR program favors research that has the potential for commercialization through products and applications sold to the private sector transportation industry, State DOTs, USDOT, or other federal agencies.

The program is administered by the Volpe Transportation Center. The SBIR Program Office publishes two solicitations each fiscal year for proposals on specific research topics of interest to USDOT operating administrations, including the FHWA.

### **Program Objectives:**

To encourage small businesses to engage in research or research and development (R/R&D) that has the potential for commercialization and meets federal R/R&D objectives.

### **Anticipated Program Activities:**

In FY 2018, FHWA will continue to participate in the USDOT SBIR program solicitation. It is expected that approximately two new topics will be solicited, with two contracts being awarded for feasibility studies (SBIR Phase I). In addition, it is expected that three or more SBIR Phase II contracts will be awarded to continue current Phase I work.

### **Expected Program Outcomes:**

- Increased participation in innovation and entrepreneurship by small businesses and socially and economically disadvantaged persons; and
- Increased private sector commercialization of innovations derived from federal R&D funding.

### **FY 2018 Collaboration Partners (Internal USDOT)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
SBIR	<b>Office of the Secretary of Transportation, Federal Transit Administration, National Highway Traffic Safety Administration, and Federal Motor Carrier Safety Administration through Volpe National Transportation Systems Center</b> , which manages the SBIR Program for USDOT.

### **FY 2018 Collaboration Partners (External)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (External)</b>
SBIR	None

#### **How does the Program meet statutory requirements?**

This program is authorized in Public Law 112-81, the SBIR/STTR Reauthorization Act of 2011 (STTR stands for Small Business Technology Transfer.)

#### **Describe how public and stakeholder input have been utilized in the development of this research program:**

The general public is encouraged to suggest SBIR topics through the Volpe SBIR website:  
<https://hostedsites.volpe.dot.gov/SBIR/SuggestTopic.aspx>

## **Section 2 - Program Descriptions, FY 2019**

### **Federal Highway Administration**

#### **Bridges and Structures**

##### **Program Description:**

FHWA's bridge and structures R&D produces technologies and methodologies, guidelines and specifications for the design, construction, evaluation, assessment, and preservation of bridges, tunnels, culverts, geotechnical constructions (e.g., walls, slopes, cuts, and fills) and other highway structures (e.g., sign structures); and hydraulic engineering guidance; design and mitigation guidance for extreme events (e.g., hurricanes, flooding and scour); advanced materials and structural systems; technologies and methodologies for condition assessment and monitoring of highway structures; and data-driven performance management and preservation tools.

##### **Program Objectives:**

- To improve the safety and durability, and extend the life of highway bridges and structures.
- To develop and deliver guidance, methodologies and technologies to improve the resilience of transportation infrastructure to natural and human-induced hazards.
- To advance new and innovative technologies to support more rapid, cost effective and sustainable construction of highway bridges and structures.

##### **Anticipated Program Activities:**

1. Bridge Hydraulics – Further improve the tools and guidance currently provided to predict and mitigate flooding and scour on all bridges over waterways and address sea-level rise, storm surge and tsunami effects on coastal bridges.
2. Geotechnical Engineering – Provide advances in the state of the practice in design, construction and performance of bridge foundations and geotechnical structures.
3. Bridges and Structures – Drive innovation in structural design, construction, and maintenance through the development of best practice guidance and novel solutions to present challenges in bridges, tunnels, and ancillary structures.
4. Extreme Events – Address hurricanes, floods, wind and other extreme events to improve the state of the practice and develop resilient and adaptable systems to mitigate the impact of such hazards on bridges and other structures.

In 2019, the program is expected to deliver:

- Design and Construction Guidance for Ultra-High Performance Concrete Structures
- Optimized Prefabricated Bridge Elements and Construction Systems
- Advanced Welding Solutions for Steel Bridge Fabrication

- Design Guidance for Bearing Resistance of Large Diameter Open End Piles
- Load Factors for Earth Pressure in Reinforced Soil Retaining Walls and Abutments
- Probabilistic Scour Design Guidance within the AASHTO Load-and-Resistance Factor Design (LRFD) Framework
- Design Guidelines for Buried Bridge Scour Protection Systems
- Guidance on the applicability of unmanned aerial systems (UAS) data for highway bridge inspection, including the analysis, management and archiving of such data.
- A methodology, guidance, and an accompanying tool for analyzing data and determining agency bridge preservation decision rules.
- Evaluation of the effectiveness of State Highway Agencies (SHA) quality assurance practices utilized on accelerated bridge construction projects and guidance to improve these practices.
- Guidance on enhancing bond performance of grout-concrete interfaces and proper selection of repair materials.
- Evaluation and comparison of methods for stripping paint.
- Revised guidance or specifications for mitigating corrosion during design or construction.
- Evaluation of self-healing paint for use with epoxy-coated rebar.

#### **Expected Program Outcomes:**

- Enhanced quality and durability of bridges, tunnels, and other highway structures.
- Improved highway performance under all conditions.
- Minimized impact of construction on traffic.
- Next generation building materials and applications for transportation infrastructure
- Resilient infrastructure with minimal impact to livelihood, and economy following a hazard event.

#### **FY 2019 Collaboration Partners (Internal USDOT)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
Bridges and Structures	<b>Federal Railroad Administration, National Highway Traffic Safety Administration, Maritime Administration, Federal Transit Administration</b> on corrosion research.

### FY 2019 Collaboration Partners (External)

Program Name	Name of Collaboration Partner(s) (External)
Bridges and Structures	<b>Oregon DOT</b> – Bridge weigh in motion <b>NY State DOT, Alaska DOT, Caltrans, Washington State DOT, Oregon DOT</b> – Multi-hazard bridge design guidelines <b>NY City DOT, Caltrans, Utah DOT</b> – Post hazard bridge assessment <b>Virginia DOT</b> - corrosion research FHWA partners with 41 States through the Transportation Pooled Fund Program to conduct Bridges and Structures research

#### How does the Program meet statutory requirements?

This program is authorized in sections 502 and 503 of title 23, United States Code, which require the Secretary to carry out highway research, development, and technology deployment activities covering a broad range of topic areas to improve highway safety, improve infrastructure integrity, strengthen transportation planning and environmental decision-making, reducing congestion, and enhancing freight productivity, among others.

#### Describe how public and stakeholder input have been, or will be, utilized in the development of this research program:

FHWA regularly engages in both formal and informal interactions with a variety of stakeholder groups including AASHTO, State DOTs and various industry groups.

## Pavements and Materials

### Program Description:

FHWA is engaged in forward-looking research and development to improve the durability, economy, environmental sustainability and safety characteristics of highway pavements. This includes research and development addressing pavement structural design and analysis, pavement materials selection, evaluation and mixture design, work toward more sustainable pavement materials and practices, and pavement and materials specifications, construction and quality assurance practices.

### Program Objectives:

- Optimize pavement structural design to achieve a desired performance based on specific loading, environment and functional requirements.
- Optimize material selection, analysis and mixture design to achieve required performance characteristics.
- Improve the sustainability of highway pavements through effective use of reclaimed or recycled materials, industrial by-products, and innovative materials.

### Anticipated Program Activities:

1. Pavement Structural Design - Advance understanding and improvement of pavement Life Cycle Cost procedures, and improve design methods for pavement preservation, maintenance and rehabilitation.
2. Pavement Materials - Enhance and optimize mixture design, testing, and specifications that support pavement performance for mixtures using both virgin and recycled/reclaimed materials and industrial byproducts.
3. New and Innovative Materials - Explore the use of new and innovative materials and practices that minimize environmental impacts.

In 2019, the program is expected to:

- Advance performance related specifications for both asphalt and concrete pavements, through:
  - Use of small scale specimen for dynamic modulus testing and fatigue testing;
  - Performance-based mix design;
  - Shadow projects with SHAs;
  - Cost/benefit analyses for materials inspection/testing programs;
  - Showcase risk analysis methods.
- Demonstrate continuous friction and macrotexture measurement equipment and develop Pavement Friction Management Programs in four States.
- Deliver:
  - An AASHTO Provisional test method for the quantitative determination of Re-refined engine oil bottoms (REOB) in asphalt binder.



- A more reliable test method for detecting aggregates prone to alkali silica reaction (ASR) (replacement of ASTM 1260 and 1293).
- Performance based test methods for asphalt mixtures.
- Demonstrate rapid asphalt binder quality assurance test in 10 States. (Easy to use software that predicts PG grades of asphalt binders using data from QC binder tester.)
- Demonstrate rapid lab and field mix test for use as a performance indicator in 5 States.
- Demonstrate impact on performance of using high reclaimed asphalt pavement (RAP) and recycled asphalt shingles (RAS) contents in asphalt concrete mixtures
- Quantify impact of compaction on premature cracking and rutting.
- Deliver models for correlating aggregate properties with concrete mechanical performance

#### **Expected Program Outcomes:**

- Highway agencies will have access to analytical tools and guidance to that support optimization of pavement structural design to achieve desired performance targets.
- Highway agencies will be able to select and design mixtures to achieve required performance characteristics.
- Highway pavements will be more durable and sustainable.

#### **FY 2019 Collaboration Partners (Internal USDOT)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
Pavement and Materials	<b>Federal Railroad Administration, National Highway Traffic Safety Administration, Maritime Administration, Federal Transit Administration</b> on corrosion research.  <b>Federal Aviation Administration</b> on airport planning, designs, and improves runway pavement design, construction, and maintenance.

### FY 2019 Collaboration Partners (External)

Program Name	Name of Collaboration Partner(s) (External)
Pavement and Materials	<p><b>Colorado DOT, Kansas DOT, Maine DOT, North Carolina DOT, Missouri DOT, Illinois Tollway Authority</b> – pavement performance related specifications</p> <p><b>Caltrans, Georgia DOT, Idaho DOT, Illinois DOT, Nevada DOT, New York DOT, Pennsylvania DOT, South Carolina DOT, Virginia DOT</b> – network level pavement structural evaluation</p> <p><b>Indiana DOT, Washington DOT, Texas DOT, Florida DOT</b> –continuous pavement friction and macrotexture measurement</p> <p><b>Texas DOT, Florida DOT, Utah DOT and New Jersey DOT</b> – porous graded asphalt</p> <p><b>Maine DOT and North Dakota DOT</b> – flooded pavement analysis</p> <p><b>NIST</b> - concrete &amp; alternative cementitious materials (ACM) research</p> <p><b>Army Corp of Engineers</b> - geotechnical research</p> <p><b>AASHTO and State Agencies</b> - asphalt, aggregate, and concrete research</p> <p><b>Oklahoma State University and Oregon State University</b> - concrete research</p> <p><b>Clarkson University</b> - concrete research</p> <p><b>ChemCrete</b> - Alternative Cementitious Materials research</p> <p><b>Swedish Road Authority</b> - asphalt research</p> <p><b>University of Cantabria (Spain)</b> - asphalt research</p> <p>FHWA partners with 48 States plus Puerto Rico, through the Transportation Pooled Fund Program to conduct Pavement &amp; Materials research</p>

### How does the Program meet statutory requirements?

This program is authorized in sections 502 and 503 of title 23, United States Code, which require the Secretary to carry out highway research, development, and technology deployment activities covering a broad range of topic areas to improve highway safety,

improve infrastructure integrity, strengthen transportation planning and environmental decision-making, reducing congestion, and enhancing freight productivity, among others.

**Describe how public and stakeholder input have been, or will be, utilized in the development of this research program:**

FHWA regularly engages in both formal and informal interactions with stakeholder groups including AASHTO and various industry groups. Additionally, FHWA has formed a number of expert task groups which include representatives from government agencies, academia and industry. These groups provide technical input as well as help FHWA carrying out technical work to facilitate deployment of pavement innovations.

## Construction and Program Administration

### Program Description:

FHWA is working to advance construction, preservation and program administration technologies and practices that reduce onsite construction time, improve the quality of end product, and optimize investment of federal, state and local agency resources in providing effective oversight at all stages of the project delivery process. This includes work to advance automated construction technologies and e-construction, as well as development and delivery guidance concerning handling of utilities in the project right-of-way, alternative project delivery methods, risk-based stewardship and oversight, and design.

### Program Objectives:

To accelerate on-site phases of highway construction while improving as-constructed quality and enhance the overall effectiveness and efficiency of the Federal-Aid program.

### Anticipated Program Activities:

1. Construction – Further efforts to advance e-construction, construction automation and other technologies to accelerate and/or improve construction quality and performance-based construction standards.
2. Infrastructure Preservation – Further efforts to advance the timely and appropriate application of effective treatments to preserve infrastructure in a state of good repair.
3. Program Administration- Development and delivery of guidance and best practices to enhance the efficiency and effectiveness of federal investments in highway infrastructure, and risk-based stewardship and oversight.
4. Design – Development and delivery of guidance and best practices to advance performance-based practical design.

Expected 2019 accomplishments include:

- Guidance for inspecting and accepting construction projects in a 3D design, bid, build environment to ensure accuracy, precision and independent verifiability by the owner agency.
- Quantification of how construction industry mergers, acquisitions or other consolidations are impacting the cost and quality of highway construction
- Development of a technological toolbox that will provide the highway agencies with solutions for integrating their emergency response operations within their maintenance management system framework and be able to account for the resources used in emergency response.

### Expected Program Outcomes:

- Accelerated project delivery
- Improved infrastructure quality
- More effective investment of federal resources in program stewardship and oversight

- More optimal investment of Federal-aid program funds

#### **FY 2019 Collaboration Partners (Internal USDOT)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
Construction and Program Admin.	None

#### **FY 2019 Collaboration Partners (External)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (External)</b>
Construction and Program Admin.	<p><b>AASHTO, Association of General Contractors (AGC), American Road and Transportation Builders Association (ARTBA)</b> – construction research coordination</p> <p><b>Colorado DOT, Montana DOT, Washington DOT, AASHTO</b> – index based cost estimation</p> <p><b>Wisconsin DOT, Virginia DOT, New York DOT, Utah DOT, Missouri DOT</b> – 3D models in construction case studies</p> <p><b>Pennsylvania DOT, Florida DOT, Texas DOT, Michigan DOT</b> – e-construction return on investment analysis</p> <p><b>Pennsylvania DOT, Caltrans, Minnesota DOT, Ontario Ministry of Transportation</b> – snow plow guidance system</p> <p><b>TRB</b> – Civil Integrated Management (CIM) coordination</p> <p>FHWA partners with 45 States through the Transportation Pooled Fund Program to conduct Construction and Program Administration research</p>

#### **How does the Program meet statutory requirements?**

This program is authorized in sections 502 and 503 of title 23, United States Code, which require the Secretary to carry out highway research, development, and technology deployment activities covering a broad range of topic areas in order to improve highway safety, improve infrastructure integrity, strengthen transportation planning and environmental decision-making, reducing congestion, and enhancing freight productivity, among others.

#### **Describe how public and stakeholder input have been, or will be, utilized in the development of this research program:**

The FHWA receives stakeholder input through a variety of both formal and informal interactions with AASHTO Committees and various industry groups and considers the information received in developing its programs.

## Transportation Performance Management

### Program Description:

The FHWA is working to advance implementation of the MAP-21 mandates, continued in the FAST Act, to implement Transportation Performance Management (TPM) and the supporting Asset Management requirements. This includes development and delivery of technologies, analytical tools, supporting guidance and training for FHWA, state and local agency personnel; and supporting communication and outreach efforts. In support of advancing the long-term effectiveness of TPM, FHWA is continuing research to advance the understanding of infrastructure performance through long term pavement and bridge performance research.

### Program Objectives:

The FHWA's objective is to achieve and sustain effective implementation of Transportation Performance Management, and the supporting Asset Management requirements, toward improvement in the overall return on highway transportation investments.

### Anticipated Program Activities:

1. Implementation of Transportation Performance Management – FHWA will develop and deploy web-based analytical tools, and develop and deliver guidance, training and technical assistance to support state and local agencies in meeting the requirements of the Transportation Performance Management and Asset management rules.
2. Next Generation Inspection and Performance Measurement – FHWA will conduct research and development toward identification of improved infrastructure condition assessment technologies and performance measures for use in Transportation Performance Management.
3. Long Term Infrastructure Performance Programs – FHWA will continue an integrated approach to managing the Long Term Pavement Performance and Long Term Bridge Performance Programs to advance understanding of infrastructure performance and provide the foundation for well-founded decisions concerning their management. In addition, FHWA will explore moving toward a more integrated approach to managing and conducting these programs to enable economies in common data collection and management needs.

States will be establishing targets for the first time in FY 2018 under the new requirements. FY 2017 work will continue into FY 2018 with a concentrated focus on advancing effective target setting practices.

Expected 2019 program accomplishments include:

- Development of more strategic pavement performance measure and its means of collection, in order to better account for pavement structural capacity and better link investments to long term performance.

- Development of tools and methodologies to guide implementation of a comprehensive asset management plan including trade-off analysis from a common ground among disparate assets that are traditionally individually assessed and managed.
- Guidance for a highway agency to determine what assets, and asset data, to capture beyond pavements and bridges that focus on a long-term, sustainable infrastructure investment strategy and answer the question of what assets are worth tracking for their particular agency.
- Collection and release of additional LTPP data through the LTPP InfoPave web portal.
- Additional insights into pavement performance derived through analysis of the LTPP data.
- Expansion of LTBP data collection efforts to include bridges in 12 clusters and 10 corridors nationally.

#### **Expected Program Outcomes:**

- An increased capability for State DOTs and Metropolitan Planning Organizations (MPOs) to comply with new regulatory requirements.
- Enhanced understanding of infrastructure (pavement & bridge) performance and the factors that affect it.
- Improved investment decision making focused on national goals and state and metropolitan performance targets.
- Increased transparency in the performance aspects of the Federal-aid Highway program.

#### **FY 2019 Collaboration Partners (Internal USDOT)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
Transportation Performance Management	<p><b>Federal Transit Administration, National Highway Traffic Safety Administration and Office of the Secretary of Transportation</b> regarding regulations.</p> <p><b>Federal Transit Administration and Office of the Secretary of Transportation</b> on the development of a web-based tool for viewing and analyzing data.</p>



### FY 2019 Collaboration Partners (External)

Program Name	Name of Collaboration Partner(s) (External)
Transportation Performance Management	<p><b>Maryland DOT, Washington DOT</b> – remaining service interval</p> <p><b>All States, AASHTO, State DOTs, Road Profile Users' Group, Falling-Weight Deflectometer (FWD) User Group, NAPA, Asphalt Institute, ACPA, and the National Center for Pavement Preservation</b> - the Long Term Pavement Performance Research</p> <p><b>National Academies Sciences/Transportation Research Board</b> - consensus input on the LTPP and LTBP Research</p> <p><b>National Steel Bridge Alliance (NSBA) and National Concrete Bridge Alliance (NCBC)</b> - Input into LTBP research activities</p> <p>FHWA partners with 19 States through the Transportation Pooled Fund Program to conduct Transportation Performance Management research</p>

#### How does the Program meet statutory requirements?

This program is authorized in sections 502 and 503 of title 23, United States Code, which require the Secretary to carry out highway research, development, and technology deployment activities covering a broad range of topic areas to improve highway safety, improve infrastructure integrity, strengthen transportation planning and environmental decision-making, reducing congestion, and enhancing freight productivity, among others.

#### Describe how public and stakeholder input have been, or will be, utilized in the development of this research program:

The FHWA receives stakeholder input through a variety of both formal and informal interactions with AASHTO Committees and various industry groups and considers the information received in developing its programs. Stakeholder groups meet at least quarterly to share best practices and to receive feedback on implementation for both Transportation Performance Management (TPM Roundtable) and Asset Management (TAM ETG). A TRB-managed Stakeholder group, the TRB Long Term Infrastructure Committee, is used as a forum to obtain consensus stakeholder input to inform the management of the LTPP and LTBP programs.

## Safety

### Program Description:

The FHWA's safety research, development and technology program addresses the contributing factors of roadway deaths and injuries related to roadway design, construction, and maintenance. This program develops robust data analysis tools that enable transportation professionals to match crash causes with cost-effective countermeasures. With safety resources aimed at targeted safety problems, state and local agencies can deliver significant safety improvements to the public.

### Program Objectives:

- Reduce fatalities and serious injuries for all users on all public roadways
- Foster scientific, data driven approach to safety decision making
- Implement a performance driven Highway Safety Improvement Program

### Anticipated Program Activities:

In FY 2019, the program will continue efforts to improve roadway safety in areas targeted through a data driven safety approach: data and analysis, intersections, roadway departure, HSIP, Local & Rural Roads, and pedestrians and bicyclists. The implementation of connected vehicle technologies like vehicle-to-infrastructure communications and vehicle-to-pedestrian communications will be assessed for effectiveness and for ease of use.

1. Data and Analysis: Complete an in-service performance evaluation of guardrail end terminals involving four states. Apply the empirical evidence from this evaluation to prepare guidelines to other states to conduct their own evaluations and considerations for routine reporting on the status of life-critical hardware. Develop guidelines for new safety countermeasures based on research conducted with states using the second SHRP2 Naturalistic Driving Study.
2. Intersections: Explore how real time traveler information available from mobile devices can be used to collect data on how motorized and non-motorized users interact at intersections. Expand the performance-based approach to planning and designing intersections, and provide technical assistance and evaluation support to practitioners considering alternative intersection designs in corridor configurations. Deploy the results of mini roundabouts evaluation and research, including a modular components-based approach.
3. Pedestrians/Bicyclists: Develop tools that can support predictive analyses of pedestrian and bicyclist safety. Establish guidelines that enable states and localities to determine the appropriate pedestrian and bicyclist roadway separation, depending on the local context and type of facility. Assess the safety impact on vehicle-to-pedestrian technologies emerging from connected vehicle research.
4. Roadway Departure (RwD): Evaluate how enhanced delineation treatments can reduce crashes at horizontal curves. Continue working with states to evaluate low cost

strategies for implementing safety countermeasures, with a focus on rural roadways where fatality and injury risk is greater. Prepare guidelines for states and localities on applying object markers to reduce risk of fixed object crashes. Conduct laboratory crash tests of safety barriers to assess performance.

5. **Connected Vehicles:** Leverage connected vehicle programs to extract potential safety benefits. Support the refinement of safety focused vehicle-to-infrastructure applications and testing
6. **Human Factors:** Apply and test methods to connect the Human Factors laboratories with other simulators for multimodal simulations. Evaluate how scenario testing for many participants in remote locations to operate in the same virtual environment. Conduct testing to support Roadway Departure activities related to Older Users and Roadside Objects, and other support related to Automated Vehicle user acceptance.
7. **Highway Safety Improvement Program (HSIP):** Provide guidance to states on noteworthy practices for developing State HSIPs. Provide technical assistance and delivery of peer-to-peer exchanges among states to improve the practice of program development. Promote systemic approach to safety. Enhance the capabilities of the Roadway Safety Data Dashboard to increase value and to accommodate the data requirements for safety performance measures and to communicate with the HSIP online reporting tool.
8. **Local and Rural Roads:** Provide national leadership in identifying, developing, and delivering safety programs and products to agencies, elected officials, governments and other stakeholders to improve safety on local and rural roads. Develop and promote resources, such as guides and case studies, to address local and rural road safety needs. Promote the value of local and rural roads safety investment.

### **Expected Program Outcomes:**

- Better highway, intersection, roadside, pedestrian, and bicyclist safety design on all roads, guided by data driven safety analysis.
- Improved safety through reduction of crash frequency and severity.
- Prevention of crashes and attenuation of negative consequences of crashes that do occur.
- Improved safety through use and widespread deployment of new technologies, and training those deploying the technologies.
- Accelerated implementation and acceptance of new innovations and proven safety countermeasures.
- Human-centered countermeasures that apply Naturalistic Driving Study data of vehicle operators interacting with the roadway environment.

### FY 2019 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Connected Vehicle	<b>Federal Railroad Administration and Federal Motor Carrier Safety Administration</b> - collaborates on intelligent transportation systems R&D.
Human Factors	<p><b>National Highway Traffic Safety Administration</b> – Safety program staff evaluate Coordinated Automated Cruise Control applications.</p> <p><b>U.S. Department of Transportation’s Human Factors Coordinating Committee</b> – representatives from various modal agencies of DOT meet on a monthly basis to coordinate activities and provide updates on human factors projects.</p>
DOT Traffic Records Coordinating Committee (DOT TRCC) (associated with the Data and Analysis program activities)	<b>Federal Motor Carrier Safety Administration, National Highway Traffic Safety Administration, Office of the Secretary</b> - This multi-modal group works to improve the collection, management, and analysis of traffic safety data at the State and Federal level. FHWA’s Safety Performance Measures Management Final Rule (23 CFR 490) and NHTSA’s Uniform Procedures for State Highway Safety Grants Program Interim Final Rule (23 CFR 1300) establish a single, national definition for States to report serious injuries per the Model Minimum Uniform Crash Criteria (MMUCC) 4th Edition.
Pedestrians and Bicyclists	<b>National Highway Traffic Safety Administration and Federal Motor Carrier Safety Administration</b> – Active participants in a working group focused on reducing pedestrian and bicyclist fatalities.
Crashworthiness (associated with the Roadway Departure program activities)	<b>National Highway Traffic Safety Administration</b> - Collaborates on developing and conducting crash simulation models.
Speeding (associated with the Roadway Departure program activities)	<b>National Highway Traffic Safety Administration and Federal Motor Carrier Safety Administration</b> - The three agencies have an intermodal speed team that meets periodically to share project information and occasionally to more formally collaborate on joint projects.

### FY 2019 Collaboration Partners (External)

Program Name	Name of Collaboration Partner(s) (External)
All Safety Program Areas	<p><b>American Association of State Highway and Transportation Officials (AASHTO)</b> –Collaborates on research problem statements.</p> <p><b>Transportation Research Board</b> – Coordinates on research problem statements. Safety program staff participates on various safety related research projects and committees.</p> <p><b>National Association of County Engineers</b> – Collaborates on projects to address safety on local and rural roads.</p> <p>FHWA partners with 46 States plus the District of Columbia through the Transportation Pooled Fund Program to conduct Safety research.</p>

#### How does the Program meet statutory requirements?

This program is authorized in sections 502 and 503 of title 23, United States Code, which require the Secretary to carry out highway research, development, and technology deployment activities covering a broad range of topic areas to improve highway safety, improve infrastructure integrity, strengthen transportation planning and environmental decision-making, reducing congestion, and enhancing freight productivity, among others.

#### How does the Program incorporate public and stakeholder input into the research planning process?

The FHWA seeks both formal and informal participation from a variety of stakeholder groups. The safety research, development and technology program collaborates with the AASHTO Standing Committee on Highway Traffic Safety (SCOHTS) and relies heavily on input and feedback from the State DOTs. This program conducts numerous training and outreach sessions throughout the country with stakeholders at the state and local level and engages stakeholder public agencies through pooled fund studies. Staff members are actively involved with TRB committees on safety related topics.

## Freight and Operations

### Program Description:

Highway reliability affects our ability to visit family, get to work, deliver products to customers, live our lives, and grow the economy. FHWA's freight and operations research is developing innovative technology and processes that lead to system-wide improvements in how FHWA and its state and local partners and other stakeholders manage and increase the reliability of the National Highway System and the movement of people and goods throughout the transportation networks.

These innovations target the daily operations of transportation agencies and other stakeholders, and their planning for operations. Research areas include performance management, efficient goods movement that enable freight to move where and when it needs to go, active transportation and demand management strategies, guidance for transportation management for scheduled or unscheduled events, and improved traffic analysis techniques. Research into new technologies and noteworthy management practices provides state and local agencies and other operations and freight entities with additional tools to implement the institutional changes that will allow them to meet operational challenges.

### Program Objectives:

- To develop, test, and provide tools to decision-makers that enable more effective and sustained transportation systems management & operations (TSMO) actions and programs to improve regional transportation system safety, efficiency, reliability, and options for people & goods movement.
- To make highways safer and more efficient by reducing the impacts of the causes of congestion.
- To deploy technologies that support safer, more efficient, and improved people & goods movement.
- To lead towards automation in transportation through connected and automated vehicles research

### Anticipated Program Activities:

1. Organizing for Reliability - State action plans: develop and deliver tools, technical assistance, and training to state and regional transportation agencies to create and improve business processes for TSMO analysis, planning, and implementation.
2. Work zone management: Conduct and manage applied research to develop new approaches to work zone traffic control and work zone performance management.
3. Road weather / Special events / Emergency management: Develop implementation guides, tool kits, and training materials for road weather management, special events transportation management, and transportation agency responses to emergency events.

4. Traffic incident management: Develop and deliver tools to assist responders in all phases of traffic incident management to efficiently and safely address traffic incident response, management of traffic, and restoration of highway capacity.
5. Organizing / Planning for Operations / ITS: Develop next generation traffic management systems and models through researching specific technologies, including ITS, that can improve the performance of the system's services to support freight productivity and economic competitiveness of the United States.
6. Freight operations / technology: Provide products and technical assistance to improve freight movement, reduce freight-related congestion, evaluate impacts of vehicle size and weight on infrastructure & operations, address specific infrastructure challenges related to truck parking & mobility at intermodal facilities, and develop freight performance measurement & management systems
7. Connected / automated vehicle research: Conduct connected and automated vehicle research to develop and test applications and technologies, to assess the impacts of connected/automated technology deployments on transportation and freight operations, and to understand the technologies' policy implications.
8. Operations and freight performance management and measurement (includes portion of travel time data purchase):
  - a. Advance performance measures and data to analyze the effectiveness of TSMO strategies and track progress toward meeting operations objectives
  - b. Continue acquisition and application of travel time data for operations and freight performance management and measurement by FHWA, the States, and MPOs.
9. Freight and traffic analysis tools: Develop and improve freight and traffic analysis tools such as Freight Analysis Framework (FAF).
10. Active transportation / demand management: Develop and deliver tools, technical assistance, and training to stakeholders in various aspects of active transportation and demand management, such as integrated corridor management, arterial systems, congestion pricing, and real-time information to improve the safety, reliability, and efficiency of moving people and goods.
11. MUTCD: Research related to traffic control devices and their applications as related to the MUTCD.
12. Communications / outreach: Communicate with stakeholders and outreach leveraging all methods and organizations, including the National Operations Center of Excellence.

FY 2019 will apply lessons learned from previous operations and freight operations programs to improve research programs and work with private and public stakeholders to promote research results. FHWA will gather and share best practices and success stories to encourage broader adoption of effective practices and innovations. Operations and freight research programs will continue to be updated to address emerging issues, the availability of new tools and technologies, and the advancement of connected and autonomous vehicles. Emerging issues include the anticipated increase in extreme weather events and the demands that such events impart upon transportation system operations and management. With respect to automated vehicles, in addition to the need to promote effective technology deployment



by our public sector partners, work will also be done to best address the emerging requirements from automated vehicles upon the infrastructure, especially pertaining to the clear and consistent placement of signs, signals and pavement markings.

### Expected Program Outcomes:

- Improved decision-making tools used by transportation entities to address congestion and its causes to improve traffic flow.
- Increased regional transportation collaboration and improved routine traffic operations across all facilities to provide more reliable travel experiences for all highway users.
- Decreased congestion and improved reliability during planned and unplanned disruptive events.
- Improved safety, security, efficiency, reliability, and resiliency of multimodal freight transportation through the use of innovation and advanced technology. Improved understanding by transportation entities of the potential use of connected and automated vehicle technologies to improve transportation operations.
- Improved short- and long-distance movement of goods.
- Improved flexibility of states to support multi-state corridor planning, and multi-state organizations to increase the ability of states to address multimodal freight connectivity.

### FY 2019 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Freight and Operations	<p><b>Federal Transit Administration</b> on programs with multimodal implications, such as Active Transportation and Demand Management and Integrated Corridor Management.</p> <p><b>National Highway Traffic Safety Administration, Office of the Secretary of Transportation, Federal Motor Carrier Safety Administration</b> on Connected and Automated Vehicle research and ITS Research.</p> <p><b>Federal Railroad Administration</b> collaborates on intelligent transportation systems R&amp;D.</p> <p><b>Maritime Administration and Federal Railroad Administration</b> on improving the efficiency of intermodal freight connections.</p> <p><b>Maritime Administration and Federal Railroad Administration, Federal Aviation Administration and Bureau of Transportation Statistics</b> – regular teleconferences on emerging freight issues, major projects</p>



	and events, and OST initiatives, including FAST Act implementation.  <b>Federal Motor Carrier Administration</b> - Work zones, road weather, and events management
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### FY 2019 Collaboration Partners (External)

Program Name	Name of Collaboration Partner(s) (External)
Freight and Operations	<p><b>Transportation Research Board</b> to identify research gaps and opportunities to share research results</p> <p><b>American Association of State Highway and Transportation Officials</b> (particularly through Vehicle-to-Infrastructure Coalition) engages stakeholders who identify operational problems and opportunities to work collaboratively to deploy innovative technologies and practices</p> <p><b>Department of Defense, Aberdeen Test Center</b> to develop test procedures for connected and automated vehicles</p>

### How does the Program meet statutory requirements?

This program is authorized in sections 502 and 503 of title 23, United States Code, which require the Secretary to carry out highway research, development, and technology deployment activities covering a broad range of topic areas in order to improve highway safety, improve infrastructure integrity, strengthen transportation planning and environmental decision-making, reducing congestion, and enhancing freight productivity, among others.

### Describe how public and stakeholder input have been, or will be, utilized in the development of this research program:

Operations and freight programs have developed internal and external stakeholder groups or leveraged stakeholder associations to engage the various transportation and program area communities and modal partners in gathering input through methods such as in-person meetings, peer exchanges, virtual meetings, or web-based events.

## Planning and Environment

### Program Description:

Professionals must consider the complex relationships among a variety of factors affecting individuals, communities, the economy, and the environment when advancing transportation projects. The FHWA's Office of Planning, Environment, and Realty research supports this work by assessing new programs, processes, and tools that produce better decisions, leading to improved outcomes.

The FHWA provides resources, technical assistance, proven processes, and data so States, MPOs and local agencies can perform effective project planning, environmental, and realty decision making. Enhanced coordination across disciplines leads to more efficient project delivery and better resource conservation. The result is a safer, more reliable, and accessible transportation system that is environmentally sound and responsive to the public's needs.

### Program Objectives:

To develop a better understanding of the complex relationship between surface transportation and the environment, and to promote more informed transportation decision making that improves transportation planning, programming, operations, and coordination.

### Anticipated Program Activities:

1. Planning - Focuses on providing quality data, analysis and information to transportation partners and decision-makers. This program develops and implements programs, and activities that advance and support comprehensive international, interstate, State, metropolitan, rural, regional, multi-modal, and tribal planning processes. Other planning research initiatives support the performance based planning process and linking planning data to the NEPA process, environmental justice and public engagement, transportation safety planning, forecasting transportation demand and system changes, smart growth, and transportation land use.
2. Air Quality and Highway Noise - Conducts comprehensive research to support the development and implementation of programs and activities including the Congestion Mitigation and Air Quality Improvement (CMAQ) program, transportation conformity, air quality analysis and assessment and highway traffic noise. Research activities include: advancing the practice of near-road air quality modeling applications and analysis, enhancements to the CMAQ public access system functions, and updating and supporting the Traffic Noise Model applications and guidance while exploring the potential of roadside structures and vegetation to reduce traffic related air quality and noise impacts.
3. Adaptation, Sustainability and Climate Change - Focuses on development and deployment of techniques, strategies and methodologies for greenhouse gas reduction from surface transportation modes. The research products include

enhancing tools and techniques for assessing the sustainability of transportation plans, projects and programs along with the development of tools and techniques to assess the vulnerability of transportation infrastructure to the effects of climate change and strategies to enhance resilience and reduce risk to climate and extreme weather events.

4. Livability - Develops and implements programs and activities to improve the human environment through the advancement of programs which consider human interaction with transportation systems. Research supports improving livability through funding activities that integrate community and transportation considerations. Research is done to promote pedestrian and bicycle networks, environmental justice, context sensitive solutions, and initiatives to support the integration of the human environment and community considerations with transportation planning and project development.
5. National Highway Systems - Supports NHS that meets current and future travel needs; and supports national and regional economic competitiveness and economic development. The focus is on supporting a highway system that minimizes disruption and meets the environmental and economic needs of communities. Research is conducted to improve the official record of the NHS and to examine how the NHS meets travel needs for goods and people, and the economic development impacts of highways.
6. Accelerating Project Delivery - Seeks to improve decision-making that considers potential impacts on the human and natural environment while meeting the public's need for safe and efficient transportation improvements. This effort supports improving the National Environmental Policy Act environmental review process to accelerate project delivery. The FHWA works to improve the coordination and communication between Federal and State agencies, as well as the general public, to create efficiencies in project review. This program area supports work to accelerate project delivery through interagency collaboration, capacity building for environmental practitioners, integrating planning and environmental processes, and disseminating information about environmental programs and processes.
7. Project Mitigation - Focus is on accelerating project delivery while improving the environmental review processes. This program supports work to coordinate with resource agencies to develop tools to meet environmental laws and regulations in the Federal-aid highway program project delivery. The FHWA develops tools for natural resources and cultural resources analyses and activities, including programmatic approaches for project reviews and interagency coordination.
8. Realty - Seeks to increase the effectiveness and efficiency of acquisition and management of highway real property interests and real property appraisal practices. The Realty Office develops methodologies, technology, and systems to streamline right-of-way and outdoor advertising control activities. The research efforts focus on evaluating appraisal issues, encouraging local scale effectiveness and national scale relevance for the acquisition and management of highway real property interests; developing methodology, technology and systems appropriate for right of way agencies and advancing technological innovations of property management routines such as integrated database resources and internet access. This is particularly important for outdoor advertising control and access

management concerns. As part of the research effort, survey data may also be used in the program to gather input from relocates and others affected by realty activities.

### **Expected Program Outcomes:**

- Improved state of the practice regarding the impact of transportation on the environment.
- Improved sustainability of the highway infrastructure.
- Enhanced knowledge of strategies to improve transportation in rural areas and small communities.
- Improved pedestrian and bicycle networks that provide functional connections and transportation choices.
- Resources that ensure compliance with environmental justice and Title VI.
- Improved evidence-based highway decisions.
- Decreased congestion; improved environmental conditions.
- Improved planning, operation, and management of surface transportation systems and rights of way.
- Strengthened and advanced State, local, and tribal capabilities regarding surface transportation and the environment.
- Accelerated project delivery.
- Improved transportation decision-making and coordination across borders.
- Improved community connectivity.
- Carried out short and long-term sustainability initiatives.
- Minimized negative impacts from transportation investments on natural and human environment.

In FY 2019, The FHWA Office of Planning, Environment, and Realty's research program seeks to generate solutions and provide accelerated decision-making tools and information to advance the state of the practice in planning and environment and incorporate these research findings into guidance and policy developments to support the Federal-aid program. Activities include:

- Strategies to accelerate project delivery and improving the environmental review process
- Livability and sustainability initiatives that improve project delivery
- Enhance and assess the sustainability of transportation plans and projects
- Applications for geographic information to travel forecasting
- Providing technical assistance, best practices and training to assist states, metropolitan planning organizations, local public agencies, partners and stakeholders in the planning and environmental process

### FY 2019 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Air Quality Models	<b>Volpe National Transportation Systems Center</b> on R&D on the applications of emissions and air quality models on transportation.
Congestion Mitigation and Air Quality Improvement (CMAQ) Program	<b>Volpe National Transportation Systems Center, Federal Transit Administration</b> on research efforts to support the implementation of the CMAQ program including the completion of a set of cost-effectiveness tables to assist project sponsors in selecting projects for CMAQ fund, and the implementation of the CMAQ performance plan and measures. Development is underway of a tool to help project sponsors to calculate potential emissions benefits of CMAQ funded projects
Connected Vehicles and Autonomous Vehicles Research	<b>Federal Transit Administration</b> to disseminate information resulting from case studies and pilot programs to planning practitioners for the planning and future implementation of connected vehicles and autonomous vehicles.
Environmental Justice (EJ)	<b>Office of the Secretary of Transportation, Federal Transit Administration, Federal Railroad Administration, Federal Motor Carrier Safety Administration, Pipeline and Hazardous Materials Safety Administration, and Maritime Administration</b> on OST-led EJ working group to support research and technology deployment related to EJ analysis in transportation planning and project development.
Pedestrian and Bicycle Activities	<b>Office of the Secretary of Transportation, Federal Transit Administration, Federal Railroad Administration, and National Highway Traffic Safety Administration</b> on OST-led Pedestrian and Bicycle Coordinating Committee and to support pedestrian and bicycle research and technical assistance. FHWA leads on topics related to infrastructure and programmatic topics; NHTSA leads for safety education. FHWA and NHTSA fund the Pedestrian and Bicycle Information Center.

Performance Based Planning and Programming – Report to Congress	<b>Federal Transit Administration and Volpe National Transportation Systems Center</b> to extract information from surveys, case studies, and review planning processes and products to determine the state of practice of performance based planning and programming and its effectiveness as a tool for guiding transportation investments at State DOTs and MPOs.
Rails-with-Trails	<b>Federal Railroad Administration, Federal Transit Administration, and National Highway Traffic Safety Administration</b> on Rails-with-Trails Effective Practices research to improve trail safety and accommodation along rail and transit corridors. FRA's Safety office and FHWA's Recreational Trails Program are funding the study through the Volpe Center.
Scenario Planning – Report to Congress	<b>Federal Transit Administration and Volpe National Transportation Systems Center</b> to extract information from surveys, case studies, and review planning processes and products to determine the status of implementation of scenario planning by MPOs including an assessment of the benefits and costs associated with scenario planning as part of developing the metropolitan transportation plan and the technical and financial capacity of the MPO needed to develop scenarios.
Health in Transportation	<b>Federal Transit Administration, National Highway Traffic Safety Administration, Office of the Secretary of Transportation, and Volpe National Transportation Systems Center</b> on the Health in Transportation Working Group to improve leadership and communications across the Department on issues related to transportation and health and to collaborate on research activities.
Climate Change, Planning and Environment	<b>Federal Transit Administration, Federal Railroad Administration, Maritime Administration and the Office of the Secretary (research) and the Center for Climate Change and Environmental Forecasting</b> on planning and environmental work.
Highway Noise	<b>Volpe National Transportation Systems Center</b> on R&D on the noise emissions and support for Traffic Noise Model (TNM) 3.0 development.

Sustainability	<b>Volpe National Transportation Systems Center</b> on developing tools and methods to enhance the sustainability of transportation decision-making.
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### FY 2019 Collaboration Partners (External)

Program Name	Name of Collaboration Partner(s) (External)
Environmental Justice	<b>Environmental Protection Agency, Department of Housing and Urban Development, and Transportation Research Board</b> to support research and technology deployment related to environmental justice and community impact assessment in transportation planning and project development.
National Highway Systems	<b>DOD's Military Surface Deployment and Distribution Command Transportation Engineering Agency (SDDCTEA)</b> on maintaining the Strategic Highway Network designation.
National Highway Systems	<b>American Association of State Highway and Transportation Officials</b> – on implementing Strategic Highway Research Program 2 (SHRP2) economic development products as part of the EconWorks effort.
National Highway Systems	<b>Transportation Research Board</b> – on joint areas of interest with the TRB Committee on Transportation and Economic Development, including the periodic International Transportation and Economic Development conference.
Near Road Dispersion Modeling Enhancements	<b>Environmental Protection Agency</b> on evaluating the state of practice to model the impacts of traffic emissions on near road air quality impacts. The objective of the collaboration is to assess the current capabilities of dispersion models to accurately predict near road air quality and identify appropriate enhancements.
Pedestrian and Bicycle Activities	<b>American Association of State Highway and Transportation Officials, National Association of City Transportation Officials and Transportation Research Board</b> to support the identification of future pedestrian and bicycle research needs.
Sustainability	<b>Arizona DOT, Atlanta Regional Commission MPO, MetroPlan Orlando MPO, North Central Texas Council of Governments, Pennsylvania DOT, St. Joseph Area (MO)</b>



	<b>Transportation Study Organization, and Tennessee DOT</b> on sustainability tool implementation and deployment.
Planning and Environment Research	FHWA partners with 30 States plus the District of Columbia through the Transportation Pooled Fund Program to conduct Planning and Environment research.

### **How does the Program meet statutory requirements?**

This program is authorized in sections 502 and 503 of title 23, United States Code, which require the Secretary to carry out highway research, development, and technology deployment activities covering a broad range of topic areas in order to improve highway safety, improve infrastructure integrity, strengthen transportation planning and environmental decision-making, reducing congestion, and enhancing freight productivity, among others.

### **How does the Program incorporate public and stakeholder input into the research planning process?**

The FHWA seeks input from the general public and stakeholders on a regular basis, through their participation in conferences, meetings, peer exchanges and webinars. A variety of input and opportunities for collaboration arise for all these research program areas. Advice and input is routinely solicited from Federal agencies, State and local governments, and transportation and environmental stakeholders. FHWA also seeks input from division specialists, State and local transportation agencies, potential vendors and other stakeholders. FHWA makes an effort to leverage funds for research programs by seeking input and resources from potential funding partners on collaborative research opportunities.

There are numerous Federal agencies with a strong interest in transportation planning including: Housing and Urban Development, the Environmental Protection Agency and the Centers for Disease Control and Prevention. Within the USDOT, FHWA partners with the Federal Transit Administration, Federal Railroad Administration, Maritime Administration and the Office of the Secretary (research) and the Center for Climate Change and Environmental Forecasting on planning and environmental work. Other stakeholders include the Association of Metropolitan Planning Organizations, AASHTO, and TRB.



## Policy

### Program Description:

Policy decisions made today will shape the highway transportation system of tomorrow. FHWA's policy research program focuses on a) analyzing current and emerging issues in the context of broad policy options that will affect the way transportation systems are built, maintained, and used and b) collecting and disseminating national transportation data for the entire transportation community and c) developing new analytical tools and procedures which support informed analysis and decision making on policy needs, alternatives, and outcomes.

Understanding transportation needs and the effects of proposed legislation and policy decisions requires a foundation of quality transportation knowledge and information. The FHWA policy research program aggregates and analyzes transportation data to support policy development and evaluation, informed planning and performance measurement. Data and information are also used to support an improved understanding of the characteristics, distribution, and level of travel demand for proactive transportation planning and investment.

By improving the understanding of transportation trends, FHWA helps its stakeholders and partners identify future transportation needs. The FHWA's policy research program develops and evaluates policy options and strategies to address emerging transportation challenges and opportunities. The research program also refines and updates current methods and tools to evaluate the performance, cost-effectiveness, and societal and economic impacts of highway infrastructure investments and options for delivering and funding these investments. Through policy research studies that explore transportation topics pertinent to state, local, and tribal governments, the FHWA helps these entities identify and cooperatively address issues that may have budgetary and legislative implications. FHWA also promotes interagency collaboration and the sharing of program innovations by facilitating information exchanges between the United States, other countries, and international organizations.

### Program Objectives:

The primary objectives of the FHWA policy research program are to:

- Identify and evaluate current and emerging issues that will affect surface transportation performance.
- Identify and evaluate broad policy gaps, alternatives, and outcomes in the context of changing transportation revenue, investment needs, supply, and demand.
- Facilitate development and implementation of FHWA's strategic goals and objectives in light of emerging risks and opportunities.
- Collect and process comprehensive national highway transportation data
- Promote data sharing, and utilization among states and MPOs to improve highway management and investment decisions;

- Research intergovernmental issues between states, cities, and tribal governments that impact transportation policy decisions, budgetary processes, and legislative recommendations; and
- Promote the exchange of highway technology and program innovations between the United States and foreign countries and organizations.

### **Anticipated Program Activities:**

The FHWA's Office of International Programs leads agency efforts to keep up with international highway technologies and practices. The office promotes knowledge exchange by leveraging partnerships, and establishing and managing cooperative agreements with other government agencies and professional organizations worldwide. These efforts help provide direction for U.S. collaboration on highway research and practice and broaden the depth of knowledge in given priority areas. OIP efforts address areas of national significance that deliver a clear public benefit (to the U.S.), tackle current or emerging needs, seek to fill gaps in research, and focus on priorities of FHWA and the U.S. transportation community.

Planned activities include:

- Global Benchmarking Program (GBP): Conduct a GBP study to obtain information on proven foreign highway innovations with the prospect of successful application in the U.S.; additionally, information collection on specific innovative technologies and practices of high interest to the agency.
- World Road Association (WRA): Support the FHWA Executive Director's participation in WRA; Participation in the WRA 2019 Congress, in collaboration with AASHTO and TRB.
- Korea: Continuation of exchanges on Joint Geo-hazards and resiliency to extreme weather project(s) engineering assessments, in accord with established work plan.
- Japan: US-Japan Bridge workshop will be conducted, continuation of a successful annual activity that has been ongoing for 30+ years. Specific topics to be determined.

## **2. Legislative Analysis and Policy Communications**

This program focuses on legislative analysis, highway authorization, and intergovernmental relationships. Planned activities include support for National Tribal Transportation Conference, and support for an electronic congressional database service to facilitate the identification of emerging legislative issues.

## **3. National Transportation Data Collection, Reporting and Processing**

This program covers the collection of motor vehicle registration, licensed drivers, fuel, travel and traffic condition and behavior, truck weight, pavement condition, roadway inventory, finance, and fuel taxation on a regular basis. These data provide the needed information for FHWA/USDOT to assess investment needs and administer the Federal-aid highway program. In addition, these data serve as the foundation for the entire transportation community.

#### 4. Data Collection Methods, Processing Techniques, and Guidance

This program focuses on: 1) ensuring data methods and data are consistent among all State DOTs where data can be compared and contrasted for national trend and program usage, 2) modifying procedures, methods, and practices for data collection and processing as a result of needs change, technology changes, industry practice advancement, and budget changes, and 3) developing new processes and procedures to support emerging needs, such as multimodal travel behavior and long distance travel.

#### 5. Comprehensive Utilization of National Transportation Data

This program is to ensure all collected raw data can be easily and readily linked, used and interpreted. Focus areas include: 1) compiling data in an effective manner ensuring timeliness release, 2) developing value added data through data modeling techniques, 3) forecasting future trends on key parameters such as travel demand (miles and hours), fuel consumption and others, 4) integrating data and providing effective visualization tools.

#### 6. Impact of Investment on Transportation Performance & the Economy

This program focuses on assessing the relationship between highway investment and current and future conditions and performance of the Nation's highways and bridges, as well as the impact of such investment on the broader national economy. This program: 1) Supports decisions concerning current and future highway capital investments at all levels of government by developing and utilizing engineering/economics models and related tools to assess current and future conditions and performance of the Nation's highways and bridges; 2) Provides insights to decision makers about the contributions of highway capital spending and infrastructure investments to the economy and private sector economic performance; 3) Communicates research results to our stakeholders and customers via mechanisms such as the joint FHWA/FTA biennial "Status of the Nation's Highways, Bridges and Transit: Conditions and Performance" report to Congress (C&P report), white papers, and issue briefs.

#### 7. Policy Studies, Analysis and Outreach

The Policy Studies, Analysis and Outreach program provides corporate strategic planning and research on current and emerging issues as they relate to national transportation policy. Research conducted includes quantitative analysis, policy evaluations, and the application of analytic models to assess the relationship between changes in social, demographic, economic, and technological trends on the characteristics, distribution, and level of travel demand. Key components of this program include: 1) Strategic and performance-based planning and management through corporate risk assessment, strategic planning, implementation and outcome/performance measurement and dashboard reporting and managerial accounting practices, 2) Qualitative and quantitative analysis to assess policy gaps, alternatives and outcomes in the context of emerging socio-demographic, economic, technological and geographic trends and changes in travel demand, preferences, and needs; 3) Development of analytical tools and related products to quantify the relationship between existing and proposed policy and benefits and costs to transportation programs, system users, and infrastructure; 4) Identification and

assessment of current and potential revenue sources for transportation investments; and (5) Evaluation of the alignment of current policies, programs, and practices with future transportation needs and opportunities and identifying options for addressing any significant barriers, gaps, or inefficiencies.

### **Expected Program Outcomes:**

Expected outcomes of the FHWA policy research program include:

- Expedited information delivery for timely policy decisions to address current transportation issues.
- Expanded U.S. knowledge base for improved decision-making tools.
- Enhanced foreign knowledge of U.S. technologies and products.
- Improved international collaboration.
- Improved decision tools and context for Federal, State, and local policymakers.
- Proactive planning and policy making for emerging transportation technologies, users, and use.
- Improved understanding of travel trends, travel behavior, and travel demand - past, present, and future.
- Improved understanding of the impact of transportation investments on transportation performance, the economy, and society; as well as options for selecting, paying for, and delivering transportation investments.
- Opportunity for FHWA and other policy decision-makers to explore emerging policy needs and options.
- Meaningful guidance for state agencies and the communities on how data can be collected, processed, and reported ensuring consistency and comparability crossing jurisdictional lines.
- Ensured data availability for the Federal-aid program including apportionment and performance management.
- Delivery of the 24th edition of the biennial Conditions & Performance Report to the Congress.
- Delivery of quarterly and annual performance reports to FHWA and USDOT leadership.
- Delivery of a range of policy studies and symposia.

### **FY 2019 Collaboration Partners (Internal USDOT)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
Impact of Investment on Transportation Performance & the Economy	<b>Federal Transit Administration</b> —FHWA and FTA staff meet weekly to coordinate the planning and writing of a key joint product of the research program, the biennial “Status of the Nation’s Highways, Bridges and Transit: Conditions and Performance” report to Congress (C&P report).

Impact of Investment on Transportation Performance & the Economy	<b>Volpe National Transportation Systems Center</b> – economists at the Volpe Center conduct R&D for FHWA relating to the ongoing development of the Highway Economic Requirements System (HERS) and the customized highway-oriented version of the United States General Equilibrium Model (USAGE-Hwy).
Policy Studies, Analysis and Outreach – Transportation Policy Symposiums	<b>Office of the Secretary</b> – FHWA and OST collaborate to bring together internal and external stakeholders to discuss transportation policy and performance in the context of salient transportation issues.
Future Travel Demand Forecasting	<b>Volpe National Transportation Systems Center</b> –  FHWA and VOLPE staff has been working in a close team fashion in developing both a national and state level vehicle mile travelled models to project future travel demand as a result of future social, economic, and demographic changes. In addition, the team is also actively engaged in developing a travel time estimate model for the entire nation. The result of the research has been filling this national data and information gap in understanding national travel demand.
Global Technology Exchange Program	<b>OST, FMCSA, FTA, NHTSA</b> : Participate in development and implementation of work plans, through both remote/virtual means and occasional in person activities.
International Travel	<b>OST</b> : Collaboration on the approval processes
International Visitors Program	<b>OST, FRA, NHTSA, FTA</b> : Infrequent participation in presentations to foreign visitors in instances where the topics requested call for it.

### FY 2019 Collaboration Partners (External)

Program Name	Name of Collaboration Partner(s) (External)
Policy Studies, Analysis and Outreach – Transportation Policy Symposiums	<b>Transportation Research Board</b> – FHWA and TRB are partnering to conduct an expert symposium on emerging trends in transportation with a focus on industry, worker, and job trends and changing transportation system needs.

National Transportation Data Collection	<b>State DOTs and MPOs</b> – FHWA partners with several State DOTs and MPOs in the collection of household travel data for the national household travel survey. This program and collaboration maximized the utility of the information collected and supports analysis across states, regions, as well as national comparisons.
Global Technology Exchange Program	<b>Foreign Ministries of Transport and related official entities, EC, foreign embassies, industry/professional associations, other USG Federal agencies, academia, TRB:</b> Participate in and collaboration on development and implementation of work plans, through both remote/virtual means and occasional in person activities.
World Road Association	<b>AASHTO, TRB:</b> Participate in and collaboration on development of strategies and participation in technical aspects of US participation in WRA.  Foreign Ministries of Transport and related official entities, International financial institutions, other international road associations: collaboration related to development of management and technical aspects of the WRA.
Global Benchmarking Program	<b>AASHTO, State DOTs:</b> Participate in studies, exchanges with foreign experts and follow on implementation of key findings.  Foreign points of contact in counterpart agencies—provide information and expertise and meet with US representatives in response to focused inquiries from US.
International Travel	<b>US Department of State:</b> Country clearances and occasional coordination for delegations where US Embassies are participating. Infrequent coordination with other US Federal agencies when joint participation in activities is called for. Foreign governments regarding details of travel itineraries/arrangements.
International Visitors Program	<b>Foreign entities</b> who request visits to FHWA, governmental, academic and private sector.
Policy Research	FHWA partners with 28 States through the Transportation Pooled Fund Program to conduct Policy research.

### **How does the Program meet statutory requirements?**

This program is authorized in sections 502 and 503 of title 23, United States Code, which require the Secretary to carry out highway research, development, and technology deployment activities covering a broad range of topic areas in order to improve highway safety, improve infrastructure integrity, strengthen transportation planning and environmental decision-making, reducing congestion, and enhancing freight productivity, among others. The Infrastructure Investment Needs Report is a requirement under section 503(b)(8) of title 23, United States Code.

### **Describe how public and stakeholder input have been utilized in the development of this research program:**

The FHWA's Office of International Programs coordinates the international research planning process within the USDOT, involving FHWA program offices, other operating administrations, and OST to ensure that the agency's international work supports USDOT and FHWA priorities. Direct coordination with other federal agencies and state, academic, and private sector partners garners support and buy-in for the efforts.

The FHWA's Office of Highway Policy Information works directly with state highway agencies, MPOs, and local governmental agencies to identify data-related issues and challenges. In addition, the office conducts a monthly webinar on issues related to data and information where all interested parties throughout the community are invited to present and participate with the goal of sharing innovation and knowledge, identifying both long term and short terms issues to resolve. The office is also actively working with various TRB committees to identify issues and challenges and solutions. Internally within USDOT, the office conducts periodic discussions and briefings with other offices and modes to ensure concerns are addressed.

The FHWA's Office of Transportation Policy Studies sponsors workshops and symposia with external transportation policy and research organizations, to identify emerging policy issues warranting future research. The Office also convenes technical review panels to comment on analytical tools developed in support of policy research efforts, and to recommend potential future research to enhance them.



## **Innovative Program Delivery**

### **Program Description:**

Innovative Program Delivery (IPD) provides training, tools, and expertise that support the transportation community's exploration and implementation of innovative financial, procurement and project management strategies to deliver costly and complex infrastructure projects. FHWA's efforts in this area are primarily led by the Center for Innovative Finance Support (CIFS). The CIFS research and technology deployment efforts focus on revenue generation (tolling), procurement (public-private partnerships), and innovative finance (GARVEEs and SIBs). Support for our partners include (1) capacity building and outreach, (2) technical assistance for project implementation, and (3) technical resources, guidebooks, and analytical tools.

### **Program Objectives:**

- Conduct research in the areas of financial stewardship and innovative finance.
- Support innovative financing approaches that promote efficient, accelerated project delivery.
- Develop innovative procurement and revenue generation tools and technical resources.
- Build technical expertise at the federal, state and local levels in the use and stewardship of innovative finance methods and programs.

### **Anticipated Program Activities:**

1. Researching public policy issues in P3 program administration, e.g., best practices in public disclosure of transactions negotiated between a public sponsor and private concessionaire
2. Training public sponsors to apply Value for Money analysis that incorporates benefit-cost principles, using FHWA's P3-VALUE 2.0 as the educational platform
3. Providing ongoing capacity building opportunities to state and local project finance partners.
4. Research how FHWA right-of-way laws can support value capture opportunities to rebuild aging highways and support communities.

Each of these activities will require extensive collaboration with other USDOT operating administrations, coordinated through the Office of the Secretary's Build America Bureau as authorized in the FAST Act. The principles of P3 project delivery and innovative finance apply across multiple transportation modes, and this research will be valuable to organizations throughout the United States Department of Transportation (USDOT).

External partners have a substantial stake and interest in FHWA's research. In previous years, research projects such as the P3 Model Contract Guide and the P3 Best Practices



Report required extensive collaboration with the private transportation industry and elicited wide-ranging public comment from stakeholders.

The CIFS program activities in FY 2018 are anticipated to build on our traditional research foundations: monitoring the state of the industry, sharing best practices, and building the technical capacity of state and local partners to consider financing and delivery options both innovative and complex.

Research may focus on the organizational impacts to agencies that have delivered projects via the P3 method. Specific topics would include the “change management” practices adopted by these agencies, as well as a comparison of the different organizational forms selected for an agency’s P3 unit.

The CIFS sees a continual need to build the public sector’s technical capacity to consider and deliver projects as P3s. Training opportunities in FY 2018 may focus on policy issues, and be directed toward the professional staffs in legislative and gubernatorial offices.

The CIFS research program will monitor the state demonstrations of user-based alternative revenue mechanisms awarded by FHWA (beginning in FY 2016) via the Surface Transportation System Funding Alternatives (STSFA) program, authorized per Section 6020 of the FAST Act. Lessons learned from these early demonstration efforts may delineate new research avenues for revenue options, whether focused on a statewide program or targeted toward a single project seeking a viable delivery option.

### **Expected Program Outcomes:**

The IPD research program seeks the following short-term outcomes:

- To provide the U.S. transportation community with the most complete, up-to-date body of knowledge on P3s.
- To improve awareness of P3 opportunities and challenges.
- To improve the statutory and policy framework enabling and supporting P3s.
- To increase consideration of the P3 delivery option for major projects.
- To support the accrual of P3 knowledge by industry practitioners and advisors in the areas of planning/evaluation, procurement, and monitoring/oversight.

The IPD research program seeks the following medium-to-long-term outcomes:

- An improved environment for P3 use within states (i.e., new or expanded P3, policy or support programs).
- Greater consideration among states of alternative project revenue options such as user fees and value capture.
- Improved P3 decision-making capabilities.
- Better alignment of the P3 delivery option with appropriate transportation projects.

### FY 2019 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Innovative Program Delivery	<b>Office of the Secretary of Transportation</b> – collaborate with the Build America Bureau in the Office of the Secretary to update the Center’s various web resources to reflect a multimodal perspective. The Center seeks input and holds regular meetings with the Build America Bureau to ensure that all Center research products include a multimodal perspective.

### FY 2019 Collaboration Partners (External)

	(External)
Innovative Program Delivery	<p><b>American Association of State Highway and Transportation Officials (AASHTO)</b> –AASHTO members review CIFS research products to provide the public owners’ real-world perspective on the challenges and opportunities of P3s.</p> <p><b>American Road and Transportation Builders, Public Private Partnership (P3) Division</b> – Members of the ARTBA P3 Division include construction and legal firms that participate extensively in the US market. Similar to how it uses the public owners represented by AASHTO, the CIFS uses this industry group to review research products and provide real-world perspective from the private side.</p> <p>FHWA partners with 15 States through the Transportation Pooled Fund Program to conduct Innovative Program Delivery research.</p>

### How does the Program meet statutory requirements?

This program is authorized in sections 502 and 503 of title 23, United States Code, which require the Secretary to carry out highway research, development, and technology deployment activities covering a broad range of topic areas in order to improve highway safety, improve infrastructure integrity, strengthen transportation planning and environmental decision-making, reducing congestion, and enhancing freight productivity, among others.

**Describe how public and stakeholder input have been, or will be, utilized in the development of this research program:**

Public and stakeholder input is central to the research planning process. The CIFS Research Roadmap is directly shaped by stakeholder focus groups and regular discussions with research interests such as the TRB Revenue and Finance Committee. This stakeholder input continually helps to refine and update the research agenda.

## Exploratory Advanced Research

### Program Description:

The Exploratory Advanced Research program (EAR) conducts higher-risk, longer-term research with the potential for dramatic breakthroughs in surface transportation.

### Program Objectives:

To develop potentially transformational solutions to improve the durability, efficiency, environmental impact, productivity, and safety aspects of highway and intermodal transportation systems.

### Anticipated Program Activities:

Current Areas of Interest include:

1. Connected Highway and Vehicle System Concepts —This focus area emphasizes the longer term needs to reach critical FHWA safety and mobility goals by developing the theory for and assessing the feasibility of systems that leapfrog current technological approaches for linking infrastructure with future vehicle and personal mobility technology.
2. Breakthrough Concepts in Material Science —This focus area leverages new approaches in materials science to produce innovative new highway materials with characteristics that enable enhanced functionality (including multi functionality), constructability, sustainability, cost effectiveness or operating characteristics of highway infrastructure and system monitoring sensors to enhance highway safety, reliability, and resilience.
3. Human Behavior and Travel Choices —This focus area leverages research concepts from the social sciences, including psychology and economics, along with more traditional research for improving safety, reducing congestion, and improving the livability of the Nation's communities.
4. Technology for Assessing Performance — This focus area seeks novel approaches and breakthrough technology that will revolutionize the use of performance management in the highway sector.
5. New Technology and Advanced Policies for Energy and Resource Conservation — This focus area cuts across infrastructure, operations, and societal and complex natural systems that support innovative methods for reducing highway industry costs and move toward sustainability.

In FY 2019, FHWA will continue to work with partners in the research community to modify focus areas for the EAR Program in light of new discoveries and emerging needs. With reduced funding, the EAR Program portfolio will decrease from two dozen active projects in FY 2017 to under 20. To lessen impact, the EAR Program is pursuing more cross-cutting topics where there is potential for joint funding with other agencies. The EAR Program anticipates crosscutting areas could include new data analytic and simulation. At the same time, the EAR Program anticipates continued investment in

ongoing the ongoing area of material characterization, modeling, and design, where early stage research can have a large impact on future industry practices.

#### **Expected Program Outcomes:**

- Potential breakthrough solutions in all areas of highway transportation.
- Improvements in planning, building, renewing, and operating safe, congestion-free, and environmentally sound transportation facilities.
- Follow-on research topic areas resulting from exploratory research projects.

#### **FY 2019 Collaboration Partners (Internal USDOT)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
Exploratory Advanced Research	<p><b>Federal Motor Carrier Safety Administration, Federal Transit Administration, and National Highway Traffic Safety Administration</b> in the area of connected highway and vehicle systems concepts with.</p> <p><b>Bureau of Transportation Statistics, Federal Motor Carrier Safety Administration, Federal Railroad Administration, and Pipeline and Hazardous Materials Safety Administration</b> for research in the area of Human Behavior and Travel Choices on long distance freight and passenger travel.</p> <p><b>Bureau of Transportation Statistics, Federal Motor Carrier Safety Administration, Federal Transit Administration, and National Highway Traffic Safety Administration</b> in the areas of data analytics and simulation.</p>

#### **FY 2019 Collaboration Partners (External)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (External)</b>
Exploratory Advanced Research	<b>US Department of Defense, US Department of Energy, NIST, University Transportation Centers (UTCs), State DOTs, and industry</b> in the areas of data analytics and simulation.

#### **How does the Program meet statutory requirements?**

This program is authorized in section 503(b)(6) of title 23, United States Code.

**Describe how public and stakeholder input have been, or will be, utilized in the development of this research program:**

Broad scientific participation and extensive coverage of advanced ideas and new technologies are secured by engaging stakeholders throughout the EAR program's processes – not only in identifying and scoping topics, but also in ensuring the technical quality of sponsored research through expert panels and in communicating research results.

## Performance Management Data Support

### Program Description:

Per the FAST Act, up to \$10 million for each of FYs 2016 through 2020 may be used to carry out this program. This initiative will develop, use, and maintain data sets and data analysis tools to assist metropolitan planning organizations, States, and the FHWA in carrying out performance management analyses.

### Program Objectives:

To improve data collection for performance analysis by enhancing existing data systems and tools, collecting missing data, and developing and implementing new methods for data analysis and visualization.

### Anticipated Program Activities:

*Note: many of the activities outlined below are provisionally planned, subject to funding availability or allocation to this program beyond currently budgeted amount.*

1. Probe data and analytics: Provides uniform and consistent national freight and passenger vehicle probe based travel time data set to State DOTs and MPOs for use in performance management, planning, and national performance measures purposes.
2. Performance Management: This system and suite of tools focus on performance management of the Federal-aid system and include:
  - a. National Performance Reporting System - will provide access to data, performance outcomes, and progress reports at a local, regional, and national level on a publicly available website. The information on the site is envisioned to be used by State DOTs and MPOs to review performance trends across the country and by industry associations and advocacy groups interested in analyzing and understanding the performance of the system and changes in its performance over time.
  - b. State Performance Reporting Tool – to be used by State DOTs in generating a performance report that is required to be submitted to FHWA on a biennial basis. This report will document performance trends and progress they have made toward the achievement of targets.
  - c. Performance Analysis Tools - for use by State DOTs and MPOs to analyze trends, understand investment impacts to performance outcomes, and to develop targets of future performance related to the MAP-21 National Performance Measures. These may include tools and data to support the evaluation of investment strategies, cost benefit or cost effectiveness analysis, congestion analysis, and bridge and pavement impacts.
  - d. Performance Management System - an internal system to assist States and MPOs in the evaluation of performance and in the setting of targets for the National Highway Performance Program and the Highway Safety

Improvement Program and to assess progress in applying performance-based principles to planning and programming decision making.

3. Travel behavior data: This data provides the why, when, and how we travel. . The behavior data will cover both long distance crossing jurisdictional and state boundary travel, and local commuting travel. The data will provide travel behavior information for states and MPOs to improve their modeling and simulation capacity in assessing multimodal future travel needs, offering external-to-internal, external-to-external, and internal-to-external travel data. FHWA's current National Household Travel Survey (NHTS) lacks coverage on long distance travel and it has no fixed data collection schedule. Past cycles were ranged from 5 years to more than 8 years. The new plan is to enhance the current NHTS data collection in a timelier manner and adding the interregional long distance component to the overall behavior data. In addition, new on-line data analytics will be developed and deployed for public to access and analyze behavior data.
4. Freight Analysis Tools and Auxiliary Data: These tools and data provide States and MPOs assistance in analyzing projects for MAP-21 and FAST freight opportunities and project planning and performance measurement requirements, completing the analytical elements of the State Freight Plans, undertaking performance management and system planning, and in determining and designating freight corridors to be part of the freight network. These include:
  - a. FAF - integrates data from a variety of sources to create a comprehensive picture of freight movement among states and major metropolitan areas by all modes of transportation. FAF is used by State DOTs and MPOs in development of Freight and Long Range Transportation Plans, as well as a key input for a variety of specialized freight studies. Developing the next generation FAF is critical for states and regions to understand their major trading partners with the volumes and sources of through traffic at a corridor level.
  - b. Fluidity Analysis and Supply Chain and Cost Surveys - Suite of data and analytical tools that will provide information on multi-modal freight trip performance, costs of freight transportation (one of the most commonly requested data sets of FHWA from States and MPOS) and information on key regional and national supply chains that impact particular States.
  - c. Domestic Transport of International Trade - will provide State DOTs, MPOs and USDOT with an understanding of transportation movement for the domestic freight movement leg of imports and exports - current data does not provide this information.
5. Highway Policy Information Data and Analytical Tools: These data are used in the development of highway legislation at both the federal and state levels. These data are also used in preparing legislatively required reports to Congress; determining current and future highway system conditions and performance; calculating and evaluating Federal-aid apportionments; keeping the federal and state governments informed; and in general, as an aid to highway planning, programming, budgeting, forecasting, and fiscal management. The Highway Policy Information data programs include:



- a. Traffic Monitoring and Analysis System (TMAS) – TMAS collects traffic volume data on a monthly basis. TMAS is also the system that produces the Monthly Traffic Volume Trend (TVT) report where vehicle mile travelled is being analyzed and published. The TVT is the most sought after publication among all FHWA publications.
- b. Highway Performance and Monitoring System (HPMS) – HPMS collects roadway inventory, travel, and pavement data on an annual basis. HPMS data is the foundation for Federal-aid apportionment, safety analysis, pavement condition analysis, freight analysis, financial analysis, and performance management.
- c. Fuel and Finance Analysis System (Fuels & FASH) – FASH is a system collects and analyzes finance (federal, state and local) and fuel consumption data. While the finance side of the system performs annual data collection, fuel subsystem performs monthly data capturing duties. The system also handles driver license, vehicle registration, and other 500 Series data.
- d. Data Portal (Fuels & FASH v4.0) – New form based access point for state agencies to report toll, mileage certification, 500 series and Performance Management Data.
- e. Integrated Transportation Information Platform (ITIP) – An online system that is used to deliver data and information in an easy to understand and comprehend manner, style, and format.
- f. Purchase proprietary data for policy and program analysis – Annually purchase R.L. Polk vehicle data and Omen Bid Tabulation data.
- g. Automate vehicle registration data table production. This effort is to design an automated process for vehicle registration data compilation, data quality control, and final data publication. Once the process is developed, it will be implemented in the Data Portal.
- h. Explore the feasibility of collecting state vehicle identification number (VIN) data for all registered motor vehicles and trailers. This would eventually replace the reporting of similar aggregate data, which tends to be inconsistent from state to state.
- i. Data Portal – Training state and FHWA staff on how to use the system for reporting and analyzing state performance management, 500 series, and toll data. Finalize development of workflow, analytic procedures, and reporting requirements for all forms.
- j. Explore expanding the collection of driver license data to include age group and gender totals for motorcycle, CDL, and provisional/restricted licenses.
- k. Conclude project to move HPMS data validations and analytics to cloud.

#### Anticipated FY 2018 Activities:

1. Probe data and analytics: To perform data analysis for performance rule making and performance management.
  - a. Continue providing access to probe data to State DOTs and MPOs
  - b. Assist State DOTs and MPOs in using probe data to develop performance measures

- c. Continue to support Urban Congestion Report program, Freight Performance Measurement Program and related congestion and reliability analyses
2. Performance Management: Reporting of state performance targets on the new Transportation Performance website. Development of analytical tools for FHWA and State use to help assess investment impacts to performance.
3. Travel behavior data: Initiate the exploration of interregional long distance travel data collection via acquiring cellular data for the entire nation. Continuing the current NHTS data collection effort and develop tools and analytics for subsequent data analysis and dissemination.
4. Freight Analysis Tools and Auxiliary Data: Continue to upgrade FAF to FAF 4 and provide the forecast through 2045; implement freight fluidity national system and support regional implementation at the MPO level for state and regional planning support.
5. Office of Highway Policy Information (HPPI) Data and Analytical Tools: Across all HPPI data programs – operate, maintain and enhance the analytic capabilities and data structures as a result of both national program reviews and state data system changes. Depending on the outcome of the VIN and driver license efforts, modification of the Data Portal would begin this fiscal year.

#### Expected Program Outcomes:

- Improved decision-making tools to evaluate the effects of project investments on performance.
- Improve the reliability of data sets and data analysis tools for performance management analysis.
- Release of a new Transportation Performance Website that will increase transparency in the performance aspects of the Federal-aid highway program.
- Train data providers and FHWA staff on data requirements.
- Publish the results of various research and outreach efforts including final decision on collecting VIN data and proposed method for collecting detailed driver license data.
- Improved understanding of freight movement and impacts of congestion and delay or events.

#### FY 2019 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Performance Management Data Support	<p><b>Federal Transit Administration and Office of the Secretary of Transportation</b> in the performance management area on performance reporting and analysis tools development and providing access to data.</p> <p>The FHWA Offices of Highway Policy Information, Program Performance Management, Transportation Management, and Freight Management &amp; Operations collaborate on data support.</p>

### **FY 2019 Collaboration Partners (External)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (External)</b>
Performance Management Data Support	None

#### **How does the Program meet statutory requirements?**

This program is authorized in section 6028 of the FAST Act, Public Law 114-94.

#### **Describe how public and stakeholder input have been, or will be, utilized in the development of this research program:**

Approaches to incorporate stakeholder input include:

- Regular and periodic stakeholder engagement via:
  - Conference calls
  - Presentations and briefings
  - Stakeholder Groups – An informal stakeholder group including organizations that represent a wide range of stakeholders meet quarterly to share implementation efforts and receive feedback on work products.
  - On the travel behavior data front, FHWA has been working with states DOTs and MPOs and the public on a continuous basis through both a formal task force established through TRB, the on-line training and webinars, and several formal workshops.
  - Coordination with the private sector for freight movement data and analysis, as well as supporting the Department of Commerce Advisory Committee on Supply Chain Effectiveness and data and analysis at the Bureau of Transportation Statistics and the Census Bureau.
- Posting research roadmaps and planned activities to FHWA program websites
- Releasing regulatory policy and guidance for public comment to Federal Register

## Surface Transportation System Funding Alternatives

### Program Description:

As required by the FAST Act, this program will provide grants to States to demonstrate user-based revenue mechanisms that utilize a user fee structure to maintain the long-term solvency of the Highway Trust Fund.

### Program Objectives:

Activities carried out under this program must meet the following goals:

- To test the design, acceptance, and implementation of 2 or more future user-based alternative revenue mechanisms.
- To improve the functionality of such user-based alternative revenue mechanisms.
- To conduct outreach to increase public awareness regarding the need for alternative funding sources for surface transportation programs and to provide information on possible approaches.
- To provide recommendations regarding adoption and implementation of user-based alternative revenue mechanisms.
- To minimize the administrative cost of any potential user-based alternative revenue mechanisms.

### Anticipated Program Activities:

In FY 2017, the FHWA solicited applications from States or groups of States to initiate new projects to demonstrate user based alternative revenue mechanisms that utilize a user fee structure to maintain the long-term solvency of the Highway Trust Fund. Results from the FY 2017 solicitation process will inform the awardee selection and funding decisions corresponding to FYs 2019-2020. If all the funds are awarded in 2019, FHWA will continue to assemble information and results from grantees. Grantees continue to utilize the funds to test the design, implementation, and acceptance of functional future user-based alternative revenue mechanisms that minimize administrative costs, increase public awareness of the need for and possible approaches for alternative funding sources for surface transportation programs, and to provide recommendations on various approaches.

Should all the funds be awarded during the FY 2016 and FY 2017 solicitation processes, awardees will continue activities throughout FY 2019 and beyond.

### Expected Program Outcomes:

Improved functionality of user-based alternative revenue mechanisms.

Increased public awareness regarding the need for alternative funding sources for surface transportation programs.

### FY 2019 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
STSFA	<b>Office of the Secretary of Transportation</b> to coordinate FAST Act Implementation.

#### FY 2019 Collaboration Partners (External)

Program Name	Name of Collaboration Partner(s) (External)
STSFA	<b>Rounds One and Two STSFA State Partners: California DOT; Delaware DOT; Hawaii DOT; Minnesota DOT; Missouri DOT; Oregon DOT; and Washington DOT (additional Round Two partners pending selection as of this report)</b> – research on alternative funding mechanisms to carry out program objectives.

#### How does the Program meet statutory requirements?

This program is authorized in section 6020 of the FAST Act, Public Law 114-94.

#### Describe how public and stakeholder input have been, or will be, utilized in the development of this research program:

The program conducted an introductory webinar with stakeholders and prospective applicants after the release of the FY 2016 solicitation to describe the program and its goals to help applicants plan their proposals. The recipients provide annual reports on meeting their expected outcomes and lessons learned for future deployment of alternative revenue mechanisms that utilize a user fee structure, and may be used in shaping any future program solicitations.

## Corporate and Communications

### Program Description:

The FHWA plays a vital leadership role in developing and implementing a coordinated highway research and technology agenda that addresses national needs, meets future demands, and maximizes the strengths of all research entities. This R&T agenda is stakeholder driven, with partners engaged throughout the entire innovation lifecycle process, from agenda setting and planning, through the research, technology development, and innovation deployment phases, to the implementation and assessment stages.

The FHWA R&T Program supports the goals of the USDOT to invest strategically in transportation infrastructure, promote safe and secure transportation, enhance our environment, and create new alliances between the nation's transportation and technology industries.

The TFHRC is committed to this mission of research and innovation. Communication, coordination, and collaboration are crucial to conducting the right research, doing it well, and delivering solutions when and where they are needed. Communication strategies address the needs of internal and external audiences and cover the depth and breadth of the federal effort for highway research and technology, displaying prudent use of government resources, advancing the state of the practice, and building a case for continued and future funding.

### Program Objectives:

- To provide leadership, coordination, and support in the development of a national highway research agenda.
- To foster and promote enhanced coordination of highway research among all stakeholders;
- To communicate, publish, market, and disseminate research results to appropriate audiences
- To operate the Turner-Fairbank Highway Research Center, a federally-owned and operated research facility in McLean, Virginia that supports:
  - the conduct of highway research and development relating to emerging highway technology;
  - the development of understandings, tools, and techniques that provide solutions to complex technical problems through the development of economical and environmentally sensitive designs, efficient and quality-controlled construction practices, and durable materials;
  - the development of innovative highway products and practices; and
  - the conduct of long-term, high-risk research to improve the materials used in highway infrastructure.

## **Anticipated Program Activities:**

1. **Communications, Publishing, and Marketing:**
  - FHWA Research Library: conducts literature searches and provides technical information, documents, bibliography preparation, electronic resources, and provides knowledge management services of FHWA research reports.
  - Publications, periodicals, and technical reports: Plans, edits, and prepares technical reports and documents for publishing in print or on the web, and publishes the Public Roads magazine. Develops outreach materials to communicate research results to State DOTs and other stakeholders.
  - Develops, manages, and maintains the TFHRC website, which provides public access to program policy, on-going and completed research, laboratory information, and connects you to experts as well as invites visitors to tour the facility and laboratories.
2. **TFHRC Laboratory Capacity Building:** Supports the technical and scientific needs of researchers, such as installing special hardware or software, maintaining scientific laboratory instruments. Supports the repair or replacement of research equipment resulting from failure or replacement of obsolete or end-of-service-life equipment, enhanced capabilities for existing laboratories.
3. **Partnerships:**
  - Transportation Pooled Fund (TPF) Program: When significant or widespread interest is shown in solving transportation-related problems, research, planning, and technology transfer activities may be jointly funded by several federal, State, regional, and local transportation agencies, academic institutions, foundations, or private firms as a pooled fund study. The FHWA-administered TPF Program allows federal, state, and local agencies and other organizations to combine resources to support transportation research studies.
  - National partnerships: FHWA actively seeks cooperation with stakeholders. FHWA participates in TRB standing committees and in the AASHTO Research Advisory Committee. FHWA sponsors transportation stakeholder events such as the TRB annual meeting.
  - International partnerships: International cooperation to conduct research of interest to multiple countries is achieved through a partnership with the Forum of European Highway Research Laboratories (FEHRL) and through other agreements with foreign countries.
  - R&T Evaluations Program: The R&T Evaluation Program has been designed to further TFHRC's transparency, accessibility, and responsiveness of R&T for stakeholders. The program conducts retrospective and prospective program evaluations of selected FHWA research programs and projects. The results will be published periodically.
4. **Knowledge Management:** Supports 140 websites to address critical business topics by conducting day-to-day business and sharing knowledge within FHWA and with external partners including State DOTs and private organizations.

FY 2019 research efforts are expected to be a continuation of the work pursued in FY 2018. No major changes in program direction are expected in FY 2019.

**Expected Program Outcomes:**

- A coordinated, comprehensive research and technology program that takes into account stakeholder and partner input.
- Improved coordination, planning, and dissemination of research and technology activities.

**FY 2019 Collaboration Partners (Internal USDOT)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
Corporate and Communications	<b>Office of the Secretary of Transportation</b> on budget and legislative matters.  <b>Office of the Secretary of Transportation</b> on international research collaboration issues.  <b>Office of the Secretary of Transportation and National Highway Traffic Safety Administration</b> to twin selected projects of common interest with the European Commission's Horizon 2020.

**FY 2019 Collaboration Partners (External)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (External)</b>
Corporate and Communications	<b>TRB and AASHTO</b> on research program coordination  <b>State DOTs</b> – Transportation Pooled Fund Program  <b>Forum of European Highway Research Laboratories (FEHRL)</b> – Coordination of international research opportunities  FHWA partners with 33 States through the Transportation Pooled Fund Program to conduct Corporate Communications research.

**How does the Program meet statutory requirements?**

This program is authorized in sections 502 and 503 of title 23, United States Code, which require the Secretary to carry out highway research, development, and technology deployment activities covering a broad range of topic areas in order to improve highway safety, improve infrastructure integrity, strengthen transportation planning and environmental decision-making, reducing congestion, and enhancing freight productivity, among others.



**Describe how public and stakeholder input have been, or will be, utilized in the development of this research program:**

The TRB Research and Technology Coordinating Committee (RTCC), has served as an independent adviser on national and federal highway research for 30 years. The RTCC provides tactical advice on highway research topics, funding, and research management. The RTCC periodically issues reports assessing the state of highway research at national and federal levels and highlighting strategic issues of importance to policy makers.

The FHWA created the FHWA R&T Agenda process and website in an effort to better present and communicate the objectives and reasons of FHWA's R&T program. It was created to improve accessibility & transparency of the R&T program, and increase input from a broader stakeholder community. It also encourages stakeholders to help address national-level research needs and complement our federal R&T. Stakeholders are able to provide input to the Agenda through the FHWA R&T agenda website:

<https://www.fhwa.dot.gov/research/fhwaresearch/agenda/index.cfm>.

In 2015, FHWA initiated the Top Three initiative, which solicited input from the FHWA Division Offices in consultation with the State DOTs to identify the top three issues or needs that each State is facing. The input was analyzed to determine if new research ideas could solve these issues, and 20 research activities were identified and added to FHWA's R&T program roadmaps. FHWA will continue seeking input from the State DOTs through similar initiatives in the future.

*Public Roads* is a bimonthly magazine designed to report on the advances and innovations in highway/traffic research and technology, critical national transportation issues, important activities and achievements of FHWA and others in the highway community, specific FHWA program areas, and subjects of interest to highway industry professionals. The magazine also emphasizes the continuing commitment of FHWA to be a world leader in promoting highway research and technology transfer. Its stakeholders include all FHWA employees; international, national, state, and local transportation officials; members of highway-related professional societies and associations; researchers at technical libraries and technology transfer centers; professors and students of engineering and traffic management; members of appropriate congressional committees; and others interested in highway research and technology and in FHWA policies and programs. Stakeholders are able to submit articles for consideration into the magazine via the *Public Roads* website: <http://www.fhwa.dot.gov/publications/publicroads/author.cfm>.

## Every Day Counts Program

### Program Description:

The EDC is a state-based initiative to identify and rapidly deploy proven, yet underutilized innovations to shorten the project delivery process, enhance roadway safety, reduce congestion and improve environmental sustainability. Under EDC, technical assistance, training, and other resources are provided to state, local, and tribal transportation agencies to support the implementation and widespread adoption of the promoted innovations. In short, EDC identifies underutilized, market-ready technologies with high pay-offs and accelerates their deployment and acceptance throughout the nation. The FAST Act recognizes the success of the EDC initiative and adds it as a required program.

### Program Objectives:

To accelerate the deployment and adoption of proven innovative practices and technologies.

### Anticipated Program Activities:

Through the EDC model, FHWA works with transportation stakeholders to identify a new collection of innovations to champion every two years. Innovations are selected collaboratively by stakeholders, taking into consideration market readiness, impacts, benefits and ease of adoption of the innovation. After selecting the EDC technologies for deployment, transportation leaders from across the country gather at regional summits to discuss the innovations. Transportation agencies then select the innovations that make the most sense for their unique program needs, establish performance goals and commit to finding opportunities to get those innovations into practice over the next two years. Throughout the two-year deployment cycle, FHWA deployment teams provide technical support and specifications, best practices, lessons learned and relevant data are shared among stakeholders through case studies, webinars, demonstration projects, newsletters, etc.

#### FY 2019 Anticipated Activities:

- Prepare and conduct for EDC-5 Regional Summits held in fall of 2018
- EDC-5 Innovation Deployment (FHWA technical assistance and support) (start in 2019 – complete in 2020)

### Expected Program Outcomes:

Accelerated deployment of the promoted innovations and enhancement of the culture of innovation within the highway community.

Reduced project development and delivery times, enhanced safety, reduced congestion, improved environmental sustainability, and enhanced infrastructure integrity through accelerated deployment of innovations.

Increased support of all USDOT and FHWA goals and objectives through accelerated implementation of promoted innovations and the associated benefits of those technologies and processes.

#### **FY 2019 Collaboration Partners (Internal USDOT)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
Every Day Counts	None

#### **FY 2019 Collaboration Partners (External)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (External)</b>
Every Day Counts	<p><b>Key stakeholders and collaborators include:</b></p> <p><b>American Association of State Highway and Transportation Officials;</b></p> <p><b>American Council of Engineering Companies;</b></p> <p><b>American Road &amp; Transportation Builders Association;</b></p> <p><b>American Society of Civil Engineers;</b></p> <p><b>American Public Works Association;</b></p> <p><b>Associated General Contractors of America;</b></p> <p><b>Association of Metropolitan Planning Organizations;</b></p> <p><b>National Association of County Engineers;</b></p> <p><b>American Traffic Safety Services Association;</b></p> <p><b>Institute of Transportation Engineers;</b></p> <p><b>National Association of Regional Councils; and</b></p> <p><b>National Local Technical Assistance Program Association</b></p> <p>– coordination on identifying and vetting innovative technologies and practices for potential deployment through EDC.</p>

#### **How does the Program meet statutory requirements?**

This program is authorized in section 1444 of the FAST Act, Public Law 114-94.

**Describe how public and stakeholder input have been, or will be, utilized in the development of this research program:**

Through the EDC model, FHWA works with transportation stakeholders to identify a new collection of innovations to champion every two years. A public solicitation of innovation suggestions for deployment through EDC is first conducted and the innovations are then selected by FHWA collaboratively with transportation stakeholders, taking into consideration market readiness, impacts, benefits and ease of adoption of the innovation. Transportation stakeholder input is obtained through formal correspondence (emails, letters, etc.) as well as an annual face-to-face meeting to discuss the EDC initiative. Meetings are also held with each stakeholder association on an annual basis to discuss opportunities for further collaboration on deployment efforts. Stakeholders also regularly support and assist FHWA deployment teams with technology transfer activities.

Representatives from the External Collaboration Partners regularly provide input and support the EDC initiative.

## State Transportation Innovation Council Incentive Program

### Program Description:

The State Transportation Innovation Council (STIC) Incentive program provides resources to help STICs foster a culture for innovation and make innovations standard practice in their States. Through the program, funding up to \$100,000 per state per federal fiscal year is made available to support or offset the costs of standardizing innovative practices in a state transportation agency or other public sector STIC stakeholder.

### Program Objectives:

To accelerate the adoption of proven innovative practices and technologies as standard practices.

### Anticipated Program Activities:

Provide incentive funding to STICs to conduct internal assessments; build capacity; develop guidance, standards, and specifications; implement system process changes; organize peer exchanges; offset implementation costs; or conduct other activities the STIC identifies to foster a culture of innovation or to make an innovation a standard practice.

The program will continue in FY 2018 funding \$100,000 per STIC to support eligible activities.

### Expected Program Outcomes:

Increased deployment and adoption of innovations and enhancement of the culture of innovation within the highway community through incentive-funding support of STIC projects.

#### FY 2019 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
STIC Incentives	None

#### FY 2019 Collaboration Partners (External)

Program Name	Name of Collaboration Partner(s) (External)
STIC Incentives	<b>Individual State STICs</b> – on identifying and integrating innovative practices into State DOT or other public sector STIC stakeholder business practices

### How does the Program meet statutory requirements?

This program is authorized in section 503(c)(2)(B)(iii) of title 23, United States Code, which require the Secretary to develop improved tools and methods to accelerate the adoption of proven innovative practices and technologies as standard practices.

**Describe how public and stakeholder input have been, or will be, utilized in the development of this research program:**

A STIC or other equivalent task force, committee or group is intended to bring together public and private transportation stakeholders to evaluate innovations and spearhead their deployment in each state. As such, each STIC serves as the vehicle to engage stakeholders in the identification and deployment of innovations that best fit the unique needs of their respective highway program. The STIC Incentive program supports the projects identified by STICs to enhance the culture of innovation and to adopt selected innovations as a standard practice.

## Accelerated Innovation Deployment Demonstration Program

### Program Description:

The Accelerated Innovation Deployment (AID) Demonstration Program provides incentive funding to State DOTs, federal land management agencies, tribal governments, metropolitan planning organizations, and local governments to offset the risks associated with deployment of an innovation on a project. Funds are available to cover the full cost of implementation of an innovation on a project, up to the maximum amount of \$1 million, in areas such as planning, financing, operations, pavements, structures, materials, environment, and construction.

### Program Objectives:

To accelerate the deployment and adoption of proven innovative practices and technologies.

### Anticipated Program Activities:

Provide incentive funding to support the pilot/demonstration of innovations on projects by State DOT, federal land management agencies, tribal governments, metropolitan planning organizations, and local governments. Funding recipient reports on experiences and lessons learned from each innovation deployment will be shared via the program web site to provide technology transfer.

The program will continue in FY 2018 with an award goal of \$10,000,000 to support pilot/demonstration of innovations on projects by State DOTs, federal land management agencies, tribal governments, metropolitan planning organizations, and local governments.

### Expected Program Outcomes:

Increased deployment and adoption of innovations.

Enhanced technology transfer.

### FY 2019 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
AID Demos	None

### FY 2019 Collaboration Partners (External)

Program Name	Name of Collaboration Partner(s) (External)
AID Demos	<b>State DOTs, federal land management agencies, tribal governments. Metropolitan planning organizations and local governments</b> – on identifying and deploying innovative technologies and practices to improve project delivery, safety, congestion and environmental sustainability.

#### How does the Program meet statutory requirements?

This program is authorized in section 503(c)(2)(B)(i) of title 23, United States Code, which requires the Secretary to establish and carry out demonstration programs.

#### Describe how public and stakeholder input have been, or will be, utilized in the development of this research program:

State DOTs, federal land management agencies, tribal governments, metropolitan planning organizations, and local governments submit applications for funding to support deployment of innovations on projects of their choosing. The FHWA evaluates the applications in accordance with published criteria for the program which was established through a Notice of Funding Availability which incorporated public comments.



## Accelerating Market Readiness (AMR) Program

### Program Description:

The Accelerating Market Readiness (AMR) program supports promising new or underutilized innovations that have the potential to be considered for accelerated deployment under the EDC initiative. The program provides funding to support the testing, evaluation, or validation of innovations to obtain more comprehensive performance information. Other activities may include the development of product specifications, operating guidelines, standards, or procedures to accelerate the market readiness of the innovation and support future deployment efforts. The FHWA is considering extending the program to innovations and technologies earlier in the market readiness stage.

### Program Objectives:

To accelerate the market readiness of promising innovations for future promotion and deployment by FHWA through the EDC initiative or other programs. Market readiness indicates: market research has been conducted to ensure that the innovation is mature and is readily available; the innovation has been sufficiently piloted and evaluated in the U.S. highway community and has documented performance results; technical specifications and/or standards exist to guide implementation; technical expertise exists within FHWA to lead deployment activities; and industry support and early adopters of this innovation exist.

### Anticipated Program Activities:

The program will continue in FY 2018 funding up to \$1,500,000 to support activities to accelerate the market readiness of promising innovations.

### Expected Program Outcomes:

Accelerated market readiness of promising innovations for future promotion and deployment by FHWA through the EDC initiative or other programs.

### FY 2019 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Accelerating Market Readiness	None

### FY 2019 Collaboration Partners (External)

Program Name	Name of Collaboration Partner(s) (External)
Accelerating Market Readiness	<b>National STIC Network; and AASHTO</b> – on identifying and field testing innovative technologies and practices for potential deployment through EDC or otherwise made available to State and local transportation agencies.

#### **How does the Program meet statutory requirements?**

This program is authorized in section 503(c)(2)(B)(iii) of title 23, United States Code, which requires the Secretary to develop improved tools and methods to accelerate the adoption of proven innovative practices and technologies as standard practices.

#### **Describe how public and stakeholder input have been, or will be, utilized in the development of this research program:**

Innovations are suggested for EDC deployment through the public and stakeholder solicitation process which were determined to be promising, but not yet market ready are considered by FHWA for further testing and evaluation through the Accelerated Market Readiness program.

## Accelerated Deployment of Pavement Technologies

### Program Description:

The FAST Act extends this MAP-21 designated program to promote, demonstrate, support, and document the application of innovative pavement technologies, practices, performance, and benefits. More than 50 percent of highway funding is spent on pavements. To ensure the greatest return on these investments and accelerate the process of delivering safe, smooth, durable pavements in a state of good repair, the Accelerated Deployment of Pavement Technologies (ADPT) program focuses on prompt implementation of innovative pavement technologies, products, and processes.

Activities are funded as part of the Pavement and Materials program, the Accelerated Innovation Deployment program, and the Every Day Counts initiative.

### Program Objectives:

To promote, implement, deploy, demonstrate, support, and document the application of innovative pavement technologies, practices, performance, and benefits.

### Anticipated Program Activities:

1. Increased asphalt in-place density for longer pavement life and related pavement production and placement procedures.
2. Implement performance specifications and tests for concrete pavement mixtures.
3. Effective testing, analysis and construction procedures to evaluate and encourage the use of recycle and reclaimed materials into pavements.
4. Review of state agency quality assurance programs for regulatory compliance, and provide guidance and tools for effectiveness and innovation.
5. Improved materials physical tests and non-destructive procedures that predict pavement performance and reduce the likelihood of inadequate performance.
6. Advance sustainable technologies and practices for adoption by state highway agencies.

In FY 2018, FHWA will further advance this program with the national adoption of enhanced materials testing, construction and quality assurance, reflected in the actual achievement of increased pavement performance/longer life. Anticipating the balloting and adoption of an AASHTO Provisional Standard for Performance Concrete Mixture Design and development and implementation of a Roadmap for the Sustainable Pavements Program, with a focus on the quantification of environmental impacts related to pavements through Life Cycle Assessment.

### Expected Program Outcomes:

- Enhanced pavement durability;
- Effective and efficient pavement design and construction;

- Innovative and balanced state highway agency materials standards and construction specifications;
- Increased use of recycled and industrial by products into pavements;
- Establishment of effective state material quality assurance programs.

#### **FY 2019 Collaboration Partners (Internal USDOT)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
Pavement Technologies Deployment	<b>Federal Railroad Administration, National Highway Traffic Safety Administration, Maritime Administration, Federal Transit Administration</b> on corrosion research.

#### **FY 2019 Collaboration Partners (External)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (External)</b>
Pavement Technologies Deployment	<b>AASHTO, National STIC Network; National Asphalt Pavement Association; American Concrete Pavement Association, National Center for Asphalt Technology, and other paving associations</b> – on the deployment of pavement technologies.

#### **How does the Program meet statutory requirements?**

This program is authorized in section 503(c)(3) of title 23, United States Code, which requires the Secretary to establish and implement a program to promote, implement, deploy, demonstrate, showcase, support, and document the application of innovative pavement technologies, practices, performance, and benefits.

#### **Describe how public and stakeholder input have been, or will be, utilized in the development of this research program:**

The FHWA has formed a number of expert task groups which include representatives from government agencies, academia and industry. These groups provide technical input as well as help FHWA carrying out technical work to facilitate deployment of pavement innovations.

## Intelligent Transportation Systems (ITS) Connected Vehicles

### Program Description:

As our environments become more connected, Intelligent Transportation Systems (ITS) play a key role in ensuring the economic vitality and quality of life for citizens in our cities, towns, suburbs, and rural communities. The transportation system can best serve vital national needs to move people and goods reliably and safely when technology enables transportation system managers to effectively “connect the dots” combining information from multiple sources to deal with challenging conditions (e.g., severe weather, high demand, multi-vehicle incidents, and other unanticipated emergencies). The ITS, connected vehicles, and automated vehicles are the logical steps in developing a robust interoperable connected and automated transportation infrastructure to demonstrate what is possible when communities use technology to connect transportation assets into an interactive network. Connected Vehicle (CV) technology is an essential core mechanism that allows wireless communications among vehicles, mobile devices, and roadside infrastructure. This connectivity has the potential to dramatically improve traveler safety while advancing personal mobility and boosting national economic productivity.

The USDOT’s top priority is the safety of all users of the transportation system. In keeping with this objective, the ITS Joint Program Office (JPO) in coordination with USDOT’s modal entities and in collaboration with state officials, industry, car manufacturers, academia, and other organizations, created a technology-driven framework to advance CV development. The CV Program is the keystone of ITS JPO’s research and engagement aligned with USDOT’s mission of advancing safety innovations in transportation. Capabilities leveraging these safety innovations also have demonstrated capability to provide new levels of personal mobility and dramatically improve the efficiency of goods movement.

The CV program is a catalyst moving emerging technologies from isolated testbeds to large-scale deployed systems. The flagship deployment effort of the program is the CV Pilot Deployment Program, funding large-scale CV system implementation efforts led by the NYCDOT; the THEA; and the WYDOT. Similar, interoperable technologies are being used differently in three sites to improve safety in environments as diverse as dense urban grid networks and isolated high-plains interstates. The three sites piloted a deployment planning process that is transferrable to other regions in the US. All sites are currently completing a design/test/build phase before moving on to an operational phase in 2018.

The CV technologies, applications, guidance, and supporting systems are also being leveraged in the agency’s Smart City Challenge efforts and FAST Act Advanced Transportation and Congestion Management Technologies Deployment Program grants. Collectively, these early deployment efforts illustrate how CV technologies address critical local issues (e.g., reducing collisions, injuries, and fatalities) and spur nationwide deployment of interoperable CV products and coordinated CV systems.

### Program Objectives:

To advance knowledge of Connected Vehicle (CV) systems (Research); to collect benefits and costs and implementation lessons learned information from high priority CV applications (Development); and to support State and local, and transit agency integrating CV environment deployments (Adoption).

### Anticipated Program Activities:

1. Operate Connected Vehicle Pilot sites in New York City, Tampa, FL and Wyoming.
2. Conduct evaluation to support Connected Vehicle Pilot deployment.
3. Operate Security Credential Management System (SCMS) for connected vehicle deployment sites.

No major changes in program direction are anticipated in FY 2019; program objectives and activities will continue advancing.

### Expected Program Outcomes:

- Demonstrations of CV environments that fit into real-world environments of today.
- Real-time and real-world data to help with transportation planning and transportation system operations.
- Increase in safety, mobility, system efficiency and access to resources for disadvantaged groups, and decreases in vehicle emissions.
- Increased opportunities to partner with non-government groups, such as private industry and universities.
- Reduction of fatalities through weather-related safety, infrastructure-based, and other applications.

### FY 2019 Collaboration Partners

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
CV Pilots	FTA, FMCSA, NHTSA and Volpe work with the JPO to conduct evaluations of the safety, mobility, environmental and public agency efficiency impacts from the CV Pilot sites and on the CV Pilots Phase 2 which is the Design/Build/Test Phase for CV technologies.
Connected Vehicle Policy	FTA and NHTSA work with the JPO to better understand the relationships between connected and automated vehicle systems and to develop a connected vehicle certification governance structure.
Mobility on Demand (MOD)	FTA works with the JPO to evaluate and analyze Mobility on Demand (MOD) approaches and demonstrations.
Connected Vehicle	NHTSA, FTA and OST-R work with the JPO to evaluate the as-built Security Credential Management System (SCMS) and to provide continuing security credential management services to early connected vehicle deployments.

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Connected Vehicle	FTA, FRA and NHTSA work with the JPO to enable the V2I Deployment Coalition to work collaboratively with industry, state and local governments, academia and USDOT to achieve the goal of deploying and operating a functioning CV environment.
Connected Vehicle	FTA works with the JPO to ensure the V2I and V2X infrastructure components are accurately addressed.

Program Name	Name of Collaboration Partner(s) (External)
CV Pilots	
Connected Vehicle Policy	
Mobility on Demand (MOD)	
Connected Vehicle	

### **How does the Program meet statutory requirements?**

This program is authorized in sections 512 to 518 of Title 23, United States Code.

### **How does the Program incorporate public and stakeholder input?**

The 2015-2019 ITS Strategic Plan incorporated public and stakeholder (including external and internal partners) input from over 700 stakeholders: the JPO hosted three series of webinars; over 286 different organizations participated in the development of the plan; public meetings for stakeholder input were held at numerous national annual meetings, including the National Rural ITS Annual Meeting (NRITS), the ITE Annual Meeting, ITS American Annual Meeting, IEEE and the Connected Vehicle Trade Association (CVTA). The ITS Strategic Plan has had 8,500 visitors since it was published on line in 2014.

Additionally, the research program managers and the professional capacity building and communications staff routinely host a multitude of webinars; utilize social media (email and Twitter); issue publications; and speak at conferences and events.

Connected Vehicle Pilots: in 2015 and 2016, the ITS JPO held 12 public webinars and four webinars that were open only to the three pilot sites. Since 2014, the ITS JPO has held more than 18 webinars on CV Pilots.

## Automated Vehicles

### Program Description:

The development of Automated Vehicle (AV) technology is occurring at a rapid pace, with industry investing billions of dollars a year. Several states have enacted legislation regarding AV and testing is currently occurring on public roads. Partially automated vehicles are available in the market today and heavy vehicle automation technologies are approaching commercialization.

Recognizing the importance of these advancements, the USDOT is playing a significant role in addressing the key technological and institutional barriers that have emerged. The ITS JPO automation research program promotes policy and technical research to reduce risks and produce positive outcomes. The program seeks to “enable safe, efficient, and equitable integration of automation into the transportation system.” ITS JPO program research is conducted by ITS JPO staff and stakeholders in collaboration with other USDOT modal agencies in keeping with the ITS JPO’s coordination role. The ITS JPO works closely with NHTSA, FTA, FMCSA, and MARAD to address key technical and policy challenges for automation.

In the 2016 Smart City Challenge the topic of urban automation was the highest of twelve priority areas. The development and adoption of safe vehicle automation through real-world pilot projects like the Smart City Challenge and the FAST Act ATCMTD Program grants should assist as the USDOT engages with other national and international activities. A key component of our Smart City Challenge includes investigating the impact of automated vehicle technology for promoting safety, improving mobility, improving infrastructure, preserving the environment.

### Program Objectives:

To define the core elements and the performance criteria for automation (Research); to test automation components in the Smart City Challenge and FAST Act Advanced Transportation and Congestion Management Technologies Deployment Program grants, as well as in other test situations (Development); and to define the Federal role in facilitating and encouraging deployment of automated systems (Adoption).

### Anticipated Program Activities:

1. Identify policy areas that require Federal government involvement and where policies may need to be revised or developed to support the safe deployment of automated vehicles.
2. Complete testing and safety review of first mile/last mile driverless shuttle vehicles
3. Complete on-road demonstration of arterial truck platooning.
4. Assess federal and state safety requirements for different levels of truck platooning



No major changes in program direction are anticipated in FY 2019; program objectives and activities will continue advancing.

### **Expected Program Outcomes:**

- Provide guidance to State and local agencies to help the understanding of impacts of automated vehicles on the assets they manage.
- Expand the reach of transportation modes to disabled and older users and provide “last mile” connectivity services for all users.
- Reduce the number and severity of crashes caused by drivers or by other conditions (e.g. weather, pedestrians, and roadway conditions).

### **FY 2019 Collaboration Partners**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
Automated Vehicles (AV)	NHTSA conducts research for JPO on AV human factors, functional safety, test procedures, and cybersecurity.
Automated Vehicles	FMCSA provides requirements and oversight to JPO research on AV implications for Federal Motor Carrier Safety Regulations and prototype port applications.
Automated Vehicles	FTA provides requirements and oversight to JPO on first mile/last mile service and other Smart City AV applications.
Automated Vehicles	Volpe Center conducts AV policy and benefits research for JPO and provides program management and internal collaboration support.

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (External)</b>
Automated Vehicles (AV)	

### **How does the Program meet statutory requirements?**

This program is authorized in sections 512 to 518 of Title 23, United States Code.

### **How does the Program incorporate public and stakeholder input?**

The 2015-2019 ITS Strategic Plan incorporated public and stakeholder (including external and internal partners) input from over 700 stakeholders: the JPO hosted three series of webinars; over 286 different organizations participated in the development of the plan; public meetings for stakeholder input were held at numerous national annual meetings, including the NRITS Annual Meeting, the ITE Annual Meeting, ITS American Annual Meeting, IEEE and the CVTA. The ITS Strategic Plan has had 8,500 visitors since it was published on line in 2014.

Additionally, the research program managers and the professional capacity building and communications staff routinely host a multitude of webinars; utilize social media (email and Twitter); issue publications; and speak at conferences and events.

## Emerging Technology

### Program Description:

The Emerging Technology program focuses on cultivating the next generation of transportation systems. As the scale of ITS increases, vehicle manufacturers, infrastructure providers, innovators, and entrepreneurs discover new opportunities to use technology and the data that will be generated. These technological advances, new functionality, new applications, new operational concepts, and disruptive innovations need to be tracked by the USDOT to determine technological, market, and demographic trends throughout the globe and across industries to seek, evaluate and sometimes incubate emerging capabilities that demonstrate the potential to transform transportation. As this happens, the USDOT will be positioned and engaged as a partner to guide research, development, and technology adoption in a systematic manner.

An example of a major initiative in the Emerging Capabilities program is the Smart City Challenge. The Smart City Challenge was launched in December 2015 as an innovative competition for cities to reshape their transportation systems harnessing the power of technology, data, and creativity to reimagine how people and goods move. The challenge called on cities to use USDOT leadership in transportation research to do more than merely introduce new technologies onto their streets, requiring them to boldly envision new solutions that would change the face of transportation by closing the gap between rich and poor; capturing the needs of both young and old; and bridging the digital divide through smart design so that the future of transportation meets the needs of all residents.

Seventy-eight cities submitted entries to the competition, and in March 2016, seven finalists were selected. The finalists included Austin, Columbus, Denver, Kansas City, Pittsburgh, Portland, and San Francisco. Each finalist was awarded \$100,000 to develop detailed applications that captured their plans to conduct a federally funded Smart City Demonstration in their jurisdiction. In June 2016, Columbus was selected as the winner of the Smart City Challenge.

### Program Objectives:

To establish ways to use new technologies and decision support tools for real-time needs, and to meet longer-term public policy objectives (Research); and to integrate the operational characteristics of new technologies into CV, AV, and legacy systems and applications (Development).

### Anticipated Program Activities:

1. Conduct a demonstration and evaluation with Columbus, Ohio to test, evaluate and demonstrate the benefits of connected city concepts.
2. Identify truck port staging, queuing and access technology applications and approaches for the ITS MARAD Program.

### Expected Program Outcomes:

- Forge stronger relationships and partnerships with private industry and universities.
- Increase ability to adapt existing or upcoming program to accommodate new ITS technologies.
- Stimulate economic growth through innovation and technological leadership.

### **FY 2019 Collaboration Partners**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
Smart City Challenge	OST, FTA, FMCSA, NHTSA, MARAD, FRA work with the JPO to conduct the demonstration and evaluation of the Smart City winner to test, evaluate and demonstrate the benefits of connected city concepts.
ITS MARAD	MARAD and FMCSA works with the JPO in a three-phased effort to incorporate maritime port ITS needs into current and existing ITS JPO research, including a project related to low speed automated truck queuing at ports and warehouses.
ATTRI	FTA works in coordination with the ITS JPO to research, develop, and implement transformative solutions, applications, and systems to help all people, particularly those with disabilities, effectively plan and execute their travel, addressing individual mobility needs.

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (External)</b>
Smart City Challenge	The city of Columbus, Ohio on identifying and deploying innovations on their transportation systems that harness the power of technology, data, and creativity to reimagine how people and goods move.
ITS MARAD	
ATTRI	

### **How does the Program meet statutory requirements?**

This program is authorized in sections 512 to 518 of Title 23, United States Code.

### **How does the Program incorporate public and stakeholder input?**

The 2015-2019 ITS Strategic Plan incorporated public and stakeholder (including external and internal partners) input from over 700 stakeholders: the JPO hosted three series of webinars; over 286 different organizations participated in the development of the plan; public meetings for stakeholder input were held at numerous national annual meetings, including the NRITS Annual Meeting, the ITE Annual Meeting, ITS American Annual

Meeting, IEEE and the CVTA. The ITS Strategic Plan has had 8,500 visitors since it was published on line in 2014.

Additionally, the research program managers and the professional capacity building and communications staff routinely host a multitude of webinars; utilize social media (email and Twitter); issue publications; and speak at conferences and events.

## Enterprise Data

### Program Description:

Methods to collect, share, and use data are needed for management and operations of ITS, and state and local governments will need to have the capacity – and motivation – to implement these new methods nationwide to enable interoperability of the future transportation system and effective privacy protection for travelers. This program seeks to develop a better understanding of critical uses for these data, their value for the public, private, and academic sectors, and the potential Federal role in enabling these data to be collected and shared to unlock the full potential societal value of deploying these new technologies.

The program focuses on enabling effective data capture from ITS-enabled technologies, including CV (automobiles, transit, and commercial vehicles), Automated Vehicles, Smart Cities, mobile devices, and infrastructure in ways that protect the privacy of users while exchanging and utilizing real-time data. In addition, these activities focus on the creation of open source data environments that enable integration and sharing of open and protected data from multiple sources for use in transportation research, management, and performance measurement.

These efforts aim to establish a foundation for agility, data sharing, and privacy protection for the future transportation system by helping early deployers of these technologies to adopt modern IT and data management best practices.

Concurrently, the program will investigate demand for accessing streaming data from the CV environment and other emerging ITS data sources as well as archiving these data for future research and other uses.

### Program Objectives:

To integrate new data sets with other legacy data management systems (Research); to identify a model for data management and ownership (Development); and to enable new business relationships between the public and private sector to ensure privacy protection.

### Anticipated Program Activities:

1. Operationalize the ITS Operational Data Environment (ODE) ITS Data Policy Playbook, drive their adoption in deployment projects, and hand off maintenance to the user community.
2. Cut down latency of distributing ITS research data to the community through updated data sharing procedures and systems.
3. Train local agencies to adopt modern IT best practices, such as agile methodologies, that support ITS deployment.

No major changes in program direction are anticipated in FY 2019; program objectives and activities will continue advancing.

**Expected Program Outcomes:**

- Increase adoption of efficient and secure data sharing architectures within ITS deployments.
- Increase adoption of modern IT and digital best practices to increase agility, innovation, and data utility.
- Operationalize privacy-positive principles to enable responsible sharing of ITS data.
- Share ITS research data to fuel third-party research and application development  
Provide strategic direction for the ITS community.

**FY 2019 Collaboration Partners**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
Connected Data Systems (CDS)	FTA works with the JPO to provide specialized technical support to the CDS Program in the area of modern software development tools and methods.
Connected Data Systems (CDS)	OST and FTA work with the JPO to jumpstart the ecosystem of third party development around the data made available through the USDOT's Smart City Challenge.
Connected Data Systems (CDS)	FTA and BTS will work with the JPO to conduct national/regional workshops (and supporting virtual events/activities) to elicit stakeholder needs related to data sharing, identify potential approaches to federate data among operational data environments, and summarize findings.

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (External)</b>
Connected Data Systems (CDS)	

**How does the Program meet statutory requirements?**

This program is authorized in sections 512 to 518 of Title 23, United States Code.

**How does the Program incorporate public and stakeholder input?**

The 2015-2019 ITS Strategic Plan incorporated public and stakeholder (including external and internal partners) input from over 700 stakeholders: the JPO hosted three series of webinars; over 286 different organizations participated in the development of the plan; public meetings for stakeholder input were held at numerous national annual meetings, including the NRTIS Annual Meeting, the ITE Annual Meeting, ITS American Annual Meeting, IEEE and the CVTA. The ITS Strategic Plan has had 8,500 visitors since it was published on line in 2014.

Additionally, the research program managers and the professional capacity building and communications staff routinely host a multitude of webinars; utilize social media (email and Twitter); issue publications; and speak at conferences and events.



## Interoperability

### Program Description:

As ITS evolves from primarily infrastructure systems – for example traffic signal coordination or ramp metering – towards a nationwide or North American, complex “system of systems” including connected and automated vehicles, secure system-wide interoperability becomes far more critical. Incorporating vehicles via V2V and V2I – collectively Connected Vehicle (CV) - capabilities offers great promise to improve safety and mobility. However, once vehicles, which can easily travel across North America, become part of the ITS system, multi-regional interoperability becomes a requirement rather than merely a benefit.

The ITS JPO supports interoperability via funding and program execution in cross-modal cooperation within FHWA on V2I deployment, the NHTSA on V2V research, as well as, with other surface transportation modes and with state, local, international, industry and academic partners.

The Interoperability budget funds key technical research to advance ITS architecture and standards, cyber security and human factors guidelines that support efficient, secure large-scale deployment of ITS technologies. Interoperability programs support test beds and pilot deployments and serve to assure a broad, competitive marketplace for ITS equipment and services. The goal of this research is to ensure effective connectivity from the device level to the transportation system level.

### Program Objectives:

To develop and evolve a comprehensive National ITS Architecture to support large scale interoperable ITS infrastructure, connected vehicle and connected automation deployments across the nation – especially across borders with Canada and Mexico (Development); to develop and maintain an inventory of candidate interfaces for standardization and support standards development efforts for interfaces where there is greatest public interest and benefit, including those interfaces required to support regulatory activity (Development); to cooperate internationally, leveraging common interests to reduce US resource requirements, access broader expertise, speed development and harmonize architecture and standards to support an international marketplace for US vendors (Adoption); and to facilitate availability of testing and certification processes and procedures to ensure required interoperability and regulatory compliance (Adoption).

### Anticipated Program Activities:

1. Further evolution integrated ITS reference architecture and toolset to support large-scale infrastructure and connected vehicle deployments. Architecture evolution to

continue to remain consistent with ITS infrastructure, connected vehicle and connected automation technological advancements, inclusive of stakeholder input, and leveraging international cooperation when in the public interest. Development of initial capabilities to support connected automation as well as facilitate connection to other relevant system architectures such as electrical power grid management.

2. Update detailed IT and ITS standards recommendations for all interfaces within the connected vehicle portion of the system architecture, identify remaining gaps to be addressed. Work is conducted in resource-sharing collaboration with Australia and Europe; leveraging common interests to minimize cost to US while accessing international expertise.
3. Continue internationally cooperative effort to further enhance support for full-scale connected vehicle developments by adding detailed test and certification recommendations for key interfaces within the connected vehicle portion of the architecture. Work planned to be conducted in resource-sharing collaboration with Australia and Europe; leveraging common interests to minimize cost to US while accessing international expertise.
4. Building on the successful completion of vehicle-to-vehicle standards to support initial operating capability, continued development and updates of key vehicle -to-infrastructure standards to support connected vehicle deployment, leveraging international cooperation when in the public interest.
5. Ongoing support for interoperable architectures with Mexico and Canada to permit North American interoperability for all ITS services and efficient cross-border movement of people and goods.

No major changes in program direction are anticipated in FY 2019; activities in support of advancing program objectives will continue.

#### **Expected Program Outcomes:**

- Nationwide—preferably North American—interoperability for all participants in the ITS system inclusive of vehicles, infrastructure, and mobile devices and applications, efficient ITS-supported cross border movement of people and goods.
- Architecture and standards tools and solutions that facilitate efficient, effective and secure interoperable ITS infrastructure, connected vehicle and connected automation deployments.
- Efficient, standardized sharing of relevant information across transportation network operators, users and stakeholders as well as archiving of information to support transportation planning and other analyses.
- Greater adoption rates with reduced anxiety over obsolescence.
- Increased harmonization between U.S. and other global ITS architectures and standards, resulting in broader, more efficient markets for vehicles, infrastructure and services.
- Maintenance and updates of published standards as needed to assure suitability for intended purposes, security and required forward/backward compatibility to support optimizing performance and life-cycle cost.

### FY 2019 Collaboration Partners

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Interoperability	NHTSA and ITS-JPO cooperate to develop, maintain and evolve standards required to support Vehicle-to-Vehicle safety broadcast and associated rulemaking actions.
Interoperability	NHTSA, FHWA, FTA, FRA, FMCSA, SLSDC, MARAD, PHMSA and ITS-JPO to incorporate all modal stakeholder needs in developing and evolving the integrated National ITS Architecture and software tools to support large scale, interoperable deployment of ITS, connected vehicle and connected automation technology.
Interoperability	NHTSA and ITS JPO to cooperate in developing heavy-vehicle cybersecurity case studies and best practices.
Interoperability	ITS JPO and the Volpe Center to collaborate on development of a cybersecurity five-year program plan and roadmap.
Interoperability	ITS JPO and NHTSA to cooperate on support to an industry-based certification lab consortium to develop certification test procedures.
Interoperability	ITS JPO and NHTSA to advance human-machine interface guidelines for cooperative ITS technologies.

Program Name	Name of Collaboration Partner(s) (External)
Interoperability	European Commission (EC) and Transport Certification Australia (TCA) on standards recommendations, gap analyses and testing/certification recommendation across connected vehicle architectures.
Interoperability	Canadian and Mexican governments on region-wide and cross border interoperability.

#### How does the Program meet statutory requirements?

This program is authorized in sections 512 to 518 of Title 23, United States Code.

#### How does the Program incorporate public and stakeholder input?

The 2015-2019 Strategic Plan incorporated public and stakeholder (including external and internal partners) input from over 700 stakeholders: the JPO hosted three series of webinars; over 286 different organizations participated in the development of the plan; public meetings for stakeholder input were held at numerous broadly attended events including those sponsored by AASHTO, APTA, IEEE, ITE, ITS America, SAE International. The ITS Strategic Plan has had 8,500 visitors since it was published on line in 2014. The ITS Architecture program has conducted numerous public workshops to gather input on the architecture and provide deployment support and accepts input via electronic means. The ITS standards program participates in numerous ITS standards working groups

comprised of interested stakeholders. In accordance with legislative direction – and good practice –ITS standards development is conducted in cooperation with multiple standards development organizations (SDOs) including IEEE, SAE International, the ITE, National Electrical Manufacturers Association (NEMA), the International Organization for Standardization (ISO) via processes open to all interested stakeholders in order to leverage broad expertise and assure the development of broadly acceptable, complete and correct standards. Reference architecture development and evolution activities are conducted with broad stakeholder input obtained via multiple means, leveraging inputs and cooperation from multiple stakeholders and international partners with common interests.

Additionally, the research program managers and the professional capacity building and communications staff routinely host webinars; utilize social media (email and Twitter); issue publications; and speak at conferences and events.

## Accelerating Deployment

### Program Description:

As new ITS technologies and systems evolve into market-ready products, the ITS Accelerating Deployment Program is addressing questions associated with adoption and deployment. The goal of the Accelerating Deployment program is to speed up the transformation of ITS research and prototypes into market-ready technologies that are commercially viable and adopted by the transportation community. This program provides communication and education support to facilitate awareness, understanding, acceptance, adoption, and deployment of ITS technologies across stakeholder groups; and ensures effective partnerships are fostered and developed at various levels – executive, program, and project. The ITS JPO seeks to spur adoption of technology, and help stakeholders and localities deploy maturing ITS systems. The program provides knowledge transfer, and supports technical assistance, training, outreach, program evaluation, and other stakeholder engagement. The program supports advancing ITS research, to initial adoption, and subsequently on to wider scale deployment in coordination with other stakeholders at the federal, state, regional and local levels. The program key areas are discussed in the following:

- Training – As CAV technologies progress, the workforce will need new knowledge, skills, and abilities to drive implementation, the ITS Professional Capacity Building (PCB) program will continue developing courses to advance the ITS workforce.
- Technical Assistance – The Connected Vehicle (CV) deployment test bed/technical assistance program and CV pilot program will continue development of an agile platform to deliver support to test sites remotely using a help desk model with targeted in-person testing capabilities and coordination between early deployers.
- Stakeholder outreach through workshops and webinars – The PCB program will offer ITS knowledge and lessons learned from CV deployments to stakeholder's in-person and then package these materials for a wider audience through an economical and scalable platform.
- The Communications Program updates and maintains the ITS JPO website and develops microsites on selected topics of interest such as CV basics and connected vehicle deployment.
- The ITS JPO supports knowledge and technology transfer in key areas with key stakeholders such as the FHWA's V2I Deployment as well as the joint AASHTO, ITE, and ITSA effort to engage stakeholder through the V2I Deployment Coalition.
- The ITS Evaluation program supports CV pilot deployment and smart city evaluation efforts, conduct the ITS Deployment Tracking Survey, document benefits, costs, and lessons learned from ITS deployments, and conduct studies of ITS program effectiveness.
- The Communications program provides support for any ITS JPO-funded research project. This includes presentations, articles, and fact sheets about connected vehicle, automated vehicle and all other ITS activities. These materials are used to educate the public and provide stakeholders with the tools they need to promote deployment of ITS technology.

### Program Objectives:

To define collaboration and communication mechanisms and targets to encourage public and private investment (Research); to develop comprehensive cost benefits and analytic tools that allow deployers to understand the financial and operational benefits of new technologies and systems (Development); and to establish the tools that support the new user base (Adoption).

### Anticipated Program Activities:

1. Prepare publications in Technical Journals for Connected Vehicle (CV) outreach support.
2. Research site recommendations for ITS transit technical support. Conduct CV and AV workshops to increase technical knowledge of connected vehicle and automated vehicle deployers.
3. Create Emerging Technologies outreach and training activities.
4. Develop University ITS & Community College ITS Workshops to facilitate deployment of ITS-CV-AV teaching within higher education venues.
5. Conduct stakeholder outreach through workshops and webinars including peer-to-peer events.
6. Provide active technical assistance to early deployers of CV and other emerging ITS technologies.

### Expected Program Outcomes:

- Provide deployment support by assisting with transition planning, training, transition plans, timelines and milestone development.
- Provide communication and education support to facilitate awareness, understanding, acceptance, adoption, and deployment of ITS technologies across all stakeholder groups. Ensure effective partnerships are fostered and developed at various levels – executive, program and project.
- Develop partnerships encompassing a wide range of public and private partners.

### FY 2019 Collaboration Partners

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Professional Capacity Building (PCB) Program	NHI (FHWA) and TSI (OST) develop and offer courses on ITS Awareness, ITS National Architecture, Connected Vehicles and other topics.
PCB Program	FTA and FMCSA provide subject matter experts to review training materials and offer course instructors for PCB classes and webinars.
PCB Program	Volpe Center conducts transit standards course development, provides technical assistance for T3 webinar series, and provides program management and internal collaboration support.
Evaluation Program	Volpe Center conducts evaluation research for JPO.

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Mobility Services for All Americans (MSAA)	FTA conducts research, reviews publications, and assists with executing best practices workshops for MSAA.
Communications	OST-R, NHTSA and FTA to work with the JPO to develop a redesigned, interactive website that engages external audiences such as ITS stakeholders, interested members of the public, policymakers, and media, and uses new and social media in a graphically appealing and engaging manner to convey the latest information on old ITS technologies.
Communications	All USDOT modes will continue to have a booth presence at key trade shows.
CV Pilot - Deployment Technical Assistance	NHTSA and FTA work with the JPO to ensure that policy is appropriately represented within the emerging certification test procedures, this project continues the work of the Test Labs and provides the Policy Program and modal partners with an opportunity to ensure the evolving test procedures are in line with policy.

Program Name	Name of Collaboration Partner(s) (External)
Professional Capacity Building (PCB) Program	
Evaluation Program	
Mobility Services for All Americans (MSAA)	
Communications	
CV Pilot - Deployment Technical Assistance	

### **How does the Program meet statutory requirements?**

This program is authorized in sections 512 to 518 of Title 23, United States Code.

### **How does the Program incorporate public and stakeholder input?**

The 2015-2019 Strategic Plan incorporated public and stakeholder (including external and internal partners) input from over 700 stakeholders: the JPO hosted three series of webinars; over 286 different organizations participated in the development of the plan; public meetings for stakeholder input were held at numerous national annual meetings, including the NRITS Annual Meeting, the ITE Annual Meeting, ITS American Annual Meeting, IEEE and the CVTA. The ITS Strategic Plan has had 8,500 visitors since it was published on line in 2014.

The ITS Professional Capacity Building (PCB) Program's Connected Vehicle (CV) Training and Education Implementation Plan FY2016 – 2020 incorporated input from nearly 200 individual stakeholders on CV training needs.

Additionally, the research program managers and the professional capacity building and communications staff routinely host a multitude of webinars; utilize social media (email and Twitter); issue publications; and speak at conferences and events.



## **Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD)**

### **Program Description:**

The FAST Act directs the USDOT to establish an advanced transportation and congestion management technologies deployment initiative to provide grants to eligible entities to develop model deployment sites for large scale installation and operation of advanced transportation technologies to improve safety, efficiency, system performance, and infrastructure return on investment. FHWA will enter into agreements with eligible entities to establish model technology deployment sites.

Per the FAST Act, the \$60 million required for this program are carved out of three existing programs in the following amounts: Highway Research and Development (\$20 million), Technology and Innovation Deployment (\$19 million), and Intelligent Transportation Systems (\$21 million) (amounts are estimates subject to change).

The program solicitation in FY 2018 will have adjusted focus areas to reflect then-current USDOT priorities.

### **Program Objectives:**

The technology deployments funded under this program will: reduce costs & improve return on investments; deliver environmental benefits that alleviate congestion & streamline traffic flow; measure & improve the operational performance of the applicable transportation network; reduce the number & severity of traffic crashes & increase driver, passenger, & pedestrian safety; use real-time transportation-related information to improve mobility, reduce congestion, & provide for more efficient & accessible transportation; monitor transportation assets to improve infrastructure management, reduce maintenance costs, prioritize investment decisions, & ensure a state of good repair; deliver economic benefits by reducing delays, improving system performance, & providing for the efficient & reliable movement of goods & services; or accelerate the deployment of vehicle-to-vehicle, vehicle-to-infrastructure, autonomous vehicles, & other technologies.

### **Anticipated Program Activities:**

Each fiscal year, FHWA will make no fewer than 5 and no more than 10 awards of up to \$12 million individually. Focus areas are identified for each year's solicitation and may include: Transportation Elements Associated with Smart Cities; multimodal Integrated Corridor Management (ICM); installation of connected vehicle technologies at intersections; advanced technologies to improve goods movement; incorporation of connected and automated vehicle technologies in public sector fleets; infrastructure maintenance, monitoring, and condition assessment; and advanced technologies to improve access to transportation services.

### **Expected Program Outcomes:**

These model technology deployments will demonstrate how emerging transportation technologies, data, and their applications can be effectively deployed and integrated with existing systems to address transportation challenges.

**Describe how public and stakeholder input have been, or will be, utilized in the development of this research program:**

The program conducts introductory webinars with stakeholders and prospective applicants after the release of the annual solicitation to describe the program, goals, and the focus areas to help applicants plan their proposals. The technology deployments provide annual reports on meeting their expected outcomes that are used in shaping future program solicitations.

**FY 2019 Collaboration Partners (Internal USDOT)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (Internal USDOT)</b>
ATCMTD	None

**FY 2019 Collaboration Partners (External)**

<b>Program Name</b>	<b>Name of Collaboration Partner(s) (External)</b>
ATCMTD	None

## Small Business Innovation Research

### Program Description:

The SBIR program is a highly competitive, awards-based program that encourages domestic small businesses to engage in research and development addressing high priority research areas within USDOT. The SBIR program favors research that has the potential for commercialization through products and applications sold to the private sector transportation industry, State DOTs, USDOT, or other federal agencies.

The program is administered by the Volpe Transportation Center. The SBIR Program Office publishes two solicitations each fiscal year for proposals on specific research topics of interest to USDOT operating administrations, including the FHWA.

### Program Objectives:

To encourage small businesses to engage in research or research and development (R/R&D) that has the potential for commercialization and meets federal R/R&D objectives.

### Anticipated Program Activities:

In FY 2018, FHWA plans to continue participating in the USDOT SBIR program solicitation. It is expected that approximately two new topics will be solicited, with two contracts being awarded for feasibility studies (SBIR Phase I). In addition, it is expected that two or more SBIR Phase II contracts will be awarded to continue current Phase I work.

### Expected Program Outcomes:

- Increased participation in innovation and entrepreneurship by small businesses and socially and economically disadvantaged persons; and
- Increased private sector commercialization of innovations derived from federal R&D funding.

### FY 2019 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
SBIR	Office of the Secretary of Transportation, Federal Transit Administration, National Highway Traffic Safety Administration, and Federal Motor Carrier Safety Administration through Volpe National Transportation Systems Center, which manages the SBIR Program for USDOT.

### FY 2019 Collaboration Partners (External)

Program Name	Name of Collaboration Partner(s) (External)
SBIR	None

#### How does the Program meet statutory requirements?

This program is authorized in Public Law 112-81, the SBIR/STTR Reauthorization Act of 2011 (STTR stands for Small Business Technology Transfer.)

#### Describe how public and stakeholder input have been, or will be, utilized in the development of this research program:

The general public is able to suggest SBIR topics through the Volpe SBIR website:  
<https://hostedsites.volpe.dot.gov/SBIR/SuggestTopic.aspx>