

United States Department of Transportation

Annual Modal Research Plans Fiscal Year 2017

Federal Highway Administration (FHWA)

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Contents

Section 1: FY 2017 RD&T Program Funding Details	2
Section 2: FY 2017 RD&T Program Budget Request by USDOT Goal(s).....	3
Section 3: RD&T Program Details for FY 2017	4
Section 4: FY 2017 RD&T Projects	77
Section 5: FY 2018 Outlook.....	83

Section 1: FY 2017 RD&T Program Funding Details

RD&T Program Name	FY 2017 Pres. Budget (\$000)	FY 2017 Basic	FY 2017 Applied	FY 2017 Development	FY 2017 Technology
Highway Research and Development (HRD) & Tech. and Innov. Deployment (TIDP) ⁽¹⁾					
Bridges and Structures	6,000		3,000	2,300	700
Pavement and Materials	11,000		2,000	500	8,500
Construction and Program Administration	3,000		2,100	900	
Transp. Performance Management (TPM)	15,000		10,500	4,500	
Safety	13,500		8,000	4,000	1,500
Freight and Operations	14,000		9,100	2,800	2,100
Planning and Environment	12,500		7,000	2,500	3,000
Policy	8,000		5,600	1,600	800
Innovative Program Delivery	2,500		2,000	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		5,100		2,400
Every Day Counts	8,000				8,000
State Transp. Innov. Council (STIC) Incentives	6,000				6,000
Accelerated Innov. Deployment (AID) Demos	12,000				12,000
Accelerating Market Readiness	1,500				1,500
Accelerated Deployment of Pavement Technologies (ADPT) (non-add) ⁽²⁾	(12,000)				
Advanced Transp. and Congestion Management Program (ATCMTD) ⁽¹⁾	39,000				39,000
Small Business Innovation Research (SBIR) ⁽³⁾	2,000		1,850	150	
Intelligent Transportation Systems (ITS) ⁽¹⁾					
Connected Vehicles	30,275		30,275		
Automated Vehicles	3,950		3,950		
Emerging Technology	18,025		18,025		
Enterprise Data	3,400		3,400		
Interoperability	6,050		6,050		
Accelerating Deployment	15,300		14,300		1,000
ATCMTD ⁽²⁾	21,000				21,000
SBIR ⁽³⁾	2,000		2,000		
Administrative Costs	19,852		11,167	3,722	4,963
TOTAL	312,352		154,917	24,972	132,463

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

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

⁽²⁾ The ADPT designation is funded out of the Pavement and Materials program and the AID Demos program.

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

Section 2: FY 2017 RD&T Program Budget Request by USDOT Goal(s)

RD&T Program Name	FY 2017 Pres. Budget (\$000)	Safety	State of Good Repair	Economic Competitiveness	Quality of Life in Communities	Environmental Sustainability
HRD and TIDP ⁽¹⁾						
Bridges and Structures	6,000	1,200	2,400	1,200	600	600
Pavement and Materials	11,000	2,200	4,400	2,200	1,100	1,100
Construction & Program Admin.	3,000	600	1,200	600	300	300
TPM	15,000	3,000	6,000	3,000	1,500	1,500
Safety	13,500	11,475	675		1,350	
Freight and Operations	14,000	2,100		10,500	1,400	
Planning and Environment	12,500	625	625	1,250	5,000	5,000
Policy	8,000	1,200	1,840	3,520	560	880
Innovative Program Delivery	2,500		1,000	1,500		
Exploratory Advanced Research	6,000	1,800	1,800	1,200	600	600
Perf. Management Data Support	5,000		2,500	2,500		
STSFA	20,000			20,000		
Corporate and Communications	7,500	1,500	1,500	1,500	1,500	1,500
Every Day Counts	8,000	1,600	1,600	1,600	1,600	1,600
STIC Incentives	6,000	1,200	1,200	1,200	1,200	1,200
AID Demos	12,000	2,400	2,400	2,400	2,400	2,400
Accelerating Market Readiness	1,500	300	300	300	300	300
ADPT (non-add) ⁽²⁾	(12,000)					
ATCMTD ⁽¹⁾	39,000	6,700	9,900	6,800	7,800	7,800
SBIR ⁽³⁾	2,000	500		1,000		500
ITS ⁽¹⁾						
Connected Vehicles	30,275	18,165	3,028	4,541	3,025	1,516
Automated Vehicles	3,950	1,975	395	790	395	395
Emerging Technology	18,025	7,011	2,003	2,003	5,006	2,002
Enterprise Data	3,400	680	680	1,360	340	340
Interoperability	6,050	1,815	1,210	1,210	1,210	605
Accelerating Deployment	15,300	4,590	1,530	3,060	3,060	3,060
ATCMTD ⁽¹⁾	21,000	6,300	2,100	4,200	4,200	4,200
SBIR ⁽³⁾	2,000	1,000		1,000		
Administrative Costs	19,852	3,972	3,970	3,970	3,970	3,970
TOTAL	312,352	83,908	54,256	84,404	48,416	41,368

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

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

⁽²⁾ The ADPT designation is funded out of the Pavement and Materials program and the AID Demos program.

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

Section 3: RD&T Program Details for FY 2017

Bridges and Structures

(\$6,000)

(\$000)

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); aerodynamic and hydraulic engineering guidance; design and mitigation guidance for extreme events (e.g., seismic, blast, hurricanes, tsunamis, 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 seismic, blast, hurricanes, tsunamis, 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.

FY 2017 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Bridges and Structures	Federal Railroad Administration, National Highway Traffic Safety Administration, Maritime Administration, Federal Transit Administration on corrosion 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 decisionmaking, reducing congestion, and enhancing freight productivity, among others.

How does the Program incorporate public and stakeholder input?

FHWA regularly engages in both formal and informal interactions with a variety of stakeholder groups including the American Association of State Highway and Transportation Officials (AASHTO), State Departments of Transportation (DOTs) and various industry groups.

Pavements and Materials

(\$11,000)
(\$000)

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.

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.

FY 2017 Collaboration Partners (Internal USDOT)

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

	construction, and maintenance. Federal Motor Carrier Administration – Pavement and 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 decisionmaking, reducing congestion, and enhancing freight productivity, among others.

How does the Program incorporate public and stakeholder input?

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

(\$3,000)

(\$000)

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 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 2017 Collaboration Partners (Internal USDOT)

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

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 decisionmaking, reducing congestion, and enhancing freight productivity, among others.

How does the Program incorporate public and stakeholder input?

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

(\$15,000)

(\$000)

Program Description:

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 completion of the rulemaking process initiated under MAP-21; 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 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 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.

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 2017 Collaboration Partners (Internal USDOT)

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

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 decisionmaking, reducing congestion, and enhancing freight productivity, among others.

How does the Program incorporate public and stakeholder input?

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). Stakeholder groups providing input on the Long Term Pavement and Bridge Performance Programs (TRB LTPP and TRB LTBP Committees) meet twice per year.

Safety
(\$13,500)
(\$000)

Program Description:

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:

- Improve safety data and expand capabilities for analysis and evaluation.
- Enhance the stewardship and oversight of the highway safety improvement program.
- Develop and promote roadway safety improvements.
- Champion FHWA safety policies and programs to advance safety improvements.
- Promote a safety culture by emphasizing safety performance as a key factor in all transportation system decisions and investments.

Anticipated Program Activities:

1. Data and Analysis: Apply emerging big data analytics to support data driven safety countermeasure development. Expand the Roadway Safety and Analysis Toolbox to include new analytical capabilities prioritized by the community of practice. Explore the geographic information system data linkage opportunities to leverage the second Strategic Highway Research Program (SHRP2) Roadway Inventory Database. Conduct analyses through the Highway Safety Information System to determine safety deficiencies based on crash data that can be addressed through safety countermeasure development.
2. Intersections: Develop guidelines to aid practitioners in analyzing data and selecting the right combinations of different alternative intersection designs, in determining spacing that will accommodate turning movements and signal coordination, in deciding how to best handle access to adjacent parcels, and in including provisions for pedestrians and bicycles. Analyze crash data, identify opportunities to reduce motorcycle crashes at intersections, and develop intersection safety treatments and countermeasures to promote to address the problem.
3. Pedestrians/Bicyclists: Define methods for identifying/prioritizing high or frequent pedestrian and bicyclist crash zones; develop a recommended practices guide to assist state and local agencies in identifying high pedestrian and bicyclist crash locations, corridors, and zones (including considerations for Highway Safety Manual application.)
4. Roadway Departure (RwD): Determine effectiveness of strategies to address fixed object crashes (i.e. utility poles and trees) and develop crash modification factors to

provide designers and safety engineers a better understanding of the performance of countermeasures and to help agencies make informed tradeoff decisions. Develop and promote resources, such as guides and case studies, to address roadway departure crashes.

5. **Connected Vehicles:** Evaluate a method for identifying unequipped vehicles in the connected vehicle environment at critical locations. Connected vehicle roadway departure applications will be assessed in comparison with known safety countermeasures to examine the marginal value.
6. **Human Factors:** Using existing research tools in the Human Factors Laboratory and innovative methods such as virtual reality to conduct empirical and analytical human factors and behavioral research in one or more of the following areas: intersections, roadway departure, pedestrians/bicyclists, visibility, speed management, and ITS/connected vehicle safety.
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 2017 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Connected Vehicle	Office of the Secretary ITS Joint Program Office – Safety staff serve as project managers on the validation, testing, and evaluation of vehicle to vehicle safety applications.

	Federal Railroad Administration and Federal Motor Carrier Administration - collaborates on intelligent transportation systems R&D.
Human Factors	National Highway Traffic Safety Administration – Safety program staff evaluate Coordinated Automated Cruise Control applications. U.S. Department of Transportation’s Human Factors Coordinating Committee – representatives from various modal agencies of DOT meet on a monthly basis to coordinate activities and provide updates on human factors projects.
DOT Traffic Records Coordinating Committee (DOT TRCC)	Federal Motor Carrier Safety Administration, National Highway Traffic Safety Administration, Office of The Secretary - 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.
Pedestrian and Bicyclists	National Highway Traffic Safety Administration and Federal Motor Carrier Administration – Active participants in a working group focused on reducing pedestrian and bicyclist fatalities.
Crashworthiness	National Highway Traffic Safety Administration - Collaborates on developing and conducting crash simulation models.
Speeding	National Highway Traffic Safety Administration and Federal Motor Carrier Administration - The three agencies have an intermodal speed team that meets periodically to share project information and occasionally to more formally collaborate on joint projects.

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 decisionmaking, 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. 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 on applications and technologies for impacts on transportation and freight operations, and on 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.

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 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 2017 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Freight and Operations	<p>Federal Transit Administration on programs with multimodal implications, such as Active Transportation and Demand Management and Integrated Corridor Management.</p> <p>National Highway Traffic Safety Administration, Office of the Secretary of Transportation, Federal Motor Carrier Administration, and ITS JPO on Connected and Automated Vehicle research and ITS research.</p> <p>Federal Railroad Administration collaborates on intelligent transportation systems R&D.</p> <p>Federal Motor Carrier Safety Administration on work zone management issues.</p> <p>Maritime Administration and Federal Railroad Administration on improving the efficiency of intermodal freight connections.</p> <p>Maritime Administration and Federal Railroad Administration, Federal Aviation Administration and Bureau of Transportation Statistics – regular teleconferences on emerging freight issues, major projects and events, and OST initiatives, including FAST Act implementation.</p> <p>Federal Motor Carrier Administration - Work zones, road weather, and events management</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 decisionmaking, reducing congestion, and enhancing freight productivity, among others.

How does the Program incorporate public and stakeholder input?

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.

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 enrich human interaction with transportation systems. Research supports improving livability through funding activities that integrate community considerations to enhance where people live, work and recreate. Research is done to promote pedestrian and bicycle networks, environmental justice, context sensitive solutions, ladders of opportunities and place-based initiatives to support the integration of the human environment and community considerations.
5. **National Highway Systems** - Supports a National Highway System (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 (including traditionally underserved populations), 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 balance accelerated project delivery with environmental stewardship. FHWA works to improve the coordination and communication between federal and state agencies, as well as the general public, to ensure transparency and 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. **Environmental Impacts and Mitigation** - Focus is on accelerating project delivery while improving the environmental review processes and stewardship. This program supports work to improve ecological outcomes and coordinate with resource and regulatory agencies to develop tools to meet environmental laws and regulations in the Federal-aid highway program project delivery. 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. The Realty Office develops methodologies, technology, and systems to streamline right-of-way and outdoor advertising control activities. The research efforts focus on 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.
- Tools and resources to connect communities and retrofit transportation infrastructure.
- 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 2017 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Air Quality Models	Volpe National Transportation Systems Center on R&D on the applications of emissions and air quality models on transportation.
Congestion Mitigation and Air Quality Improvement (CMAQ) Program	Volpe National Transportation Systems Center, Federal Transit Administration 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 funds. 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	Federal Transit Administration and the ITS Joint Program Office 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)	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 on EJ Analysis in Transportation Planning and Programming State of the Practice with FTA review and input. Office of the Secretary of Transportation, Federal Railroad Administration, Federal Motor Carrier Safety Administration, Pipeline and Hazardous Materials Safety Administration, and Maritime Administration on Goods Movement Resource Compendium to be published in FY 2017.
Pedestrian and Bicycle Activities	Office of the Secretary of Transportation, Federal Transit Administration, Federal Railroad Administration, and National Highway Traffic Safety Administration on OST-led bicycle and pedestrian safety work group and to support pedestrian and bicycle safety and accommodation 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	Federal Transit Administration and Volpe National Transportation Systems Center 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	Federal Railroad Administration, Federal Transit Administration, and National Highway Traffic Safety Administration 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	Federal Transit Administration and Volpe National Transportation Systems Center 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	Federal Transit Administration, National Highway Traffic Safety Administration, Office of the Secretary of Transportation, and Volpe National Transportation Systems Center 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	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.

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 decisionmaking, 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. 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
(\$8,000)
(\$000)

Program Description:

Policy decisions made today will shape the highway transportation system of tomorrow. FHWA's policy research program focus on a) evaluating 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) collecting and disseminating national transportation data for the entire transportation community and c) developing new analytical tools and procedures for both scenario technical support analysis and data collection.

Forecasting the effects of proposed legislation and policy decisions requires quality transportation data. The FHWA policy research program devotes substantial amount of resources in developing guidance and tools, which standardize how transportation professionals collect data on highway system characteristics such as road types, funding methods, and travel patterns. These consistent national data provide a snapshot of today's transportation system that is essential for good policy and for projecting future requirements.

By keeping an eye on policy trends, FHWA helps its stakeholders and partners address current transportation challenges and anticipate future needs. FHWA's policy research program includes initiatives to refine current methods and procedures used to analyze the impacts, benefits, and costs of highway infrastructure 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:

- Evaluate impacts of a broad range of policy options, and analyze current and emerging issues that will affect surface transportation programs;
- Collect and process comprehensive national highway transportation data and promote efficient, systematic, and comprehensive data collection, 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

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.

Planned activities include:

- Global Benchmarking Program: Two new studies per year will be undertaken on priority topics that will be identified by FHWA's leadership.
- Sweden: Professional exchanges on livability issues, in cooperation with HEP and HSA.
- Netherlands: Selection and implementation of the next two topics, as mutually agreed to by both participants.
- Mexico: Training related to ITS in support of the U.S.-Mexico High Level Economic Dialogue.
- Brazil- Develop work plans based on the priorities identified in the 2015 bilateral consultations.
- Australia: Develop work plan based on recommendations of the synthesis report documenting the exchanges on freight-related and innovative finance topics between Australia and the U.S.
- South Africa: Develop work plan based on identified priority topic areas. Undertake first activity in support of work plan. This is dependent on progress at the OST level.
- Innovation: Based on the findings of a literature review and analysis of innovation cultures and successes, if appropriate, an international workshop/meeting on innovation will be coordinated and held.

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 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

The program has three focus areas: 1) ensuring methods and systems are in sync with each State DOT technology advancements and adoptions, 2) modifying procedures, methods, and practices and establishing new approaches 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 include 1) compiling data in an effective manner ensuring timeliness release, 2) developing value added data by using current available data through various data modeling techniques, 3) forecasting future trends and tendencies on several key parameters such as travel demand, greenhouse gas emission, fuel consumption and others, 4) integrating various data and provide 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. Key components of this research program include: 1) Developing engineering/economics analytical tools and related products to assess the current and future conditions and performance of the Nation's highways and bridges, in order to support decisions concerning current and future highway capital investments at all levels of government; 2) Utilizing advanced econometric methodologies to quantify linkages between transportation infrastructure investments and private sector economic performance, in order to provide insights to decision makers about the contributions of highway capital spending to the economy; 3) Communicating 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 area provides corporate strategic planning and research on current and emerging issues as they relate to transportation programs and policy. Research conducted includes quantitative analysis, case studies, policy evaluations, and the application of analytic models to assess the relationship between changes in social, demographic, economic, and technological trends on the distribution and level of travel demand. Key components of this policy research program include: 1) Strategic and performance-based planning and management practices (i.e., Stakeholder and SWOT analysis, strategic and business planning frameworks and schema, and strategy implementation); 2) Performance management (i.e., outcome measurement, management dashboards, and managerial accountability practices); 3) Utilizing qualitative and quantitative methods to assess current and emerging trends and their potential impact on short and long term travel demand, preferences, and needs; 4) Developing 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;
 5) Evaluating existing policy and programs for barriers and gaps in the context of future socio-demographic, economic, technological, geographic scenarios.

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 knowledge of U.S. technologies and products.
- Improved international collaboration.
- Improved decision-making tools for States and policymakers.
- Improved data and economic tools for decision making for States and policymakers.
- Improved understanding of travel trends, travel behavior, and travel demand - past, present, and future
- 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
- Improved integration of data for the department and the community ensuring accessibility and usability of all data
- Delivery of the 2016/2017 edition of the C&P report to the Congress.
- Delivery of the 2016/2017 national travel behavior data (why, how and when we travel)

FY 2017 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Impact of Investment on Transportation Performance & the Economy	Federal Transit Administration —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	Volpe National Transportation Systems Center —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).

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 decisionmaking, 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.

How does the Program incorporate public and stakeholder input?

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.

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.

FHWA's Office of Transportation Policy Studies sponsors workshops 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 (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. The IPD'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 program delivery.
- 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 program delivery 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. Developing a state-by-state inventory and review of P3 enabling legislation for transportation
3. 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
4. Providing ongoing capacity building opportunities to state and local project finance partners.

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

External partners have a substantial stake and interest in IPD's research. In previous years, IPD 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 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 legislation, 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 2017 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Innovative Program Delivery	Office of the Secretary of Transportation – 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.

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 decisionmaking, reducing congestion, and enhancing freight productivity, among others.

How does the Program incorporate public and stakeholder input?

Public and stakeholder input is central to the IPD research planning process. The IPD 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 IPD's 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 2017 Collaboration Partners (Internal USDOT)

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

How does the Program meet statutory requirements?

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

How does the Program incorporate public and stakeholder input?

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 publically 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) covers only commuting 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.

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 2017 Collaboration Partners (Internal USDOT)

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

How does the Program meet statutory requirements?

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

How does the Program incorporate public and stakeholder input?

Approaches to incorporate stakeholder input include:

- Regular and periodic stakeholder engagement via:
 - Webinars – FHWA will be conducting public engagement webinars in the FY 2017 to receive input on the design and functionality of the new Transportation Performance Management website. Quarterly webinars are held with users of the travel probe data set to increase proficiency levels through learning opportunities and to listen to feedback from users on the usability and applicability of the dataset
 - 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 will solicit 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. There will be only one solicitation in FY 2017 to select awardees and make funding decisions corresponding to FYs 2017-2020.

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 2017 Collaboration Partners (Internal USDOT)

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

How does the Program meet statutory requirements?

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

How does the Program incorporate public and stakeholder input?

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.

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.

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 2017 Collaboration Partners (Internal USDOT)

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

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 decisionmaking, reducing congestion, and enhancing freight productivity, among others.

How does the Program incorporate public and stakeholder input?

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 Initiative

(\$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 2017 Anticipated Activities:

- Conduct EDC-4 Regional Summits (October-December 2016)
- EDC-4 Innovation Deployment (FHWA technical assistance and support) (2017-2018)
- Publish EDC-3 Final Report (Spring 2017)

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 2017 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Every Day Counts	None

How does the Program meet statutory requirements?

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

How does the Program incorporate public and stakeholder input?

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 following transportation stakeholder associations regularly provide input and support the EDC initiative:

- AASHTO
- American Council of Engineering Companies (ACEC)
- American Road & Transportation Builders Association (ARTBA)
- American Society of Civil Engineers (ASCE)
- American Public Works Association (APWA)
- Associated General Contractors (AGC) of America
- Association of Metropolitan Planning Organizations (AMPO)
- National Association of County Engineers (NACE)
- American Traffic Safety Services Association (ATSSA)
- Institute of Transportation Engineers (ITE)
- National Association of Regional Councils (NARC)
- National Local Technical Assistance Program Association (NLTAPA)

State Transportation Innovation Council Incentive

(\$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 2017 Collaboration Partners (Internal USDOT)

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

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.

How does the Program incorporate public and stakeholder input?

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 Demonstrations

(\$12,000)
(\$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 2017 Collaboration Partners (Internal USDOT)

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

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.

How does the Program incorporate public and stakeholder input?

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 Availability which incorporated public comments.

Accelerating Market Readiness

(\$1,500)
(\$000)

Program Description:

The Accelerating Market Readiness program supports promising new or underutilized innovations that have the potential to be considered for accelerated deployment under the Every Day Counts (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. 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 2017 Collaboration Partners (Internal USDOT)

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

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.

How does the Program incorporate public and stakeholder input?

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 Non-Add)

(\$000)

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.

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 2017 Collaboration Partners (Internal USDOT)

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

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.

How does the Program incorporate public and stakeholder input?

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

(\$30,275)
(\$000)

Program Description:

The connected vehicle program, like all ITS research, benefits from a multimodal planning and coordination process utilized by the ITS Joint Program Office. All surface transportation modes participate in the modal Strategic Planning Group (modal associate administrators), with concurrence by the Management Council (comprised of all surface mode administrators, chaired by the Deputy Secretary) to coordinate ITS project funding. Examples of integrated ITS research include the FHWA/FTA joint effort “Accessible Transportation Technologies Research Initiative (ATTRI)”, FHWA’s “Integrated Corridor Management” and “Deployment Readiness” efforts, and MARAD’s “ITS Assessment.”

The CV program plans to advance the Department’s goal of transferring research results into real world application. Building on over a decade and nearly \$600 million in ITS investments, this program will continue to support: the issuance of the NHTSA Vehicle to Vehicle (V2V) rule; the FHWA Vehicle to Infrastructure (V2I) guidance; the development of a scalable operational Security Certification Management System (SCMS) to accommodate tens of millions of vehicles; and expand the deployment of both vehicles and infrastructure through the continued support of the connected vehicle pilots. The primary focus is to spur widespread adoption and deployment of the system nationwide reducing collisions, injuries, and fatalities.

The program will promote technology transfer of over 60 connected vehicle applications, that in addition to promoting safety, also enhance traveler and freight efficiency, address impacts of weather on road transportation, reduce fuel consumption and reduce greenhouse gas and other pollutants. Connected vehicle technology research and development is being leveraged in the USDOT CV pilots in New York City, Tampa, FL and Wyoming. This technology is also being leveraged in the agency’s Smart City Challenge efforts and FAST Act Advanced Transportation and Congestion Management Technologies Deployment Program grants.

In addition, this program will commit resources to conduct research to respond to congressional interest in the use of Wi-Fi and Dedicated Short Range Communications spectrum (DSRC) for this collision avoidance technology.

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. Design and test Connected Vehicle Pilot concepts in NYC, Tampa, FL and Wyoming.
2. Develop program plan and roadmap for Cyber Security.
3. Summarize findings and prepare project report for Southeast Michigan Advanced Data Capture Field Testing.
4. Deliver test results and documentation of the Systems Engineering Management Plan (SEMP) and testing plans for V2V systems engineering and vehicle integration research for deployment project.
5. Continue development of On-Board Equipment Minimum Performance Requirements and Test Procedures.
6. Conduct SCMS end-to-end testing for V2V system engineering and vehicle integration research for deployment project.
7. Conduct spectrum sharing testing with other modes and the Federal Communications Commission (FCC).
8. Evaluate improvements with ITS technology to reduce truck involved work zone crashes.
9. Develop and demonstrate a prototype system for Heavy Vehicles V2V basic safety message (BSM) and implementation issues for deployment.

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 negative environmental impacts such as vehicle emissions, the need for physical expansion and noise.
- Increased opportunities to partner with non-government groups, such as private industry and universities.
- Decreases in undesirable transportation impacts to the environment and society.
- Reduction of fatalities through weather-related safety, infrastructure-based, and other applications.

FY 2017 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
CV Pilots	FHWA, 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.
CV Pilots	FHWA, FTA, FMCSA, NHTSA and Volpe work with the JPO on the CV Pilots Phase 2 which is the Design/Build/Test Phase for CV technologies.
Connected Vehicle Policy	NHTSA, FHWA, FTA and OST-R work with the JPO to understand the impacts of spectrum use.
Connected Vehicle Policy	FHWA works with the JPO to foster a deployment community

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
	that moves forward in a consistent manner, which is a significant basis for interoperability.
Connected Vehicle Policy	FHWA, FTA and NHTSA work with the JPO to better understand the relationships between connected and automated vehicle systems.
Connected Vehicle Policy	FHWA, FTA and NHTSA work with the JPO to develop a connected vehicle certification governance structure.
Mobility on Demand (MOD)	FTA and FHWA will work with the JPO to evaluate and analyze Mobility on Demand (MOD) approaches and demonstrations.
Model Deployment Follow-up Ann Arbor	NHTSA works with the JPO to support continuing research and development of technologies and applications using Vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) technology.
Connected Vehicle	NHTSA, FHWA, 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.
Road Weather Management	FHWA works with the JPO to analyze the effects of weather and road conditions on connected and automated vehicles.
V2X	FTA and FHWA work with the JPO to test market ready Vehicle-to-Pedestrian (V2P) technologies.
Vehicle-to-Infrastructure	FHWA, 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.
Vehicle-to-Infrastructure	FHWA, FTA and FRA work with the JPO on the Multi-Modal Intelligent Traffic Signal System (MMITSS) which focuses on the interaction of traffic as it moves between arterials and freeways.
Vehicle-to-Infrastructure	FHWA, FTA and FRA work with the JPO on multimodal V2I safety applications including enhanced transit bus stop pedestrian warnings (TSPW) and at-grade rail crossing violation warnings (RCVW).
Connected Vehicles	FTA, NHTSA and FMCSA work with the JPO to integrate unequipped vehicles and vulnerable road users into the CV environment.
Vehicle-to-Infrastructure	FHWA works with the JPO to develop Connected Vehicle Road Side Unit Specification, RSU v4.1 and updated procure devices compliant with RSU v4.1 specification to update test beds used for USDOT research.
Vehicle-to-Infrastructure	FHWA works with the JPO to ensure the V2I infrastructure components are accurately addressed in the Connected Vehicle Reference Implementation Architecture (CVRIA).

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

(\$3,950)

(\$000)

Program Description:

The development of Automated Vehicles (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 already available in the market today and heavy vehicle automation technologies are approaching commercialization. The speeds of these developments are challenging our existing regulatory frameworks and significant Federal investment is required to ensure the safe development and deployment of this technology.

Recognizing the importance of these advancements, the USDOT is playing a significant role in addressing the key technological and institutional barriers that have emerged. In early 2016, the National Highway Traffic Safety Administration (NHTSA) announced its intention to develop operational guidance, model state policy, and identify potential new authorities needed for automation. In addition, the topic of urban automation was the highest of twelve priority areas for the 2016 Smart City Challenge. 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 would enable the USDOT to engage and catch up with other international activities. A key component of our Smart City Challenge includes investigating the impact of automated vehicle technology on mobility, safety and sustainability.

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 final report for Automated Speed Harmonization – Testing and Evaluation.
2. Develop White Paper: Standards Applicable to Automated Vehicles: Currently Existing and Those Being Developed.
3. Prepare roadmap for development of automated vehicle standards.
4. Prepare technical finding briefs and reports of simulator experiments of driver acceptance of level 1 automation.
5. Develop safety requirements for conventional braking and automated lane centering for functional safety of automated lane centering controls.
6. Prepare technical memorandum: Multimodal Shared-Use Operational Strategies for Universal Automated Community Transport.

7. Prepare final report and briefing: Operational Concept for Universal Automated Community Transport.
8. Develop and select algorithms for CACC vehicle control.
9. Develop specification for CACC implementation and perform hazard analysis
10. Report for extension of technical and operations cyber security requirements to automated vehicles.
11. Complete test track and over the road functional testing of varying levels of automated vehicles.
12. Conduct naturalistic study of L2 automated vehicle functions over-the-road and report results.
13. Develop and validate vehicle automation benefits model.

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.
- Increasing the efficiency and effectiveness of existing transportation systems.
- Reduce the number and severity of crashes caused by drivers or by other conditions (e.g. weather, pedestrians, and roadway conditions).
- Reduce incidence of aggressive driving.

FY 2017 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Automated Vehicles (AV)	NHTSA conducts research for JPO on AV human factors, functional safety, test procedures, and cybersecurity.
Automated Vehicles	FHWA conducts research for JPO on AV human factors, technology and applications for connected automation, weather impacts, and accessibility.
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 also provides program management and internal collaboration support.

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

(\$18,025)

(\$000)

Program Description:

The United States Department of Transportation (USDOT) emerging capabilities program focuses on cultivating the next generation of transportation systems. As the scale of intelligent transportation systems (ITS) increases, vehicle manufacturers, infrastructure providers, innovators, and entrepreneurs discover new opportunities to use technology and the data that will be generated. Technological advances, new functionality, new applications, new operational concepts, and disruptive innovations result. The USDOT needs to track 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 Emerging Capabilities is the USDOT's Beyond Traffic: Smart City Challenge. The Smart City Challenge was launched in December 2015 by USDOT Secretary Anthony Foxx 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 throughout cities. The Challenge called on cities to do more than merely introduce new technologies onto city streets, requiring them to boldly envision new solutions that would change the face of transportation in our cities 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 city residents.

The USDOT sought bold and innovative ideas for proposed demonstrations to effectively test, evaluate, and demonstrate the significant benefits of smart city concepts. Seventy-eight cities submitted entries to the competition, and in March 2016, seven finalists were selected. The finalists were Austin, Columbus, Denver, Kansas City, Pittsburgh, Portland, and San Francisco. In June 2016, Columbus was selected and the ITS JPO will work with the City of Columbus to implement its Smart Columbus program.

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. The Smart City Challenge will follow a systems engineering process for project development, then move to the build phase, followed by operations and evaluation.

FY2017 will include development of a concept of operations, system requirements and design for 12 vision elements focusing on connected vehicles, automated vehicles, mobility on demand, electrification, and infrastructure communications.

2. Deliver presentations for Accessible Transportation Technologies Research Initiative (ATTRI) Socio-Economic Impact.
3. Deliver final report, potential impacts of ATTRI Socio-Economic Impact.

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 2017 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Accessible Transportation Technologies Research Initiative (ATTRI)	Federal Transit Administration (FTA) and Federal Highway Administration (FHWA) work with the JPO on supporting the development of Concept of Operations document and Functional Requirements for two ATTRI applications.
Smart City Challenge	OST, FHWA, 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, FHWA 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.

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.

Enterprise Data

(\$3,400)

(\$000)

Program Description:

The ITS Joint Program Office (JPO)'s Enterprise Data 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 data system foundation for agility, data sharing, and privacy protection for future ITS, Internet of Things, and Smart City developments. This includes demonstrating how sharing streaming and archived data from connected and automated vehicles and combining it with other data sources can fuel innovative public and private transportation services, such as mobility on demand and urban freight and logistic services, and accelerate research and deployment.

The vision of the Enterprise Data Program is that State DOTs and Metropolitan Planning Organizations (MPOs) will have access to low cost, scalable, interoperable data management tools that can ingest new data sources and feed new applications in ways that protect the privacy of users while enabling on-demand data sharing at regional, state and national levels.

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. The result will be a national strategy for sharing and archiving these data which accounts for public, commercial, and academic sector needs.

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. Investigate innovative approaches to integrate CV data into transportation management systems for integrated big data in operational practice.
2. Identify opportunities to integrate CV data and enhanced data collection into transportation management systems for integrated big data in operational practice.
3. Report on analysis of data-related program needs for the Dynamic Interrogative Data Capture project.

4. Create gap analysis for roadside devices and transportation management systems to collect CV data for integrated big data in operational practice.
5. Recommend architecture enhancements to enable hosting large data sets on RDE for connected vehicle data privacy investigation.
6. Conduct privacy analysis of data sets and environments for connected vehicle data privacy investigation.
7. Enhance de-identification procedures for connected vehicle data privacy investigation.
8. Prepare mobile devices initiative FY 2017-2022 work plan report for crowdsourcing/social media/mobile devices.
9. Conduct webinar promoting innovative practices for data challenges.

Expected Program Outcomes:

- Improve quality (accuracy and timeliness) of data.
- Increase efficiency of information sharing. Assuring the public that the privacy of data will be protected.
- Efficiently manage large datasets.
- Stimulate innovation in new applications by enabling research.
- Monitor performance and enabling more efficient responses.

FY 2017 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Connected Data Systems (CDS)	FHWA and FTA work 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, FHWA 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)	NHTSA, FHWA and OST work with the JPO to create operational procedures and open source algorithms for real-time connected vehicle data de-identification.
Connected Data Systems (CDS)	FTA, FHWA and BTS work with the JPO to develop the Concept of Operations (ConOps) for the sharing (or federation) of data among multiple Operational Data Environments (ODEs), namely: ingesting data collected by local ODEs, coordination data feeds among local ODEs, and merging/sharing the data for use on a state-wide or multi-state corridor level.
Connected Data Systems (CDS)	FTA and FHWA will work with the JPO to investigate use of new approaches to provide secure, revocable access to large and sensitive data sets in a secure enclave along with algorithms and shared computing resources approaches within the transportation sector to accelerate research into the safety of autonomous vehicles and other emerging technologies using cutting edge, re-usable analysis tools.

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Connected Data Systems (CDS)	FTA, FHWA 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.
Connected Data Systems (CDS)	FTA, FHWA and BTS will work with the JPO to create a concise online collection of existing policies, principles and real-world examples of successful data management policies and practices.

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.

Interoperability

(\$6,050)

(\$000)

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 Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) – collectively Connected Vehicle (CV) - capabilities offers great promise to improve safety and mobility while reducing environmental impact. 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 with FHWA on V2I deployment, the National Highway Traffic Safety Administration (NHTSA) on V2V rulemaking, 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 and regulatory decision-making. 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. Evolution of the National ITS Architecture and software tools to be 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. Detailed IT and ITS standards specifications covering CV architecture developed in resource sharing collaboration with Australia and Europe.
3. Development and updates of key standards to support connected vehicle deployment, leveraging international cooperation when in the public interest.
4. 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.
5. Self-sustaining certification capability for key connected vehicle capabilities.

Expected Program Outcomes:

- Nationwide—especially North American—interoperability for all participants in the ITS system inclusive of vehicles, infrastructure, and mobile devices and applications.
- Architecture and standards tools and solutions that facilitate efficient, effective and secure interoperable ITS infrastructure, connected vehicle and connected automation operations.
- Efficient, standardized sharing of relevant information across transportation network operators, users and stakeholders.
- 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 of the forward and backward interoperability of ITS equipment and reduce need for re-investment over time.

FY 2017 Collaboration Partners (Internal USDOT)

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	FHWA and ITS JPO cooperate in identifying, prioritizing and executing Vehicle-to-Infrastructure standards development.
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.

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Interoperability	NHTSA and ITS JPO to cooperate in developing heavy-vehicle cybersecurity case studies and best practices.
Interoperability	FHWA and ITS JPO to cooperate on development of a Roadway Infrastructure Cybersecurity Partnership, Alert System, and capability maturity model for deployers and operators.
Interoperability	ITS JPO and the Volpe Center to collaborate on development of a cybersecurity five-year program plan and roadmap.
Interoperability	ITS JPO, FHWA, 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.

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.

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 Intelligent Transportation Systems (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. ITS JPO seeks to advance ITS work from research, to initial adoption, and subsequently on to wider scale deployment in coordination with other stakeholders at the federal, state, regional and local levels.

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. Publish final report for Rural Connected Vehicle GAP Analysis.
2. Prepare final report for ICM Independent Evaluation.
3. Prepare publications in Technical Journals for Connected Vehicle outreach support.
4. Prepare 2016 Benefit Cost Lessons Learned Update Report for Evaluation.
5. Research site recommendations for ITS transit technical support.
6. Prepare Presentations, articles, and fact sheets for Mobility Services for All Americans (MSAA) Implementation materials.
7. Conduct MSAA best practices workshops for MSAA Knowledge and Technology Transfer.
8. Conduct CV and AV workshops to increase technical knowledge of connected vehicle and automated vehicle deployers.
9. Create CV Emerging Technologies outreach and training activities.
10. Develop University ITS & Community College ITS Workshops to facilitate deployment of ITS-CV-AV teaching within higher education venues.
11. Conduct stakeholder outreach through workshops and webinars including peer-to-peer events.

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 2017 Collaboration Partners (Internal USDOT)

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	FHWA, FTA, 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 T3 webinar series, and also 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	FHWA, 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, FHWA 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.

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 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.

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)

**(\$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; Systemic Applied Pedestrian Crossing Technology; Multi-modal Integrated Corridor Management (ICM); Traffic Signal Data Acquisition, Analysis, and Management; Unified Fare Collection & Payment System across Transportation Modes and Jurisdictions; Incorporation of Connected Vehicle Technology in Public Sector and First Responder Fleets; Weigh-in-Motion (WIM) Facilities for Advanced Data Collection; and Dynamic Ridesharing.

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 2017 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
ATCMTD	Office of the Secretary of Transportation and Federal Transit Administration 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.

How does the Program incorporate public and stakeholder input?

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; funded from HRD (\$2,000) 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 2017, 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 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 2017 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.

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.)

How does the Program incorporate public and stakeholder input?

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

**Section 4: FY 2017 RD&T Projects
 (\$5.0M or greater)**

FY 2017 RD&T Project Funding Details

RD&T Project Name	FY 2017 Pres. Budget (\$000)	FY 2017 Basic	FY 2017 Applied	FY 2017 Development	FY 2017 Technology
ITS-Smart City Challenge	\$15,000		\$15,000		
ITS-Connected Vehicle Pilots	\$8,000		\$8,000		
ATCMTD	\$60,000				\$60,000
Totals	\$83,000		\$23,000		\$60,000

FY 2017 RD&T Project Budget Request by USDOT Goal

RD&T Project Name	FY 2017 Pres. Budget (\$000)	Safety	State of Good Repair	Economic Competitiveness	Quality of Life in Communities	Environmental Sustainability
ITS-Smart City Challenge	\$15,000	\$4,500		\$4,500	\$3,000	\$3,000
ITS-Connected Vehicle Pilots	\$8,000	\$4,000		\$4,000		
ATCMTD	\$60,000	\$12,000	\$12,000	\$12,000	\$12,000	\$12,000
Totals	\$83,000	\$20,500	\$12,000	\$20,500	\$15,000	\$15,000

ITS-Smart City Challenge

\$15,000

(\$000)

8/1/16 - 12/30/20

Project Description:

The USDOT is encouraging cities to put forward their best and most creative ideas for innovatively addressing the challenges they are facing. The vision of the Smart City Challenge is to demonstrate and evaluate a holistic, integrated approach to improving surface transportation performance within a city and integrating this approach with other smart city domains such as public safety, public services, and energy. The USDOT intends for this challenge to address how emerging transportation data, technologies, and applications can be integrated with existing systems in a city to address transportation challenges.

The USDOT will make an award of up to \$40 Million for one city that can demonstrate how advanced data and intelligent transportation systems (ITS) technologies and applications can be used to reduce congestion, keep travelers safe, use energy more efficiently, respond to climate change, connect underserved communities, and support economic vitality.

Project Objectives:

The USDOT seeks bold and innovative ideas for proposed demonstrations to effectively test, evaluate, and demonstrate the significant benefits of smart city concepts. The project will look at automated vehicles, connected vehicles, infrastructure communications, data analytics, mobility issues, freight movement, and electric vehicles. The project will leverage partnerships in the use of systems architecture and standards.

Anticipated Project Activities:

The project will follow a systems engineering process for project development, then will move to build phase, followed by operations and evaluation. FY 17 will include development of a concept of operations, system requirements and design for 12 vision elements focusing on connected vehicles, automated vehicles, mobility on demand, electrification, and infrastructure communications.

Expected Project Outcomes:

Improve Safety – By using advanced technologies, including connected vehicle technologies, to reduce the number of collisions, fatalities, and injuries for both vehicle occupants and non-vehicle occupants.

Enhance Mobility – By providing real-time traveler information and emerging mobility services to improve personal mobility for all citizens including those with disabilities.

Enhance Ladders of Opportunity – By increasing connectivity to employment, education, services and other opportunities, increase access to digital resources, support workforce

development , or contribute to community revitalization, particularly for disadvantaged groups.

Address Climate Change – By implementing advanced technologies and policies that support a more sustainable and cost-effective relationship between transportation and the environment through more efficient fuel use and emissions reductions.

FY 2017 Collaboration Partners (Internal USDOT)

Project Name	Name of Collaboration Partner(s) (Internal USDOT)
ITS - Smart city Challenge	FTA, NHTSA, FMCSA, MARAD

How will Project be evaluated?

Independent evaluation will be conducted. The evaluation will monitor the impact of the demonstration on mobility, safety, ladders of opportunity, efficiency, clean energy, sustainability, and climate change.

ITS- Connected Vehicle Pilots

\$8,000

(\$000)

9/30/15 – 9/30/18

Project Description:

CV Pilots Program seeks to spur innovation among early adopters of connected vehicle application concepts, using best available and emerging technologies. The pilot deployments are expected to integrate connected vehicle research concepts into practical and effective elements, enhancing existing operational capabilities.

Project Objectives:

The intent of these pilot deployments is to encourage partnerships of multiple stakeholders to deploy applications utilizing data captured from multiple sources across all elements of the surface transportation system to support improved system performance and enhanced performance-based management. The pilot deployments are also expected to support an impact assessment and evaluation effort that will inform a broader cost-benefit assessment of connected vehicle concepts and technologies.

Project Activities:

The USDOT has awarded up to \$42 million to New York City DOT, Tampa Hillsborough Expressway Authority, and ICF/Wyoming for the initial wave of pilots of next-generation connected vehicle technology. The locations were selected in a competitive process to go beyond traditional vehicle technologies to help drivers better use the roadways to get to work and appointments, relieve the stress caused by bottlenecks, and communicate with pedestrians on cell phones of approaching vehicles. These 3 sites will develop a Comprehensive Deployment Plan and then go through a Design/Test/Build phase before running an Operational Environment for up to 24 months.

Expected Project Outcomes:

With the Connected Vehicle Pilot Deployment Program, the USDOT is now focusing on accelerating the deployment of ITS technology in more regions throughout the nation. The USDOT's expected outcomes for the program are straightforward—advance deployment, measure impact, and uncover and address the technical and non-technical barriers to deployment in a hands-on way.

FY 2017 Collaboration Partners (Internal USDOT)

Project Name	Name of Collaboration Partner(s) - (Internal USDOT)
Connected Vehicle Pilots	NHTSA, FTA, FMCSA

How will Project be evaluated?

All three CV Pilot sites will be independently evaluated. This evaluation will include a comprehensive assessment of mobility, environmental, and public agency impacts of the individual sites as well as a national-level evaluation of the overall CV Pilots Deployments.

Advanced Transportation and Congestion Management Technologies Deployment

**\$6,000 to \$12,000 each project; 5 to 10 projects per year; up to \$60,000 per year
(\$000)**

12/4/2016-12/4/2017

Project Description:

As part of the ATCMTD program previously described, the FHWA will enter into agreements with eligible entities to establish model technology deployment sites for large-scale installation and operation of advanced transportation technologies to improve safety, efficiency, system performance, and infrastructure return on investment.

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).

Project 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 Project 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; systemic applied pedestrian crossing technology; incorporation of connected vehicle technology in public sector and first responder fleets; and dynamic ridesharing.

Expected Project 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 2017 Collaboration Partners (Internal USDOT)

Project Name	Name of Collaboration Partner(s) (Internal USDOT)
ATCMTD	Office of the Secretary of Transportation and Federal Transit Administration on identification of technology focus areas and on evaluation of proposals.

How will Project be evaluated?

The technology deployments provide annual reports on meeting their expected outcomes that are used in shaping future program solicitations.

Section 5: FY 2018 Outlook

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); aerodynamic and hydraulic engineering guidance; design and mitigation guidance for extreme events (e.g., seismic, blast, hurricanes, tsunamis, 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 seismic, blast, hurricanes, tsunamis, 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.

Work in FY 2018 is expected to continue and build upon the FY 2017 efforts.

In FY 2018, this program will release guidelines for tunnel inspection.

Per Sec. 1422 of the FAST Act, FHWA will work with the Transportation Research Board (TRB) to analyze the results of a Study on the performance of bridges that received funding under the Innovative Bridge Research and Construction program.

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 2018 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Bridges and Structures	Federal Railroad Administration, National Highway Traffic Safety Administration, Maritime Administration, Federal Transit Administration on corrosion 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 decisionmaking, reducing congestion, and enhancing freight productivity, among others.

How does the Program incorporate public and stakeholder input?

FHWA regularly engages in both formal and informal interactions with a variety of stakeholder groups including the American Association of State Highway and Transportation Officials (AASHTO), State Departments of Transportation (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.

Work in FY 2018 is expected to continue and build upon FY 2017 efforts.

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.

FY 2018 Collaboration Partners (Internal USDOT)

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

	and maintenance.
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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 decisionmaking, reducing congestion, and enhancing freight productivity, among others.

How does the Program incorporate public and stakeholder input?

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.

Work in FY 2018 is expected to continue and build upon the FY 2017 efforts.

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 Admin.	None

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 decisionmaking, reducing congestion, and enhancing freight productivity, among others.

How does the Program incorporate public and stakeholder input?

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:

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 completion of the rulemaking process initiated under MAP-21; 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 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 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. FY 2018 research efforts are expected to be a continuation of the work pursued in FY 2017.

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)

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

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 decisionmaking, reducing congestion, and enhancing freight productivity, among others.

How does the Program incorporate public and stakeholder input?

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). Stakeholder groups providing input on the Long Term Pavement and Bridge Performance Programs (TRB LTPP and TRB LTBP Committees) meet twice per year.

Safety

Program Description:

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:

- Improve safety data and expand capabilities for analysis and evaluation.
- Enhance the stewardship and oversight of the highway safety improvement program.
- Develop and promote roadway safety improvements.
- Champion FHWA safety policies and programs to advance safety improvements.
- Promote a safety culture by emphasizing safety performance as a key factor in all transportation system decisions and investments.

Anticipated Program Activities:

1. **Data and Analysis:** Apply emerging big data analytics to support data driven safety countermeasure development. Expand the Roadway Safety and Analysis Toolbox to include new analytical capabilities prioritized by the community of practice. Explore the geographic information system data linkage opportunities to leverage the second Strategic Highway Research Program (SHRP2) Roadway Inventory Database. Conduct analyses through the Highway Safety Information System to determine safety deficiencies based on crash data that can be addressed through safety countermeasure development.
2. **Intersections:** Develop guidelines to aid practitioners in analyzing data and selecting the right combinations of different alternative intersection designs, in determining spacing that will accommodate turning movements and signal coordination, in deciding how to best handle access to adjacent parcels, and in including provisions for pedestrians and bicycles. Analyze crash data, identify opportunities to reduce motorcycle crashes at intersections, and develop intersection safety treatments and countermeasures to promote to address the problem.
3. **Pedestrians/Bicyclists:** Define methods for identifying/prioritizing high or frequent pedestrian and bicyclist crash zones; develop a recommended practices guide to assist state and local agencies in identifying high pedestrian and bicyclist crash locations, corridors, and zones (including considerations for Highway Safety Manual application.)
4. **Roadway Departure (RwD):** Determine effectiveness of strategies to address fixed object crashes (i.e. utility poles and trees) and develop crash modification factors to provide designers and safety engineers a better understanding of the performance of

countermeasures and to help agencies make informed tradeoff decisions. Develop and promote resources, such as guides and case studies, to address roadway departure crashes.

5. **Connected Vehicles:** Evaluate a method for identifying unequipped vehicles in the connected vehicle environment at critical locations. Connected vehicle roadway departure applications will be assessed in comparison with known safety countermeasures to examine the marginal value.
6. **Human Factors:** Using existing research tools in the Human Factors Laboratory and innovative methods such as virtual reality to conduct empirical and analytical human factors and behavioral research in one or more of the following areas: intersections, roadway departure, pedestrians/bicyclists, visibility, speed management, and ITS/connected vehicle safety.
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.

In FY 2018, 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. Also, exploration into areas such as ITS/connected vehicles is anticipated.

- **Data and Analysis** – Conduct nationwide roadway safety data capabilities assessment in each state to gauge progress. Develop safety-engineering toolkit to compile knowledge on infrastructure-related safety countermeasures into a single database accessible to all transportation professionals via a web-based platform. The Safety Training and Analysis Center will provide remote access to SHRP2 Naturalistic Driving Study data that enables safety countermeasures to be developed that consider the human operator. Engage in cooperative research with the States to create a range of novel safety improvements. Expand the Crash Modification Factors Clearinghouse to include empirical evidence for Connected Vehicle based safety applications.
- **Intersections** – Visualize intersection/interchange design concepts generated during intersection technical support to state and local agencies. Synthesize the many reports and studies concerning various aspects of roundabouts and update current guidance to promote institutionalization of roundabouts in the United States.

- Human Factors – Develop guidance on the selection of treatments for pedestrian crossings and traffic control devices for older road users. Evaluate the human factors of innovative interchanges to help with design.
- Roadway departure – Provide technical information to implement pavement marking retroreflectivity standards. Evaluate different types of roadside vegetation to identify landscaping treatments that may present less risk over time.
- Pedestrians and bicyclists – Identify pedestrian and bicyclist volume patterns and extrapolation factors. Evaluate effectiveness of emerging lighting technologies on nighttime pedestrian crashes. Determine effects of various types of newly retrofitted pedestrian facilities on the number of increased pedestrian trips. Investigate effectiveness (safety, mobility and comfort) of visual, audible, and tactile signals or traffic signs and markings for special needs populations (older pedestrians and those with disabilities).
- HSIP-Evaluate the effectiveness of the HSIP and provide support for Strategic Highway Safety Plan (SHSP) evaluation. Provide guidance on crash costs that the states should use for HSIP purposes. Conduct a crash causation study and synthesis of SHSP strategies to provide direction to SHSP priorities, strategies and resulting highway safety improvement projects. Develop resources to support diagnosis of safety issues for potential highway safety improvement projects. Determine the role of HSIP and SHSP in connected vehicles.
- Local and Rural Roads – Synthesize best practices for developing databased local road safety plans. The local road safety plans will complement the State’s strategic highway safety plans, provide viable input of local road safety issues in the State’s strategic plans and promote the value of local roads safety investment.
- Connected Vehicles – Analyze applications concerning vehicle-to-infrastructure interactions at intersections and other high priority areas to determine viable crash modification factors. Conduct spectrum analysis to determine radio interference that may affect performance of vehicle-to-infrastructure safety applications.

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	Office of the Secretary ITS Joint Program Office – Safety staff serve as project managers on the validation, testing, and evaluation of vehicle to vehicle safety applications. Federal Railroad Administration and Federal Motor Carrier Administration - collaborates on intelligent transportation systems R&D.
Human Factors	National Traffic Highway Safety Administration – Safety program staff evaluate Coordinated Automated Cruise Control applications. U.S. Department of Transportation’s Human Factors Coordinating Committee – representatives from various modal agencies of DOT meet on a monthly basis to coordinate activities and provide updates on human factors projects.
DOT Traffic Records Coordinating Committee (DOT TRCC)	Federal Motor Carrier Safety Administration, National Highway Traffic Safety Administration, Office of The Secretary - 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.
Pedestrian and Bicyclists	National Highway Traffic Safety Administration and Federal Motor Carrier Administration – Active participants in a working group focused on reducing pedestrian and bicyclist fatalities.
Crashworthiness	National Highway Traffic Safety Administration - Collaborates on developing and conducting crash simulation models.
Speeding	National Highway Traffic Safety Administration and Federal Motor Carrier Administration - The three agencies have an intermodal speed team that meets periodically to share project information and occasionally to more formally collaborate on joint projects.

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 decisionmaking, 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

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 on applications and technologies for impacts on transportation and freight operations, and on 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 2018 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 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>Federal Transit Administration on programs with multimodal implications, such as Active Transportation and Demand Management and Integrated Corridor Management.</p> <p>National Highway Traffic Safety Administration, Office of the Secretary of Transportation, Federal Motor Carrier administration, and ITS JPO on Connected and Automated Vehicle research and ITS Research.</p> <p>Federal Railroad Administration collaborates on intelligent transportation systems R&D.</p> <p>Federal Motor Carrier Safety Administration on work zone management issues;</p> <p>Maritime Administration and Federal Railroad Administration on improving the efficiency of intermodal freight connections.</p> <p>Maritime Administration and Federal Railroad Administration, Federal Aviation Administration and Bureau of Transportation Statistics – regular teleconferences on emerging freight issues, major projects and events, and OST initiatives, including FAST Act implementation.</p> <p>Federal Motor Carrier Administration - Work zones, road weather, and events management</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 decisionmaking, reducing congestion, and enhancing freight productivity, among others.

How does the Program incorporate public and stakeholder input?

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.

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 enrich human interaction with transportation systems. Research supports improving livability through funding activities that integrate community considerations to enhance where people live, work and recreate. Research is done to promote pedestrian and bicycle networks, environmental justice, context sensitive solutions, ladders of opportunities and place-based initiatives to support the integration of the human environment and community considerations.
5. National Highway Systems - Supports a National Highway System (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 (including traditionally underserved populations), 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 balance accelerated project delivery with environmental stewardship. FHWA works to improve the coordination and communication between federal and state agencies, as well as the general public, to ensure transparency and 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. Environmental Impacts and Mitigation - Focus is on accelerating project delivery while improving the environmental review processes and stewardship. This program supports work to improve ecological outcomes and coordinate with resource and regulatory agencies to develop tools to meet environmental laws and regulations in the Federal-aid highway program project delivery. 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. The Realty Office develops methodologies, technology, and systems to streamline right-of-way and outdoor advertising control activities. The research efforts focus on 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.
- Tools and resources to connect communities and retrofit transportation infrastructure.
- 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 2018, 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 minimize the environmental impact of transportation
- Livability and sustainability initiatives that improve project delivery
- Advancing the state of the practice to adjust for climate change
- 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 2018 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Air Quality Models	Volpe National Transportation Systems Center on R&D on the applications of emissions and air quality models on transportation.
Congestion Mitigation and Air Quality Improvement (CMAQ) Program	Volpe National Transportation Systems Center, Federal Transit Administration 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 funds. 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	Federal Transit Administration and the ITS Joint Program Office 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)	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 on EJ Analysis in Transportation Planning and Programming State of the Practice with FTA review and input. Office of the Secretary of Transportation, Federal Railroad Administration, Federal Motor Carrier Safety Administration, Pipeline and Hazardous Materials Safety Administration, and Maritime Administration on Goods Movement Resource Compendium to be published in FY 2017.
Pedestrian and Bicycle Activities	Office of the Secretary of Transportation, Federal Transit Administration, Federal Railroad Administration, and National Highway Traffic Safety Administration on OST-led bicycle and pedestrian safety work group and to support pedestrian and bicycle safety and accommodation 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	Federal Transit Administration and Volpe National Transportation Systems Center 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	Federal Railroad Administration, Federal Transit Administration, and National Highway Traffic Safety Administration 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	Federal Transit Administration and Volpe National Transportation Systems Center 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	Federal Transit Administration, National Highway Traffic Safety Administration, Office of the Secretary of Transportation, and Volpe National Transportation Systems Center 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	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.

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 decisionmaking, 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. 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 focus on a) evaluating 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) collecting and disseminating national transportation data for the entire transportation community and c) developing new analytical tools and procedures for both scenario technical support analysis and data collection.

Forecasting the effects of proposed legislation and policy decisions requires quality transportation data. The FHWA policy research program devotes substantial amount of resources in developing guidance and tools, which standardize how transportation professionals collect data on highway system characteristics such as road types, funding methods, and travel patterns. These consistent national data provide a snapshot of today's transportation system that is essential for good policy and for projecting future requirements.

By keeping an eye on policy trends, FHWA helps its stakeholders and partners address current transportation challenges and anticipate future needs. FHWA's policy research program includes initiatives to refine current methods and procedures used to analyze the impacts, benefits, and costs of highway infrastructure 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:

- Evaluate impacts of a broad range of policy options, and analyze current and emerging issues that will affect surface transportation programs;
- Collect and process comprehensive national highway transportation data and promote efficient, systematic, and comprehensive data collection, 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

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.

Planned activities include:

- Global Benchmarking Program: Two new studies per year will be undertaken on priority topics that will be identified by FHWA's leadership.
- Sweden: Professional exchanges on livability issues, in cooperation with HEP and HSA.
- Netherlands: Selection and implementation of the next two topics, as mutually agreed to by both participants.
- Mexico: Training related to ITS in support of the U.S.-Mexico High Level Economic Dialogue.
- Brazil- Develop work plans based on the priorities identified in the 2015 bilateral consultations.
- Australia: Develop work plan based on recommendations of the synthesis report documenting the exchanges on freight-related and innovative finance topics between Australia and the U.S.
- South Africa: Develop work plan based on identified priority topic areas. Undertake first activity in support of work plan. This is dependent on progress at the OST level.
- Innovation: Based on the findings of a literature review and analysis of innovation cultures and successes, if appropriate, an international workshop/meeting on innovation will be coordinated and held.

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 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

The program has three focus areas: 1) ensuring methods and systems are in sync with each State DOT technology advancements and adoptions, 2) modifying procedures, methods, and practices and establishing new approaches 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 include 1) compiling data in an effective manner ensuring timeliness release, 2) developing value added data by using current available data through various data modeling techniques, 3) forecasting future trends and tendencies on several key parameters such as travel demand, greenhouse gas emission, fuel consumption and others, 4) integrating various data and provide 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. Key components of this research program include: 1) Developing engineering/economics analytical tools and related products to assess the current and future conditions and performance of the Nation's highways and bridges, in order to support decisions concerning current and future highway capital investments at all levels of government; 2) Utilizing advanced econometric methodologies to quantify linkages between transportation infrastructure investments and private sector economic performance, in order to provide insights to decision makers about the contributions of highway capital spending to the economy; 3) Communicating 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 area provides corporate strategic planning and research on current and emerging issues as they relate to transportation programs and policy. Research conducted includes quantitative analysis, case studies, policy evaluations, and the application of analytic models to assess the relationship between changes in social, demographic, economic, and technological trends on the distribution and level of travel demand. Key components of this policy research program include: 1) Strategic and performance-based planning and management practices (i.e., Stakeholder and SWOT analysis, strategic and business planning frameworks and schema, and strategy implementation); 2) Performance management (i.e., outcome measurement, management dashboards, and managerial accountability practices); 3) Utilizing qualitative and quantitative methods to assess current and emerging trends and their potential impact on short and long term travel demand, preferences, and needs; 4) Developing 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; 5) Evaluating existing policy and programs for barriers and gaps in the context of future socio-demographic, economic, technological, geographic scenarios.

No major changes in program direction are anticipated in FY 2018. Depending on available resources, several travel behavior data collection and analysis tasks may be initiated pertaining to long distance travel and multimodal travel for both long distance and local trips (bicycle, pedestrian, bus, and public transportation, air, rail, and POV).

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 knowledge of U.S. technologies and products.
- Improved international collaboration.
- Improved decision-making tools for States and policymakers.
- Improved data and economic tools for decision making for States and policymakers.
- Improved understanding of travel trends, travel behavior, and travel demand - past, present, and future
- 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
- Improved integration of data for the department and the community ensuring accessibility and usability of all data
- Delivery of the 2016/2017 edition of the C&P report to the Congress.
- Delivery of the 2016/2017 national travel behavior data (why, how and when we travel)

FY 2018 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Impact of Investment on Transportation Performance & the Economy	Federal Transit Administration –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	Volpe National Transportation Systems Center –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).

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 decisionmaking, 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.

How does the Program incorporate public and stakeholder input?

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.

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.

FHWA's Office of Transportation Policy Studies sponsors workshops 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. The IPD'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 program delivery.
- 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 program delivery 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. Developing a state-by-state inventory and review of P3 enabling legislation for transportation
3. 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
4. Providing ongoing capacity building opportunities to state and local project finance partners.

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

External partners have a substantial stake and interest in IPD's research. In previous years, IPD 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 IPD’s 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 IPD 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 IPD 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 legislation, 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 2018 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
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Innovative Program Delivery	Office of the Secretary of Transportation – 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.
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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 decisionmaking, reducing congestion, and enhancing freight productivity, among others.

How does the Program incorporate public and stakeholder input?

Public and stakeholder input is central to the IPD research planning process. The IPD 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 IPD’s 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 2018, FHWA will continue to work with partners in the research community to develop and modify focus areas for the EAR Program. With reduced funding, the EAR Program portfolio will decrease from over 30 projects in FY 2016 to around 20 by the end of FY 2017 then fewer than 20 in FY 2018. To lessen impact, the EAR Program will pursue more cross-cutting topics where there is potential for joint funding with other agencies and reduce funding of early stage research in traditional highway topics that would be more likely to transition into existing research road maps. The EAR Program anticipates crosscutting areas could include new data analytic and simulation methods and continued

investment in traditional topics could include new methods for material characterization, modeling, and design.

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>Federal Motor Carrier Safety Administration, Federal Transit Administration, and National Highway Traffic Safety Administration in the area of connected highway and vehicle systems concepts with.</p> <p>Bureau of Transportation Statistics, Federal Motor Carrier Safety Administration, Federal Railroad Administration, and Pipeline and Hazardous Materials Safety Administration for research in the area of Human Behavior and Travel Choices on long distance freight and passenger travel.</p>

How does the Program meet statutory requirements?

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

How does the Program incorporate public and stakeholder input?

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 publically 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) covers only commuting 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. 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 2018 Collaboration Partners (Internal USDOT)

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

How does the Program meet statutory requirements?

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

How does the Program incorporate public and stakeholder input?

Approaches to incorporate stakeholder input include:

- Regular and periodic stakeholder engagement via:
 - Webinars – FHWA will be conducting public engagement webinars in the FY 2017 to receive input on the design and functionality of the new Transportation Performance Management website. Quarterly webinars are held with users of the travel probe data set to increase proficiency levels through learning opportunities and to listen to feedback from users on the usability and applicability of the dataset
 - 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 will solicit 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. There will be only one solicitation in FY 2017 to select awardees and make funding decisions corresponding to FYs 2017-2020.

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.

Awardees selected during the FY 2017 solicitation process will continue activities throughout FY 2018 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 2018 Collaboration Partners (Internal USDOT)

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

How does the Program meet statutory requirements?

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

How does the Program incorporate public and stakeholder input?

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.

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 2018 research efforts are expected to be a continuation of the work pursued in FY 2017. No major changes in program direction are expected in FY 2018.

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)

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

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 decisionmaking, reducing congestion, and enhancing freight productivity, among others.

How does the Program incorporate public and stakeholder input?

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 Initiative

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) (2017-2018)
- Solicit suggestions and identify innovations for EDC-5 deployment in 2019-2020
- Prepare for EDC-5 Regional Summits

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)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Every Day Counts	None

How does the Program meet statutory requirements?

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

How does the Program incorporate public and stakeholder input?

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 following transportation stakeholder associations regularly provide input and support the EDC initiative:

- AASHTO
- American Council of Engineering Companies (ACEC)
- American Road & Transportation Builders Association (ARTBA)
- American Society of Civil Engineers (ASCE)
- American Public Works Association (APWA)
- Associated General Contractors (AGC) of America
- Association of Metropolitan Planning Organizations (AMPO)
- National Association of County Engineers (NACE)
- American Traffic Safety Services Association (ATSSA)
- Institute of Transportation Engineers (ITE)
- National Association of Regional Councils (NARC)
- National Local Technical Assistance Program Association (NLTAPA)

State Transportation Innovation Council Incentive

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 2018 Collaboration Partners (Internal USDOT)

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

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.

How does the Program incorporate public and stakeholder input?

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 Demonstrations

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 2018 Collaboration Partners (Internal USDOT)

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

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.

How does the Program incorporate public and stakeholder input?

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 Availability which incorporated public comments.

Accelerating Market Readiness

Program Description:

The Accelerating Market Readiness program supports promising new or underutilized innovations that have the potential to be considered for accelerated deployment under the Every Day Counts (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. 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 2018 Collaboration Partners (Internal USDOT)

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

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.

How does the Program incorporate public and stakeholder input?

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 2018 Collaboration Partners (Internal USDOT)

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

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.

How does the Program incorporate public and stakeholder input?

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:

The connected vehicle program, like all ITS research, benefits from the multimodal planning and coordination process utilized by the ITS Joint Program Office. All surface transportation modes participate in the modal Strategic Planning Group (modal associate administrators), with concurrence by the Management Council (comprised of all surface mode administrators, chaired by the Deputy Secretary) to coordinate ITS project funding. Examples of integrated ITS research include the FHWA/FTA joint effort “Accessible Transportation Technologies Research Initiative (ATTRI)”, FHWA’s “Integrated Corridor Management” and “Deployment Readiness” efforts, and MARAD’s “ITS Assessment” etc.

The CV program plans to advance the Department’s goal of transferring research results into real world application. Building on over a decade and nearly \$600 million in ITS investments, this program will continue to support: the issuance of the NHTSA Vehicle to Vehicle (V2V) rule; the FHWA Vehicle to Infrastructure (V2I) guidance; the development of a scalable operational Security Certification Management System (SCMS) to accommodate tens of millions of vehicles; and expand the deployment of both vehicles and infrastructure through the continued support of the connected vehicle pilots. The primary focus is to spur widespread adoption and deployment of the system nationwide reducing collisions, injuries, and fatalities.

The program will promote technology transfer of over 60 connected vehicle applications, that in addition to promoting safety, also enhance traveler and freight efficiency, address impacts of weather on road transportation, reduce fuel consumption and reduce greenhouse gas and other pollutants. Connected vehicle technology research and development is being leveraged in the USDOT CV pilots in New York City, Tampa, FL and Wyoming. This technology is also being leveraged in the agency’s Smart City Challenge efforts and FAST Act Advanced Transportation and Congestion Management Technologies Deployment Program grants.

In addition, this program will commit resources to conduct research to respond to congressional interest in the use of Wi-Fi and Dedicated Short Range Communications spectrum (DSRC) for this collision avoidance technology.

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 NYC, Tampa, FL and Wyoming.
2. Conduct evaluation to support Connected Vehicle Pilot deployment.
3. Operate SCMS for connected vehicle deployment sites.
4. Prepare Final Report for Heavy Vehicles BSM and implementation issues for deployment.
5. Publish on-board requirements and certification procedures for V2V systems (from NHTSA CAMP SE task).
6. Publish minimum performance requirements and characteristic effectiveness for haptic driver-vehicle interfaces for crash warning systems (from NHTSA Haptic Warning project).

No major changes in program direction are anticipated in FY 2018; 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 negative environmental impacts such as vehicle emissions, the need for physical expansion and noise.
- Increased opportunities to partner with non-government groups, such as private industry and universities.
- Decreases in undesirable transportation impacts to the environment and society.
- Reduction of fatalities through weather-related safety, infrastructure-based, and other applications.

FY 2018 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
CV Pilots	FHWA, 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.
CV Pilots	FHWA, FTA, FMCSA, NHTSA and Volpe work with the JPO on the CV Pilots operations phase.
Connected Vehicle Policy	FTA and FHWA work with the JPO to assist state and local

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
	transportation agencies with decision-making and prioritization of implementing connected vehicle technologies and systems.
Connected Vehicle Policy	FHWA, FTA and NHTSA work with the JPO to better understand the relationships between connected and automated vehicle systems.
Mobility on Demand (MOD)	FTA and FHWA will work with the JPO to evaluate and analyze Mobility on Demand (MOD) approaches and demonstrations.
Connected Vehicle	NHTSA, FHWA, 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.
Road Weather Management	FHWA works with the JPO to analyze the effects of weather and road conditions on connected and automated vehicles.
V2X	FTA and FHWA work with the JPO to test market ready Vehicle-to-Pedestrian (V2P) technologies.
Vehicle-to-Infrastructure	FHWA, 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.
Vehicle-to-Infrastructure	FHWA, FTA and FRA work with the JPO on the Multi-Modal Intelligent Traffic Signal System (MMITSS) which focuses on the interaction of traffic as it moves between arterials and freeway.
Connected Vehicle	FTA, NHTSA and FMCSA work with the JPO to integrate unequipped vehicles and vulnerable road users into the CV environment.
Vehicle-to-Infrastructure	FHWA works with the JPO to ensure the V2I infrastructure components are accurately addressed in the Connected Vehicle Reference Implementation Architecture (CVRIA).

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 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 Vehicles (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 already available in the market today and heavy vehicle automation technologies are approaching commercialization. The speeds of these developments are challenging our existing regulatory frameworks and significant Federal investment is required to ensure the safe development and deployment of this technology.

Recognizing the importance of these advancements, the USDOT is playing a significant role in addressing the key technological and institutional barriers that have emerged. In early 2016, National Highway Traffic Safety Administration (NHTSA) announced its intention to develop operational guidance, model state policy, and identify potential new authorities needed for automation. In addition, the topic of urban automation was the highest of twelve priority areas for the 2016 Smart City Challenge. 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 would enable the USDOT to engage and catch up with other international activities. A key component of our Smart City Challenge includes investigating the impact of automated vehicle technology on mobility, safety and sustainability.

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. Advance the state-of-the-practice for understanding the impacts of AVs on congestion, personal mobility, and travel behavior.
2. Analyze the effects of weather and road conditions on automated vehicles and provide a document to support USDOT (JPO, FHWA, NHTSA), transportation agencies, and OEM decision-making and policy making.
3. 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.
4. Improve the safety of automated mixed function vehicles by ensuring that automated vehicle intent and status indications facilitate the decision processes of other road users including nearby drivers, vehicles, pedestrians, and automated vehicle operators.

5. Increase understanding of human factors related issues for vehicle automation, data and results to support Office of Operations' vehicle automation application research activities, information for standards development (e.g., SAE) and potential NHTSA performance requirements activities.
6. Begin testing and safety review of first mile/last mile driverless shuttle vehicles
7. Begin on-road demonstration of arterial truck platooning.

No major changes in program direction are anticipated in FY 2018; 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.
- Increase the efficiency and effectiveness of existing transportation systems.
- Reduce the number and severity of crashes caused by drivers or by other conditions (e.g. weather, pedestrians, and roadway conditions).
- Reduce incidence of aggressive driving.

FY 2018 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Automated Vehicles (AV)	NHTSA conducts research for JPO on AV human factors, functional safety, test procedures, and cybersecurity.
Automated Vehicles	FHWA conducts research for JPO on AV human factors, technology and applications for connected automation, weather impacts, and accessibility.
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 also provides program management and internal collaboration support.

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

Program Description:

The United States Department of Transportation (USDOT) emerging capabilities program focuses on cultivating the next generation of transportation systems. As the scale of intelligent transportation systems (ITS) increases, vehicle manufacturers, infrastructure providers, innovators, and entrepreneurs discover new opportunities to use technology and the data that will be generated. Technological advances, new functionality, new applications, new operational concepts, and disruptive innovations result. The USDOT needs to track 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 Emerging Capabilities is the USDOT's Beyond Traffic: Smart City Challenge. The Smart City Challenge was launched in December 2015 by USDOT Secretary Anthony Foxx 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 throughout cities. The Challenge called on cities to do more than merely introduce new technologies onto city streets, requiring them to boldly envision new solutions that would change the face of transportation in our cities 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 city residents.

The USDOT sought bold and innovative ideas for proposed demonstrations to effectively test, evaluate, and demonstrate the significant benefits of smart city concepts. 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. In June 2016, Columbus was selected and the ITS JPO will work with the City of Columbus to implement its Smart Columbus program.

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. Develop, test and deliver three prototype applications for the Accessible Transportation Technologies Research Initiative (ATTRI).

3. 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 (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Accessible Transportation Technologies Research Initiative (ATTRI)	Federal Transit Administration (FTA) and Federal Highway Administration (FHWA) will work with the JPO on developing three prototype applications for ATTRI.
Smart City Challenge	OST, FHWA, 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, FHWA 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.

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 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:

The ITS Joint Program Office (JPO)'s Enterprise Data 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 data system foundation for agility, data sharing, and privacy protection for future ITS, Internet of Things, and Smart City developments. This includes demonstrating how sharing streaming and archived data from connected and automated vehicles and combining it with other data sources can fuel innovative public and private transportation services, such as mobility on demand and urban freight and logistic services, and accelerate research and deployment.

The vision of the Enterprise Data Program is that State DOTs and Metropolitan Planning Organizations (MPOs) will have access to low cost, scalable, interoperable data management tools that can ingest new data sources and feed new applications in ways that protect the privacy of users while enabling on-demand data sharing at regional and national levels.

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. The result will be a national strategy for sharing and archiving these data which accounts for public, commercial, and academic sector needs.

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 section to ensure privacy protection

Anticipated Program Activities:

1. Identify opportunities to integrate CV data and enhanced data collection into transportation management systems for integrated big data in operational practice.
2. Conduct privacy analysis of data sets and environments for connected vehicle data privacy investigation.
3. Enhance de-identification procedures for connected vehicle data privacy investigation.
4. Prepare final report for data challenges.

5. 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.
6. Engage state and local agencies regarding the value of sharing data among multiple Operational Data Environments (ODEs), develop use cases for sharing real-time data among ODEs as well as finding regional/national uses of the data, development of institutional, financial, and technical products useful to encouraging efficient data sharing across jurisdictions and functional boundaries in the surface transportation system.

No major changes in program direction are anticipated in FY 2018; program objectives and activities will continue advancing.

Expected Program Outcomes:

- Improve quality (accuracy and timeliness) of data.
- Increase efficiency of information sharing. Assuring the public that the privacy of data will be protected.
- Efficiently manage large datasets.
- Stimulate innovation in new applications by enabling research.
- Monitor performance and enabling more efficient responses.

FY 2018 Collaboration Partners (Internal USDOT)

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Connected Data Systems (CDS)	FHWA and FTA work 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, FHWA 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)	NHTSA, FHWA and OST work with the JPO to create operational procedures and open source algorithms for real-time connected vehicle data de-identification.
Connected Data Systems (CDS)	FTA, FHWA and BTS work with the JPO to develop the Concept of Operations (ConOps) for the sharing (or federation) of data among multiple ODEs, namely: ingesting data collected by local ODEs, coordination data feeds among local ODEs, and merging/sharing the data for use on a state-wide or multi-state corridor level.
Connected Data Systems (CDS)	FTA and FHWA will work with the JPO to investigate use of new approaches to provide secure, revocable access to large and sensitive data sets in a secure enclave along with algorithms and shared computing resources approaches within the transportation sector to accelerate research into the safety of autonomous vehicles and other emerging technologies using cutting edge, re-usable analysis tools.

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
Connected Data Systems (CDS)	FTA, FHWA 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.
Connected Data Systems (CDS)	FTA, FHWA and BTS will work with the JPO to create a concise online collection of existing policies, principles and real-world examples of successful data management policies and practices.

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.

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 Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) – collectively Connected Vehicle (CV) - capabilities offers great promise to improve safety and mobility while reducing environmental impact. 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 with FHWA on V2I deployment, the National Highway Traffic Safety Administration (NHTSA) on V2V rulemaking, 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 and regulatory decision-making. 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. Evolution of the National ITS Architecture and software tools to be 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. Development and updates of key standards to support connected vehicle deployment, leveraging international cooperation when in the public interest.
3. Resource sharing, internationally cooperative efforts to evolve CV certification and testing capabilities and security policies.
4. 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.
5. Self-sustaining certification capability for key connected vehicle capabilities.

No major changes in program direction are anticipated in FY 2018; program objectives and activities will continue advancing.

Expected Program Outcomes:

- Nationwide—especially North American—interoperability for all participants in the ITS system inclusive of vehicles, infrastructure, and mobile devices and applications.
- Architecture and standards tools and solutions that facilitate efficient, effective and secure interoperable ITS infrastructure, connected vehicle and connected automation operations.
- Efficient, standardized sharing of relevant information across transportation network operators, users and stakeholders.
- 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 of the forward and backward interoperability of ITS equipment and reduce need for re-investment over time.

FY 2018 Collaboration Partners (Internal USDOT)

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	FHWA and ITS-JPO cooperate in identifying, prioritizing and executing Vehicle-to-Infrastructure standards development.
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

Program Name	Name of Collaboration Partner(s) (Internal USDOT)
	cybersecurity case studies and best practices.
Interoperability	FHWA and ITS JPO to cooperate on development of a Roadway Infrastructure Cybersecurity Partnership, Alert System, and capability maturity model for deployers and operators.
Interoperability	ITS JPO and the Volpe Center to collaborate on development of a cybersecurity five-year program plan and roadmap.
Interoperability	ITS JPO, FHWA, 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.

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.

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 Intelligent Transportation Systems (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. We seek to spur adoption of technology, and help stakeholders and localities deploy maturing ITS systems. ITS JPO provides knowledge transfer, and supports technical assistance, training, outreach, program evaluation, and other stakeholder engagement. ITS JPO seeks to advance ITS work from research, to initial adoption, and subsequently on to wider scale deployment in coordination with other stakeholders at the federal, state, regional and local levels.

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

No major changes in program direction are anticipated in FY 2018; program objectives and activities will continue advancing.

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 (Internal USDOT)

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	FHWA, 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 also provides program management and internal collaboration support.
Evaluation Program	Volpe Center conducts evaluation research for JPO.
Communications	FHWA, 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, FHWA 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.

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 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.

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; Systemic Applied Pedestrian Crossing Technology; Multi-modal Integrated Corridor Management (ICM); Traffic Signal Data Acquisition, Analysis, and Management; Unified Fare Collection & Payment System across Transportation Modes and Jurisdictions; Incorporation of Connected Vehicle Technology in Public Sector and First Responder Fleets; Weigh-in-Motion (WIM) Facilities for Advanced Data Collection; and Dynamic Ridesharing.

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.

How does the Program incorporate public and stakeholder input?

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

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 2017, 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 three or more SBIR Phase II contracts will be awarded to continue current Phase I work.

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 2018 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.

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.)

How does the Program incorporate public and stakeholder input?

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