

United States Department of Transportation Annual Modal Research Plans FY 2024 Program Outlook FY 2025

Cover Page

FEDERAL TRANSIT ADMINISTRATION

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Executive Summary

The Federal Transit Administration's (FTA) mission is to improve America's communities through public transportation. Public transportation takes people to jobs, school, leisure activities, and community services. Access to public transportation reduces congestion, improves community health, and lowers carbon emissions. Though transit is one of the safest modes of travel, FTA is dedicated to enhancing the safety of riders, workers, and all who are within or near transit systems. FTA's Public Transportation Innovation Research Program (49 U.S.C. § 5312) accelerates innovation to improve America's communities through public transportation that enhances everyone's safety, improves equitable mobility, refines transit operations, and fosters clean energy.

FTA's research investments support the U.S. Department of Transportation's (DOT) strategic goals of:

- **Safety:** to make our transportation system safer for all people. Advance a future without transportation-related serious injuries and fatalities.
- **Economic Strength and Global Competitiveness:** grow an inclusive and sustainable economy. Invest in our transportation system to provide American workers and businesses with reliable and efficient access to resources, markets, and good-paying jobs.
- **Equity:** reduce inequities across our transportation systems and the communities they affect. Support and engage people and communities to promote safe, affordable, accessible, and multimodal access to opportunities and services while reducing transportation-related disparities, adverse community impacts, and health effects.
- **Climate and Sustainability:** tackle the climate crisis by ensuring that transportation is central to the solution. Substantially reduce greenhouse gas emissions and transportation-related pollution and build more resilient and sustainable transportation systems to benefit and protect communities.

- **Transformation:** design for the future. Invest in purpose-driven research and innovation to meet the challenges of the present and modernize a transportation system of the future that serves everyone today and in the decades to come.
- **Organizational Excellence:** strengthen our world-class organization. Advance the Department’s mission by establishing policies, processes, and an inclusive and innovative culture to effectively serve communities and responsibly steward the public's resources.

Over the years, FTA’s research investments have led innovation in mobility across the country, helped to launch low or no emissions buses, improved safety for transit workers and riders, and enhanced equitable, accessible transit services for all. For Fiscal Year (FY) 2024 and FY 2025, FTA’s research activities will build on these accomplishments as transit systems transition to a post-COVID pandemic world during a time of transformative technologies and societal change.

Over the past year, under the Bipartisan Infrastructure Law (BIL), the FTA supported transit agencies and communities as they modernize and seek to attract new riders. BIL provides unprecedented Federal investment in public transportation. FTA completed a new strategic plan to develop tools, technologies, systems, and service models that improve safety, build resiliency, increase sustainability, improve equity, and connect communities. BIL also launched several new research initiatives. One major change in BIL is a new Accelerating Advanced Digital Construction Management Program. It is designed to help transit agencies improve efficiency and reduce delays in large transit construction programs by utilizing new digital infrastructure solutions. Additionally, BIL expanded the capabilities of the low or no emissions component testing program by allowing funds to be used for directed technology research related to new and emerging technology components, intended for use in low or no emission vehicles. BIL also increased funding for FTA’s research programs, including the Transit Cooperative Research Program (TCRP) managed by the Transportation Research Board.

This FTA Annual Modal Research Plan (AMRP) outlines major areas planned for research and levels of finding for FY 2024 and the outlook for FY 2025.

DOT RD&T Strategic Plan

FTA’s FY 2024 and FY 2025 plan has eight specific research programs. Each program addresses one or more DOT strategic goals with specific activities and objectives.

Safety

FTA is seeking ways to improve safety for transit workers, transit riders and all who are in or near transit systems. Safety research also leverages innovative technologies, processes, and applications to monitor, predict and plan operations and maintenance using unmanned aircraft systems (UAS), artificial intelligence and robotics; and explore the use of other advanced technologies that increase worker, rider, pedestrian, and bicyclist safety.

Equity

FTA embarked on a new equity initiative in FY 2023 to understand the impact and experiment with payment models that ensure historically disadvantaged riders have access to the services they need for their lives. Additionally, FTA continues to advance mobility through *Mobility NeXt*. This program builds upon the successes of past Mobility on Demand (MOD) projects to advance new mobility concepts, technologies, and solutions (such as personalized traveler information enabled by artificial intelligence) and support public transportation to improve mobility and accessibility in America's communities.

Climate and Sustainability

FTA is investing over a billion dollars a year to help transit agencies transition to lower emission fleets. These transitions are complex and require significant changes in operations, data analytics, and worker training. FTA's *Environmental Sustainability and Resiliency* projects such as the Transit Advanced Vehicle Innovative Development programs support research to help agencies use novel renewable energy methods to reduce carbon emissions.

Economic Strength and Global Competitiveness

The new BIL program, *Advanced Digital Construction Management Systems (ADCMS)*, will accelerate the adoption of advanced digital systems from project planning, design, engineering, construction, operations, and maintenance. Integrated enterprise technology solutions that link all process and functions across major transit infrastructure programs can reduce construction cost overruns, improve lifecycle management of the program, help keep the program on schedule, enhance sharing of information across all contractors, and improve program management. FTA's ADCMS program will research the most effective practices in deploying these complex technologies solutions and develop resources to help agencies implement them. Additionally, FTA's *Small Business Innovative Research (SBIR) Program* continues to invest in small businesses to help them grow and thrive.

Transformation

Many research initiatives are transformative. One excellent example is FTA's *Strategic Transit Automation Research Program*. Moving now into the second phase of research, this initiative is exploring the development and deployment of transit bus automation especially advanced driver assistance systems and maintenance yard automation. These automation technologies can vastly improve safety.

Organizational Excellence

FTA continues to explore better ways to share research results. The *Research to Practice and Dissemination program* is part of this deployment outreach activity. This program's key

goal is to enhance transit agencies' ability to learn about and utilize promising practices resulting from research and technology investments.

Critical RD&T Programs and Anticipated Outcomes

FTA has two new critical research programs: Technology Enhanced Living (TEL) and Transit Defined Systems. TEL is the continuation of FTA's Mobility, Access, and Transportation Insecurity program. This program explores impact of transit access on people's lives, especially those who depend upon public transportation to get to their jobs, school, community and health services, leisure activities, and visiting friends/family. Once initial results are obtained from this program, FTA will broaden the focus to address the areas where equity issues were predominant TEL. Additionally, vehicle design is moving quickly with change and innovation. FTA must invest to understand the utility of advanced vehicle designs, develop new technologies to improve state of good repair, and begin to utilize artificial intelligence and modeling/simulation to assess the effects of emerging technologies.

FTA continues the critical Safety program to reduce assaults on bus operators, not only protect them more effectively, but also improve their ability to keep passengers safe and have greater visibility outside the bus. The Safety program continues to address ways to improve traveler safety by improving rail crossing safety, mitigating suicides, mitigating cybersecurity risks, and implementing the DOT Safe Systems Approach. Expected outcomes are fewer transit worker assaults and greater public confidence in transit.

Another program that continues to be one of FTA's flagship and critical areas of research is the Mobility NeXt initiative. This supports transit operational efficiency, and smarter, climate friendly mobility choices for travelers with projects that address mobility payment, curated traveler information, accessible transportation research, and data standards/governance. In FY 2024, the program will develop a strategic program plan, and conduct exploratory research on data analytics, technological solutions, and ways to improve transit operations. Expected outcomes are greater transportation resiliency, interoperability within the mobility ecosystem, and human-centered universal design of transit systems and services.

Collaboration Efforts

Partnerships are a core strategy for FTA's research activities, and FTA broadly collaborates with many organizations. Each year, FTA also adds additional recipients which continues to improve and extend partnership activities. An example of a new recipient from the last year includes the University of Minnesota as the lead for the Mobility, Access, and Transportation Insecurity program. This university will bring a new level of scientific integrity and validity to FTA's research.

FTA's collaboration is broad and includes internal and external partners. Internal partners are other DOT modal administrations, the Intelligent Transportation Systems (ITS) Joint Program Office (JPO), Office of the Assistant Secretary for Research and Technology (OST-R), the VOLPE Center, and the Bureau of Transportation Statistics. Many benefits accrue when leveraging research across similar subject matter areas. Key modal partners for FTA's research are the Federal Railroad Administration (FRA), the Federal Highway Administration (FHWA), the National Highway Traffic Safety Administration (NHTSA), and the Pipelines, Hazardous Materials and Safety Administration (PHMSA). FTA is leveraging previous research in unmanned aerial systems from the Federal Aviation Administration (FAA) and FRA to inform its work in this relatively new area for public transit agencies.

External partnerships include nonprofit organizations, academic institutions, transportation industry associations, and private sector consulting organizations; as well as local/state/Federal governmental entities.

FTA has long established collaborations with academic institutions, industry-leading nonprofits, and diverse Federal partners. Auburn University, The Ohio State University, and the Altoona Bus Testing Center at Penn State University lead LoNo emission component testing and bus testing. The Center for Urban Transportation Research (CUTR) at the University of South Florida, the Virginia Tech Transportation Institute, and the Texas A&M Transportation Institute provide vital expertise in safety and project evaluation.

Consulting partners like the Center for Transportation and the Environment (CTE), and CALSTART provide critical research in electrification, alternative fuel buses, and carbon emission research. FTA also routinely collaborates with the U.S. Department of Energy's National Renewable Energy Laboratory (NREL) and Vehicle Technology Office.

Collaboration is a core element of FTA's mobility research. National associations like the American Public Transportation Association (APTA) and the Community Transportation Association of America (CTAA) and nonprofit partners like the Shared Use Mobility Center and Intelligent Transportation Systems (ITS) America, as well as evaluation partners such as ICF International have helped FTA research, demonstrate, and feature mobility innovations spanning new mobility as service models, smart phone apps, transit automation, and cashless integrated payment systems. FTA also benefits from interagency partnerships that further accessibility. The Accessible Transportation Technology Research Initiative (ATTRI) partners closely with the National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR).

One of FTA's statutory partners is the Transportation Research Board (TRB) of the National Academy of Sciences, Engineering, and Medicine (NASEM), which manages TCRP. This program is a grassroots research program driven by research needs noted and chosen by the transit industry. FTA also works closely with TRB on many other important activities. Yearly, FTA participates in the TRB Annual Meeting, and sometimes funds special projects with TRB. TRB hosts the Transport Research International Documentation (TRID), which

contains over 1.3 million records of transportation research worldwide, combined from TRB's Transportation Research Information Services (TRIS) and OECD's Joint Transport Research Centre's International Transport Research Documentation (ITRD) Database. FTA research reports, in addition to being hosted on DOT's research hub and the Repository & Open Science Access Portal (ROSA P), are also included in TRID.

Broad stakeholder partnerships enhance and deepen research projects. FTA's also benefits from close involvement of transit agencies across the United States who often bid and win research projects. Being able to assess the viability and validity of technologies and processes within transit agencies is a core element of FTA's research strategy.

Technology Transfer/Deployment Activities

FTA refers to Technology Transfer as Research to Practice, which is sharing research information and results. The primary method for sharing research information is through our website and reports. Surveys to FTA's recipients show that the web is their preferred method to receive FTA information. In addition, FTA's is also assessing other research to practice methodologies.

FTA continues to improve its communications, outreach, and dissemination efforts, including a new quarterly FTA research newsletter to inform transit industry stakeholders about FTA-sponsored transit research and innovation activities. The newsletter highlights the latest FTA research news, TCRP recently released documents, and recent FTA publications.

FTA tracks and assesses the impact of outreach is through monitoring technology adoption in two ways. First, FTA tracks technology research projects along the lifecycle of the projects and notes whether the recipient chooses to adopt the new technology or process. Secondly, FTA analyzes data from the internal database of all FTA funded programs using natural language search techniques. FTA sees where FTA recipients choose to invest non-research funding in areas where FTA invested in past research activities. This has led to an increase in the understanding of the return on investment of research funding in key areas such as mobility, and low or no emissions systems.

Evaluation and Performance Measurement Efforts

FTA recently completed a three-year effort assessing the best ways to measure success at multiple levels of research activities. It included project level evaluation, program evaluation, research goal measurements, and public transportation innovation impacts. All FTA research demonstration programs are independently evaluated and the evaluation reports are posted on the FTA research site (<https://www.transit.USDOT.gov/research-innovation/fta-reports-and-publications>). FTA identified and is tracking some overarching measures that help assess success. These are high-level measures based upon data that serves as a proxy for indicators of correlation to industry use of FTA's past research investments results.

- **Public Transportation Innovation performance** is technology innovation adoption. This measure is compiled by totaling the funding invested and number of transit agencies adopting previous research technology solutions through the analysis of narrative text in grant applications.
- **Climate and Sustainability Trends in Public Transportation** success is the speed of transition of transit agencies to low and no emissions buses. It is measured utilizing the NTD and greenhouse gas (GHG) emissions calculator (<https://www.transit.USDOT.gov/regulations-and-guidance/environmental-programs/ftas-transit-greenhouse-gas-emissions-estimator>).
- **Level of Equity Focus/poverty related research** tracks how FTA’s research recipients have expanded their focus on communities of color and historically disadvantaged communities. The analysis extracts place of performance location and census demographics.
- **Increasing Safety in Transit Systems** results look toward achieving a reduction in incidents including those at rail crossings, suicides, worker safety incidents, and bus collisions.

FTA monitored and updated an inventory of 155 technologies that FTA’s research has funded since 2018. FTA tracks the implementation status of technologies on a quarterly basis and determines whether the technology is being adopted by the project sponsors. In FY 2022, FTA continued its work on natural language processing and text mining, including deploying a keyword search engine that is updated nightly with narratives from FTA’s grants system and is used to better understand how transit agencies have adopted innovative technology.

FTA is developing a five-year strategic research plan that will include logic models for each strategic goal to link specific activities to outputs, outcomes, and impacts. The FTA research strategic plan aligns with FTA’s, OST-R’s, and DOT strategic goals. The information in the logic models will be aligned with FTA’s Nested Research Evaluation Framework, which analyzes the efficiency, effectiveness, and quality of FTA’s research portfolio. The strategic plan will also contain performance measures for each goal and a process for developing quarterly updates on progress towards these measures. FTA’s research data scientist provides technical support and assistance to research recipients in the development of public data access plans; and research program managers work with each cooperative agreement partner at the statement of work stage to ensure performance measures are SMART – specific, measurable, achievable, relevant, and timely.

Table 1 - FY 2024 RD&T Program Funding Details

RD&T Program Name	FY 2024 President's Budget Request (\$000)	Applied (\$000)	Technology Transfer (\$000)	Facilities (\$000)	Experimental Development (\$000)	Major Equipment, R&D Equipment (\$000)
Public Transportation Innovation Fund						
Mobility Innovation	\$7,116	\$7,116				
Strategic Transit Automation Program	\$5,000				\$5,000	
Advanced Digital Construction Management	\$1,500	\$1,500				
Low or No Emission Component Testing	\$5,238				\$5,238	
Small Business Innovation Research (SBIR)	\$847				\$847	
Transit Cooperative Research Program (TCRP)	\$6,891	\$6,891				
Safety	\$10,000	\$10,000				
Research to Practice and Dissemination Program	\$2,000		\$2,000			
Sub-total	\$38,592	\$25,507	\$2,000	\$-	\$11,085	\$-
Transit Research						
Mobility NeXt	\$7,924	\$7,924				0
Environmental Sustainability and Resiliency	\$5,000	\$5,000				
Transit Defined Systems	\$9,116	\$9,116				
Transit Enhanced Living	\$7,000	\$7,000				
SBIR	\$960				\$960	
Sub-total	\$30,000	\$29,040	\$-	\$-	\$960	\$-
Totals	\$68,592	\$54,547	\$2,000	\$-	\$12,045	\$-

The AMRP reflects funding as found in the annual President's budget request per 49 U.S.C. Chapter 65 Sec. 6501 Research Planning. The enacted numbers will be posted as part of the President's budget request for the ensuing fiscal year.

Table 2 - FY 2024 RD&T Program Budget Request by DOT Strategic Goal

RD&T Program Name	FY 2024 President's Budget Request* (\$000)	Safety (\$000)	Economic Strength and Global Competitiveness (\$000)	Equity (\$000)	Climate and Sustainability (\$000)	Transformation (\$000)	Organizational Excellence (\$000)
Public Transportation Innovation Fund							
Mobility Innovation	\$7,116					\$7,116	
Strategic Transit Automation Program	\$5,000					\$5,000	
Advanced Digital Construction Management	\$1,500			\$1,500			
Low No Component Testing	\$5,238				\$5,238		
Small Business Innovation Research (SBIR)	\$847		\$847				
Transit Cooperative Research Program (TCRP)	\$6,891	\$1,379	\$1,378	\$1,378	\$1,378	\$1,378	
Safety	\$10,000	\$10,000					
Research to Practice and	\$2,000						\$2,000
Sub-total	\$38,592	\$11,379	\$2,225	\$2,878	\$6,616	\$13,494	\$2,000
Transit							
Mobility NeXt	\$7,924					\$7,924	
Environmental	\$5,000				\$5,000		
Transit Defined Systems	\$9,116				\$9,116		
Transit Enhanced Living	\$7,000			\$7,000			
SBIR	\$960		\$960				
Sub-total	\$30,000						
Totals	\$68,592	\$11,378	\$3,185	\$9,878	\$20,732	\$21,418	\$2,000

The AMRP reflects funding as found in the annual President's budget request per 49 U.S.C. Chapter 65 Sec. 6501 Research Planning. The enacted numbers will be posted as part of the President's budget request for the ensuing fiscal year.

Chapter 1 – FY 2024 RD&T Programs

Mobility Innovation

(\$7,116)

(000)

Program Description:

FTA’s Mobility Innovation program will support the next generation of technologies, practices, and strategies, such as artificial intelligence, to advance carefree mobility for all. The program will mobilize Federal and private sector investments to advance new models of how transportation is delivered and consumed to achieve equitable and climate smart mobility outcomes.

This program will build upon prior FTA and private sector investments in mobility innovation such as the Mobility on Demand (MOD) Sandbox, the Enhancing Mobility Innovation (EMI), the Accelerating Innovative Mobility (AIM) Challenge Grant Initiatives, the Integrated Mobility Innovation (IMI) Demonstration as well as others.

FTA will also work to deliver new tools, solutions, and analytical techniques to help agencies transform their systems.

Major Program Objectives:

1. Manage Traveler Expectations – Travelers expect more control, flexibility, and choice in how to plan, use and pay for their travel. FTA’s research will examine to understand and model changing expectations and how to use data and decision tools to curate transportation options for travelers.
2. Advance Equity and Accessibility – Ensure new mobility approaches are available to everyone regardless of who they are, where they live, or how much they earn. New mobility approaches can provide more equitable, accessible transportation.
3. Address Climate Change – Identify how people’s transportation choices can impact greenhouse gas emissions and promote supply-side and demand-side strategies for reducing carbon emissions. Apply human-centric consideration of how mobility is used in communities can impact overall carbon outcomes. This requires holistic exploration of integrated mobility strategies and solutions, from both demand and supply perspectives.

Anticipated Program Activities:

- Conduct a study and develop a roadmap for transit data interoperability that includes capturing, curating, cataloging, managing, and exchanging data.
- Develop tools (to include modeling) to support industry decision-making, expand trip personalization, optimize travel choices, and leverage dynamic supply and demand.

- Research the safety and equity implications of shared mobility for transportation disadvantaged populations.

Potential Program Outputs, Outcomes, and Impacts on Technologies and Practices:

FTA will conduct research on emerging technologies, and innovative mobility strategies and practices to improve public transportation operations and traveler experience, while enabling equitable and climate smart mobility choices. To achieve these impacts, FTA will fund demonstrations of mobility innovation with public transportation as the backbone.

Outputs: Research reports, independent evaluation findings and technical assistance materials and tools to promote widespread adoption of results.

Outcomes: Each selected project recipient will develop specific SMART goals for at least one of the three impact areas: Improve public transit operations, enhance the traveler experience, and enable climate friendly decision-making for riders.

Impacts: Improve public transit operations, enhance the traveler experience, and enable climate friendly decision-making for riders

Potential Economic or Societal Impacts:

The Mobility Innovation program and the resulting tools and findings improve travelers' experiences, reduce barriers to transportation and improve quality of life. The program will also accelerate learning and facilitate informed decision making. The transit data interoperability and framework effort can further advance equity and strengthen service integration. The program also contributes to cleaner air and reduced environmental impact of transportation through data standardization, analytical tools, and transit industry capacity building.

Potential Progress Made Toward Achieving Modal Strategic Goals:

For the primary strategic goal of Equity, Mobility Innovation supports the concept of carefree mobility for all through equitable mobility innovations that expand access to and enhance convenience of high-quality public transportation. The program also ensures that future mobility systems will be equitable by researching and demonstrating technological solutions and policy interventions with close partnerships with the transportation disadvantaged communities and populations.

Collaboration Partners:

- *Internal partners:* OST offices, FHWA, the Volpe Center, and the JPO.
- *Other Federal partners:* DOE's Vehicle Technology Office.
- *External partners:* Private sector mobility providers and technology developers, Shared Use Mobility Center, TRB, APTA, CTAA, Mobility on Demand (MOD) Standing Committee by

Intelligent Transportation Society of America (ITSA), CUTR, Texas Transportation Institute (TTI), Other Academic and Research Institutions, and private sector consulting firms.

Strategic Transit Automation Research (STAR) Program

\$5,000
(\$000)

Program Description:

Automation capabilities have advanced rapidly in recent years. Transit bus automation could deliver many potential benefits, including improved safety, enhanced mobility, and a better quality of life for those with little or no other transportation options. To make informed automated transit deployment decisions, agencies need additional research and policy guidance to fully understand the benefits, use cases and implications of transit automation. FTA's Strategic Transit Automation Research (STAR) Program aims to address these issues.

The STAR Program will continue to advance the research, development, and deployment of transit bus automation and share lessons learned. The STAR program will provide examples on how to safely design and integrate automated transit buses into revenue service and will engage with stakeholders to conduct a market analysis and analyze of transit bus automation technologies.

The STAR Program supports the Department's strategic goals of Transformation and Safety.

Major Program Objectives:

1. To improve transit safety for operators, riders, and the traveling public, including vulnerable road users.
2. To increase efficiency and productivity of transit operations.
3. To improve traveler satisfaction, particularly for essential transit users including people with disabilities, women, older adults, and underserved communities.
4. To advance deployment of automated buses and integration of automated technologies and grow American industry.
5. To spur economic development by introducing automation for transit-focused applications, such as bus rapid transit in transit dense corridors and within transit right-of-ways.

Anticipated Program Activities:

STAR Demonstrations and Evaluations: FTA has demonstrated selected advanced driver assistance systems (ADAS) (SAE L1-2) and Automated Driving Systems (ADS) (SAE L3-5) technologies for transit specific use cases to achieve greater safety and mobility performance, including demonstrations to support ADAS for transit safety and automated transit bus maintenance and yard operations. In FY 2024, these demonstrations will be underway, and FTA will evaluate the results and promote any promising findings. In addition, FTA will explore the potential to transfer, and scale automated on-demand micro

transit to small urban, exurban, and rural areas. FTA will also test and demonstrate technologies that enable people with disabilities interact with and use automated vehicles without assistance from onboard staff. These activities include automating mobility device securement and interacting with the vehicle through human-machine interfaces, as a potential path towards automated paratransit service and greater mobility and independence for people with disabilities.

STAR Enabling Research: Continue to conduct research to share information on commercially available automation technologies. Also, continue to analyze established laws, regulations, and policies that impact the deployment of automated transit buses and recommend potential changes to them for FTA and DOT consideration. New enabling research will lead to guidance outlining best practices for ADAS human-machine interface (HMI) design, ADAS training for bus operators and maintenance staff, and other areas with potential human factors considerations based on experience gained through the ADAS demonstrations. New research will also explore safety and security considerations related to transit bus automation, such as first responder interactions with automated transit buses.

Potential Program Outputs, Outcomes, and Impacts:

ADAS and automated transit bus maintenance and yard operations demonstrations will be underway, advancing the state of the technology and producing lessons learned. An independent evaluation will identify and measure the Impact of these demonstrations. FTA will begin automated on-demand microtransit demonstrations in small urban and difficult-to-serve low density transit environments. FTA will conduct research and publish information to highlight the availability, capabilities, and limitations of transit bus automation and analyze the accessibility implications of automated transit buses in a variety of use cases. FTA will also provide technical assistance and share information with stakeholders on the state and capabilities of transit bus automation.

Outputs: Update to FTA Report 116 – Strategic Transit Automation Research Plan, accessible at <https://rosap.ntl.bts.gov/view/USDOT/35646>; several other research reports, webinars, and presentations related to STAR projects.

Outcomes:

By 2026, support 10 percent increase from 2023 level in automated transit bus revenue miles.

By 2026, support 10 percent increase from 2023 level in number of bus procurements with automation capabilities, both for ADAS and ADS.

Impacts: Broader support and adoption of transit bus automation; fewer and less severe of bus crashes; greater service coverage and more efficient operations.

Potential Economic or Societal Impacts:

Bus automation, if applied appropriately, has the potential to expand service coverage and hours of operation to underserved communities and persons, such as, underserved rural areas and low-income areas and persons with disabilities. Improved service will also increase provide new opportunities for employment. In addition, improved service will provide underserved populations access to education, employment, and other needed societal activities and services. Bus service automation also has the potential to enhance safety by reducing the severity and frequency of collisions.

Potential Progress Made Toward Achieving Strategic Goals:

The STAR Program continues to fund exploratory research, demonstrations, and experimentation, uncover opportunities and challenges, and bring new voices into public transportation. Research completed or underway to-date includes a preliminary Federal policy analysis and frequently asked questions, market assessment, business case analysis, evaluation guidance, and practical demonstrations in revenue service for several use cases. These activities provide a foundation for better understanding the benefits, costs, and other impacts of transit bus automation, including, safety, service delivery, and user acceptance. The current and planned STAR Program activities will continue to look at automation technology performance to improve safety and accelerate transformation of the public transportation industry.

Collaboration Partners:

- *Internal partners:* NHTSA, FHWA, FMCSA, OST, Volpe Center and the ITS JPO. Additional modes are commencing research programs or are in the process of increasing their research efforts, such as FRA and the U.S. Maritime Administration (MARAD).
- *Other Federal partners:* DOL, DOE, National Park Service (NPS), United States Access Board.
- *External partners:* Research universities, bus manufacturers, technology providers, and trade associations (e.g., APTA), and local USDOTs, public transit agencies, and MPOs implementing their own automation projects.

Advanced Digital Construction Management Systems

\$1,500

(\$000)

Program Description:

The construction phase of any transit project is the most expensive and potentially the most disruptive, making construction management the key to completing projects on time and on budget. Construction project managers should have a clear understanding of the purpose and significance of specific alterations or enhancements, and should be informed of changes in construction methods, delays, and stakeholder feedback. Transit projects that lack effective construction management strategies are likely to experience delays, exceed the budget, require additional work, result in injuries, and produce poor outcomes.

FTA will establish and implement a new statutory program as authorized under 49 U.S.C. § 5312(b)(4), to promote, implement, deploy, and demonstrate Advanced Digital Construction Management Systems (ADCMS).

The ADCMS program will enable innovative technologies to perform digital project management from procurement to construction, while boosting productivity, interoperability, integration, security, transparency, and a single source of real-time information that can be accessed by all stakeholders in a project.

This program will support DOT's strategic goals of transformation, economic strength, and global competitiveness.

Major Program Objectives:

1. To establish, implement, deploy, and evaluate advanced digital construction management systems throughout the construction lifecycle.
2. To maximize capital project interoperability, boost productivity, reduce capital project delays, and cost overruns, and enhance safety and quality.
3. To facilitate advanced digital transformation, technology adoption and implementation success by fostering partnerships with internal and external partners.

Anticipated Program Activities:

Release a notice of funding opportunity (NOFO): To select a contractor that will work with at least two different transit agencies implementing at least two different ADCMS solutions.

Strategic Partnerships: Explore and build partnerships within DOT and with other federal agencies to leverage current research projects and investments. Form strategic partnerships to accelerate the goals of the program.

Potential Program Outputs, Outcomes, and Impacts:

FTA will establish advanced digital construction management systems program, conduct research, and select deployment and demonstrations to maximize interoperability, boost productivity, and enhance safety and quality by working with States, local governmental authorities, and public transportation agencies.

Outputs: A lessons-learned guidance document will help transit stakeholders adopt advanced digital construction systems, and a pilot plan for broad development and deployment. The document will provide guidance for updating regulations where needed.

Outcomes: After the NOFO is awarded, within 2 years of award, the contractor will provide an overview of the cost/benefit for a transit agency to plan and implement an ADCMS solution.

Impacts: By accelerating the use of ADCMS systems in transit construction programs, transit agencies will have less cost overruns and greater probability of meeting construction schedules.

Potential Economic or Societal Impacts:

This program will grow the economy by making transit project delivery more efficient, improve the flow of information across a construction project's lifecycle, and expand economic development for the ADCMS software solutions sector.

Potential Progress Made Toward Achieving Strategic Goals:

The program supports DOT's strategic goals of transformation, economic strength, and global competitiveness with emerging technology solutions, environmental footprint reduction of construction projects, and technology training and workforce development.

Collaboration Partners:

- *Federal partners:* Federal Highway Administration
- *Other potential Federal partners:* General Services Administration (GSA), the National Aeronautics and Space Administration (NASA).
- *External partners:* Construction Management Association of America (CMAA), American Association of State Highway and Transportation Officials (AASHTO), Building Information Management (BIM) Council.
- *Private Sector and Consultant:* software solutions manufactures and consultants who help agencies plan and implement ADCMS systems.

Low or No Emission (LoNo) Component Testing (LoNo-CAP)

\$5,238
(\$000)

Program Description:

FTA was instrumental developing and deploying of zero emission transit vehicles. FTA continues this innovation tradition with the Low No emission (LoNo) Emission Vehicle Component Assessment Program (LoNo-CAP), funded through the Bipartisan Infrastructure Law (LoNo-CAP, 49 U.S.C. § 5312(h)). Examples of key components that require research are batteries in battery electric buses. FTA is assessing fire hazards and potential mitigations to reduce thermal incidents through this program and new authorization for directed research. This directed research provision allows the LoNo-CAP Centers to do directed research on new and emerging technology components, intended for use in low or no emission vehicles.

LoNo-CAP conducts testing, evaluation, and analysis of LoNo vehicle components intended for use in LoNo vehicles. In 2017, FTA competitively selected two institutions – The Ohio State University (Ohio State) and Auburn University (Auburn) – to implement and manage LoNo-CAP Testing Centers. Since that time, manufacturers of LoNo components for transit buses can voluntarily submit components for testing to one of the Testing Centers.

This program will use the LoNo-CAP centers to develop and adopt LoNo vehicle components and stimulate economic growth and transformation in LoNo components.

The program supports DOT's strategic goals of climate sustainability as well as economic competitiveness and transformation.

Major Program Objectives:

1. To operate and maintain LoNo-CAP testing centers to conduct testing, evaluation, and analysis of LoNo emission vehicle components.
2. To conduct directed technology research innovating new low no emission components and strengthening domestic supply chain.
3. To support the transition of the nation's transit industry toward zero carbon emissions.

Anticipated Program Activities:

LoNo-CAP Testing Centers: Continue to conduct testing, evaluation, and analysis of LoNo emission vehicle components. Test sponsors will include transit vehicle manufacturers (TVMs), component suppliers, industry organizations, and transit agencies.

Directed and Advanced Vehicle Research: The centers will provide FTA with directed research topic proposals for review. Potential directed research topics may originate directly from the Centers, the FTA, or as a request from industry groups, manufacturers, or transit agencies based on the requirements of the industry.

Capital Equipment and Facility: The centers' planned capital equipment and facility upgrades will complement and expand the existing test and directed research capabilities, and support anticipated industry technology development needs. The capital equipment and facility modifications and additions will directly support the FTA component assessment program and directed technology research.

Potential Program Outputs, Outcomes, and Impacts:

FTA will maintain the LoNo-CAP centers to conduct testing, evaluation, and analysis of LoNo vehicle components. The program will conduct state of the art research and select various demonstrations to spur innovation, design, and development. The program will encourage bus manufacturers, transit agencies, States, and local governmental authorities to adopt and deploy LoNo emission vehicle components.

Outputs: Increase in number of LoNo vehicle components, technologies and solutions developed, tested, identified, and adopted.

Outcomes: Reduced carbon emissions in the transit sector; more competitive American transit manufacturing market; expanded and more stable domestic supply for LoNo components; increased transit use resulting from cleaner, quieter, and more efficient and attractive transit services.

Impacts: Spur innovation in and deployment of LoNo emission vehicle components with directed technology research and demonstrations that create more timely products and low emission solutions, which, in turn, positively impact the climate by reducing greenhouse gas emissions and reliance on fossil fuels.

Potential Economic or Societal Impacts:

Innovation in LoNo emission vehicle components with directed technology research and demonstrations will enable wider adoption of Low No vehicles, mitigate environmental impacts, vitalize the domestic supply chain, and increase global competitiveness.

Potential Progress Made Toward Achieving Strategic Goals:

The program supports DOT's strategic goals of climate and sustainability and transformation by innovating new Low No emission components, as well as economic strength and global competitiveness by supporting development of products in America to contribute to the domestic supply chain.

Collaboration Partners:

- *Internal partners:* NHTSA, FMCSA, FHWA
- *Other Federal partners:* DOE, NASA.

- *External partners:* Mid-Size Bus Manufacturers Association, Transit Vehicle Manufacturers (TVMs).

Small Business Innovation Research Program (SBIR)

\$1,807
(\$000)

Program Description:

The SBIR Program will build on past momentum in FY 2023. In FY 2024, the program will prioritize the goals of the Biden-Harris Administration by funding product development research that advances safety, equity, climate & sustainability, and transformation. The SBIR program will support safety by continuing to research ways to reduce transit bus collisions with motor vehicles. This research will help develop safety for workers and travelers through a data-driven and multi-perspective approach. The SBIR program will also address equity by continuing its phased research on connecting people to healthy food in rural and urban areas across the United States. \$847,000 is provided from the Trust Funds and \$960,000 is included in the General Fund request.

The program will build upon DOT's transformation goal by researching blockchain-enabled transit incentivization. This research will improve transportation demand management by allowing multiple stakeholders to influence traveler behavior simultaneously while rewarding individuals for using transit and providing valuable insights about demand to inform service planning. This research will experiment with new ideas and innovations that will help modernize transit of the future.

FTA's SBIR program will seek technological innovations that incorporate green technologies and help combat climate change. In addition, FTA's SBIR program will continue to promote equity by fostering and encouraging participation in innovation and entrepreneurship by women and socially and economically disadvantaged persons. The goal of FTA's SBIR program is to help small businesses grow by funding product development research in strategic areas such as safety, infrastructure, mobility, and other topics important to transit. The program supports innovative solutions that help solve complex challenges and invests in promising early-stage innovations that may otherwise be too high of a risk for private investors.

The program supports DOT's strategic goals of climate sustainability as well as economic competitiveness and transformation.

Major Program Objectives:

1. Stimulate technological innovation.
2. Meet Federal research and development needs.
3. Foster and encourage participation in innovation and entrepreneurship by women and socially or economically disadvantaged persons.
4. Increase private-sector commercialization of innovations derived from Federal research and development funding.

Anticipated Program Activities:

Phase II anticipated activities include:

Reduction of Transit Bus Collisions with Other Vehicles: Research activities in Phase II will build on activities in Phase I by further improving and finalizing the deep learning object detection and near crash detection algorithms developed in Phase I. In addition, research activities in Phase II will focus on Roadside LiDAR Solutions for Bus Stops, as most bus collisions happen at intersections and bus stops.

Connecting Individuals in “Food Deserts” to Healthy Foods: Activities in Phase II will build on efforts in Phase I by improving mobility options to reduce food deserts and provide options for all individuals to access affordable and quality groceries and healthy food. This will include assisting decision makers, leaders, and planners to first identify areas that face accessibility challenges and provide them with the most effective food-to-people and people-to-food solutions.

Blockchain-Enabled Transit Incentivization: Building on the findings in Phase I, the research team will develop a proof of concept to test with select small audiences and support community and partner development for pilots. To ensure the user engagement required to carry out successful pilots, initial product releases will focus on agility and user experience

Potential Program Outputs, Outcomes, and Impacts:

In FY 2024, R&D will continue as Phase II projects will commence. FTA anticipates Phase II projects to build on the feasibility studies/proof-of-concepts developed in Phase I. Phase II effort is based on the results of Phase I, the scientific and technical merit of the Phase II proposal, and the commercial potential of the proposed Phase II project.

Outputs: Monthly progress reports of R&D efforts in Phase II and final Phase II project reports.

Outcomes: Successful Phase II projects with the goal of commercially viable products/solutions.

Impacts: Reduction in transit bus collisions and fatalities; increase in access to healthy foods; and increase in use of blockchain technology in transit that can positively impact traveler behavior and provide valuable insights about demand to inform service planning.

Potential Economic or Societal Impacts:

Research activities in FY 2024 have the potential to impact the economy and society in numerous ways. The Reduction of Transit Bus Collisions with Other Vehicles project has the potential to reduce bus collisions with non-transit vehicles and reduce fatalities and injuries. Connecting individuals in food deserts to healthy foods helps people to live

healthier lives, and focuses on what affordable and accessible options can be delivered to reduce transportation-related disparities at large.

Phase II Research efforts on blockchain-enabled transit incentivization has the potential to impact the economy and society in a positive way. The incentivization of travel options allows for more efficient use of transportation resources, improves coordination of mobility solutions, and potentially enhances how transit agencies and communities coordinate and operate transportation services. This will help in promoting equity and traveler mobility.

Potential Progress Made Toward Achieving Strategic Goals:

Phase II research activities for FY 2024 have not begun yet, as Phase II activities are expected to commence in the summer of 2023.

Collaboration Partners:

- *Internal partners:* OST-R, FRA, NHTSA, FHWA, JPO, and the Volpe Center
- *Other Federal partners:* Small Business Administration.
- *External partners:* Transit agencies and other industry stakeholders

Transit Cooperative Research Program (TCRP)
\$6,891
(\$000)

Program Description:

The TCRP program is authorized in Federal public transportation law (49 U.S.C. § 5312(i)) and operated through the Transportation Research Board (TRB). This program provides applied research with near-term, practical results addressing key public transit challenges. TCRP publishes reports on critical issues such as bus service reliability, equity analysis, data sharing, tax increment financing for transit projects, and women in the public transportation workforce. The TCRP Oversight and Project Selection (TOPS) Commission selects the highest priority projects annually and is supported by a panel of expert practitioners from the industry and managed by TRB staff.

In FY 2024, TCRP will support the Department's strategic goals of Safety, Economic Strength and Global Competitiveness, Equity, Climate Sustainability, and Transformation through TCRP project solicitations and evaluations. TCRP research aligns with the Departmental priorities and complements existing efforts.

Major Program Objectives:

1. Identify the highest priority transit problems in need of research and development (R&D) investigation.
2. Provide an opportunity for transit operators, local government officials, and many other constituents – including construction organizations, financiers, real estate developers, and community representatives – to identify problems and participate in developing appropriate solutions.
3. Improve communications, technical information transfer, and dissemination.
4. Provide a means of addressing a variety of near-term transit problems in cooperation and in coordination with Federal public transportation research.

Anticipated Program Activities:

Solicit ideas from practitioners and the public: Issue a broad call to public transportation and related industries for members of the public to identify challenges common in practice.

Project Selection: The Screening Committee conducts an initial review of proposed projects. Those that merit further consideration move to the TOPS Commission for final review, ranking, and selection. The Research Project Panel Development reviews and request for proposals from research organizations. FTA Solicitates volunteers to serve on expert practitioner panels and identify liaisons from within the agency.

Conduct Research: Research project panelists review proposals and select contractors to produce individual research deliverables.

Dissemination: APTA carries out dissemination under the direction of TRB and, in cooperation with partners, shares research results through events, bulletins, webinars, and email blasts.

Address Statutory Requirement: TCRP will assist FTA in meeting the requirement in the appropriations to public transportation research.

Potential Program Outputs, Outcomes, and Impacts:

TCRP continues to serve as one of the principal means by which the public transportation industry develops innovative near-term solutions to demands and needs. TCRP has an established reputation for providing useful reports and other tools to help public transportation practitioners solve problems and inform decision makers.

Outputs: Call to public transportation stakeholders and related industries for members of the public to identify challenges to be addressed. Enlist a Screening Committee to conduct an initial review of proposed projects. Production of approximately 20 publications; approximately 70 research studies are in progress. Continue the dissemination under the direction of the TRB and, in cooperation with partners, share research results through events, bulletins, webinars, and email blasts.

Outcomes: Solutions that will increase transit workplace and passenger safety; reduce emissions by adopting zero-emission vehicles; increase mobility through technology tools; reduce operating costs to make transit more affordable; improve maintenance practices; and improve access to employment and services.

Impacts: Reduction of transit-related injuries and fatalities due to unsafe workplace practices, vehicle collisions and assaults on operators and passengers; a reversal of climate change due to the elimination of emissions from public transit vehicles; and support universal access to transportation.

Potential Economic or Societal Impacts:

TCRP's research will present innovative solutions enabling transit agencies to provide service that will improve the quality of life for communities. For example, the research will identify strategies to eliminate transportation barriers to good-paying jobs, quality education and community amenities. Research results will also help improve air quality by providing information on how transit agencies can reduce greenhouse gas emissions by adopting zero-emission vehicles. Research on fare policies can determine how zero or reduced fares can improve the economic condition of low-income households and provide more equitable transit service.

Potential Progress Made Toward Achieving Strategic Goals:

TCRP will advance DOT's progress toward achieving strategic goals by selecting research proposals that address how the topic supports the goals and promoting research results that further the goals. Research results will provide tools and strategies on how to reduce the number of transit-related collisions and workplace accidents. Research results will advise transit agencies on how to create an agency that is sustainable and prepared to adapt to future environmental and social challenges.

Collaboration Partners:

- *Internal partners:* Other DOT operating administrations as appropriate.
- *Other Federal partners:* When appropriate, Coordinating Council on Access and Mobility partners.
- *External partners:* APTA, COMTO, and the National Transit Institute (NTI). When appropriate, FTA Technical Assistance Centers.

Safety
\$10,000
(\$000)

Program Description:

Transit is the safest mode of surface travel, but the Department’s vision of zero fatalities or serious injuries has not yet been achieved. Operator and passenger assaults, suicides and trespassing incidents, vehicle crashes, and safe access to transit, require improvements and new mitigations. Of the total, FTA proposes to use \$10.964 million in Contract Authority provided under the Bipartisan Infrastructure Law for Transit Cybersecurity (\$2 million) and \$8.964 million for Safety initiatives. The President’s Budget included an additional \$5.008 million General Funds request to support Safety program.

A major area of focus in safety is operator safety, and in June of 2023, FTA held a listening session to gather input for a major initiative to improve safety for bus operators, riders and all who encounter a transit bus. Findings from this session will inform major research investment decisions related to several of the major activities for this area of research: Bus Compartment Redesign and Bus of the Future.

Safety of transit riders, operators, bicyclists and pedestrians of all ages and abilities is paramount. To improve transit ridership, safety on the nation’s roadways must be improved for pedestrians and bicyclists around bus and rail stops, and the pathways leading up to them because pedestrians and bicyclists suffer disproportionately from serious injuries and fatalities when crashes occur as compared to people in motor vehicles.

Transit cybersecurity is an increasingly important area given the proliferation of computer systems in transit applications. Each computer system creates a pathway to vulnerability and risk.

FTA’s expanded Safety research initiative will continue to advance transit safety at all levels by incorporating the DOT’s Safe System approach, specifically adopting the elements of:

- Safer People: Encourage safe, responsible behavior by people who use our roads/transitways and create conditions that prioritize their ability to reach their destination unharmed.
- Safer Roads: Design roadway/transitway environments to mitigate human mistakes and account for injury tolerances, to encourage safer behaviors, and to facilitate safe travel by the most vulnerable users.
- Safer Vehicles: Expand the availability of transit/vehicle systems and features that help prevent crashes and minimize the impact of crashes on both occupants and non-occupants.

This initiative will also leverage innovative technologies, processes, and applications to monitor, predict and plan operations and maintenance using unmanned aircraft systems (UAS), artificial intelligence and robotics; and explore the use of other advanced technologies that increase worker, rider, pedestrian, and bicyclist safety.

Research will develop and demonstrate applications that reduce worker injuries, as well as increase rider, bicyclist, and pedestrian safety, and improve monitoring and maintenance of transit assets.

This program supports the Department's strategic goal of Safety by making the public transportation system safer for all people, and work toward a future where transportation-related serious injuries and fatalities, and system vulnerabilities are eliminated.

Major Program Objectives:

1. To reduce fatalities and injuries and improve safety culture with the use of transformational innovative technologies, practices, and systems.
2. To improve transit operational safety by leveraging state of art technologies and practices to monitor and maintain critical transit assets.
3. To advance innovation, best practices, and guidance to make transit, road, and street systems safe for workers, operators, and riders.

Anticipated Program Activities:

Transit Worker and Rider Safe System Approach Demonstrations: Utilize Artificial Intelligence (AI), Robotics, digital infrastructure, and emerging technology for demonstration projects to showcase promising mitigation strategies. This effort will be a follow up to the Transit Worker and Rider Safety (TWRS) Best Practices Research project.

Bus Compartment Redesign Phase II: Work with transit industry and stakeholders to build on FTA's Bus Compartment Redesign Phase I/Phase II will design, prototype, and demonstrate bus operator compartment enhancements that meet transit needs including operator barriers and other improvement for passenger movement.

Bus of the Future: Conduct research and demonstration working with the industry and stakeholders to further develop the bus design to meet the needs of the future.

Transit Cybersecurity Roadmap: Develop a research strategy and transit cybersecurity roadmap with input from FTA and industry that includes research tracks, milestones, and products.

Transit Cybersecurity Rollout: Implement the transit cybersecurity strategy and key actions from the cybersecurity roadmap with a plan to adopt well-established, robust cybersecurity strategies from other industries and evaluate changes in transportation cybersecurity vulnerabilities, threats, and risks.

Automated Track Detection and Flight Automation Research & Demonstration: Develop automated track detection and flight automation capability using unmanned aerial systems, robotics, automation, artificial intelligence (AI)/machine learning, etc. to monitor, maintain and improve operational safety, system resiliency and condition-based maintenance including identification of three promising applications for further research and demonstration.

Intersection Safety Challenge: Collaborate and coordinate with ITS JPO transform intersection safety through systems that identify, predict, and mitigate unsafe conditions involving vehicles and vulnerable road users.

Public Safety Awareness: Identify technologies that increase public safety awareness and reduce surface transportation injuries and fatalities.

Transit Vulnerable Road User Protection Program: Develop tools to utilize AI, robotics, and emerging technologies to improve the safety of pedestrians, bicyclists, and other vulnerable road users to achieve the objectives of DOT's National Roadway Safety Strategy (NRSS).

Transit Worker Health Study: Conduct a study, in consultation with the Occupational Safety and Health Administration (OSHA), that examines public transit worker health and safety standards, health outcomes, and whether facility and/or equipment upgrades could improve working conditions for these workers.

Challenges Facing Pregnant Women Riding Transit: Conduct follow-on research to “Analysis of Challenges Facing Pregnant Women Riding Transit” to increase the FTA’s understanding of the needs of pregnant transit riders no later than 18 months after enactment.

Office of Transit Safety and Oversight (TSO) Key Safety Studies: Based on top safety issues.

Potential Program Outputs, Outcomes, and Impacts:

FTA will conduct research and select effective program deployments and demonstrations designed to reduce fatalities and injuries, advance innovation, and build best practices.

Outputs: Research reports, guidance documents, software, and applications.

Outcomes: Reduction in operator assaults within 2 years of related research and improved use of safe system approaches in transit agency safety plans.

Impacts: Reduce fatalities and injuries, and increase perception of safety on transit systems by riders.

Potential Economic or Societal Impacts:

By providing better safety and security for worker, rider, operator and transit systems, the program will increase rider and operator confidence in using transit systems, make transit a desirable mode of transportation and increase use of transit.

Potential Progress Made Toward Achieving Strategic Goals:

The program supports DOT's strategic goal of safety and will document lessons learned, guidance documents, and tools that ensure the safety of all including the riders, operators, transit users and others.

Collaboration Partners:

- *Internal partners:* FRA, FAA, PHMSA, ITS JPO.
- *Other Federal partners:* OSHA, DHS, TSA.
- *External partners:* Transit agencies, standard development organizations, universities, technology providers.

Research to Practice and Dissemination Program (Tech Transfer)

\$2,000

(\$000)

Program Description:

The program will highlight research results and assist public transportation agencies in applying research solutions to improve service delivery. The program will also continue to improve project monitoring, reporting, and outreach efforts to drive research to practice. For example, FTA develops and executes a research-to-practice strategy and publishes a quarterly research newsletter to inform transit industry stakeholders about FTA-sponsored research.

The program will advance the Department's mission by improving transit agencies' ability to deploy the results of research and technology investments and assess barriers identified in demonstration programs. The program will provide a framework for communicating research and technology development in the areas of Safety, Economic Strength and Global Competitiveness, Equity, Climate and Sustainability, Transformation, and Organizational Excellence.

Collectively, the research results from this program support the Department's strategic goals, with Organizational Excellence as the primary goal.

Major Program Objectives:

1. Design and produce consistent, Section 508 compliant, high-quality research products and other supporting materials targeted to public transportation providers.
2. Improve the dissemination of FTA research outputs, outcomes, and impacts by identifying and using outreach and marketing methods preferred by key transit stakeholders.
3. Leverage social media venues to communicate research results.
4. Identify opportunities for outreach to the transit industry.

Anticipated Program Activities:

Research to Practice Project: FTA entered into an agreement with CALSTART to provide support in identifying the best ways to communicate FTA research results to the transit industry and develop an implementation plan with the goal of having transit agencies put those results into practice. This technical assistance project is funded under 49 U.S.C. § 5314.

Research Newsletter: To inform the transit industry stakeholders about FTA-sponsored transit research activities.

Research Marketing and Communications Plan: To identify and implement strategies and tactics to increase awareness of FTA-funded research in the transit industry.

Outreach and Dissemination Project: Publish a \$3 million Notice of Funding Opportunity (NOFO) for an eligible recipient to support FTA in producing FTA final reports and publications; ensuring the products are 508 compliant and accessible to the public transportation industry and the public.

Potential Program Outputs, Outcomes, and Impacts:

To share the results of FTA research investments, FTA will ensure research reports are published on FTA's website and in DOT's National Transportation Library (NTL) Repository & Open Science Access Porta (ROSA-P) and the findings are marketed through appropriate means.

Outputs: Publishing of FTA's Newsletter on time and on schedule; track and report the deployment of new innovations; number of reports posted in ROSA-P and FTA's public webpage.

Outcomes: Increased understanding of effective strategies; broader adoption and collaboration; accelerated innovation building on the experiences of others.

Impacts: Broadened support and adoption for FTA research results and technologies; and broader dissemination of reports and evaluations.

Potential Economic or Societal Impacts:

The economic impact of the program is demonstrated by the effective use of Federal funds by allowing program managers and collaborating partners to allocate time and resources to developing the content of the research products instead of formatting documents. The societal impacts are demonstrated by ensuring all FTA reports and publications are 508 compliant and accessible to the public transportation industry, academia, and the public in general.

Potential Progress Made Toward Achieving Strategic Goals:

FTA has published over 200 reports in FTA's public website, accessible at <https://www.transit.dot.gov/research-innovation/fta-reports-and-publications> and ROSA-P's FTA collection, accessible at <https://rosap.ntl.bts.gov/cbrowse?pid=dot%3A42631&parentId=dot%3A42631>. All reports are 508 compliant. FTA has established report production policies, processes, and an inclusive and innovative culture to effectively serve communities and responsibly steward the public's resources, meeting the DOT's strategic goal of Organizational Excellence.

Collaboration Partners:

- *Internal partners:* OST-R, and NTL.
- *External partners:* APTA, CALSTART, CTAA, CUTR, and TRB.

Mobility NeXt
\$7,924
(\$000)

Program Description:

As the mobility industry continues to evolve rapidly, combined with accelerated changes in traveler behavior following the pandemic, the future of mobility holds great potential for positive change and yet at the same time remains uncertain. The FY 2024 President's Budget requests funding to support FTA's Mobility NeXt program. It focuses on the potential for emerging technologies, practices, and strategies to accelerate public transportation transformation, such as personalized traveler information – preparing for and leading a more equitable and sustainable future.

The program will continue to seek public-private partnership opportunities in mobility research to advance new mobility concepts, technologies, and solutions (such as personalized traveler information enabled by artificial intelligence). It will also support public transportation to deliver quality mobility in America's communities for everyone. A major focus of the Mobility NeXt program in FY 2024 is to help transit rapidly understand and adapt to the new patterns of mobility demand and supply following the COVID-19 pandemic. In the longer term, the program strives to mobilize Federal and private sector investments in mobility research to advance new models of how public transportation is delivered and consumed, leveraging technologies and solutions to achieve equitable and climate-smart mobility outcomes.

The Mobility NeXt program supports the Department's strategic goals of Transformation and Equity. This program helps reduce inequities across our transportation systems and the communities they affect. It will also support and engage people and communities to promote safe, affordable, accessible, and multimodal access to opportunities and services while reducing transportation-related disparities, adverse community impacts, and health effects. Mobility NeXt aims to make transit use easy, seamless, and frictionless. If successful, it will increase transit and shared mobility use and decrease single occupant vehicle travel.

Major Program Objectives:

1. To better understand mobility innovation through foundational and enabling research, a review of existing opportunities and challenges in meeting mobility need, and innovation scans that look across and beyond the transportation industry. This will produce a holistic picture of the mobility industry, including its current state, what is relevant, and what is possible.
2. To support innovative mobility solutions, including modeling, to support industry decision making, expanding trip personalization, optimizing travel choices, and leveraging dynamic supply and demand. The program will also refine existing metrics and identify new ones toward equity and sustainability, and identify techniques to

leverage partnerships beyond transit for the benefit of transit. These new tools will inform mobility systems, decisions, and outcomes.

3. To demonstrate new mobility solutions in the real world through targeted projects, testing, validating, and evaluating new solutions, Demonstrations will focus on both travel personalization and novel trip payment. These demonstrations will uncover which innovative solutions work for transit.
4. To enable and implement equitable, climate-smart, and carefree mobility solutions by analyzing both opportunities and barriers, (including the way they relate to FTA policy); examining strategies to fund and implement promising mobility solutions; identifying successful public-private partnership practices; and engaging with industry through roundtable discussions, meetings, and workshops.

Anticipated Program Activities:

Mobility NeXt enabling research: Conduct exploratory research on mobility data analytics, technological solutions, and traveler behavioral research and their potential to enhance travelers' mobility and inform mobility choices. Examples include artificial intelligence (AI), modeling and simulation, and blockchain, that promote user-centric mobility innovation, such as using AI to fuse archived and real-time data to support the more tailored system operations, modeling, and simulation tools to estimate mobility outcomes based on various pricing scenarios, and blockchain to support secured transactions and more efficient allocation of mobility resources, such as vehicle capacity and curb space.

Mobility NeXt demonstration projects: Fund demonstration projects that explore and test smart operational concepts, smart traveler tools, novel policy experiments, and/or advanced mobility strategies. Example projects to fund may include personalized traveler information and mode incentivization, innovative strategies for payment integration across agencies and modes, data modeling and analytical strategies to improve operations and improve transit service, and innovative partnerships and governance strategies for integrated mobility to address transportation equity.

Mobility NeXt smart partnerships: Establish and maintain a community of practice for mobility innovation to enhance public transportation equity, efficiency, and effectiveness, and accelerate transformation by fostering collaboration and knowledge-sharing among public and private stakeholders.

Potential Program Outputs, Outcomes, and Impacts:

FTA will conduct exploratory research on mobility data analytics, technological solutions, and traveler behavioral research that enable smart transit operations through integrated mobility, and smart travelers through personalized mobility. FTA will fund demonstrations, while achieving equitable and climate smart mobility. FTA will also share information and help deploy promising mobility innovation technologies, tools, and approaches.

Outputs: Produce a comprehensive 5-year Mobility NeXt strategic program plan; establish a mobility innovation community of practice; produce research reports and briefings on mobility data analytics and technological solutions; fund targeted demonstration projects that explore and test smart operational concepts, smart traveler tools, and/or advanced mobility strategies; introduce new technologies for transit applications.

Outcomes: By 2027, partner with 25 transit agencies that adopt artificial intelligence capability to enhance transit service efficiency and equity in communities across the US with different built environment. By 2027, support 5 novel business models and technology approaches related to mobility payment integration in communities across the US. By 2027, design and experiment 5 novel smart traveler tools using artificial intelligence, data analytics, and gamifications to support personalized traveler advisory based on personal preference and real-time situational awareness.

Impacts: Widespread transit agency exploration of mobility operational strategies; smarter traveler behaviors enabled by better information, and personalized choices and decision support tools; reduced national transportation cost burden by 5%, and mobility cost as a percent of income; and FTA policy modernization to incentivize transit agency innovation.

Potential Economic or Societal Impacts:

Mobility NeXt's research, demonstration, and knowledge-transfer efforts on smart operations and smart travelers will improve public transportation's viability and traveler's experiences, reduce barriers to transportation and improve quality of life through improved access to employment, healthcare, education, shopping, and leisure activities. A major focus of the Mobility NeXt program is to support community-driven efforts to promote economic and social mobility and other opportunities in American communities, particularly disadvantaged communities. For example, innovative payment integration technologies and concepts can further advance transportation equity. Mobility integration can expand access and ease of use of all modes and services by all travelers. Mobility NeXt also contributes to cleaner air and reduced environmental impact of transportation through climate-smart technologies, operational strategies, and traveler incentives.

Potential Progress Made Toward Achieving Strategic Goals:

For the primary strategic goal of Transformation, Mobility NeXt will experiment with new mobility strategies and technologies that drive the industry forward; benefit operators, travelers, and society; and create a more resilient mobility system. The program will encourage high-risk, high-reward research with the goal of advancing mobility solutions that are equitable and climate-smart. The program will also promote flexibility through the development of innovations that will help our public transportation systems adapt and predict changing needs and trends in mobility and society.

For the secondary strategic goal of Equity, Mobility NeXt will remove barriers to opportunity through equitable mobility innovations that expand access to and enhance convenience of high-quality public transportation. The program also ensures that future mobility system interventions will be equitable by establishing channels for diverse voices and community inclusion to identify underserved needs. Mobility NeXt focuses on improving quality of life through an improved mobility system that connects people seamlessly to where they need and want to go.

Collaboration Partners:

- *Internal partners:* OST offices, FHWA, NHTSA, FMCSA, FRA, FAA, the Volpe Center, and the JPO.
- *Other Federal partners:* DOL, NIDILRR and the DOE's Vehicle Technology Office.
- *External partners:* Private sector mobility providers and technology developers, Shared Use Mobility Center, TRB, APTA, CTAA, Mobility on Demand (MOD) Standing Committee by Intelligent Transportation Society of America (ITSA), CUTR, Texas Transportation Institute (TTI), Other Academic and Research Institutions, and private sector consulting firms.

Environmental Sustainability and Resiliency **(\$5,000)** **(000)**

Program Description:

Changes in individual travel behavior, such as shifting away from single occupancy vehicles to public transportation or active modes (e.g., walking, biking, scootering) can significantly lower greenhouse gas (GHG) emissions.

This program will research ways that travelers can make climate-smart decisions when they travel. New data-driven tools and other recent innovations can equip travelers with information to make informed choices about how, when, and even where they travel, that result in reductions in GHG emissions.

FTA recognizes that making each trip decision a climate decision is a key principle to advance environmental sustainability and resiliency. Recent advancements in technologies, such as artificial intelligence, can empower the transit industry to provide personalized and curated traveler information to influence and incentivize climate-smart traveler decisions, including mode choices, as well as the time and locations of each trip.

This program will investigate enabling technologies, such as artificial intelligence, scan recent developments in traveler behavior research and examine national and global policies and practices. The program will also review relevant research in other industries, such as education to develop personalized learning plans for students, and retail to personalize the shopping experience for consumers. The program will identify strategies and technologies that transit agencies can utilize to encourage meaningful behavior changes.

The program supports the Department's strategic goals of Climate and Sustainability and Transformation. It works to reduce GHG emissions from the transport sector by informing climate-smart mobility choices. It also supports experimentation and implementation of emerging technologies, including artificial intelligence, as they apply to improving public transit and mobility for travelers and society.

Major Program Objectives:

The program objective is to conduct research and develop plans for demonstrations that enable public transportation providers to better understand and implement traveler behavior changes targeting GHG emissions reductions. The technological tools and best practices from this program can improve mobility options and support sustainable growth and can also be used by decisionmakers to leverage mode shift and other traveler behavior changes to support environmental sustainability and resiliency.

Anticipated Program Activities:

Climate-smart traveler research: Conduct research on artificial intelligence and modelling capabilities to simulate the climate impacts of traveler behavior and inform climate-smart mobility choices; Develop personalization tools, drawing from other industries, to provide travelers with curated information that enhances mobility and ability to make climate-smart travel choices. Conduct a scan of the latest research in traveler behavior to inform how these tools can be used.

Climate-smart traveler demonstration projects: Fund demonstration projects that test tools that provide travelers with personalized, climate-smart choices that reduce GHG emissions. For example, targeted demonstration projects may include blockchain to support personalization and mode incentivization.

Potential Program Outputs, Outcomes, and Impacts on Technologies and Practices:

FTA will conduct research on emerging technologies, such as artificial intelligence, to evaluate their potential application to the public transit industry and to provide personalized and curated traveler information to influence and incentivize climate-smart traveler decisions. FTA will fund demonstration projects that test these tools' ability to influence traveler decisions and reduce GHG emissions from transport.

Outputs: Produce a program plan for the climate-smart traveler program; conduct research on the application of emerging technologies on traveler personalization and GHG emissions reductions in the public transit industry; and fund targeted demonstrations that test smart traveler tools.

Outcomes: By 2027, partner with 15 transit agencies that adopt personalization tools that enhance traveler mobility and inform climate-smart travel choices. By 2027, design and experiment 5 novel smart traveler tools using artificial intelligence, data analytics, and gamifications to support personalized traveler advisory based on GHG emissions, personal preference, and real-time situational awareness.

Impacts: Widespread adoption of personalization tools that enable travelers to make environmentally sustainable, climate-smart travel decisions; and reduced GHG emissions in the transport sector.

Potential Economic or Societal Impacts:

This program will support changes in traveler behavior, such as mode shift toward public transit and active modes, through personalization, incentives, and modelling and artificial intelligence that simulates and predicts climate impacts of traveler choices and policy changes. These traveler behavior changes have the potential to significantly lower GHG emissions from transport, while improving quality of life through improved health and decreasing transportation cost burden through a shift towards more cost-effective travel

modes. The program contributes to environmental sustainability at the local level, through reduced congestion and local air pollution from incentivizing a shift towards climate-friendly travel modes, and at the global level, through a reduction in GHG emissions. Reductions in local and global transport emissions directly benefit disadvantaged communities, who are disproportionately negatively impacted by air pollution and climate change.

Potential Progress Made Toward Achieving Modal Strategic Goals:

This program will address local air pollution and environmental sustainability as well as climate change through research and demonstrations that encourage mode shift away from single-occupancy vehicles and towards public transportation and active mobility modes. The program focuses on traveler behavior shifts that will benefit individuals through reduced costs and enhanced mobility, as well as society through decreased congestion and air pollution and the mitigation of climate change.

For the secondary strategic goal of Transformation, the program will facilitate experimentation and implementation of recent technologies that drive the public transportation industry forward; benefit travelers, society, and the planet; and create a more sustainable, resilient mobility system. The program will encourage knowledge transfer from other industries to public transportation and support the development of artificial intelligence and modelling that allows FTA and the industry to better understand the climate impacts of traveler behavior, with the goal of uncovering tools and policies that incentivize and encourage climate-smart travel choices.

Collaboration Partners:

- *Internal partners:* OST offices, FHWA, NHTSA, FMCSA, FRA, FAA, the Volpe Center, and the JPO.
- *Other Federal partners:* DOL, NIDILRR and the DOE's Vehicle Technology Office.
- *External partners:* Private sector mobility providers and technology developers, Shared Use Mobility Center, TRB, APTA, CTAA, Mobility on Demand (MOD) Standing Committee by Intelligent Transportation Society of America (ITSA), CUTR, Texas Transportation Institute (TTI), Other Academic and Research Institutions, and private sector consulting firms.

Transit Defined Systems

\$9,116

(000)

Program Description:

In FY 2024, FTA will create a new program to purpose-build and purpose-design systems which put transit purpose and design first to create systems that enhance transit rider experience and transit accessibility. This new program will use new innovations and emerging technologies to create carbon-neutral smart vehicles, rail, and infrastructure systems, such as electrified powertrains, battery ecosystem. It will decentralize renewable energy generation designed for transit, including focused research and investment in new vehicle and rail systems and diagnostics, new vehicle form factors (electric cutaway chassis), and smart connected systems for transit etc.

Collectively, this program supports the Department's strategic goals of Sustainability and Transformation.

Major Program Objectives:

- To conduct research and innovation to modernize transit systems.
- To foster sustainable and resilient systems for vehicle, rail and infrastructure that are carbon neutral by 2050.

Anticipated Program Activities:

Transit Defined Technology Laboratory: Establish a laboratory that enables rapid prototype and rapid testing of smart connected systems for transit vehicle, rail and infrastructure that are carbon neutral and enhance national vitality.

Foundational Research: Conduct global innovation scan to assess and leverage LoNo vehicle, rail, and infrastructure components such as chassis, HVAC, and other advanced and emerging technologies, that are either in research, or early limited deployment and build transit use cases. Recommend up to three scenarios for future research and demonstration.

Transit Chassis Equity: Work with transit industry to design, prototype, and demonstrate transit chassis that meet transit needs including low floor platform that facilitates modular design and configuration for different battery and vehicle types and uses, travelers and communities.

Potential Program Outputs, Outcomes, and Impacts:

The program will support expanded adoption and deployment of LoNo emission systems by bus manufacturers, transit agencies, States, and local governmental authorities.

Outputs: Increase in number of transit vehicle, rail and infrastructure components, technologies and solutions developed, tested, identified, and adopted.

Outcomes: Reduced carbon emissions in the transit sector; more competitive American transit manufacturing market; expanded and more stable domestic supply for LoNo components; increased transit use resulting from cleaner, quieter, and more efficient and attractive transit services.

Impacts: Spur innovation in and deployment of transit vehicle, rail and infrastructure components that create more timely products and emerging solutions, which, in turn, positively impact the climate by reducing greenhouse gas emissions and reliance on fossil fuels.

Potential Economic or Societal Impacts:

Innovation in transit vehicle, rail and infrastructure research and demonstrations will enable wider adoption of innovative transit systems, mitigate environmental impacts, vitalize the domestic supply chain, and increase global competitiveness.

Potential Progress Made Toward Achieving Strategic Goals:

The program supports DOT's strategic goals of climate and sustainability and transformation by innovating new transit vehicle, rail, and infrastructure components, as well as economic strength and global competitiveness by supporting development of products in America to contribute to the domestic supply chain.

Collaboration Partners:

- *Internal partners:* FRA, NHTSA, FMCSA, FHWA
- *Other Federal partners:* DOE, NASA.
- *External partners:* Mid-Size Bus Manufacturers Association, Transit Vehicle Manufacturers (TVMs).

Transit Enhanced Living (TEL) Program

\$7,000
(\$000)

Program Description:

Transportation insecurity is the condition in which people are unable to travel regularly and reliably to meet the needs of daily life. Nationally, there are well-established policies and programs that aim to address food insecurity and housing insecurity, but not transportation insecurity. A growing body of research indicates that transportation insecurity is a significant factor in persistent poverty.

The Transit Enhanced Living (TEL) program compliments public transportation through interventions to address transportation insecurity and evaluate outcomes and impacts of these interventions upon individuals and communities. This Program develops and implements demonstrations that augment public transportation to mitigate transportation insecurity, and evaluates each demonstration's outcomes and effectiveness. This Program also documents the impacts and potential strategies to address transportation insecurity.

TEL supports the Department's strategic goals Equity and Transformation.

Major Program Objectives:

1. To develop and implement demonstrations that augment public transportation to mitigate transportation insecurity.
2. To evaluate and document the impacts of various strategies to address transportation insecurity.

Anticipated Program Activities:

Human-Centered Design Plans and Demonstrations: Engage with communities to develop human-centered design plans for the implementation of a transportation insecurity mitigation demonstration. Work with a subset of those communities to implement the plan and implement the demonstration over a multi-year timeframe.

National Research: Develop a research framework to identify key performance indicators that assist in tracking how organizations may address material and relational transportation insecurity challenges.

Research Committee: Convene research committee of outside transportation equity and access experts so that the research framework may be reviewed, and if applicable, refined, at various intervals of the program's lifecycle. In addition, the research committee will review preliminary and final findings of the research program.

Potential Program Outputs, Outcomes, and Impacts:

FTA will select demonstrations that put individual's needs at the center of the work. A human-centered demonstration project requires centering community collaboration and identification of priorities. FTA approach provides for that collaboration and offers all applicants support to execute on community-informed plans.

Outputs: Ten community coalitions engaged in human-centered design processes for the implementation of a transportation insecurity demonstration. Five designated demonstration designs for transportation insecurity mitigation.

Outcomes:

By 2027, transportation insecurity data standards tested and validated by FTA.

Impacts: Improved worker job access and performance; improve access to grocery and health options; and increased earnings and wealth.

Potential Economic or Societal Impacts:

Transportation insecurity research has the potential to yield insights on the benefits and impacts of mobility improvements to localities. In addition, the research may reveal that augmenting conventional public transportation with new, different, or complementary mobility services can reduce impediments to achieving a healthy and stable life.

Potential Progress Made Toward Achieving Strategic Goals:

TEL continues to build on the knowledge and learning from existing transportation insecurity research, and support community-driven designs and demonstrations that augment public transportation to mitigate transportation insecurity. The planned TEL program activities will advance FTA's understanding of the feasibility and impacts of various community-designed strategies to address transportation insecurity. In whole, the TEL will support the Department's strategic goals of Equity as its primary goal and Transformation as its secondary goal.

Collaboration Partners:

- *Internal partners:* FHWA, OST, and the Volpe Center.
- *Other Federal partners:* DOL, HHS.
- *External partners:* Research universities, philanthropic organizations, community-based organizations, and trade associations (e.g., APHA), and public transit agencies implementing their own transportation insecurity demonstrations.

Chapter 2 – FY 2025 RD&T Programs

The AMRP FY 2025 outlook year chapter in the annual plan is not developed in alignment with the President’s budget request of the same year due to the AMRP development schedule per 49 U.S.C. Chapter 65 Sec. 6501 Research Planning.

Safe Infrastructure & People (SIP)

Program Description:

In FY 2025, FTA will create new safety program that focuses on infrastructure and people to enhance transit rider experience and transit accessibility. The Safe Infrastructure and People initiative will advance transit safety, and around workers, operators, riders, and pedestrians by using innovative technologies, processes, and applications to monitor, predict and plan operations and maintenance. It will also conduct research and demonstrations to reduce worker injuries, mitigate cybersecurity risks, increase operator, rider, bicyclist, and pedestrian safety including transit supportive infrastructure, such as pedestrian and bicycle networks, to safely bring people to and from transit services and their “last mile” destinations; and improve monitoring and maintenance of transit assets.

This program will continue to support the Department’s strategic goal of Safety by making the public transportation system safer for all people, and work toward a future where transportation-related serious injuries and fatalities and system vulnerabilities are eliminated.

Major Program Objectives:

- To reduce fatalities and injuries and improve safety culture with the use of transformational innovative technologies, practices, and systems.
- To improve transit operational safety by leveraging state of art technologies and practices to monitor and maintain critical transit assets.
- To advance innovation, best practices, and guidance to make transit, road, and street systems safe for workers, operators, riders, and pedestrians.

Anticipated Program Activities:

Anticipated activities include continuing to conduct research using the Safe System The program will continue to conduct research in bus operator human factors safety, automated track detection and flight automation using unmanned aerial systems, and to reduce transportation cybersecurity vulnerabilities, threats, and risks, and develop solutions that support all public transit agencies.

LoNo-CAP

Program Description:

In FY 2025, FTA will continue to operate and maintain a facility to conduct testing, evaluation, and analysis of LoNo emission vehicle components, and to conduct directed and advanced vehicle research. The facility will continue to acquire equipment and complete capital projects related to testing LoNo emission vehicle components or research related to advanced vehicle technologies that provides advancements to the entire public transportation industry. The program is authorized under 49 U.S.C. § 5312(h), and will continue to support DOT's strategic goals of transformation and climate and sustainability. This new authorization increased statutory funding for the LoNo-CAP Centers, and added an important provision to allow the LoNo-CAP Centers to do directed research on new and emerging technology components, intended for use in low or no emission vehicles.

Major Program Objectives:

- To operate and maintain LoNo-CAP testing centers to conduct testing, evaluation, and analysis of LoNo emission vehicle components and infrastructure.
- To conduct directed technology research innovating new low no emission components and strengthening domestic supply chain.
- To support the country's transit buses to move toward a cleaner and more energy-efficient future.

Anticipated Program Activities:

Anticipated program activities include continuing to develop and demonstrate next generation of batteries and increasing density of electric drive systems, and initiate directed and advanced vehicle research in LoNo emerging component and systems. This program will also continue to explore advancement of US manufacturing and supply chain.

Transit Enhanced Living Program

Program Description:

In FY 2025, the Transit Enhanced Living Program will build upon research to address transportation insecurity and evaluate outcomes and impacts on individuals and communities from prior years' investments. Research activities will still be organized around three complementary work areas –Human-Centered Design Plans and Demonstrations, National Research, and Research Committee as appropriate. Collectively, the Transit Enhanced Living program will support the Department's strategic goals of Equity as its primary goal and Transformation as its secondary goal.

Major Program Objectives:

- To develop and implement demonstrations that augment public transportation to mitigate transportation insecurity.
- To evaluate and document the impacts of various strategies to address transportation insecurity.

Anticipated Program Activities:

Anticipated program activities will continue to include research around the core Program Areas, including demonstration and evaluation of various transportation insecurity mitigation strategies, national research, research committee, stakeholder engagement and knowledge transfer.

Transit Defined Systems

Program Description:

In FY 2025, FTA will continue to develop this program to build and design systems which put transit purpose and design first to create systems and vehicles that enhance transit rider experience and transit accessibility across different user populations and communities. This new program will continue to explore the use of new innovations and emerging technologies in creating carbon-neutral smart vehicle, rail and infrastructure systems that are designed for transit specific needs and uses including focused research and investment in new vehicle and rail systems and diagnostics, and vehicle form factors (electric cutaway chassis), and smart connected systems for transit etc.

Collectively, this program supports the Department's strategic goals of sustainability and transformation.

Major Program Objectives:

- To conduct purpose-driven research and innovation to modernize transit systems.
- To foster sustainable and resilient systems for vehicle, rail and infrastructure that are carbon neutral by 2050.

Anticipated Program Activities:

Anticipated program activities include continuing to develop transit defined technology laboratory and initiate research in vehicle, rail and infrastructure and identification of demonstration of next generation of vehicle, rail and infrastructure systems and solutions.

Transit Cooperative Research Program (TCRP)

Program Description:

This statutory program will provide applied research with near-term, practical results addressing key challenges facing the public transportation industry. TCRP will continue to publish research reports to address critical issues such as bus service reliability, equity analysis, data sharing, tax increment financing for transit projects, and women in the public transportation workforce. The TCRP Oversight and Project Selection (TOPS) Commission selects the highest priority projects annually and is supported through a panel of expert practitioners from the industry and managed by TRB staff. TCRP sponsors research projects that identify solutions that will advance DOT's Strategic Goals.

Major Program Objectives:

1. Identify transit problems in need of research and development (R&D) investigation; and to establish a priority ranking for them.
2. Provide an opportunity for transit operators, local government officials, and many other constituents - including construction organizations, financiers, real estate developers, and community representatives - to identify problems and participate in developing appropriate solutions.
3. Improve communications, technical information transfer, and dissemination.
4. Provide a means of addressing a variety of near-term transit problems in cooperation and in coordination with Federal public transportation research.

Anticipated Program Activities:

Solicit research ideas from practitioners and the public: Issue a broad call to public transportation and related industries for members of the public to identify challenges common in practice.

Research Project Selection: Screening Committee conducts an initial review of proposed projects. Those that merit further consideration move to the TOPS Committee for final review, ranking, and selection. Research Project Panel Development and request for proposals from research organizations: TRB staff solicit volunteers to serve on expert practitioner panels and identify liaisons from FTA.

Conduct Research: Research project panelists review proposals and select contractors to produce individual research deliverables.

Dissemination: APTA carries out dissemination under the direction of TRB and, in cooperation with partners, shares research results through events, bulletins, webinars, and email blasts.

Small Business Innovation Research Program (SBIR)

The SBIR Program will build on the momentum of FY 2024. In FY 2025, the program will prioritize the goals of the Biden-Harris Administration by funding product development research in strategic areas such as safety, economic strength and global competitiveness, equity, climate and sustainability, and transformation. FTA's SBIR program will seek technological innovations that incorporate green technologies and help combat climate change. In addition, FTA's SBIR program will continue to promote equity by fostering and encouraging participation in innovation and entrepreneurship by women and socially and economically disadvantaged persons. The goal of FTA's SBIR program is to help small businesses grow by funding product development research in strategic areas such as safety, infrastructure, mobility, and other topics important to transit. The program supports innovative solutions that help solve complex challenges and invests in promising early-stage innovations that may otherwise be too high of a risk for private investors.

Major Program Objectives:

1. Stimulate technological innovation.
2. Meet Federal research and development needs.
3. Foster and encourage participation in innovation and entrepreneurship by women and socially or economically disadvantaged persons.
4. Increase private-sector commercialization of innovations derived from Federal research and development funding.

Anticipated Program Activities:

In FY 2025, there is potential for FTA's SBIR program to focus on advanced technologies that are emerging disruptors and innovation accelerators. FTA anticipates the potential for research in the areas of transit cybersecurity, the use of Artificial Intelligence and machine learning to re-vision transit services, transit electrification, and data integration tools that helps FTA ensure equity/accessibility in planning and implementing public transit services.

Advanced Digital Construction Management Systems Program

Program Description:

In FY 2025, FTA will build upon what we learn in the initial ADCMS program to continue to explore the benefits of advanced digital construction management systems, accelerating the use of ADCMS systems in transit construction programs advances the DOT's strategic goals of equity, climate and sustainability, and transformation.

Major Program Objectives:

- To establish, implement and deploy the advanced digital construction management systems program throughout the construction lifecycle.
- Maximize interoperability, boost productivity, reduce project delays, and cost overruns, and enhance safety and quality.
- Facilitate advanced digital transformation, technology adoption and implementation success by fostering partnering with internal and external partners.

Anticipated Program Activities:

The program's projected activities will continue existing transit digital construction management system demonstrations, business models, and documenting best practices while assessing gaps and collaborating with key public and private organizations to determine future courses of action. Additionally, the program will maintain its partnerships with the DOT and other Federal agencies to maximize current investments in research demonstrations.

Mobility NeXt

Program Description:

In FY 2025, FTA's Mobility NeXt program will continue to focus on uncovering the next iteration of the most promising technologies, practices, and strategies to accelerate public transportation transformation – preparing for and leading a more equitable and sustainable future. The program will seek opportunities to mobilize Federal and private sector investments in mobility research to advance mobility concepts, technologies, and solutions, and support public transportation to achieve equitable and climate smart mobility outcomes. The Mobility NeXt program will support the Department's strategic goal of Transformation as its primary goal and Equity as its secondary goal.

Major Program Objectives:

- To research and demonstrate future public transportation service models, enabled by common mobility data exchange standards and tools, that accelerate transformation of public transportation providers as integrated mobility managers. This will connect all modes and services through open architecture and interoperable systems for enhanced mobility of all travelers, and allow for dynamic, flexible systems that can respond quickly to changes in travel demand and meet changing traveler expectations.
- To understand traveler behaviors and explore enabling technologies and policy tools to improve personal mobility through environmentally sensitive, personally optimized mobility decisions based on curated choices provided to travelers tailored to their individual preferences and circumstances.

Anticipated Program Activities:

Anticipated program activities include continuing to conduct exploratory research on transformational mobility data analytics, technological solutions, and traveler behavioral research and their potential to significantly enhance travelers' mobility and change mobility choices. The program will continue to fund demonstration projects that explore and test smart operational concepts, smart traveler tools, and/or advanced mobility strategies. Mobility NeXt will also maintain a community of practice for mobility innovation to improve public transportation equity, efficiency, and effectiveness, and accelerate transformation by fostering collaboration and knowledge-sharing among public and private stakeholders.

Strategic Transit Automation Research 2.0

Program Description:

The STAR 2.0 Program will continue to advance the research, development, and deployment of transit bus automation and share lessons learned from STAR. The STAR 2.0 program will provide examples on how to safely design and integrate automated transit buses into revenue service, and will engage with stakeholders to conduct a market analysis and analyze of transit bus automation technologies.

The STAR Program supports the Department's strategic goals of Transformation and Safety.

Major Program Objectives:

- To improve transit safety for operators, riders, and the traveling public, including vulnerable road users.
- To explore the most beneficial uses of automation in transit agencies.
- To spur economic development by introducing automation for transit-focused applications, such as bus rapid transit in transit dense corridors and within transit right-of-ways.

Anticipated Program Activities:

FTA will explore the potential to transfer and scale automated on-demand microtransit to small urban, exurban, and rural areas. FTA will also test and demonstrate technologies that enable people with disabilities interact with and use automated vehicles without assistance from onboard staff. These activities include automating mobility device securement and interacting with the vehicle through human-machine interfaces, as a potential path towards automated paratransit service and greater mobility and independence for people with disabilities.

Environmental Sustainability and Resiliency

Program Description:

Continued investment to reduce transit greenhouse gas emissions is critical toward advancing the goal for transit to become carbon-neutral by 2050. FTA has a long history of investment in this area, and in FY 2025, we will build upon those investments. FTA is providing billions of dollars of funding to help transit agencies transform their fleets and develop the charging/fueling systems needed to sustain zero-emission fleets. Research is needed to identify the best enablers of successful fleet transition, successful battery electric and hydrogen fueling systems, and the workforce training needed for operators and technicians.

The program supports the Department's strategic goals of Climate and Sustainability and Transformation.

Major Program Objectives:

- Foster sustainable and resilient systems for transit vehicles and infrastructure that are carbon neutral by 2050.
- Enable public transportation providers to better understand and implement traveler behavior changes targeting GHG emissions reductions.

Anticipated Program Activities:

Build upon research and demonstrate tools and strategies to support transit zero-emission fleet transition through the Transit Vehicle Innovative Development program. The Transit Vehicle Innovation Development Centers will build upon previous transit agency findings from fleet transitions to continue to refine and enhance the success of FTA's initiative to support transit agencies to achieve zero-emission fleets by 2050.

For More Information on DOT's Research see <https://researchhub.bts.gov/search>