

**FTA Annual
Report on
Public
Transportation
Innovation
Research Projects
for Fiscal Year 2022**



PREPARED BY
Federal Transit Administration



U.S. Department of Transportation
Federal Transit Administration

FEBRUARY

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FTA Annual Report on Public Transportation Innovation Research Projects for Fiscal Year 2022

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FTA Report No. 0241

PREPARED BY

Federal Transit Administration
Office of Research, Demonstration and Innovation
U.S. Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

AVAILABLE ONLINE

<https://www.transit.dot.gov/about/research-innovation>

Metric Conversion Table

SYMBOL	WHEN YOU KNOW	MULTIPLY BY	TO FIND	SYMBOL
LENGTH				
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
VOLUME				
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft³	cubic feet	0.028	cubic meters	m ³
yd³	cubic yards	0.765	cubic meters	m ³
NOTE: volumes greater than 1000 L shall be shown in m ³				
MASS				
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
TEMPERATURE (exact degrees)				
°F	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	°C

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14. ABSTRACT This report provides information on projects funded under Federal Public Transportation Law (49 U.S.C. § 5312). FTA research support DOT strategic goals, including Safety, Equity, Transformation, Economic Strength and Global Competitiveness, Climate and Sustainability, Organizational Excellence, the Transportation Cooperative Research Program. Projects active in FY 2022 promoted research, innovation and development, demonstration and deployment, and evaluation.					
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U.S. Department
of Transportation

**Federal Transit
Administration**

Administrator

1200 New Jersey Avenue, SE
Washington, DC 20590

February 3, 2023

Dear Colleagues:

I am pleased to provide the Federal Transit Administration (FTA) Annual Report on Public Transportation Innovation Research for Fiscal Year (FY) 2022. Issued annually by FTA, this report provides information on FTA's research activities that received assistance under the Public Transportation Innovation Program (49 U.S.C § 5312) during FY 2022.

This year, FTA developed a five-year strategic plan, and our vision is a better quality of life for all built upon public transportation excellence. Carefully selected research activities look to the future and identify and assess ways to achieve this vision. FTA is an innovation investor, and the over \$200 million portfolio of active research projects plays a critical role as a catalyst to deploy, demonstrate, and evaluate new technologies and processes and address pressing issues facing transit agencies today and tomorrow.

FTA continues to prioritize safety in transit systems with the largest amount of research funding, \$56 million, focused on this important strategic goal. FTA also continues to leverage transformative technologies that improve America's communities through public transportation excellence with \$46 million allocated to enhancements in mobility, integrated payment, and accessibility, with another \$8 million specifically addressing equity.

Additionally, in this first year of Bipartisan Infrastructure Law implementation, FTA continued a legacy going back to 2006 in advanced technology research related to Low or No emission buses, with \$38 million of research related to economic strength and global competitiveness, and another \$52 million supporting climate and sustainability. Another \$20 million of projects relate to organizational excellence and the Transportation Cooperative Research Program managed by the National Academy of Sciences' Transportation Research Board.

Thank you for your continued support of FTA's Public Transportation Innovation Program. I am proud of the results of our research investments. I hope you take a moment to review this report and learn more about our projects and programs.

Sincerely,

A handwritten signature in blue ink, appearing to read "Nuria I. Fernandez".

Nuria I. Fernandez

Executive Summary

The Federal Transportation Administration (FTA) Public Transportation Innovation Program (49 U.S.C. § 5312) advances innovative public transportation research by selecting, funding, and managing projects and programs of national significance that will improve public transportation. In FY2022, FTA oversaw a portfolio of over \$220 million in active projects that support FTA's vision of a better quality of life for all built upon public transportation excellence, as well as FTA's mission to improve America's communities through Public Transportation.

Research activities evolve through a statutory four-phase research-to-practice pipeline process, as seen in Figure 1, moving from the early research of promising ideas to evaluation and implementation.

Figure 1 FTA Pipeline Phased Approach



- **Research** – developing and deploying new and innovative ideas, practices, and approaches.
- **Innovative Development** – improving public transportation systems nationwide to provide more efficient and effective delivery of public transportation services through technology and technological capacity improvements.
- **Demonstration and Deployment** – enabling early deployment and demonstration of innovations in public transportation with broad applicability, including low or no emission vehicle deployment.
- **Evaluation and Implementation** – analyzing project results and plans for broad-based implementation of research findings.

The strategic research goals for FTA in FY 2022 were to facilitate equitable, accessible mobility, improve and leverage transit to reduce climate impacts, and enable a safe and secure public transit system. As the FTA Annual Modal Research Plan for FY 2022 (<https://www.transportation.gov/administrations/assistant-secretary-research-and-technology/federal-transit-administration-2022>) noted, as America transitions to a post-pandemic future, research and innovation is playing an increasingly important role as public transit reinvents itself and adapts to new work and travel patterns while tackling historic inequities, reducing greenhouse gas emissions, and accelerating equitable economic growth.

FTA's innovative research activities align with the U.S. Department of Transportation (DOT) strategic goals of safety, equity, climate and sustainability, economic strength and global competitiveness, transformation, and organizational excellence. This report is organized around these goals and each project is categorized by the primary DOT strategic goal the research is addressing. Below are descriptions of how FTA's research activities are furthering the DOT strategic goals:

- **Safety** – to research new technologies, solutions, and practices to reduce injuries and fatalities and to improve safety culture with the use of technological advancements and innovations. To operate transit systems in a safer manner through the application of advanced technologies and innovative practices that reduce transit system cybersecurity risks, threats, and vulnerabilities. Additionally, FTA’s transit automation research in automated advanced driver assistance systems and automated systems in maintenance years is furthering safety both for transit employees and riders.
- **Equity** – to uncover the next iteration of the most promising technologies, practices, programs, and strategies to accelerate and lead public transportation transformation toward a more equitable and sustainable future.
- **Climate and Sustainability** – to harness novel renewable energy methods and advance research and innovations in climate solutions to reduce carbon footprint, tackling the climate crisis by ensuring that public transportation plays a central role in the solution.
- **Economic Strength and Global Competitiveness** – to improve the efficiency, effectiveness, and quality of the FTA Bus Testing Program through adaptation of new bus technologies and testing methodologies.
- **Transformation** – to advance new and emerging technologies and concepts to improve transit operations, field integrated cashless multi-modal payment systems, and provide real-time information for trip planning and ride options for travels and understand new travel patterns and trends.
- **Organizational Excellence** – to deploy proven research solutions to improve transit service delivery. In addition, the program will continue to facilitate the implementation of research and technology development and to advance the interests of public transportation, monitor, report on, and improve outreach efforts to drive research to practice.

In FY 2022, FTA actively managed \$220 million in research funding. These funds are from multiple fiscal years and included \$56 million for Safety, \$8 million for Equity, \$46 million for Transformation, \$38 million for Economic Strength and Global Competitiveness, \$52 for Climate and Sustainability, \$4 million for Organizational Excellence, and \$16 million Transportation Cooperative Research Program.

FTA also began new initiatives based on changes the Bipartisan Infrastructure Law (BIL) made to the Public Transportation Innovation Program. These initiatives included beginning to craft the Accelerating Advanced Digital Construction Management Program and collaborating with the Low or No Emissions Component Testing Centers at Ohio State and Auburn University to conduct directed technology research related to advanced vehicle technologies that provide advancements to the entire public transportation industry.

A complete list of all FTA innovative research programs and projects receiving assistance in FY 2022 is noted in Table 1. Each project is categorized by the primary DOT strategic goal the research supports. Figure 3 shows the location of FTA’s innovative research programs and projects.

Table 1 Complete List of FY 2022 Active FTA Research Programs and Projects

DOT Strategic Area	Project Title	FTA Funding
Safety	Advanced Driver Assistance Systems (ADAS) for Transit Buses Demonstration & Automated Transit Bus Maintenance and Yard Operations Demonstration	\$6,500,000
Safety	Public Transportation COVID-19 Research Demonstration Grant Program	\$15,780,056
Safety	Innovations in Transit Public Safety Projects	\$3,362,874
Safety	Safety Risk Management (SRM) and Analysis	\$2,000,000
Safety	Redesign of Transit Bus Operator Compartment to Improve Safety, Operational Efficiency, and Passenger Accessibility (Bus Operator Compartment) Program	\$1,600,000
Safety	FY 2020 Safety Research and Demonstration (SRD) Program	\$7,513,656
Safety	FY 2020 Safety Research and Demonstration (SRD) Program Evaluation	\$700,000
Safety	FY 2016 Safety Research and Demonstration (SRD) Program	\$7,646,669
Safety	FY 2016 Safety Research and Demonstration (SRD) Program Evaluation	\$750,000
Safety	Innovative Safety, Resiliency, and All-Hazards Emergency Response and Recovery (SRER) Program	\$4,214,014
Safety	Real-Time Transit Infrastructure and Rolling Stock Condition Assessment Demonstration Program	\$1,368,816
Safety	Track Asset Management Demonstration	\$4,225,000
Equity	Mobility, Access, and Transportation Insecurity	6,000,000
Equity	Human Services Coordination Research (HSCR) Deployment Program	\$1,802,562
Transformation	Enhancing Mobility Innovation (EMI) Program	\$4,050,251
Transformation	Mobility NeXt Research Design and Implementation	\$2,000,000
Transformation	Integrated Mobility Innovation (IMI) Demonstration Program	\$19,082,420
Transformation	Accelerating Innovative Mobility (AIM) Program	\$13,774,500
Transformation	Mobility Innovation Demonstration Programs Evaluation	\$3,050,000
Transformation	Innovative Technology and Mobility Solutions Project Evaluation	\$300,000
Transformation	Transit Cost and Delivery Project	\$469,565
Transformation	Energy Efficient Mobility Systems Program	\$1,000,000
Transformation	Mobility on Demand (MOD) Sandbox	\$605,922
Transformation	Mobility on Demand (MOD) Sandbox Evaluation	\$250,000
Transformation	Strategic Transit Automation Research (STAR) Plan Enabling Research and Implementation	\$350,000
Transformation	Transit Bus Automation Strategic Partnerships	\$600,000
Transformation	The Potential Uses of Advanced Data Science Methods in Transit Planning and Operations	\$300,000
Transformation	Flexing Funds for Transit	\$300,000
Economic Strength and Global Competitiveness	Low or No (LoNo) Emission Vehicle Component Assessment (LoNo-CAP)	\$34,000,000
Economic Strength and Global Competitiveness	Small Business Innovation (SBIR)	\$3,781,065
Climate and Sustainability	Low or No (LoNo) Emission Vehicle Deployment Program*	\$47,969,437

DOT Strategic Area	Project Title	FTA Funding
Climate and Sustainability	Transit Vehicle Innovation Deployment Centers (TVIDC)	\$4,125,000
Organizational Excellence	Information Dissemination and Outreach Program	\$1,600,000
Organizational Excellence	Research Evaluation Implementation Plan	\$480,000
Organizational Excellence	National Bus Rapid Transit Institute (NBRTI)	\$1,706,250
TCRP	Transit Cooperative Research Program (TCRP)	\$16,578,592
Total		\$219,836,649

*In 2016, the LoNo Program matured from a research program to a capital discretionary program authorized by Federal public transportation law (49 U.S.C. § 5339(c)). However, the research demonstration program continued, In FY 2022 FTA is still administering and overseeing some of these projects funded under the LoNo Research Program.

Figure 2 Location of FTA Research Programs and Project Recipients



Requirements for This Report

Federal public transportation law (49 U.S.C. § 5312(f)) requires FTA to post an annual report on research available to the public on its website not later than the first Monday in February of each year. This report must include:

- A description of each project that received assistance under this section during the preceding fiscal year.
- An evaluation of each project that received assistance in the preceding year, including any evaluation conducted for demonstration and deployment projects.
- And a strategic research roadmap proposal for allocations of amounts for assistance under this section for the current and subsequent fiscal year, including anticipated work areas, proposed demonstrations, and strategic partnership opportunities.

Program and Project Descriptions

This section of the report includes detailed descriptions of programs and projects that received assistance in FY 2022. Definitions of assistance include the planning and development of a new project, the award of a new project, management of an existing project, or evaluation of a project. Program and project descriptions are categorized by DOT strategic area in FY 2022 — Safety, Equity, Climate and Sustainability, Economic Strength and Global Competitiveness, Transformation, and Organizational Excellence — and conclude with a section on supporting programs and other initiatives. Individual program and project descriptions include title, recipient(s), performance indicators (results), evaluation, and FTA funding.

Safety

Description:

FTA's Safety research program seeks to advance transit safety at all levels by leveraging innovative technologies such as AI, sensors, and machine learning to monitor, predict and plan ways to reduce worker injuries and fatalities; advanced technologies that can increase rider, bicyclist, and pedestrian safety. The program continued to develop and manage initiatives to improve the safety of passengers, employees, emergency responders, and all others who encounter the public transportation system. FTA supported research on technologies and practices to reduce fatalities and injuries, improve safety culture, identify hazards and risk, and assess processes that help transit agencies operate public systems in a safer manner.

Objectives:

The FTA Safety research program sought to:

- Support research to reduce fatalities and injuries
- Improve safety culture with the use of technological advancements and innovations

FTA had 12 active Safety programs and projects in FY 2022, as listed in Table 2.

Table 2 *Safety Research Programs and Projects Receiving Assistance from FTA, FY 2022*

Safety Programs	
Project Title	FTA Funding
Advanced Driver Assistance Systems (ADAS) for Transit Buses Demonstration & Automated Transit Bus Maintenance and Yard Operations Demonstration	\$6,500,000
Public Transportation COVID-19 Research Demonstration Grant Program	\$15,780,056
Innovations in Transit Public Safety Projects	\$3,362,874
Safety Risk Management (SRM) and Analysis	\$2,000,000
Redesign of Transit Bus Operator Compartment to Improve Safety, Operational Efficiency, and Passenger Accessibility (Bus Operator Compartment) Program	\$1,600,000
FY 2020 Safety Research and Demonstration (SRD) Program	\$7,513,656
FY 2020 Safety Research and Demonstration (SRD) Program Evaluation	\$700,000
FY 2016 Safety Research and Demonstration (SRD) Program	\$7,646,669
FY 2016 Safety Research and Demonstration (SRD) Program Evaluation	\$750,000
Innovative Safety, Resiliency, and All-Hazards Emergency Response and Recovery (SRER) Program	\$4,214,014
Real-Time Transit Infrastructure and Rolling Stock Condition Assessment Demonstration Program	\$1,368,816
Track Asset Management Demonstration	\$4,225,000
Total	\$55,661,085

Title: *Advanced Driver Assistance Systems (ADAS) for Transit Buses Demonstration & Automated Transit Bus Maintenance and Yard Operations Demonstration*

Recipients: Transit authorities partnering with local governments, educational institutions, and private entities

Project Description:

ADAS aims to establish the feasibility of automated transit bus maintenance, yard operations, use cases, and improve understanding of the impacts. The goals of the demonstrations are to: 1) increase safety and efficiency; 2) create a testbed for study of technical issues, user acceptance, operational and maintenance costs, workforce training and transition, and institutional issues; and 3) spur technology development.

Results:

On September 22, 2022, FTA announced a Notice of Funding Opportunity (NOFO) for \$6.5 million to solicit proposals from organizations interested in advancing research into transit bus automation through demonstrations of ADAS and automation of bus movements in transit bus yards. FTA also hosted a webinar for applicants on October 6, 2022. Selections from this NOFO will be made in FY 2023. The demonstration projects will help determine potential benefits, costs, and other impacts of transit bus automation. The demonstration projects will also provide transit agencies with resources, guidance, and tools to make informed deployment decisions.

Project/Program Evaluation:

The program will have an independent evaluation as statutorily required.

FTA Funding: \$6,500,000

Title: *Public Transportation COVID-19 Research Demonstration Grant Program*

Recipients: Transit authorities, state and local governments, and state DOTs in partnership with other transit providers (see Table 3)

Project Description:

The COVID-19 Research Demonstration Grant Program develops, deploys, and demonstrates innovative solutions that improve the operational efficiency of transit agencies and enhance the mobility of transit users affected by the COVID-19 pandemic. This program is developing innovative solutions in four major areas: (1) vehicle, facility, equipment, and infrastructure cleaning and disinfection; (2) exposure mitigation measures; (3) innovative mobility such as contactless payments; and (4) actions that strengthen public confidence in taking transit trips.

Results:

Example of relevant results in FY 2022 included the Vermont Transportation Agency, which ran a series of experiments to assess the effectiveness of Ultraviolet-C (UVC) lamps in killing viruses; the research and analysis is still in progress. The City of Colorado Springs completed the installation of the driver barriers for the fixed-route buses, monitoring the air testing strategy. The Ames Transit Agency installed Automatic Passenger Count (APC) in 68 buses to allow transit riders to view the capacity of buses and thereby strengthen rider confidence to return to public transportation.

Project/Program Evaluation:

The program will have an independent evaluation as statutorily required.

FTA Funding: \$15,780,056

Table 3 COVID-19 Research Demonstration Grant Projects Receiving Assistance from FTA, FY 2022

Project Title	Project Recipient	City and State	FTA Award
COVID-19 Research Demonstration Project	Alabama Department of Transportation	Montgomery, AL	\$300,000
Rock Region METRO COVID-19 Research	Rock Region Metropolitan Transit Authority	Little Rock, AR	\$288,750
COVID-19 Research Demonstration Grant Program	City of Tucson	Tucson, AZ	\$600,000
5312 National Transit Adaptation Strategy	San Francisco Municipal Transportation Agency	San Francisco, CA	\$450,000
COVID-19 Research Demonstration - Transit Vehicle and Facility Enhancements to Mitigate COVID-19 Exposure	City of Colorado Springs	Colorado Springs, CO	\$600,000
Voice Activated Ticket Vending Machine Project	Connecticut Department of Transportation	Hartford, CT	\$450,000
COVID-19 Research and Demonstration Project	Washington Metropolitan Area Transit Authority	Washington, DC	\$600,000
R&D Bus Barrier- Testing and Studying of Protective Barriers	Delaware Transit Corporation	Wilmington, DE	\$450,000

Project Title	Project Recipient	City and State	FTA Award
Tri-Rail On-Demand Microtransit Demonstration Project	South Florida Regional Transportation Authority	Pompano Beach, FL	\$167,603
Statewide Contact-less Payment System	Georgia Department of Transportation	Atlanta, GA	\$450,000
Automatic Passenger Count (APC) Research Project	Ames Transit Agency	Ames, IA	\$450,000
COVID-19 Research Demonstration Grant - Cybersecurity Resilience Assessment Tool	Rock Island County Metropolitan Mass Transit District	Moline, IL	\$400,000
Contactless Payments with Electronic Verification	South Bend Public Transportation Corporation	South Bend, IN	\$122,638
Contactless Fare Payment System	Capital Area Transit System	Baton Rouge, LA	\$300,000
Contactless Payment System for On-Demand Rides	Montachusett Regional Transit Authority	Fitchburg, MA	\$337,500
Baltimore County Public Transportation COVID-19 Research Demonstration Discretionary	Baltimore County	Baltimore, MD	\$12,096
Ride On Crowd Sourcing System (ROCSS)	Montgomery County Maryland	Rockville, MD	\$450,000
Michigan DOT's COVID-19 Research Demonstration Application for Automated Wheelchair Securement Systems and a Smart Phone App	Michigan Department of Transportation	Lansing, MI	\$600,000
Western Minnesota Contactless Payment Project	Minnesota Department of Transportation	St. Paul, MN	\$450,000
Statewide Safe and Reliable Return-to-Work Vanpool Program	Missouri Department of Transportation	Jefferson City, MO	\$450,000
KCATA Contactless Fare Validation and Integration Project	Kansas City Area Transportation Authority	Kansas City, MO	\$450,000
Commonwealth of the Northern Mariana Islands COVID-19 Research Demonstration	Commonwealth Office of Transit Authority	Saipan, CNMI	\$300,000
Choctaw Regional Transportation and Maintenance COVID-19 Research Demonstration Project	Mississippi Band of Choctaw Indians Choctaw Transit	Choctaw, MS	\$300,000
Contactless and Cashless On-Board Fare Payment System	City of Fayetteville	Fayetteville, NC	\$355,000
Improving Safety and Security via Video Analytics in the age of COVID-19 and Beyond	New Jersey Transit Corporation	Newark, NJ	\$600,000
5312 Public Transportation COVID-19 Demonstration - New EMV (Europay, Mastercard and Visa) Certified Electronic Validators for Contactless Payment on Fixed Route	Regional Transportation Commission of Southern Nevada	Las Vegas, NV	\$500,000
Transit's Path Forward in a Pandemic	New York Metropolitan Transportation Authority	New York, NY	\$600,000
Multimodal Planning in the COVID-19 Environment to Improve Public Confidence	Central Ohio Transit Authority	Columbus, OH	\$600,000
Healthy and Reliable Transit	City of Portland	Portland, OR	\$439,950
Mass Transit Vehicle Air Ventilation and Purification Technologies Evaluation	Southeastern Pennsylvania Transportation Authority	Philadelphia, PA	\$584,618
Regional Contactless Mobile Ticketing and Trip Planning App	Berkeley-Charleston-Dorchester Council of Governments	Charleston, SC	\$575,000

Project Title	Project Recipient	City and State	FTA Award
5312 Public Transportation COVID-19 Research Demonstration	Nashville Metropolitan Transit Authority	Nashville, TN	\$585,000
El Paso Sun Metro Innovative Payment Mobility System	City of El Paso, Mass Transit Department dba Sun Metro	El Paso, TX	\$225,000
UTA Electronic Voucher (eVoucher) Phase Two Expansion	Utah Transit Authority	Salt Lake City, UT	\$508,200
COVID-19 Transit Recovery Toolkit: Strategies Handbook and Statewide Marketing Campaign	Virginia Department of Rail and Public Transportation	Richmond, VA	\$247,500
Vermont UVC Research Grant	Vermont Agency of Transportation	Montpelier, VT	\$581,201
The Transit Validation Project	King County Metro	Seattle, WA	\$400,000
Total			\$15,780,056

Title: *Innovations in Transit Public Safety Projects*

Recipients: State and local governmental entities, transit authorities, non-profit organizations, or a consortium of entities, including providers of public transportation (see Table 4)

Project Description:

This effort is part of FTA’s Human Trafficking Awareness and Public Safety Initiative. This program supports the development of innovative products and services to prevent human trafficking and reduce crime on public transit vehicles and in facilities. The goals of the projects are to: 1) develop innovative projects to assist transit agencies with identifying and adopting specific measures to address public safety in transit systems, including crime prevention, human trafficking, and operator assault; and 2) maximize the transit industry’s collective impact to address human trafficking and other public safety concerns.

Results:

Examples of relevant results for FY 2022 include the City of Greensboro, which utilized this federal funding award to purchase an application and subscription to a real-time security reporting to enable immediate reporting of security issues and incidents from riders, employees, and the public. The Pinellas Suncoast Transit Authority provided training to 163 front line employees who completed the TAT Human Trafficking Course online. The training widened the horizon for awareness of Human Trafficking concerns.

FTA Funding: \$3,362,874

Table 4 *Innovations in Transit Public Safety Projects Receiving Assistance from FTA, FY 2022*

Project Title	Project Recipient	City and State	FTA Award
Mountain Line 5312 Transit Innovations FY 2021 - 2023	Northern Arizona Intergovernmental Public Transportation Authority	Flagstaff, AZ	\$87,612
Sun Tran Public Safety Initiative	City of Tucson	Tucson, AZ	\$221,100
Santa Clara Valley Transportation Authority (VTA) - Human Trafficking Prevention Program	Santa Clara Valley Transportation Authority	Santa Clara, CA	\$350,000
Develop and Implement a Public Service Outreach Campaign: Human Trafficking	SunLine Transit Agency	Thousand Palms, CA	\$37,320
Washington Metropolitan Area Transit Authority (WMATA) FFY 19 Section 5312 Public Safety Pilot Study	Washington Metropolitan Area Transit Authority	Washington, DC	\$176,000
Innovations in Transit Public Safety - Human Trafficking Awareness	Hillsborough Transit Authority	Tampa, FL	\$100,240
Pinellas Suncoast Transit Authority, Inc. (PSTA) 5312 FY 2019 Innovation in Transit Public Safety Grant	Pinellas Sound Coast Transit	St. Petersburg, FL	\$43,630
Public Safety Innovation - Live View Camera Monitoring	Gwinnett County Board of Commissioners	Lawrenceville, GA	\$352,000
Section 5312 Innovations in Transit Public Safety	Capital Area Transportation Authority	Lansing, MI	\$75,000
Train Front Line Personnel on Human Trafficking	Bi-State Development Agency	St. Louis, MO	\$187,500
Innovations in Public Safety, City of Greensboro, NC	City of Greensboro	Greensboro, NC	\$34,400
Statewide Educational and Training Program	North Carolina Department of Transportation	Raleigh, NC	\$120,000
Human Trafficking in Public Transit Awareness Campaign	Regional Transportation Commission of Southern Nevada	Las Vegas, NC	\$160,000
Innovation in Transit Public Safety - Human Trafficking Prevention	Toledo Area Regional Transit Authority	Toledo, OH	\$474,232
Crime Prevention and Public Safety Rolling Classroom for Statewide Training	Grand Gateway EDA Pelivan Transit	Big Cabin, OK	\$350,475
TriMet Operator Safety & Rider Awareness	Tri- County Metropolitan Transportation District of Oregon	Portland, OR	\$151,052
Public Safety Awareness Marketing and Public Outreach Campaign of Public Safety Officers on Transit Vehicles	Central Midlands Regional Transit Authority	Columbia, SC	\$151,776
Eliminating the Blind Spots on Human Trafficking	Greenville Transit Authority	Greenville, SC	\$20,937
Human Trafficking Awareness & Public Safety	South Dakota Department of Transportation	Spearfish, SD	\$60,000
Training and Awareness Campaign Against Human Trafficking	Dallas Area Rapid Transit	Dallas, TX	\$49,600
Bus Monitoring Equipment (FY 19 Innovations in Transit Public Safety)	Metropolitan Transit Authority of Harris County	Houston, TX	\$160,000
Total			\$3,362,874

Title: *Safety Risk Management (SRM) and Analysis*

Recipients: The Volpe Center

Program Description:

This program supports FTA by analyzing data to assist in the identification, assessment, and prioritization of transit safety risks as well as by monitoring and evaluating data related to mitigation strategies. Risk management is dependent on transit industry data and requires FTA to establish safety data identification and collection. The goals are to: 1) assess data needs and data quality and identify data gaps for assessing transit risks; and 2) provide recommendations for addressing data gaps and improving data quality.

Results:

Initial activities will start in FY 2023. The Volpe Center will develop a project management plan (PMP) for this project, providing more detailed information on the work to be conducted for each task.

FTA Funding: \$2,000,000

Title: *Redesign of Transit Bus Operator Compartment to Improve Safety, Operational Efficiency, and Passenger Accessibility (Bus Operator Compartment) Program*

Recipients: Transit authorities, local governments, non-profit organizations, and state DOTs (see Table 5)

Program Description:

The purpose of this program is to develop new transit bus operator compartment designs in partnership with bus manufacturers, technology vendors, vehicle engineering and design firms, and transit agencies. The goals are to: 1) redesign bus operator compartments to improve bus operator and public safety; and 2) improve bus operator access to vehicle instruments and controls without hindering the accessibility of passengers. This program is researching and developing new transit bus operator compartment designs to enhance protection of operators from assault and improve their view of the road, while still allowing them to interact with passengers, including people with disabilities and those in need of special assistance.

Results:

In FY 2022, the International Transportation Learning project team presented the final design to FTA during an interactive webinar with urban transit agencies about implementing Bus of the Future design concepts in bus acquisitions or refurbishments. The New Orleans Regional Transit Authority installed barriers on 108 total buses, with two buses remaining to be completed.

FTA Funding: \$1,600,000

Table 5 *Redesign of Transit Bus Operator Compartment to Improve Safety, Operational Efficiency, and Passenger Accessibility (Bus Operator Compartment) Active Projects in FY 2022*

Project Title	Project Recipient	City and State	FTA Award
Implementation of Adding Shields and Barriers on Bus Fleet to Protect Bus operators	New Orleans Regional Transit Authority (NORTA)	New Orleans, LA	\$600,000
Redesign of Transit Bus Operator Compartment to Improve Operator and Passenger Safety Project	International Transportation Learning Center	Silver Spring, MD	\$1,000,000
Total			\$1,600,000

Title: FY 2020 Safety Research and Demonstration (SRD) Program

Recipients: Transit authorities partnering with local governments, educational institutions, and private entities (see Table 6)

Program Description:

The FY 2020 SRD Program is assessing cutting-edge technologies and innovative approaches to safety, focusing on the demonstration of technologies, safer designs, and innovative approaches to eliminate or mitigate safety hazards associated with preventing and mitigating suicide and trespassing hazards on rail transit systems and improving the operational safety of shared corridor fixed guideway systems, including highway-rail grade crossing safety. The program goals are to: 1) explore advanced technologies, designs and/or practices to mitigate and prevent safety hazards on rail transit systems; and 2) evaluate the cost-effectiveness and practicality of potential solutions.

Results:

FTA awarded all eight cooperative agreements in FY 2021. In FY 2022, six projects completed the Data Management Plan (DMP) and are in the planning phase of the demonstration with procurement, preliminary testing, and installation of the equipment on the rail cars, grade crossings or right of ways.

Project/Program Evaluation:

This demonstration program will have an independent evaluation with an Interim Evaluation Report within two years of the awards, and a final evaluation report upon completion of all projects.

FTA Funding: \$7,513,656

Table 6 *FY 2020 Safety Research and Demonstration (SRD) Active Projects in FY 2022*

Project Title	Project Recipient	City and State	FTA Award
CTA's Third Rail Safety Enhancement Pilot Project	Chicago Transit Authority (CTA)	Chicago, IL	\$1,183,091
MDOT MTA Track Intrusion Detection and Alert System	Maryland Department of Transportation (MDOT)	Hanover, MD	\$675,000
An Artificial Intelligence-Aided System for Automated Detection of Trespassing at Grade Crossings	Rutgers, The State University of New Jersey	New Brunswick, NJ	\$357,072
Designed for Impact- Innovative Approach to Train Front-end Safety and Collision Fatality Reduction	New York Metropolitan Transportation Authority	New York, NY	\$3,450,907
Watch Out for CityLYNX! Be Streetcar Smart	City of Charlotte	Charlotte, NC	\$56,080

Project Title	Project Recipient	City and State	FTA Award
TriMet Risk Ranking Tool and Data Validation for Grade Crossing Safety Enhancement	Tri-County Metropolitan Transportation District of Oregon (Tri-Met)	Portland, OR	\$825,506
Transit Track Worker & First Responder Safety Protection Demonstration Project	Southeastern Pennsylvania Transportation Authority (SEPTA)	Philadelphia, PA	\$742,000
Utah Transit Authority, Suicide Prevention Research and Demonstration Project	Utah Transit Authority (UTA)	Salt Lake City, UT	\$224,000
Total			\$7,513,656

Title: *FY 2020 Safety Research and Demonstration (SRD) Program Evaluation*

Recipient: University of South Florida (USF) Center for Urban Transportation Research (CUTR)

Project Description:

This project supports FTA’s FY 2020 SRD Program and meets the statutory requirement of independent research demonstration evaluation under Federal public transportation law (49 U.S.C. § 5312 (e)(4)). The goals of this project are to 1) evaluate the FY 2020 SRD projects; 2) assess the contribution of each project towards advancing FTA’s SRD program goals of exploring advanced technologies, designs, or practices to mitigate and prevent safety hazards on rail transit systems and evaluating the cost-effectiveness and practicability of potential solutions; and 3) estimate the national-level impact of FY 2020 SRD projects. Each project-level evaluation has a set of performance measures established by FY 2020 SRD award recipients in coordination with the SRD evaluation team.

Results:

In FY 2022, CUTR worked with FTA to review the six DMPs submitted by each of the project teams. CUTR also worked with FTA project managers on tracking the progress of the project and reviewing the data generated by those projects.

FTA Funding: \$700,000

Title: *FY 2016 Safety Research and Demonstration (SRD) Program*

Recipients: Transit authorities partnering with local governments, educational institutions, and private entities (see Table 7)

Project Description:

The FY 2016 SRD Program funded cutting-edge technologies and innovative approaches to safety, focusing on the demonstration of technologies and safer designs, and pursuing innovative approaches to eliminate or mitigate safety hazards related to collision avoidance and mitigation as well as transit worker safety protection. The program goals are to: 1) explore advanced technologies to prevent transit vehicle collisions; 2) enhance the safety of transit services by incorporating safer design elements; and 3) evaluate the cost-effectiveness and practicality of potential solutions.

Results:

In FY 2022, Pierce Transit completed the installation of solid-state LiDAR-based automated collision avoidance system and related data capture equipment. The demonstration, data collection, and evaluation were completed. *The Pierce Transit Automated Collision Avoidance and Mitigation Safety Research and Demonstration Project* final report was posted in June 2022 (<https://rosap.ntl.bts.gov/view/dot/62636>). The project completed benchmarking of representative samples of the New York City Transit (NYCT) bus fleet and completed 3-D laser scan modeling of four representative buses (New Flyer, Proterra, NOVA and Orion). The project installed newly redesigned mirror on 30 buses and completed the demonstration project. The *Transit Bus Mirror Configuration Pilot Project* final technical report was posted in June 2022 (<https://rosap.ntl.bts.gov/view/dot/62634>).

FTA Funding: \$7,646,669

Table 7 FY 2016 SRD Projects Receiving Assistance from FTA in FY 2022

Project Title	Project Recipient	City and State	FTA Award
Pierce Transit Collision Avoidance and Mitigation Safety Demonstration	Pierce County Public Transportation Benefit Area Authority	Lakewood, WA	\$1,664,894
Transit Bus Mirror Configuration Research and Development	New York Metropolitan Transit Authority	New York, NY	\$880,035
CTA Operations Control Center Safety Enhancements Project	Chicago Transit Authority	Chicago, IL	\$1,078,300
Fixed-Location Train Detection and Worker Warning System Demonstration	Maryland Department of Transportation	Baltimore, MD	\$688,448
Collision Avoidance and Mitigation Technologies on LA Metro Bus Pilot	Los Angeles County Metropolitan Transportation Authority	Los Angeles, CA	\$1,450,000
Track Inspector Location Awareness with Enhanced Transit Worker Protection Pilot	Washington Metropolitan Area Transit Authority	Washington, DC	\$1,884,992
Total			\$7,646,669

Title: FY 2016 Safety Research and Demonstration (SRD) Program Evaluation

Recipient: University of South Florida (USF) Center for Urban Transportation Research (CUTR)

Project Description:

This project supports FTA’s FY 2016 SRD Program and meets the statutory requirement of independent research demonstration evaluation under Federal public transportation law (49 U.S.C. § 5312 (e)(4)). The goals of this project are to: 1) evaluate the FY 2016 SRD projects; 2) assess the contribution of each project towards advancing FTA’s FY 2016 SRD Program goals of improved collision avoidance and increased worker safety; and 3) estimate the national-level impact of FY 2016 SRD projects. Each project-level evaluation has a set of performance measures established by FY 2016 SRD award recipients in coordination with the SRD evaluation team.

Results:

FTA and the independent evaluator are working with the recipients in collecting lessons learned, analysis of data generated by the projects, reviewing the final report, assisting with knowledge transfer activities, and conducting project closeout interviews, as the projects come to completion.

FTA Funding: \$750,000

**Title: *Innovative Safety, Resiliency, and All-Hazards
Emergency Response and Recovery (SRER) Program***

Recipients: Local governments, transit authorities, educational institutions, and private entities (see Table 8)

Project Description:

The SRER program assesses innovative approaches to eliminate or mitigate safety hazards, improve infrastructure resiliency, and improve all-hazards emergency response and recovery. SRER projects focused on reducing the risk of transit-related injuries and fatalities and identified the most promising methods and/or technologies to deploy in public transit systems to improve resiliency. Projects demonstrated how to mitigate natural disasters and/or catastrophic events; and improve communication with emergency responders in the event of emergencies, disruptions, and major failures. The program goals were to 1) improve operational safety; 2) increase infrastructure or equipment resiliency; and 3) advance all-hazards emergency response and recovery methods.

Results:

All projects under SRER have published their technical final report on FTA website (<https://www.transit.dot.gov/research-innovation/fta-reports-and-publications>). The results of these projects, as noted in the respective reports, enable transit agencies to incorporate lessons learned from the demonstration projects into their own efforts to improve safety, resiliency to natural disasters, and emergency response. All the projects under the program included extensive knowledge transfer or information dissemination activities. Examples of those activities are TRB annual conferences, APTA conferences, FTA sponsored Transit Standards Working Group, FTA Safety Office newsletters, Transit Advisory Committee for Safety (TRACS) presentation, etc.

Project/Program Evaluation:

Each project report contains its independent evaluation as an appendix.

FTA Funding: \$4,214,014

Table 8 *Innovative Safety, Resiliency, and All-Hazards Emergency Response and Recovery (SRER) Research Demonstration Projects Receiving Assistance from FTA, FY 2022*

Project Title	Project Recipient	City and State	FTA Award
Demonstration and Commercialization of LRV Bumper for Enhanced Safety in Shared Right-of-Way Street Environments	Applied Research Associates	Albuquerque, NM	\$1,323,414
Coordinated Transit Response Planning and Operations Support Tools for Mitigating Impacts of All-Hazards Emergency Events	University of Chicago	Chicago, IL	\$2,890,600
Total			\$4,214,014

Title: *Real-Time Transit Infrastructure and Rolling Stock Condition Assessment Demonstration Program*

Recipient: Transit authorities, local governments, non-profit organizations, and state DOTs (see Table 9)

Project Description:

This demonstration program supports innovative approaches to eliminate or mitigate known infrastructure deficiencies in public transportation via innovative technologies and designs using state-of-the-art technologies, such as smart sensors, unmanned aerial vehicles, big data analytics and other technologies that can automatically measure, record, and report in real-time detailed information regarding the condition of the infrastructures. The goals of the program are to: 1) explore advanced cutting-edge technologies that can provide real-time condition assessment of transit capital and facilities; 2) allow a more effective way for transit agencies to assess, detect, monitor and track deficiencies and defects related to infrastructure and rolling stock; and 3) evaluate the cost-effectiveness and the practicality of proposed state-of-the-art solutions.

Results:

In FY 2022, four projects have completed the Data Management Plan and are in the planning phase of the demonstration with procurement, preliminary testing and installation of the equipment on tracks, buses and rail cars. The Dallas Area Rapid Transit conducted a presentation by demonstrating how drones, laser imaging, and photogrammetry enhance rider safety and monitor the health of transit infrastructure during the Latinos in Transit Conference on September 24, 2022.

FTA Funding: \$1,368,816

Table 9 Real-Time Transit Infrastructure and Rolling Stock Condition Assessment Demonstration Program Receiving Assistance from FTA in FY 2022

Project Title	Project Recipient	City and State	FTA Award
Real Time Track and Vehicle Health Monitoring through Rail-mounted Load Quantification Smart Sensors	Board of Trustees of the University of Illinois	Champaign, IL	\$395,000
Mobile LiDAR: Modernizing Condition Assessments- An innovative approach to data acquisition	Maryland Department of Transportation	Baltimore, MD	\$150,000
The Digital Twin Paradigm for Real-Time Transit Infrastructure Maintenance	Regional Transportation Commission of Washoe County	Reno, NV	\$131,661
SEPTA Regional Rail Automated Wire Scan	Southeastern Pennsylvania Transportation Authority (SEPTA)	Philadelphia, PA	\$170,000
DART Real-time Infrastructure and Asset Digital Condition Assessment Project	Dallas Area Rapid Transit (DART)	Dallas, TX	\$184,000
Polarized Infrared and Optical Imaging System for Transit Infrastructure Condition Assessment	Utah Transit Authority (UTA)	Salt Lake City, UT	\$338,155
Total			\$1,368,816

Title: Track Asset Management Demonstration

Recipients: Metropolitan Atlanta Rapid Transit Authority (MARTA)

Project Description:

The purpose of this project is to demonstrate an autonomous track inspection system (ATIS) to help FTA disseminate innovative track asset management practices to the transit industry. Its goals are to: 1) demonstrate the transferability of an ATIS system to transit; 2) demonstrate its effectiveness compared to existing transit track management practices (track inspection, data analysis, data management and maintenance); and 3) evaluate the return on investment of the system at MARTA.

Results:

In FY 2022, MARTA Worked Train continued to operate during Phase II to allow data to be gathered by Phase I technologies and analyzed by the team for final evaluation. Beam structural component redesign and fabrication efforts completed in May 2022 and were shipped and installed in July 2022. On July 26, 2022, MARTA and its partner ENSCO completed Phase 2 Technologies test and performed demonstration to FTA and its evaluator.

Project/Program Evaluation:

The program is conducting an independent and continuous evaluation during the project performance period. The evaluator will include detailed information about design, issues, and resolutions in its final evaluation report.

FTA Funding: \$4,225,000

Equity

Description:

FTA's equity projects and programs are designed to improve public transportation services for communities that have historically had more limited access to public transportation. The program provides for transportation activities for lower-density and lower-income portions of metropolitan areas and adjoining rural areas.

Objective:

- To uncover the next iteration of the most promising technologies, practices, programs, and strategies to accelerate and lead public transportation transformation toward a more equitable and sustainable future.

FTA had two active Equity programs and projects in FY 2022, as shown in Table 10.

Table 10 Equity Programs and Projects Receiving Assistance from FTA, FY 2022

Equity Programs	
Project Title	FTA Funding
Mobility, Access, and Transportation Insecurity	\$6,000,000
Human Services Coordination Research (HSCR) Deployment Program	\$1,802,562
Total	\$7,802,562

Title: *Mobility, Accessibility, and Transportation Insecurity (MATI)*

Recipients: Transit authorities partnering with local governments, educational institutions, and private entities

Project Description:

The purpose of MATI is to explore strategies to improve people's mobility and access to daily needs and evaluate outcomes and impacts upon individuals and communities. MATI aims to support an equitable, integrated transportation system that meets the transportation needs for low-income individuals and/or communities of need.

Results:

On August 9, 2022, FTA announced a NOFO to solicit proposals for an organization to lead the MATI: Creating Links to Opportunity Demonstration Research program. The NOFO makes \$6 million available in FY 2021 funds. Project proposals are due October 11, 2022. FTA also hosted a webinar for potential applicants on August 24, 2022. Frequently Asked Questions (FAQs) were posted at <https://www.transit.dot.gov/research-innovation/mobility-access-transportation-insecurity-creating-links-opportunity>.

Project/Program Evaluation:

MATI will have an independent evaluation for each selected project, as statutorily required once the project is active.

FTA Funding: \$6,000,000

Title: *Human Service Coordination Research (HSCR) Deployment Program*

Recipients: Transit authorities, local governments, non-profit organizations, and state DOTs (see Table 11)

Project Description:

The HSCR Deployment Program supports the implementation of innovative strategies to improve human services transportation coordination for older adults, people with disabilities, and low-income individuals. Its goals are to: 1) integrate new mobility tools such as smart phone apps and demand-responsive bus services; 2) improve multi-modal connectivity for older adults, people with disabilities, and low-income individuals; 3) address accessibility issues through innovative technologies and practices; 4) improve the quality of the traveler experience and the transit product; and 5) identify new mobility-enhancing practices and technologies. This program addresses gaps in transportation services.

Results:

The City of Shreveport implemented a new trip booking software and trained riders on its usage. The County of Fulton implemented an Alternative Senior Transportation Service, utilized by 80% of older users. The service made them less isolated, increased mobility to non-emergency medical appointments, and improved their health due to access to medical appointments.

FTA Funding: \$1,802,562

Table 11 *Human Service Coordination Research (HSCR) Projects Receiving Assistance from FTA, FY 2022*

Project	Recipient	City and State	FTA Award
Central Alabama Transportation Resource Center	United Way of Central Alabama, Inc.	Birmingham, AL	\$148,000
Bridging Medical and Healthy Food Access with Transportation in Cochise County, Arizona	Southeastern Arizona Governments Organization	Bisbee, AZ	\$235,852
Alternative Senior Transportation Service using TNCs	County of Fulton	Atlanta, GA	\$243,778
Partners for Enhanced Access to Treatment (PEAT)	Community Action Partnership of Central Illinois	Lincoln, IL	\$40,000
City of Shreveport Paratransit Passenger Portal Project	City of Shreveport	Shreveport, LA	\$54,472
Enhancing Technology Resources for Increased Mobility Options	Maryland Transit Administration	Baltimore, MD	\$240,000
Mobility Solutions for Maine: Building a Multi- Sector Network to Drive Improved Coordination and Access	Greater Portland Council of Governments	Portland, ME	\$240,000
NJ Transit: Transportation for Everyone Videos	NJ Transit	Newark, NJ	\$60,600
Coordinated Volunteer Transportation in Western New York State	Volunteer Transportation Center, Inc.	Watertown, NY	\$145,968
Osage Nation HSCR Project – Increasing Access to Transportation for Targeted Populations	Osage Nation	Pawhuska, OK	\$73,892
Rides Toward Work	Rhode Island Public Transit Authority	Providence, RI	\$150,000

Project	Recipient	City and State	FTA Award
Recovery Rides – Access to Substance Abuse Treatment and Employment	Vermont Agency of Transportation	Montpelier, VT	\$170,000
Total			\$1,802,562

Transformation

Description:

FTA’s Transformation research efforts continued to strengthen the capacity of transit agencies and communities to navigate the dynamic, evolving landscape of personal mobility. FTA leveraged emerging and transformative technologies and facilitated public-private partnerships for a user-centric approach that improves mobility options for all travelers, including travelers with disabilities, travelers from rural areas, and lower-income travelers, and for goods and services.

Objectives:

- Improve transit operations and reduce costs by leveraging public and private assets and technologies.
- Improve personal mobility by identifying and promoting seamless transportation models that engage all modes—public and private—for enhanced mobility for all travelers.

FTA had 14 active Mobility Innovation programs and projects in FY 2022, as shown in Table 12.

Table 12 Transformations Programs and Projects Receiving Assistance from FTA, FY 2022

Transformation Programs and Projects	
Project Title	FTA Funding
Mobility NeXt Research Design and Implementation	\$2,000,000
Enhancing Mobility Innovation (EMI) Program	\$4,050,251
Integrated Mobility Innovation (IMI) Demonstration Program	\$19,082,420
Accelerating Innovative Mobility (AIM) Program	\$13,774,500
Mobility Innovation Demonstration Programs Evaluation	\$3,050,000
Innovative Technology and Mobility Solutions Project Evaluation	\$300,000
Transit Cost and Delivery Project	\$469,565
Energy Efficient Mobility Systems Program	\$1,000,000
Mobility on Demand (MOD) Sandbox	\$605,922
Mobility on Demand (MOD) Sandbox Evaluation	\$250,000
Strategic Transit Automation Research (STAR) Plan Enabling Research and Implementation	\$350,000
Transit Bus Automation Strategic Partnerships	\$600,000
The Potential Uses of Advanced Data Science Methods in Transit Planning and Operations	\$300,000
Flexing Funds for Transit	\$300,000
Total	\$46,132,658

Title: *Mobility NeXt Research Design and Implementation*

Recipients: The Volpe Center

Project Description:

This project is developing a strategic plan for the next iteration of FTA's Mobility Innovation research for a five-year horizon. It is also conducting foundational research in mobility technologies, strategies, and tools. The focus of research is to uncover the next iteration of the most promising technologies, practices, and strategies to accelerate public transportation transformation and advance carefree mobility for all. The program will mobilize Federal and private sector investments in mobility research to advance new models of how transportation is delivered and consumed, leveraging technologies and solutions, supporting public transportation to achieve equitable and climate smart mobility outcomes.

Results:

Initial research activities will start in FY 2023 and will focus on understanding the current state of the practice, including examining existing mobility innovation deployments and pilots to identify research gaps and opportunities.

FTA Funding: \$2,000,000

Title: *Enhancing Mobility Innovation (EMI) Program*

Recipient: Transit authorities, state and local governments, and state DOTs in partnership with other transit providers (see Table 13)

Project Description:

The purpose of the EMI Program is to enhance mobility innovations for transit, supporting a vision for a safe, reliable, equitable and accessible mobility ecosystem for all travelers. Projects advance emerging technologies, strategies, and innovations in passenger-centric mobility in two distinct areas: concept development and/or demonstration projects that improve mobility and enhance the rider experience; and projects that support the development of software solutions to facilitate demand-response public transportation.

Results:

The program implements two provisions of the FY 2021 and FY 2022 Consolidated Appropriations Act (Pub. L. 116-260) that directed FTA to fund projects in these areas. On August 10, 2022, FTA announced nine transit agencies and organizations in six states and the District of Columbia will receive a share of approximately \$4 million in EMI grants to improve access and mobility for transit riders. All projects will be active in FY 2023.

Project/Program Evaluation:

The EMI Program will have an independent evaluation for each selected project, as statutorily required once the project is active.

FTA Funding: \$4,050,251

Table 13 *Enhancing Mobility Innovation (EMI) Projects Receiving Assistance from FTA, FY 2022*

Project Title	Project Recipient	City and State	FTA Award
San Francisco Bay Area Regional Demand Responsive Transit Brokerage Service: Software for End-to-End Demand Responsive Transit Trip Planning And Reservations	Metropolitan Transportation Commission	San Francisco, CA	\$500,000
Unify Richmond Moves: Pilot Program to Coordinate Microtransit and Paratransit Riders	City of Richmond	Richmond, CA	\$250,000
Transit App to Develop a New Digital Survey	City of Santa Monica's Big Blue Bus	Santa Monica, CA	\$330,432
Vanpool Microtransit Pilot Program	Metropolitan Washington Council of Governments	Washington, DC	\$250,000
Software Application for Transit Agencies to Generate Tradable Credits from Emission Reductions And Social Equity Improvements	University of Maryland-College Park	College Park, MD	\$800,000
Verifying Low-Income Fare Eligibility via Connections to other State Databases	Rochester Genesee Regional Transportation Authority	Rochester, NY	\$283,219
Software Solutions to Facilitates Integrated Demand-Response Public Transportation with Real-Time Open Data Exchange	NEOride	Wadsworth, OH	\$338,600
Pilot Program to Finetune Data by Scaling the Identification of Data Quality Issues and Sharing Improved Datasets	Mobility Data, Inc.	Portland, OR	\$798,000
Transit Data Twin and Simulator	NTT Data, Inc.	Plano, TX	\$500,000
Total			\$4,050,251

Title: *Integrated Mobility Innovation (IMI) Demonstration Program*

Recipient: Transit authorities partnering with local governments, educational institutions, and private entities (see Table 14)

Project Description:

The IMI Program demonstrates innovative and effective practices, partnerships, and technologies to enhance public transportation effectiveness, increase efficiency, expand quality, promote safety, and improve the traveler experience. IMI helps communities make it easier for people to use transit, especially older adults, and people with disabilities. The goals of the program are to: 1) explore new business approaches and emerging technology solutions that support transformational mobility services; 2) enable communities to adopt innovative mobility solutions that enhance transportation efficiency and effectiveness; and 3) facilitate the widespread deployment of proven mobility solutions that foster expanded personal mobility.

Results:

In FY 2022, the Stark Area (OH) Regional Transit Authority developed an innovative alternative payment system for mobility, business and personal applications targeted to low-income, disadvantaged, disabled, student, elderly and other underserved populations. The Memphis Area Transit Authority started the implementation of a micro-transit on-demand project in the

Boxtown/Westwood neighborhood of Memphis, a low-density, suburban neighborhood with a large elderly population and infrequent transit service. All active IMI project recipients participated in collaborative activities shared their approaches to mobility innovation, through monthly topical meetings, quarterly exchanges, and web-based informal exchanges.

Evaluation:

The IMI program will have an independent evaluation for each selected project as statutorily required.

FTA Funding: \$19,082,420

Table 14 *Integrated Mobility Innovation (IMI) Projects Receiving Assistance from FTA, FY 2022*

Project Title	Project Recipient	City and State	FTA Award
Matanuska-Susitna Borough Centralized Mobility Management Software Project	Matanuska-Susitna Borough	Knik- Fairview, AK	\$231,191
Baldwin County's Integrated Mobility Innovation (IMI)	Baldwin County Commission	Bay Minette, AL	\$260,800
San Joaquin Regional Transit District (RTD) FY19 Integrated Mobility Innovation (IMI)	San Joaquin Regional Transit District	San Joaquin, CA	\$306,000
On-Demand Human Services Transportation for Older Adults, People with Disabilities, and Low-Income Individuals	City of Boulder	Boulder, CO	\$224,000
Testing and Deployment of Automated Buses on Connecticut Fastrak	Connecticut Department of Transportation	Hartford, CT	\$2,000,000
Greater Hartford Program for Innovative Mobility	Greater Hartford Transit District	Hartford, CT	\$630,000
Atlanta-Region Rider Information and Data Evaluation System (ATL RIDES)	Georgia Regional Transportation Authority for Atlanta-Region Transit Link Authority (ATL)	Atlanta, GA	\$430,400
Kootenai County 2019 Integrated Mobility Innovation (IMI)	Kootenai County	Coeur d'Alene, ID	\$150,000
Road to Recovery: Driving Transformational Change and Removing Barriers for the Recovery Community	Cecil County, Maryland	Elkton, MD	\$562,845
Transportation for Rural and Small Communities	Independent Transportation Network (ITN)	Portland, ME	\$1,658,025
Comprehensive Healthcare Access with Rural Transit Solutions (CHARTS)	Michigan Department of Transportation	Lansing, MI	\$276,499
Northeastern Wake County Rural Microtransit Service	Wake County Human Services	Raleigh, NC	\$393,527
Tompkins Mobility-as-a-Service (MaaS) Phase I	Tompkins County	Ithaca, NY	\$820,000
Regional Cloud-Based Traffic Management Artificial Intelligence System to improve transit travel times and enhance Mobility on Demand services	Central Ohio Transit Authority	Columbus, OH	\$1,725,000
EZfare: The Gateway	Stark Area Regional Transit Authority (SARTA)	Canton, OH	\$1,997,503
Grand Gateway Economic Development Association - PICK Mobility on Demand	Grand Gateway Economic Development Association	Big Cabin, OK	\$1,514,479

Project Title	Project Recipient	City and State	FTA Award
STEPS to Mobility on Demand and Mobility Payment Integration	Tri-County Metropolitan Transportation District of Oregon	Portland, OR	\$1,812,282
Rural Integrated Mobility – Connecting paratransit and fixed-route services through modern ticketing technologies	Crawford Area Transportation Authority (CATA)	Meadville, PA	\$715,233
Expanding Rural Access to Non-Emergency Medical Transportation	Coordinated Community Transportation Systems	Pierre, SD	\$401,760
Boxtown/Westwood On-Demand Transit Pilot Project	Memphis Area Transit Authority	Memphis, TN	\$394,000
Arlington RAPID: Rideshare, Automation, and Payment Integration Demonstration (RAPID)	City of Arlington	Arlington, TX	\$1,698,558
Virginia Rural Microtransit Deployment Initiative	Virginia Department of Rail and Public Transportation	Wise, VA	\$160,930
Serving a Small City with Vans on Demand	Whatcom Transportation Authority (WTA)	Lynden, WA	\$719,388
Total			\$19,082,420

Title: Accelerating Innovative Mobility (AIM) Program

Recipient: Transit authorities, state and local governments, and state DOTs in partnership with other transit providers (see Table 15)

Project Description:

The purpose of the AIM Program is to support innovation throughout the transit industry by promoting forward-thinking approaches to improve transit system design, service, and financing. The goals are to: 1) explore and validate forward-thinking approaches to improve transit system design, service, and financing; 2) provide funding to transit agencies in all types of communities—urban, suburban, rural— to identify, test, and prove new approaches, technologies and service models; 3) establish a national network of public transportation stakeholders that are incorporating innovative approaches and business models to improve mobility and that will share their project results; and 4) identify and promote the most promising and effective innovations that can be implemented more broadly through FTA’s capital programs. AIM will foster innovative transit technologies, practices, and solutions that incentivize travelers to choose public transportation, promote economic development in communities, and enhance public/private partnerships to improve personal mobility.

Results:

In FY 2022, the City of Wilson in rural central North Carolina replaced its fixed-route transit service with on-demand, rural microtransit to provide more targeted service and solve first/last mile connections. The microtransit system includes accessible vehicles and phone booking and restructured fares. Rhode Island Public Transit Authority (RIPTA) used GPS technology to enable free transit rides for passengers who use farecards and board at designated stops. All active AIM project recipients participated in AIM Incubator and Mobility Innovation Collaborative activities to collaborate and share their approaches to mobility innovation, through monthly topical meetings, quarterly exchanges, and web-based informal exchanges.

Project/Program Evaluation:

The AIM Program will have an independent evaluation for each selected project, as statutorily required.

FTA Funding: \$13,774,500

Table 15 *Accelerating Innovative Mobility (AIM) Projects Receiving Assistance from FTA, FY 2022*

Project Title	Project Recipient	City and State	FTA Award
Travel Rewards Research Pilot	Los Angeles County Metropolitan Transportation Authority	Los Angeles, CA	\$700,000
Implementing App-Based, Inter-Agency Fare Purchase and Trip Planning in the Rocky Mountain West	Regional Transportation District	Denver, CO	\$687,000
Creating the World's First Integrated Mobility Solution	Delaware Transit Corporation	Dover, DE	\$317,692
Transit Integration: PSTA Direct Connect Service	Pinellas Suncoast Transit Authority	St. Petersburg, FL	\$120,000
GRTA KOKO Birds AIM for the Future Freedom of Mobility on the Patriotic Route	Guam Regional Transit Authority	Guam	\$1,950,106
RTA Regional Coordination - A Technological Solution to Coordinate Regional Transportation, Creating Efficiency in Service	Iowa Department of Transportation	Ames, IA	\$120,000
IMPACT South Cook Improving Metra, Pace and CTA Together, South Cook	Cook County Department of Transportation and Highways	Chicago, IL	\$330,000
IndyGo Mobility Concierge	Indianapolis Public Transportation Corporation	Indianapolis, IN	\$400,000
An Innovative Solution to Dynamically Manage Resource Capacity in Real-time in the Post- COVID Normal and Beyond	Transit Authority of the Lexington Fayette Urban County Government (Lextran)	Lexington, KY	\$422,625
AI Communication Platform for Revenue Expansion	Capital Area Transit System	Baton Rouge, LA	\$250,000
Installation of On-Bus Mobile Ticket Validators and Development of an Origin- Destination-transfer (ODX) Model	Pioneer Valley Transit Authority	Springfield, MA	\$617,000
Montgomery County Mobile Ticketing Project	Montgomery County Maryland	Rockville, MD	\$468,820
Southern Minnesota Mobility as a Service (MaaS) Platform	Minnesota Department of Transportation	St. Paul, MN	\$628,000
Cost-Effective Advanced Driver Assistance System (ADAS) to Ensure ADA-Compliant Level Boarding for Bus Rapid Transit	Kansas City Area Transportation Authority	Kansas City, MO	\$600,000
Transforming Public Transit in Wilson with Rural On-Demand Microtransit	City of Wilson	Wilson, NC	\$250,000
Beyond Verification & Validation (V&V) for CBTC/ UWB Systems	New York Metropolitan Transit Authority	New York City, NY	\$180,000
Enhancing Life with Automated Transportation for Everyone (ELATE)	Western Reserve Transit Authority	Youngstown, OH	\$2,331,000

Project Title	Project Recipient	City and State	FTA Award
Near Real-Time Large Transit Network Reporting System	Oregon Department of Transportation	Portland, OR	\$480,000
Advancing Geofencing Functionality	Rhode Island Public Transit Authority	Providence, RI	\$244,000
AI based smart dispatch for dynamic data driven Micro-Transit Service	West River Transit Authority	Spearfish, SD	\$308,912
Memphis Integrated Mobility Framework	Memphis Area Transit Authority	Memphis, TN	\$483,000
Transits First/Last Mile Solution: the EZ Zeus, a zero-emission, Level 4, FMVSS, ADA, and Buy America-compliant Automated Shuttle Bus	Metropolitan Transit Authority of Harris County	Houston, TX	\$1,473,435
Electric Fast Foil Ferry: Re-imagining the Mosquito Fleet for Accelerating Passenger Ferry Innovation	Kitsap County Public Transportation Benefit Area	Bremerton, WA	\$372,910
Seamless Transportation Services for the Greater Morgantown Area	Monongalia Urban Mass Transit Authority dba Mountain Line Transit	Morgantown, WV	\$40,000
Total			\$13,774,500

Title: *Mobility Innovation Demonstration Programs Evaluation*

Recipient: ICF International

Project Description:

This project supports FTA’s IMI and AIM Programs and meets the statutory requirement of independent research demonstration evaluation under Federal public transportation law (49 U.S.C. § 5312 (e)(4)). The evaluation will focus on projects that seek to lead the development and deployment of innovative practices and technologies that incentivize travelers to choose public transportation, improve personal mobility, and enhance the traveler’s experience. The project goals are to: 1) evaluate the IMI and AIM projects; 2) document the success and impact of individual projects and the potential impact nationally; and 3) develop a synthesis report of the IMI and AIM programs that include findings, lessons learned, and recommendations for research and policy actions.

Results:

In FY 2022, the independent evaluator published a blog post on the expectations for independent evaluation team site visits, such as key activities to occur and interactions with project stakeholders and users. This blog post was distributed to all IMI and AIM recipients and can be accessed at <https://sumcmic.org/what-to-expect-for-independent-evaluation-team-site-visits/>.

FTA Funding: \$3,050,000

Title: *Innovative Technology and Mobility Solutions Project Evaluation*

Recipient: Michigan Department of Transportation (MDOT)

Project Description:

The project assists in the evaluation of thirteen projects funded through the Michigan Mobility Challenge (MMC). The Challenge funds projects that bring together public transportation providers and technology providers to propose solutions for mobility gaps for seniors, persons with disabilities, and/or veterans within a defined geographic area in Michigan. The goals of the project are to: 1) evaluate MMC projects; 2) document the success and impact of individual projects and the potential impact nationally; and 3) develop a synthesis report of the MMC that includes findings, lessons learned, and recommendations to support future state and national innovation technology and mobility funding programs.

Results:

In April 2022, Michigan DOT approved a sole-source contract to Menlo Innovations LLC to conduct the independent evaluation. Menlo provided a work plan/cost proposal in May 2022, which was reviewed and accepted by MDOT in June 2022. The contract with Menlo is expected to be executed in October 2022. In June 2022, the cooperative agreement was amended to add Menlo Innovations as a subrecipient and to update the performance end date to January 30, 2024, to allow sufficient time to complete the project and for final drawdown.

FTA Funding: \$300,000

Title: *Transit Cost and Delivery Project*

Recipients: The Eno Transportation Foundation, Inc.

Project Description:

The purpose of this project is to analyze current and historical trends in public transit project delivery domestically and internationally to better understand the drivers behind the high transit capital project construction costs and delayed delivery timelines in the US. The goals are to: 1) produce a full foundational report with recommendations for federal, state, and local agencies and project sponsors; 2) develop project case studies; 3) create a database of US and select international transit construction projects that lists key metrics; 4) produce a report on international decision-making processes for 10 select countries; 5) disseminate foundational report findings and execute outreach plan; and 6) plan and host a symposium on transit project delivery.

Results:

On October 18-21, 2021, the Eno Transportation Foundation held a virtual symposium on Transit Project Delivery. The goal of the symposium was to share findings from Eno's transit cost and delivery report, and foster discussion and exchange of best practices in project delivery among transportation professionals, policymakers, and researchers. FTA Administrator, Nuria Fernandez, was the keynote speaker. On December 9, 2021, Eno briefed Secretary Buttigieg and several political appointees on the first phase of the research project and subsequent work that will be covered under the cooperative agreement with FTA.

FTA Funding: \$469,565

Title: *Energy Efficient Mobility Systems Program*

Recipients: U.S. Department of Energy (DOE)

Project Description:

The purpose of this project is to research, develop, apply, and validate technology and/or data solutions to improve the efficiency and effectiveness of public transportation so that it better meets Americans' transportation demands. The goals are to: 1) co-fund three projects to improve energy efficiency for the delivery of public transportation services; 2) enhance the traveler experience and improve public transportation operations; and 3) promote mobility for all travelers as well as quantify the energy and mobility gains that result from using advanced technologies and service delivery strategies.

Results:

In FY 2022, DOE completed the development of a simulation-based optimization model to optimize the charging scheduling for a fast-charging electric vehicle system. DOE also conducted sensitivity analysis for an operation control module and demonstrated the robust performance gain in the operation planning module.

FTA Funding: \$1,000,000

Title: *Mobility on Demand (MOD) Sandbox*

Recipients: Transit authorities, local governments, non-profit organizations, and private entities (see Table 16)

Project Description:

The purpose of the MOD Sandbox is to explore approaches to integrating promising new mobility concepts, technologies, and solutions to greatly enhance the personal mobility of individuals. The goals are to: 1) explore emerging technology solutions and new business approaches that have the potential to transform mobility services; 2) prepare the public transportation industry to deliver these innovative mobility solutions; and 3) enable the widespread deployment of integrated mobility solutions. The MOD Sandbox projects investigate, through real-world demonstration efforts, how new mobility solutions can be effectively integrated with existing transit systems to achieve the vision of MOD for an integrated network of safe and reliable transportation options available to all.

Results:

In FY 2022, FTA published the following MOD Sandbox demonstration project reports:

- *Mobility on Demand Sandbox Demonstration: Adaptive Mobility with Reliability and Efficiency (AMORE), Final Report* (<https://rosap.ntl.bts.gov/view/dot/60629>)
- *Mobility on Demand (MOD) Sandbox Demonstration: LA Metro First/Last Mile Partnership with Via, Final Report* (<https://rosap.ntl.bts.gov/view/dot/60622>)

The remaining projects under the program are in the demonstration and evaluation phases and are drafting the final reports.

FTA Funding: \$605,922

Table 16 *Mobility on Demand (MOD) Projects Receiving Assistance from FTA, FY 2022*

Project Title	Project Recipient	City and State	FTA Award
MOD Sandbox: Integrated Fare Systems – From Transit Fare to Bike Share	Chicago Transit Authority	Chicago, IL	\$400,000
MOD Sandbox: Limited Access Connections	Pierce County Public Transportation Benefit Area Authority	Lakewood, WA	\$205,922
Total			\$605,922

Title: *Mobility on Demand (MOD) Sandbox Evaluation*

Recipients: ICF International

Project Description:

The purpose of this evaluation is to conduct a comprehensive independent evaluation of the MOD Sandbox demonstrations. The independent evaluation is required by Federal public transportation law (49 U.S.C. § 5312(e)(4)). The goals are to 1) identify and analyze the project impacts from performance measures identified by the independent evaluator and the 11 MOD Sandbox Demonstration sites; and 2) assess the business models used, and how existing FTA policies and regulations may support or impede these new service transportation models.

Results:

In FY 2022, FTA published the following MOD Sandbox demonstration evaluation reports:

- *Mobility on Demand (MOD) Sandbox Demonstration: Pinellas Suncoast Transit Authority (PSTA) Public-Private-Partnership for Paratransit Evaluation Report* (<https://rosap.ntl.bts.gov/view/dot/62620>)
- *Mobility on Demand (MOD) Sandbox Demonstration: City of Palo Alto and Bay Area Fair Value Commuting Evaluation Report* (<https://rosap.ntl.bts.gov/view/dot/60628>)
- *Mobility on Demand (MOD) Sandbox Demonstration: Regional Transportation Authority (RTA) of Pima County Adaptive Mobility with Reliability and Efficiency (AMORE) Evaluation Report* (<https://rosap.ntl.bts.gov/view/dot/60623>)

ICF International is completing the last evaluation reports. Results from the evaluation advanced public transportation in the U.S. by identifying impacts and benefits of MOD alternative transportation services. The evaluations apply lessons learned for other transportation providers interested in adopting these MOD services.

FTA Funding: \$250,000

Title: *Strategic Transit Automation Research (STAR) Plan Enabling Research and Implementation*

Recipients: The Volpe Center

Project Description:

The purpose of this effort is to continue the implementation of FTA's STAR Plan, published in May 2018 and available at <https://rosap.ntl.bts.gov/view/dot/35646>. Its goals are to: 1) gain an understanding of the concerns about the viability of transit automation as an investment; 2) assess the market for automation of transit buses; 3) develop a business case for deploying automated transit buses; and 4) assist transit agencies in developing a robust, rigorous evaluation component for pilot and demonstration projects. The STAR Plan includes additional research, development, and demonstration of automation in transit bus vehicles.

Results:

In FY 2022, FTA provided Transit Bus Automation Quarterly Updates, which provided information on transit bus automation pilot projects, demonstrations, and tests, both internationally and domestically including those funded by FTA. FTA and the Volpe Center produced the updates on a quarterly basis since December 2019. These updates provide the transit industry an inventory of and up-to-date information on transit bus automation activities and pilots. The information and results from these activities assist and encourage the transit industry in adopting automation in an informed and coordinated manner by providing an understanding of the automation market and articulating the benefits.

FTA Funding: \$350,000

Title: *Transit Bus Automation Strategic Partnerships*

Recipient: University of South Florida (USF) Center for Urban Transportation Research (CUTR)

Project Description:

The purpose of the partnership is to supplement the work organizations are conducting on transit bus automation research and help disseminate their research findings to the broader transit community. The goals are to 1) leverage investment by others by others, in both the private and public sectors; and 2) gain access to datasets and results that would otherwise be unavailable. Creating strategic partnerships with organizations conducting automated vehicle research accelerates learning about automation implementations and shares that information with the public transportation industry.

Results:

In FY 2022, FTA and CUTR, in cooperation with Access Services, conducted preliminary off-road testing during summer 2022. The Port Authority of New York and New Jersey conducted Exclusive Bus Lane on-site testing without passengers in July 2022.

FTA Funding: \$600,000

Title: *The Potential Uses of Advanced Data Science Methods in Transit Planning and Operations*

Recipients: The Volpe Center

Project Description:

The goal of this research is to identify and share practical opportunities for the use of data science and location-based services data in public transportation. Part 1 of this research project explored the potential for emerging data science methods to improve transit planning and operations. It discusses specific use cases, strategies, and prerequisites for applying new analytical tools such as machine learning models to help solve longstanding transit challenges including predicting when vehicles and infrastructure will need repairs, predicting bus on-time performance, estimating crowding at stations, and managing staffing and assignments. Part 2 of the project explores the potential of location-based services (LBS) data such as data from smart phones, to help transit agencies identify changing post-pandemic travel behavior, estimate transit ridership, or redesign service to better address travel patterns and needs.

Results:

In FY 2022, FTA published the report of Part 1 of this research: *Emerging Data Science for Transit: Market Scan and Feasibility Analysis* on its website at <https://www.transit.dot.gov/sites/fta.dot.gov/files/2022-06/FTA-Report-No-0218.pdf>. The report includes uses cases where data science techniques can have a practical, real-world impact. They include:

- Using AI algorithms to predict when a bus component part may fail so that the vehicle can be sent for maintenance before the failure may occur.
- Using image recognition to identify cracks or other defects in transit infrastructure.
- Using machine learning algorithms to better predict bus and rail on-time arrivals, ridership, and vehicle and station crowding.
- Using natural language processing to conduct sentiment analysis on customer feedback provided via social media.

FTA Funding: \$300,000

Title: *Flexing Funds for Transit*

Recipients: The Volpe Center

Project Description:

The purpose of this project is to conduct research and develop outreach communication related to flexible funding options for public transportation supportive infrastructure. The goals of the project are to: 1) review legislative, regulatory language, and existing guidance materials to document eligibility and reporting requirements for flexing funds between the Federal Highway Administration (FHWA) and FTA Operating Administrations; 2) develop short case studies documenting and assessing examples of flexing federal funds for transit supportive infrastructure; and 3) develop communications materials geared toward a range of transportation professional audiences to improve implementation of flex funding.

Results:

In FHWA, FTA and FWHA held the project kick-off and coordination meeting to establish strategic partnership.

FTA Funding: \$300,000

Economic Strength and Global Competitiveness

Description:

FTA has a successful history supporting transformative public transportation research and demonstration projects to improve the state of good repair and modernize bus and rail fleets. FTA is exploring advances in technology to enhance public transportation operations across all aspects of system services—from the design of buses to effectively maintaining and managing important transit assets and ensuring state of good repair.

Objectives:

- Utilize innovative approaches to improve real-time asset management and state of good repair.
- Enhance public transit operational effectiveness and efficiency through new technologies such as unmanned aerial systems, artificial intelligence, and robotics.

FTA had two active Infrastructure programs and projects in FY 2022, as shown in Table 15.

Table 17 *Economic Strength and Global Competitiveness Programs Receiving Assistance from FTA, FY 2022*

Economic Strength and Global Competitiveness Programs	
Project Title	FTA Funding
Low or No (LoNo) Emission Vehicle Component Assessment (LoNo-CAP)	\$34,000,000
Small Business Innovation (SBIR)	\$3,781,065
Total	\$37,781,065

Title: *Low or No (LoNo) Emission Vehicle Component Assessment (LoNo-CAP)*

Recipients: The Ohio State University and Auburn University

Project Description:

The purpose of the two LoNo-CAP Centers, managed by Ohio State University and Auburn University, is to conduct testing, evaluation, and analysis of low or no (LoNo) emission vehicle components intended for use in low or no emission vehicles, as required by Federal public transportation law (49 U.S.C. § 5312(h)). The goals of the program are to: 1) perform low or no emission component tests; 2) establish performance benchmarks for low or no emission compartments for vehicle manufacturers; and 3) support emerging low and no emission bus technologies and innovations. These two centers support FTA’s statutory low and no emission transit bus capital programs and economic strength and

modernization goals by providing a voluntary mechanism for manufacturers to test innovations in low or no emissions components. The passage of the Bipartisan Infrastructure Law (BIL) expanded the roles of both institutions to permit directed research for LoNo components and capital expenditures which aided both research and testing efforts.

Results:

The LoNo-CAP program has been awarded \$26,000,000 from previous fiscal years, including \$3,000,000 from the extension of the Fixing America’s Surface Transportation (FAST) Act for FY 2021. The legislative changes under BIL provided Ohio State and Auburn with an expanded role for low and zero emission component testing and research. BIL also appropriated \$5,000,000 for this program for FY 2022. Both institutions have been coordinating with FTA in the second half of FY 2022 to develop updated work plans to conduct directed research according to the BIL provisions. With the new flexibilities and provisions of the BIL, FTA, Ohio State and Auburn have the opportunity to expand their voluntary testing centers by leveraging and enhancing existing testing facilities to conduct directed research. The Centers have also continued to conduct outreach for testing activities with transit vehicle manufacturers – which did result in one testing agreement with a TVM.

FTA Funding: \$34,000,000

Table 18 *Low or No (LoNo) Emission Vehicle Component Assessment (LoNo-CAP) Projects Receiving Assistance from FTA, FY 2022*

Project Title	Project Recipient	City and State	FTA Award
Low or No (LoNo) Emission Component Assessment Program (LoNo-CAP) - Auburn University	Auburn University	Auburn, AL	\$7,500,000
Low or No (LoNo) Emission Component Assessment Program (LoNo-CAP) - The Ohio State University	The Ohio State University	Columbus, OH	\$7,500,000
Low or No (LoNo) Emission Bus Testing Centers - Auburn University	Auburn University	Auburn, AL	\$5,500,000
Low or No (LoNo) Emission Bus Testing Centers - The Ohio State University	The Ohio State University	Columbus, OH	\$5,500,000
FY 2021 Appropriations – Auburn University	Auburn University	Auburn, AL	\$1,500,000
FY 2021 Appropriations – The Ohio State University	The Ohio State University	Columbus, OH	\$1,500,000
FY 2022 Appropriations – Auburn University	Auburn University	Auburn, AL	\$2,500,000
FY 2022 Appropriations – The Ohio State University	The Ohio State University	Columbus, OH	\$2,500,000
Total			\$34,000,000

Title: *Small Business Innovation Research (SBIR) Program*

Recipients: The Volpe Center

Project Description:

The purpose of the SBIR Program is to help small businesses grow by funding product development research in strategic areas such as safety, operations, maintenance, and other topics important to transit. FTA is one of eight operating administrations within DOT that funds SBIR research. Federal law (15 U.S.C. § 638) mandates that each operating administration set aside a portion of its annual research budget to fund SBIR grants. FTA contributes 3.2% of its yearly research discretionary funding to SBIR grants; FTA's FY 2022 discretionary funding amount for SBIR was \$1,192,369. The goals of SBIR are to: 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; and 4) increase private-sector commercialization of innovations derived from Federal research and development funding.

Results:

In FY 2022, the program completed a comprehensive literature review of accessibility score modeling and an accessibility Scoring methodology. The program developed three questionnaires for related project stakeholders namely residents, Federal and State decision-makers, and experts at food desert non-profit organizations. The program also collected detailed datasets for metropolitan Orlando and Baltimore regarding block-level information for four Accessibility Score variables, including the socioeconomic, grocery, people to food (P2F), food to people (F2P), and vehicle ownership datasets. The information collected accurately represented the existing situation of geography (boundary) in terms of accessibility to fresh-healthy food.

FTA Funding: \$3,781,065

Table 19 *Small Business Innovation Research (SBIR) Projects Receiving Assistance from FTA, FY 2022*

Project Title	Project Recipient	City and State	FTA Award
FTA Interagency Agreement with the Volpe Center for new Phase I & II projects	Volpe Center	Cambridge, MA	\$704,000
Cost Allocation Technology for Non-Emergency Medical Transportation – Phase II	RLS & Associates, Inc.	Dayton, OH	\$719,702
Virtual and Augmented Reality to Aid Transit Use by All Traveler – Phase II	Design Interactive, Inc.	Orlando, FL	\$749,852
AI for Maintenance on Buses (AIM on Bus) – Phase I	Preteckt, Inc.	Memphis, TN	\$119,619
AI Based Predictive Capabilities for Condition-based Sanitization of Public Transit Vehicles – Phase I	Interphase Materials	Pittsburgh, PA	\$148,312
Fully Autonomous Omnidirectional Adaptive Robots for the Disinfection and Decontamination of Transit Assets – Phase I	Advent Innovations, Ltd. Co.	Columbia, SC	\$147,211
FY 2022 SBIR Program	Volpe Center	Cambridge, MA	\$1,192,369
		Total	\$3,781,065

Climate and Sustainability

Description:

The purpose of this program is to make public transportation systems more sustainable and resilient by harnessing novel renewable energy methods and advancing research and innovations in climate solutions to reduce carbon footprint. Climate change is a significant and growing risk to the safety, reliability, and sustainability of transportation infrastructure and operations, not to mention impacts to human health and vitality. The emergence of battery electric technologies and fuel cell and electrical propulsion systems that are zero-emissions, along with innovation in alternative renewable energy sources and cleaner electrical grids, offer increased opportunities to make public transportation carbon neutral.

Objectives:

- Foster sustainable and resilient systems for transit vehicles and infrastructure
- Explore ways to charge and optimize charging costs and operations for large, small, and rural transit agencies

FTA had two active Infrastructure programs and projects in FY 2022, as shown in Table 18.

Table 20 *Climate and Sustainability Programs and Projects Receiving Assistance from FTA, FY 2022*

Climate and Sustainability Programs and Projects	
Project Title	FTA Funding
Low or No Emission Vehicle Deployment Program (LoNo) Program*	\$47,969,437
Transit Vehicle Innovation Deployment Centers (TVIDC)	\$4,125,000
Total	\$52,094,437

* In 2016, the LoNo Program matured from a research program to a capital discretionary program authorized by Federal public transportation law (49 U.S.C. § 5339(c)). However, the research demonstration program continued, in FY 2022 FTA is still administering and overseeing some of these projects funded under the LoNo Research Program.

Title: **Low or No (LoNo) Emission Vehicle Deployment Program**

Recipients: Transit authorities and project teams comprising transit agencies, systems experts, and bus manufacturers (see Table 19)

Project Description:

The FTA LoNo program began in FY 2013 as a program funded under Federal public transportation law (49 U.S.C. § 5312) and is now bridging FTA’s research and capital programs. The goals of the program were to: 1) lower cost and increase availability of more energy efficient buses; 2) increase private investment in transit bus development, create new jobs in U.S. transit bus manufacturing; and 3) expand knowledge regarding the strengths and weaknesses of new bus technologies, and how best to deploy these buses. The program shared the risk of early deployments of new bus technology and helped inform the industry of the capabilities and challenges of new technologies.

The LoNo Program was funded for three years as a research program under Federal public transportation law (49 U.S.C. § 5312), where it gained increasing popularity and success. In FY 2016, the FAST Act authorized the LoNo Program as a capital program under Federal public transportation law (49 U.S.C. § 5339) and funding increased to \$55 million annually. This large competitive discretionary program is managed by FTA’s Office of Program Management and was renamed “Low-No.”

Results:

In March 2022, CALSTART submitted a draft study regarding hydrogen-fired fluid heating (HFFH). The technology was investigated as a solution for zero-emission based cabin heating solutions for fuel cell electric buses (FCEBs). In July 2021, CALSTART submitted a draft report with an overview of the “Ohio 2” fuel cell bus that was demonstrated at the Stark Area Regional Transit Authority. The draft report explores the development and demonstration of next generation Buy America compliant fuel cell buses in a large transit fleet environment. In September 2021, CTE submitted a final draft report to FTA covering the project performance and results for what began as the design and deployment of an ECOSaver Electric Fuel Cell bus at the Ohio State University Center for Automotive Research, which was later revised to provide The Ohio State University a FCEB for demonstration on their campus. The remaining projects under the program are in the demonstration phase.

Project/Program Evaluation:

Through an interagency agreement with the National Renewable Energy Laboratory (NREL), part of the U.S. Department of Energy, FTA funded the technology evaluations of all LoNo project sites. NREL’s evaluations measured bus technology performance on regularly scheduled bus routes over the course of a year, with fuel economy, fuel costs, bus availability, maintenance costs, and frequency of breakdowns addressed.

FTA Funding: \$47,969,437

Table 21 Low or No (LoNo) Emission Vehicle Deployment Projects Receiving Assistance from FTA, FY 2022

Project	Project Recipient	City and State	FTA Award
Five fuel cell electric buses	SunLine Transit Agency	Thousand Palms, CA	\$9,803,860
Five 60-ft articulated battery electric buses	Massachusetts Bay Transportation Authority	Boston, MA	\$4,139,188
5 battery electric buses	Transit Authority of River City	Louisville, KY	\$3,321,250
5 battery electric buses	Duluth Transit Authority	Duluth, MN	\$6,343,890
7 battery electric buses	Dallas Area Rapid Transit	Dallas, TX	\$7,637,111
5 battery electric buses	Transit Authority of Lexington Fayette Urban County Government (Lextran)	Lexington, KY	\$6,003,534
5 battery electric buses	Los Angeles County Metropolitan Transportation Authority	Los Angeles, CA	\$5,585,000
5 battery-electric buses	Alameda-Contra Costa Transit District Commission	Oakland, CA	\$1,799,564
Deploy 8 additional battery electric buses to King County’s electric fleet	King County Metro	Seattle, WA	\$3,336,040
Total			\$47,969,437

Title: *Transit Vehicle Innovation Deployment Centers (TVIDC)*

Recipients: CALSTART, Inc. and The Center for Transportation and the Environment, Inc. (CTE)

Project Description:

The purpose of this project is to research the next generation of public transit vehicle technology and facilitate an integrated, cohesive, public transportation innovation deployment network. A key goal is to convene transit agencies and U.S. transit vehicle manufacturers that research ongoing efforts to test, deploy, and commercialize low and no emissions vehicles and related components and assess ways to ensure ease of transit agencies' modernization efforts to move to zero emissions fleets. The TVIDC research the field, coordinate and disseminate information, including tech transfer education to the public transportation industry.

Results:

In FY 2022, CALSTART, Inc. continued to operate four Transit Fleet Zero Emission Bus Working Groups in various regions of the country to be able to reach fleets that want to better understand how transition to battery electric and hydrogen buses. CALSTART also published its annual edition of *ZEROING IN ON ZEBs, the Advanced Technology Transit Bus Index: A North American ZEB Inventory* (<https://calstart.org/zeroing-in-on-zeb/>). This annual inventory is broken down by states and regions and helps Federal and state agencies, as well as industry leaders, measure the progress of the industry.

FTA Funding: \$4,125,000

Table 22 *Transit Vehicle Innovation Deployment Centers (TVIDC) Projects Receiving Assistance from FTA, FY 2022*

Project	Project Recipient	City and State	FTA Award
Transit Vehicle Innovation Deployment Centers Project	CALSTART INC	Pasadena, CA	\$1,375,000
CTE Transit Vehicle Innovation Deployment Centers (TVIDC) Project	Center for Transportation and the Environment, Inc.	Atlanta, GA	\$2,750,000
Total			\$4,125,000

Organizational Excellence

Description:

FTA has programs and projects that address cross-cutting issues associated with its three research priorities—Safety, Infrastructure, and Mobility Innovation—and to support research-to-practice implementation. In addition to those programs, FTA manages the statutorily required Transit Cooperative Research Program (TCRP) through the National Academies of Sciences, Engineering, and Medicine, and the Small Business Innovation Research Program (SBIR) to support the growth of U.S. small businesses.

Objective:

Programs under this section support FTA with dissemination, evaluation, and additional industry-driven and selected research.

Outputs:

- Deploy proven research solutions to improve transit service delivery.
- Facilitate the implementation of research and technology development.
- Advance the interests of public transportation.
- Monitor, report on, and improve outreach efforts to drive research to practice.

FTA had three active Organizational Excellence programs active in FY 2022, as shown in Table 20.

Table 23 Supporting Programs and Initiatives Receiving Assistance from FTA, FY 2022

Organizational Excellence Programs and Projects	
Project Title	FTA Funding
Information Dissemination and Outreach Program	\$1,600,000
Research Evaluation Implementation Plan	\$480,000
National Bus Rapid Transit Institute (NBRTI)	\$1,706,250
Total	\$3,786,250

Title: Information Dissemination and Outreach Program

Recipient: University of South Florida (USF) Center for Urban Transportation Research (CUTR)

Project Description:

This program assists FTA in the wide distribution of research outputs, outcomes, and impacts in a consistent and accessible way to all key stakeholders. It also assists FTA in remaining at the forefront of information accessibility by ensuring that FTA’s dissemination efforts achieve the following goals: 1) edit, design, and produce consistent, accessible, high-quality research products and other supporting materials; 2) expand upon current methods of disseminating FTA research outputs, outcomes, and impacts to all key stakeholders; and 3) assist FTA with improving the management of ongoing FTA research and technology projects.

Results:

In FY 2022, CUTR completed and FTA posted 33 final reports on its Reports and Publications page, accessible at <https://www.transit.dot.gov/research-innovation/fta-reports-and-publications> and the Repository and Open Science Access Portal (ROSA P) in the FTA collection (<https://rosap.ntl.bts.gov/cbrowse?pid=dot%3A42631&parentId=dot%3A42631>). Each report is Section 508-compliant. In addition to the posted reports, several relevant research graphics and templates were created, maintaining FTA’s research brand in the transit industry. The efforts under this program provide more efficient use of resources by allowing FTA program managers and recipients to focus more on the technical content of reports rather than the report production process.

FTA Funding: \$1,600,000

Title: *Research Evaluation Implementation Plan*

Recipient: University of South Florida (USF) Center for Urban Transportation Research (CUTR)

Project Description:

This project developed an implementation plan for FTA's Nested Research Evaluation Framework, which was designed to develop a multi-tiered structure to support a full research lifecycle evaluation – from the project level to the overall FTA statutory program level. In addition to providing more details surrounding the Level 2 demonstration program evaluation requirements, this framework also shows how data cascades upward through discrete performance measures to assess the success of FTA's research investments.

Results:

In FY 2022, CUTR contacted all the Human Service Coordination Research (HSCR) Program recipients to discuss the status of each project, including any updated milestones/timelines, data availability, collection, and reporting. CUTR created an updated spreadsheet with documentation of project extensions and the resulting revisions to project end dates; project status update, including Covid-related and other challenges; new grantee POCs; and any other changes to projects, such as changes to project's original scope, performance measures, or partners.

FTA Funding: \$480,000

Title: *National Bus Rapid Transit Institute*

Recipient: University of South Florida (USF) Center for Urban Transportation Research (CUTR)

Project Description:

The purpose of this project is to conduct continuing research and provide technical assistance to the transit industry in the area of bus rapid transit (BRT). The goals are to: 1) conduct research in BRT Safety, Technology, and State of Good Repair; 2) develop "best practices" manuals and tools; and provide Clearinghouse and Technical Assistance/Support.

Results:

In FY 2022, CUTR completed a project to research and summarize case studies and best practices in operating battery-electric and other alternative fuel vehicles or hybrids in BRT service. CUTR also completed safety research to explore BRT-related operational and safety issues including those at grade crossings, roundabouts, crosswalks, and stops/stations.

FTA Funding: \$1,706,250

Transit Cooperative Research Program (TCRP)

Description:

The TCRP purpose and funding level 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 challenges facing the public transportation industry. TCRP supported DOT's new strategic goals of Safety, Equity, Transformation, Economic Strength and Global Competitiveness, Climate and Sustainability, Organizational Excellence.

Objective:

Identify the highest priority transit problems in need of research and development (R&D) investigation. 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.

Outputs:

- Call to public transportation stakeholders and related industries for members of the public to identify challenges to be addressed.
- Production of publications.
- Continue the dissemination and share research results through events, bulletins, webinars, and email blasts.

Title: *Transit Cooperative Research Program (TCRP)*

Recipient: National Academies of Sciences, Engineering, and Medicine (NAS)

Project Description:

Its purpose is to promote, select, and conduct research and disseminate research findings to improve the practice and performance of public transportation. Its goal is to develop near-term, practical solutions to problems facing public transportation. TCRP has an established reputation for providing useful reports and other tools to help public transportation practitioners solve problems and inform decision-makers. The TCRP Oversight and Project Selection (TOPS) Commission, consisting of senior industry leaders, represents the primary beneficiaries of TCRP research. The TOPS Commission functions as the TCRP governing board and sets research priorities. TCRP also includes FTA's strategic research goals as criteria for screening and selecting projects, helping to further extend FTA's reach.

Results:

The Bipartisan Infrastructure Law (BIL) appropriated \$6,578,592 in FY 2022 to carry out TCRP. These appropriated funds are aggregated to active projects from previous fiscal years, totaling \$16,578,592. In FY 2022, TCRP published 18 publications, including seven research reports, nine syntheses, one legal research digest and two web-only documents. The TOPS Commission met in June 2022 to select six new members and receive updates on TCRP projects. Project sponsors presented the results of four projects in Employee Safety Reporting Systems, Joint Development, Improving Diversity and Inclusion, and

Transit ITS Data Management. TRB staff provided updates on Dissemination and Implementation of TCRP Research, The Transit IDEA Program, Legal Issues, and Quick Response Research.

FTA Funding: \$16,578,592

Table 24 Transit Cooperative Research Program (TCRP) Projects Receiving Assistance from FTA, FY 2022

Project	Project Recipient	City and State	FTA Award
TCRP 29th Year - FY 2020	National Academy of Sciences	Washington, DC	\$5,000,000
TCRP 30th Year - FY 2021	National Academy of Sciences	Washington, DC	\$5,000,000
TCRP 31st Year - FY 2022	National Academy of Sciences	Washington, DC	\$6,578,592
Total			\$16,578,592

Strategic Research Roadmap

Federal public transportation law (49 U.S.C. § 5312(f)(c)) requires FTA to provide a strategic research roadmap proposal for allocations of amounts for assistance under this section for the current and subsequent Fiscal Year (FY), including anticipated work areas, proposed demonstrations and strategic partnership opportunities.

FTA’s planned research allocations for FY 2022 and anticipated allocations for FY 2023 are noted below and as referenced in the FY 2022 Enacted Appropriations and in the FY 2023 Budget Request:

Table 25 Research Allocations for FY 2022 and Anticipated Allocations for FY 2023 (in Millions)

Program	FY 2022 Enacted (\$000)	FY 2023 President’s Budget (\$000)
PUBLIC TRANSPORTATION INNOVATION		
Mobility NeXt	\$3,672	
Strategic Transit Automation Program		\$7,000
Transit Cyber Security		\$2,000
Advanced Digital Construction Management	\$2,093	\$3,000
Low No Component Testing 5312(h)	\$5,000	\$5,105
Small Business Innovation Research Program (SBIR)	\$808	\$825
Infrastructure Program	\$6,480	
Bus Testing Learning Lab		\$2,000
Transit Cooperative Research Program (TCRP)	\$6,579	\$6,716
Safety NeXt	\$10,208	\$8,964
Technology Transfer and Performance	\$2,000	\$2,000
Subtotal, Transit Formula Grants	\$36,840	\$37,610

Program	FY 2022 Enacted (\$000)	FY 2023 President's Budget (\$000)
TRANSIT RESEARCH		
Innovative Mobility Solutions	\$968	
Accelerate Innovative Mobility Initiatives	\$968	
Accelerate Adoption of Zero Emission Buses	\$9,680	
Safety NeXt		\$5,008
Mobility NeXt		\$14,000
Environmental Sustainability and Resiliency		\$10,000
SBIR	\$384	\$992
Subtotal, Transit Research	\$12,000	\$30,000
Total	\$48,840	\$67,610

Anticipated Work Areas/Programs

In accordance with FTA's FY 2022 Annual Modal Research Plan, FTA will allocate FY 2022 funds toward the following projects, groups by DOT strategic goals:

Safety

Safety NeXt – to research new technologies, solutions, and practices to reduce injuries and fatalities and to improve safety culture with the use of technological advancements and innovations.

Safety - Transit Cybersecurity – to operate transit systems in a safer manner through the application of advanced technologies and innovative practices that reduce transit system cybersecurity risks, threats, and vulnerabilities.

Transformation and Equity

Mobility NeXt – to advance public transportation equity, efficiency, and effectiveness, and accelerate the exploration, development and deployment of the most promising technologies, practices and strategies to accelerate the transformation of public transportation and personal mobility – preparing for the future.

Mobility Innovation Transit Automation – to advance the research, development, and deployment of transit bus automation. Research activities are organized around three complementary work areas – Enabling Research, Integrated Demonstrations, and Strategic partnerships.

Climate and Sustainability

Environmental Sustainability and Resiliency – to assist public transportation agencies reach zero-emissions targets by 2050, and to foster sustainable and resilient transit systems through fleet transition and electrification/charging systems that are carbon neutral, and less vulnerable to natural and human-made disasters by preparedness planning and vulnerability assessments to ensure the reliability of transportation infrastructure and operations. The Accelerate Adoption of Zero Emission Buses program begun in FY 2021 will continue to expand as FTA conducts research any innovative deployment activities to support transit agencies' transition to carbon neutral fleets by 2050.

Economic Strength and Modernization

Infrastructure Bus Technologies and Testing – to improve the efficiency, effectiveness, and quality of the FTA Bus Testing Program through adaptation of new bus technologies and testing methodologies.

Small Business Innovation Research Program (SBIR) – a statutory program where FTA, like all DOT operating administrations, applies 3.2 percent of discretionary research funds for research in products and services needed by FTA that small businesses can develop and make commercially available.

One of FTA's statutory programs – the Transit Cooperative Research Program (TCRP) – aligns closely with multiple DOT strategic goals, especially the goals of equity, economic strength, climate sustainability, and transformation. TCRP, as authorized by Federal public transportation law (49 U.S.C. § 5312(i)), funds applied research with near-term, practical results that address key challenges facing the public transportation industry.

Organizational Excellence

Technology Transfer, Performance, and Dissemination – to deploy proven research solutions to improve transit service delivery. In addition, the program will continue to facilitate the implementation of research and technology development and to advance the interests of public transportation, monitor, report on, and improve outreach efforts to drive research to practice.

For FY 2023, FTA will continue to invest and build upon the findings of prior research in the following areas: Mobility NeXt, Safety NeXt, Transit Cybersecurity, Transit Automation, Technology Transfer and Performance, and Environmental Sustainability and Resiliency. For Advanced Digital Construction Management, FTA intends to release a notice of funding opportunity to launch this new Bipartisan Infrastructure Law (BIL) program.

Additionally, leveraging the new directed research capability of the BIL, FTA will launch a new initiative to develop a national network of advanced research labs.

Strategic Partnerships

Collaboration is at the heart of FTA's innovative research and is done through two primary ways – partnerships with recipients of funding and partnerships with non-funded entities. FTA collaborates with internal and external partners. Internal partners are other DOT modal partners, the Joint Program Office, the Office of the Secretary, the Volpe Center, and the Bureau of Transportation Statistics.

In addition to cross-modal partnerships within the DOT, 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 all 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. The Center for Transportation and the Environment (CTE) and CALSTART provide critical research in electrification and carbon emissions research, electrification, alternative fuel buses, and carbon emission research through the Transit Vehicle Innovative Development Centers. FTA also routinely collaborates with the U.S. Department of Energy's National Renewable Energy Laboratory (NREL) and Vehicle Technology Office.

Long established partners are also a core element of FTA's over fifteen years of mobility research. Key partners include 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 a 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). Additionally, FTA partners with other modes in mobility research including the Federal Highway Administration (FHWA), the Office of the Assistant Secretary for Research and Technology

(OST-R), the Intelligent Transportation Systems Joint Program Office (JPO). FTA is leveraging previous research in unmanned aerial systems from the Federal Aviation Administration (FAA) and the Federal Railroad Administration (FRA) to inform its work in this relatively new area for public transit agencies.

FTA is active with the Transportation Research Board (TRB) of the National Academy of Sciences, Engineering, and Medicine (NASEM). In addition to the Transit Cooperative Agreement Program (TCRP), FTA works closely with TRB on a number of 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, are also noted in TRID.

Coordinating with partners helps to extend research, leverages, and builds upon previous research findings, ensures a multi-modal focus, reduces duplication, and gathers information on research needs to help focus FTA's research project selection.



Acronyms and Abbreviations

ATTRI	Accessible Transportation Technology Research Initiative
BEERD	Bus Efficiency Enhancements Research and Demonstrations
CTE	Center for Transportation and the Environment
CUTR	Center for Urban Transportation Research at the University of South Florida
DOE	Department of Energy
DOT	Department of Transportation
FAST	Fixing America's Surface Transportation Act (Public Law 114-94)
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
FY	Fiscal Year
HST	Human Service Transportation
LoNo	Low or No Emission
MARTA	Metropolitan Atlanta Rapid Transit Authority
MOD	Mobility on Demand
NAS	National Academy of Sciences
NFCBP	National Fuel Cell Bus Program
NREL	National Renewable Energy Laboratory
SBIR	Small Business Innovation Research
SRD	Safety Research and Demonstration
SRER	Innovative Safety, Resiliency, and All-Hazards Emergency Response and Recovery Program
TCRP	Transportation Cooperative Research Program
TRB	Transportation Research Board



U.S. Department of Transportation
Federal Transit Administration

U.S. Department of Transportation
Federal Transit Administration
East Building
1200 New Jersey Avenue, SE
Washington, DC 20590
<https://www.transit.dot.gov/about/research-innovation>