United States Department of Transportation
Annual Modal Research Plans FY 2022
Program Outlook FY 2023

Cover Page

Federal Motor Carrier Safety Administration
Office of Research and Registration
Office of Analysis, Research, and Technology
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Note: The FY 2022-2023 AMRPs will be certified using the President's budget numbers and revised with enacted budget numbers after the budget passes.

Executive Summary

Overview

The Federal Motor Carrier Safety Administration (FMCSA) carries out a multiyear Motor Carrier Research & Technology (R&T) Program as mandated in 49 U.S.C. § 31108. The R&T Program includes in-house, contract, congressionally mandated, and joint-funded initiatives with other U.S. Department of Transportation (USDOT) organizations, the private sector, and academia. FMCSA is authorized to carry out research, development, and technology transfer activities with respect to:

- The causes of crashes, injuries, and fatalities involving commercial motor vehicles (CMVs)
- Means of reducing the number and severity of crashes, injuries, and fatalities involving CMVs
- Improving CMV safety and efficiency through technological innovation and improvement
- Improving technology used by enforcement officers when conducting roadside inspections and investigations to increase efficiency and information transfers
- Increasing the safety and security of hazardous materials transportation

FMCSA's mission is to reduce crashes, injuries, and fatalities involving large trucks and buses. The R&T Program provides an empirical basis for answering research questions in support of the agency's safety mission. By using research to better understand factors associated with crashes, FMCSA can streamline and prioritize its enforcement efforts, focusing on vital Federal safety oversight functions.

FMCSA's FY 2022 R&T activities have four key focus areas:

- **Futureproofing**, including data utilization and leveraging of new technologies and designs
- **Enforcement** against unsafe operators through strategic deployment of resources on the ground
- **SafeRates**, the nexus of workplace conditions and safety
- **Climate**, addressing climate change and environmental concerns

Activities may address multiple areas simultaneously. For example, research and technology transfer activities surrounding automation are most obviously *futureproofing* because they focus on new technologies and designs, but they also support the *climate* area through addressing ecologically costly supply chains, operations, maintenance, and crashes, and by opening possibilities for improved fuel efficiency.

Anticipated Outcomes

FMCSA's R&T Program develops the knowledge, practices, and technologies needed to improve the safety of commercial drivers, vehicles, and carriers and to solve problems that arise in prioritizing agency resources. Crashes involving CMVs carry significant human costs in the form of injuries and fatalities. These human costs are also significant economically; specifically, in 2018, the estimated cost of all large truck and bus crashes was $143 billion (see Table 1), and there were 5,184 fatalities associated with large truck and bus crashes (FMCSA, 2020 Pocket Guide to Large Truck and Bus Statistics). In general, research conducted by FMCSA contributes to 1) development of safety technologies for use by enforcement and commercial carriers, and to 2) recommended best practices to improve driver performance and the safe operation of CMVs, thus contributing to a reduction in crashes. Through the R&T Program's targeted research and other initiatives, FMCSA will:

Table 1. Estimated Costs of Large Truck and Bus Crashes, 2015-2018 (2015 Dollars)

Year	Fatal Crashes	Injury Crashes	Property-Damage-Only (PDO) Crashes	All Large Truck and Bus Crashes
2015	$44 billion	$46 billion	$28 billion	$119 billion
2016*	$51 billion	$53 billion	$29 billion	$132 billion
2017*	$53 billion	$55 billion	$29 billion	$137 billion
2018*	$53 billion	$57 billion	$33 billion	$143 billion

*Beginning with data for 2016, NHTSA replaced the General Estimates System with the Crash Report Sampling System. Comparisons of 2016 injury and PDO crash costs with pre-2016 estimates should thus be performed with caution.
Source: 2020 Pocket Guide to Large Truck and Bus Statistics, Table 4-22.

- Better understand the causes and impacts of CMV crashes and inform efforts to develop safety countermeasures to reduce crashes and remove unsafe drivers and carriers from the Nation's roads
- Better understand the safety impacts associated with the adoption of automated CMVs
- See continued progress in the development and testing of CMV safety technologies
- Advance the Department's strategic goals through mission-specific research

Ultimately, FMCSA's R&T efforts will contribute to the agency's mission of reducing the number and severity of CMV-involved crashes on the Nation's highways, saving lives and reducing economic costs.

Non-Duplicative Activities

The R&T Program conducts unique, nonredundant activities and cooperates with other agencies to ensure that its efforts interlock rather than overlap with related programs. To help prevent duplication of effort, FMCSA R&T staff participate in weekly multi-modal research coordination meetings to share their activities with colleagues from other operating administrations and learn about other modal partnership activities. For example, the R&T Program's work on automation in the CMV field is related but not identical to the National Highway Transportation Safety Administration's (NHTSA) work on automated passenger vehicles. Continuing cooperation between FMCSA and NHTSA will ensure a safe future that incorporates automation for both commercial and passenger vehicles.

Collaboration Efforts

FMCSA participates in the Department's Topical Research Working Groups (TRWG) on Safety (Automation, Systemic Safety Approach, Human Factors), Innovation (Emerging/Enabling Technologies, Cybersecurity), and Accountability (Technology Transfer/Deployment, Evaluation/Performance Measurement, Data).

External partnerships help the FMCSA R&T Program remain connected to the community it serves, both by providing channels to share important findings with the community and by ensuring that R&T remains apprised of gaps, needs, and advances in the world of motor carriers. Key external collaborations include work with the Commercial Vehicle Safety Alliance (CVSA) on the Large Truck Crash Causal Factors Study and a long-running relationship with the Transportation Research Board.

The R&T Program also conducts an annual Analysis, Research, and Technology Forum, an event where Government and partner researchers share findings, upcoming priorities and projects, and invite feedback and suggestions from the motor carrier community and general public.

Through the jointly funded National Surface Transportation Safety Center of Excellence (NSTSCE), the R&T Program also engages with General Motors, the Virginia Tech Transportation Institute, and other partners invested in CMV safety.

Technology Transfer (T2)

FMCSA's technology transfer (T2) activities involve providing published research, best practices guidance, or grants to State or motor carrier stakeholders. These activities are intended to increase or ease adoption of safety technologies. T2 beneficiaries include State and local governments, law enforcement, Federal and State commercial vehicle inspectors, motor carriers, and CMV drivers. These activities rely on coordination with partner organizations. For example, the FMCSA R&T staff have evaluated tire anomaly classification systems that identify unsafe tires as trucks roll over sensors embedded on entry ramps to roadside weight and inspection stations. The FMCSA staff provided their findings to State motor carrier enforcement agency partners and made this technology eligible under the Innovated Technology Deployment (ITD) Grant Program. In an example of research driving technology transfer, FMCSA staff published cybersecurity best practices for fleets to consult when purchasing aftermarket fleet management systems and other onboard devices.

Coordination of Technology Transfer (T2) Activities

The R&T Program follows several protocols to coordinate T2 activities and avoid duplicate efforts. First, the R&T project portfolio is developed each year in consultation with the FMCSA Research Executive Board (REB) (a committee of representatives from across the FMCSA staff that have research and technology interests). Second, the R&T Program also participates in the USDOT Research, Development, and Technology (RD&T) Planning Team, which includes representatives from all the USDOT operating administrations. Third, R&T Program leadership participates in Intelligent Transportation Systems Joint Program Office (ITS/JPO) working groups and meetings to coordinate and conduct joint research projects with other agencies, such as FHWA and NHTSA. Finally, through the ITD Program, which

funds State agency deployment of advanced technologies, the R&T Program collaborates closely with State government and enforcement agencies on T2 activities, data exchange, etc. These methods ensure the cost-effectiveness of FMCSA T2 efforts and eliminate duplicative T2 activity.

Program-level T2 Activities

FMCSA invests in the development, testing, and transfer of innovative technologies through the following programs and activities:

R&T Program: FMCSA's R&T Program develops the knowledge, practices, and technologies needed to solve problems and answer questions that arise in prioritizing enforcement resources and improving the safety of commercial drivers, vehicles, and carriers. Each year, the R&T Program sponsors and conducts numerous technology-focused projects designed to:

- Improve the safety and efficiency of CMVs through technological innovation and improvement—e.g., researching and evaluating the adoption of advanced driver assistance systems (ADAS)
- Improve technology used by enforcement officers when conducting roadside inspections and compliance reviews—e.g., increasing deployment of virtual weigh stations
- Test, develop, or assist in testing and developing any material, invention, patented article, or process related to the R&T Program—e.g., automated warning systems to alert CMV drivers of upcoming work zones
- Facilitate training or education of CMV safety personnel—e.g., developing best practices for use of automation technologies

Innovated Technology Deployment (ITD) Grant Program: The ITD Grant Program provides funding for State agencies to deploy, support, and maintain CMV information systems and networks. This program is FMCSA's key mechanism for transferring proven enforcement technologies into operational systems for the States. Through the High Priority (HP) Grant, the ITD Program provides up to $20 million in yearly funding for States to deploy, support, and maintain intelligent transportation systems and commercial vehicle information systems and networks. The ITD program manager regularly reports on ITD activities to support coordination with other agencies and to prevent redundant research.

USDOT Small Business Innovation Research (SBIR) Program: The SBIR program is a Congressionally mandated, competitive program that encourages domestic small businesses to engage in Federal research and development (R&D) with the potential for commercialization. Each year, Federal agencies with extramural R&D budgets that exceed $100 million are required to allocate 3.2 percent of this budget to fund small businesses (15 U.S.C. §638). The SBIR Program encourages small businesses to develop high-tech, innovative transportation solutions that could be commercialized, leading to entrepreneurial growth and economic stimulation.

FMCSA participates in the SBIR Program and administers its own SBIR projects through the John A. Volpe National Transportation Systems Center (Volpe Center). The project selection process is highly competitive, and once selected, projects progress by merit through a three-phase program. Each phase must be completed successfully before a project progresses to the next phase.

SBIR activities under the R&T Program include:
- Fostering further industry adoption of the Trucking Fatigue Meter, a technology designed to reduce crashes caused by driver fatigue
- Supporting the Multi-Modal Driver Distraction and Fatigue Detection and Warning System, a project aimed at developing systems to provide innovative, practical, fast, and reliable detection of driver fatigue and distraction
- Researching the feasibility using blockchain technology to create a secure transaction platform with a distributed ledger, a method that would improve the security of information passing between FMCSA and its partners and stakeholders

Technology Transfer (T2) Audience and Dissemination of Program Results

The R&T Program supports other FMCSA program offices; as such, the target audience is often an internal FMCSA program office (e.g., Enforcement or Policy). Specific to T2 activities, the intended audience is usually States' law enforcement and Inspector activities, as well as commercial fleets. For projects where the outcome is a final report, the agency will publish the final report via the FMCSA Web site and/or the National Transportation Library (NTL). Depending on agency communications priorities, the report may be released in conjunction with a press release, USDOT's News Digest item, or social media post. Findings may also be shared in public forums (e.g., CVSA meetings, the R&T Forum, etc.). For projects where the outcome is a technology intended for motor carrier use (e.g., the Trucking Fatigue Meter), outreach efforts to specific motor carriers will be organized. When the project outcome is an enforcement technology, the R&T Program will communicate the availability of that technology (and available grant funding to implement said technology) via the Innovated Technology Deployment (ITD) Grant Program, through the annual ITD Grant Program Notice of Funding Availability. Table 2 shows the methods FMCSA uses to disseminate R&T Program results.

Table 2. Methods Used by FMCSA's R&T Program to Disseminate Program Results, FY 2021

Dissemination Method
Technical publications made available to public via the FMCSA website
Technical publication downloads–NTL
In-person or webinar presentations delivered to foster technology transfer
Workshops or demonstrations to foster technology transfer
Research agreements with technology transfer requirements

Dissemination Method
TRB Annual Forum

Technology Transfer (T2) Performance Measurement

FMCSA's R&T Program measures the performance of its T2 activities in several ways. First, the agency tracks State deployments of enforcement technologies through its Innovated Technology Deployment (ITD) Grant Program annual reports—published and available via the NTL—which describe the various enforcement technologies that State agencies are implementing with ITD Grant Program funds. Next, during the commercialization phase, FMCSA regularly receives deployment metrics from Small Business Innovation Research (SBIR) awardees. For automated vehicle (AV) related technology transfer activities, the R&T Program seeks regular updates from original equipment manufacturers regarding how many newly manufactured CMVs are equipped with automated CMV safety systems, such as automated emergency braking and, in the future, electronically controlled braking systems (ECBS). Finally, the R&T Program conducts research to assess the effectiveness of enforcement technologies, such as weigh station e-clearance/pre-screening systems.

T2 Representation in the USDOT Research Hub, NTL, and TRB Research in Progress Database

The R&T Program's T2 activities are represented in the USDOT Research Hub and the NTL Digital Library. When applicable, FMCSA adds project summaries for newly awarded research and technology projects to the USDOT Research Hub and the TRB Research in Progress database. These higher-level project summaries link directly to the master project summaries on the FMCSA Web site, which are updated routinely with information on project funding, summary descriptions of research outputs and impacts, and other relevant project information. Additionally, FMCSA publishes all external-facing final reports via the NTL's Digital Repository and makes those links available on the FMCSA website, as appropriate.

Annual Performance Reporting of Technology Transfer (T2) Activities

Pursuant to 15 U.S.C. § 3710(f), FMCSA reports its T2 activities each year in its modal submission for the overall USDOT Technology Transfer Report. The annual USDOT Technology Transfer Report summarizes Department-wide T2 activities for the past fiscal year and includes success stories from each of the operating administrations. The annual report is submitted to the U.S. Department of Commerce, pursuant to 15 U.S.C. § 3710(g)(2).

R&T Program Evaluation/Performance Measurement

Tracking and Evaluating Progress Towards Objectives and Goals

FMCSA's R&T Program is a support program that focuses on (1) supporting the goals and priorities of the agency's other program offices, and (2) directives from other Federal organizations (e.g., Congress, the Government Accountability Office (GAO), etc.). The R&T

Program has specific annual performance goals, which demonstrate the program's outputs and impact across multiple research areas in support of FMCSA's safety mission and the Department's Strategic Goals of Safety and Innovation. To ensure continuing integration with Departmental objectives, and to prevent duplicative research, the R&T Program participates in the biannual OST-R Research Reviews.

Program Performance Measures

The R&T Program evaluates its own performance across the categories of mission support, ITD success, creation of publications, and customer feedback. These categories inform internal processes for measuring, sustaining, and improving performance.

Establishing Baselines, Analyzing Trends, and Evaluating Benefits

The R&T Program establishes performance baselines, both at the program level and at the project level. Project statements of work establish baselines and expectations, and contracted research teams submit monthly reports detailing progress. R&T Program staff continually monitor contracted research projects to ensure baselines are met.

The R&T Program also has several mechanisms in place for analyzing emergent trends and evaluating the benefits created through USDOT-sponsored research. First, the R&T Program collaborates closely with other USDOT operating administrations, participating in multiple working groups and coordinating joint research efforts where justified; when developing annual research plans and participating in the USDOT Research, Development, and Technology (RD&T) Planning Team, the R&T Program works to harmonize its efforts with those of other USDOT operating administrations, ensuring cross-modal collaboration and efficient use of Federal resources.

Next, the agency's REB review process includes discussion of the justification for each research initiative; if REB members are aware of other research efforts being conducted by other Federal agencies or State or private organizations, the research idea is re-evaluated and/or removed from the budget request. The REB considers the potential benefits and risks of funding proposed research projects and makes recommendations accordingly.

The R&T Program also works closely with State governments and agencies and external stakeholders (e.g., industry associations and research institutes) to ensure the agency's research and technology portfolio addresses current needs in the transportation safety environment. By maintaining regular communication with the States, independent committees, and industry stakeholders, FMCSA stays apprised of non-agency-funded research efforts and uses that knowledge to inform its research plans.

Funding Tables

Table 1 - FY 2022 RD&T Program Funding Details

RD&T Program Name	FY 2022 Pres. Budget* ($000)	Applied ($000)	Technology Transfer ($000)	Facilities ($000)	Experimental Development ($000)	Major Equipment, R&D Equipment ($000)
Research and Technology	12,083	8,870	3,160	-	-	53
Totals	12,083[1]	8,870	3,160	-	-	53

Table 2 - FY 2022 RD&T Program Budget Request by DOT Strategic Goals

RD&T Program Name	FY 2022 Pres. Budget* ($000)	Safety ($000)	Economic Strength and Modernization ($000)	Equity ($000)	Climate and Sustainability ($000)	Transformation ($000)	Organizational Excellence ($000)
Research and Technology	12,083	12,083	4,884	214	0	268	5,829
Totals	12,083	12,083	4,884	214	0	268	5,829

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[1] Includes administrative costs per template instruction.

Chapter 1 – FY 2022 RD&T Programs

Research & Technology
($12,083,000)

Program Description:

FMCSA's Research and Technology Program provides scientific safety research on driver behavior, vehicle and carrier operations, and technology applications. These contributions have proven critical in supporting agency safety rulemakings, identifying enforcement priorities, and facilitating technology transfer to the marketplace. Program activities range from developing enhanced enforcement technologies, promoting safe rest habits for drivers, evaluating the safety implications of automated and semi-automated vehicles, and improving database depth and utilization. These projects provide foundations for the agency's rulemaking and enforcement priorities.

Program Objectives:

- **Produce Safer Drivers:** Develop driver-based safety countermeasures to reduce crashes
- **Improve Safety of CMVs:** Improve truck and motorcoach safety through vehicle-based research and the deployment of CMV safety technologies
- **Produce Safer Carriers:** Improve motor carrier safety by compiling and communicating best management practices to motor carriers, and work with industry to accelerate adoption of safety-enhancing technology
- **Advance Safety and Research through Information-Based Initiatives:** Support agency research efforts by: (1) evaluating existing research to highlight areas for additional study, (2) investigating the overall business, economic, and technical trends in the CMV industry, and (3) evaluating potential bases for studying crash data and setting safety goals
- **Enable and Motivate Internal Excellence:** Ensure the relevance, quality, and performance of research and technology activities and develop efficient methods to respond quickly and flexibly to Departmental and agency needs

Anticipated Program Activities:

Activities are grouped topically and labeled with primary and secondary FMCSA focus areas.

Data-Driven Activities

Primary Area: **Futureproofing**

Secondary Areas: **Enforcement, SafeRates**

> R&T Program data-related activities receiving new funding in FY 2022 include original research on safety-related issues, improved integration of databases, and efforts to disseminate findings. Selected activities include efforts to incorporate new data sources into existing databases and a study to gather crash data not currently widely collected.

These activities will support internal rulemaking and subsequent research efforts. More outward-looking efforts include:

Enhancements to the **North American Fatigue Management Program** (NAFMP) website. NAFMP is a tool that supports carriers' efforts to reduce drowsy driving. Website improvements will facilitate customer access resources on driver fatigue best practices.

Establishment of a Data Sharing Community via the CARMA Collaborative GitHub Site to share information on automatic vehicles (AVs) within existing data infrastructure.

AV Technology Activities

Primary Area: **Futureproofing**

Secondary Area: **Climate**

Automated vehicles (AV) may improve safety and reduce environmental impacts by preventing and mitigating crashes. Some automation applications may also improve fuel efficiency, though studies of real-world effects are still seeking to quantify benefits.

R&T's **Automated CMV Evaluation (ACE) Program** will continue track-based testing and development of automation technologies using FMCSA's research vehicles at the Aberdeen Proving Grounds. This program will support the shift toward wider use of automation in the CMV industry—and help USDOT's enforcement and regulatory approaches evolve to match the emerging transportation landscape.

General Technology Activities

Primary Area: **Futureproofing**

Secondary Areas: **Enforcement, SafeRates**

The **Commercial Motor Vehicle Roadside Technology Corridor (CMVRTC)** is a collaboration between FMCSA and several other Federal and State agencies to promote technology transfer. Specifically, CMVRTC supports testing facilities at weigh stations to demonstrate, test, evaluate, and showcase innovative safety technologies under real-world conditions to improve commercial truck and bus safety. Results from the program shape development of functional specifications for Motor Carrier Safety Assistance Program (MCSAP) grant applications.

As described above, the **Innovative Technology Deployment (ITD) Grant Program** will continue to foster wider State deployment of advanced enforcement technologies such as tire anomaly detection systems that identify unsafe tires on trucks at highway speeds, and improved roadside access to databases that share out-of-service data with enforcement personnel. Measures like these enable the removal of unsafe trucks from the road and effective enforcement against non-compliant carriers.

Also described above, the **Small Business Innovation Research (SBIR) Program** will continue to stimulate technological innovation, utilize small business to meet Federal research and development needs, encourage participation by minority and disadvantaged businesses in technological innovation, and increase private sector

commercialization of innovations derived from Federal research. This program helps ensure that small businesses continue to play a key role in technological transformation.

Regulatory Activity, Enforcement, and Safety

Primary Area: **SafeRates**

Secondary Area: **Enforcement**

The **Impact of the Electronic Logging Device (ELD) Mandate on Small Carriers** project will examine safety and compliance impacts across large and small carriers. The resulting research will explore how the ELD mandate has affected safety records and business practices for carriers of different sizes, providing insight into how the size of a fleet informs safety in the post-mandate world.

As a follow-on to a study completed in 2014, FMCSA will investigate the **Impacts of Driver Detention Time on Safety.** The purpose of this project is to better understand the nature and scope of detention times in the CMV industry, develop strategies to mitigate driver risks, and assess the safety and operational impacts of detention time, including frequency of violations to FMCSA's Hours of Service regulations. If detention time is affecting drivers' abilities to follow these Federal requirements, then it may also affect driver safety.

Climate Research

Primary Area: **Climate**

Secondary Area: **Futureproofing, SafeRates**

Electric vehicles have the potential to reduce carbon emissions. The **Electric Commercial Motor Vehicle Exploratory Research** project will conduct a literature review and other preliminary research to set up future, in-depth studies. General fields of interest include where and how electric CMVs can reduce carbon emissions, how electric vehicles may shape the CMV industry and FMCSA's safety mission, and how electric vehicles may interact with established and fledgling safety technologies.

Collaboration Partners:

Internal Collaboration Partners

The R&T Program is working with NHTSA on a project to improve data availability on CMV crashes by identifying new data sources and analyzing near real time crash data from State partners, and a new Large Truck Crash Causal Factors Study that will provide new insights into contributing factors to CMV crashes. FMCSA also works with the Federal Highway Administration (FHWA), and the Intelligent Transportation Systems Joint Program Office (ITS/JPO) to answer research questions related to automated and connected CMVs and associated human factors issues, heavy vehicle crash avoidance and enterprise data, and the accelerated deployment of CMV safety technologies.

External Collaboration Partners

The R&T Program regularly receives, reviews, and responds to safety related CMV driver, carrier, and vehicle research and policy recommendations from the National Transportation Safety Board (NTSB), the National Academy of Sciences (NAS), the Transportation Research Board (TRB), the Committee on National Statistics (CNSTAT), the Motor Carrier Safety Advisory Committee (MCSAC), and other organizations. FMCSA evaluates recommendations from these organizations and adjusts the R&T agenda as needed. When appropriate, the R&T Program partners with external organizations— such as the National Institute of Occupational Safety and Health (NIOSH), the Department of Energy, the U.S. Army, and the Commercial Vehicle Safety Alliance (CVSA)—to conduct relevant CMV driver, carrier, and vehicle safety research. The R&T Program also maintains close contact with the motor carrier industry, collaborating with industry associations and motor carriers to advance safety improvement efforts.

Chapter 2 – FY 2023 RD&T Programs
Research & Technology Program

Program Description:

The R&T Programs overall goals and mandate remain unchanged from FY 2022, but new focuses will include climate-related research and projects exploring inspections and enforcement with a broader understanding of equity.

Program Objectives:

- **Produce Safer Drivers:** Develop driver-based safety countermeasures to reduce crashes
- **Improve Safety of CMVs:** Improve truck and motorcoach safety through vehicle-based research and the deployment of CMV safety technologies
- **Produce Safer Carriers:** Improve motor carrier safety by compiling and communicating best management practices to motor carriers, and work with industry to accelerate adoption of safety-enhancing technology
- **Advance Safety and Research through Information-Based Initiatives:** Support agency research efforts by: (1) evaluating existing research to highlight areas for additional study, (2) investigating the overall business, economic, and technical trends in the CMV industry, and (3) evaluating potential bases for studying crash data and setting safety goals
- **Enable and Motivate Internal Excellence:** Ensure the relevance, quality, and performance of research and technology activities and develop efficient methods to respond quickly and flexibly to Departmental and agency needs

Anticipated Program Activities:

Activities are grouped topically and tagged with primary FMCSA focus areas.

Data-Driven Activities and AV Technology Activities

> Activities from 2022 are anticipated to extend into 2023, continuing to address all four focus areas with emphases on **Futureproofing** and **Enforcement**. **Climate** may also come increasingly to the fore as 2022 research identifies ways to connect research efforts to climate objectives.

General Technology Activities

Primary Area: **Futureproofing**

Secondary Areas: **SafeRates, Enforcement**

> New safety projects will address **interactions between crash-avoidance technologies and external crash-mitigation technologies**. Systems designed to prevent crashes (like automated emergency braking) are growing more common on late model-year passenger vehicles, while large CMVs tend to favor externally-mounted devices designed to mitigate crashes—side guards, for example, as they are easier to retrofit onto existing large vehicles. Research on how these technologies interact may

shape crash testing protocols and identify safe, efficient paths forward for both passenger vehicle and CMV technologies and practices.

Work zone and incident areas, which are prone to congestion and often feature narrowed shoulders and complex signage, remain a hazardous space for interactions between vehicles, including CMVs. In FY 2023, the R&T Program will survey existing technologies to identify efficient alert methods to enable CMV drivers and dispatchers to safely navigate through or around work zones and incident areas.

Electronic screening may provide means of improving the rate of **necessary, targeted inspections of passenger carrier vehicles.** Currently, these vehicles are usually inspected only at waypoints, and potential issues or problems most visible mid-journey may go unaddressed for thousands of miles. Electronic screening methods may enable swift and effective intervention to identify risky vehicles and remove them from the roadway.

Regulatory Activity, Enforcement, and Safety

Primary Area: **SafeRates**

Secondary Area: **Enforcement**

New research will address the current **Skill Performance Certificate Evaluations**, analyzing how standards apply to drivers with physical disabilities in light of new advances in prostheses, therapies, and other factors informing the ability of drivers with missing limbs or other physical differences to safely operate CMVs.

New research in FY 2023 will include a project to assess **equity in inspection and enforcement activities**, examining whether and how implicit bias may shape activity. Preliminary research will also document what information is available to personnel at which stage of interaction with the CMV driver, identifying which resources, methods, and scenarios are most and least susceptible to bias.

Climate Research

Primary Area: **Climate**

Secondary Areas: **Futureproofing, SafeRates, Enforcement**

Anticipated activities will address climate-related issues along two paths. First, research into **environmental costs associated with CMV crashes**—including carbon emissions associated with delays—will update outdated studies and provide a foundation for addressing crash issues outside of lives lost, injuries, and immediate fiscal costs. Second, research will study the relationship between **electric CMVs and current hours-of-service regulations**, which evolved under the paradigm of diesel vehicles with long ranges and short refueling times. This research will inform policies, industry best practices, and infrastructure goals relevant to safely incorporate electric CMVs into plans to mitigate climate change.

General Technology

The **Innovated Technology Deployment Program** will continue to foster State agencies' use of advanced technologies to improve their core safety infrastructure, and the **Small Business Innovation Research Program** will promote small business involvement in rolling out new technologies.