

**United States Department of Transportation
Annual Modal Research Plan FY 2023
Program Outlook FY 2024**

Cover Page

Federal Motor Carrier Safety Administration

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Executive Summary

Research & Technology Program Overview

The Federal Motor Carrier Safety Administration (FMCSA) carries out a multiyear Motor Carrier Research & Technology (R&T) Program under the authority of 49 USC 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;
- Improving CMV safety through driver-centric research including human factors, fatigue, distraction, training, compensation, and related driver issues;
- Improving technology used by enforcement officers when conducting roadside inspections and investigations to increase efficiency and information transfers; and
- 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 countermeasures development and enforcement efforts, focusing on vital Federal safety oversight functions.

FMCSA's FY 2023 R&T activities align with the DOT's strategic goals (Safety, Economic Strength and Global Competitiveness, Equity, Climate and Sustainability, Transformation, and Organizational Excellence) as well as the RD&T Strategic Plan and the objectives set forth in USDOT's Innovation Principles, and the National Roadway Safety Strategy.

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). FMCSA also participates in the Department's multimodal intersection safety initiatives including the "10K Challenge" focused on reducing costs of advanced intersection safety technologies, and on the "Public Safety Awareness Technology Evaluation" (PSATE) program which focuses on identifying and evaluating emerging safety technologies—with an initial focus on technologies that address pedestrians, cyclists and other vulnerable road users (VRUs).

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 North American Fatigue Management Program and on developing uniform national procedures for inspecting both conventional and automated trucks. FMCSA continues its long-running relationship with academic and industry groups such as the Transportation Research Board, SAE International and the American Trucking Associations' Technology and Maintenance Council.

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. There were over 400 stakeholder participants at the online Forum held in March 2022.

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

Technology Transfer/Deployment Activities

FMCSA's technology transfer (T2) activities involve providing published research, best practices guidance, and/or grants to State or motor carrier stakeholders. These activities are intended to increase or ease adoption of both on-board (advanced driver assistance systems [ADAS]) and off-board (inspection and enforcement related) 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 work zone and other queue warning systems that provide in-cab notifications to truck drivers as they approach slower-moving traffic. The FMCSA staff provided their findings to State motor carrier enforcement agency partners and made this technology eligible under the Innovative Technology Deployment (ITD) Grant Program. As an example of research driving technology transfer, FMCSA staff partnered with the CVSA and launched the North American Fatigue Management Program website. This website provides truck driver fatigue awareness training and many other safety resources for fleets to help manage truck driver fatigue—a significant contributing factor in truck crashes. As another example, FMCSA's Tech-Celerate Now program provides information and decision-support tools to help fleets make informed decisions about deploying ADAS on their fleet trucks (<https://www.fmcsa.dot.gov/Tech-CelerateNow>).

Coordination of T2 Activities

The R&T Program follows several protocols to coordinate T2 activities both within FMCSA and with other modal Agencies and State partners. 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 that have research and technology interests). Second, the R&T Program participates in the USDOT Research, Development, and Technology (RD&T) Planning Team, which includes representatives from all the USDOT modes. 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 the Federal Highway Administration (FHWA) and National Highway Traffic Safety Administration (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.

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 address safety challenges 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 ADAS, automated driving systems (ADS) and cybersecurity measures.
- Improve technology used by enforcement officers when conducting roadside inspections and compliance reviews—e.g., increasing deployment of virtual weigh stations, adoption of enhanced brake inspection processes, and thermal imaging systems to detect problems with brakes and/or tires.
- Design, develop and demonstrate products and/or processes related to improving vehicle, driver or carrier safety —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.

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 technologies that enhance the efficiency, enforcement and effectiveness of CMV operational information systems for the States. The ITD Program provides approximately \$20 million in annual funding for States to deploy, support, and maintain information systems and networks targeted at enhancing the sharing of safety-related information on drivers, vehicles and carriers while also increasing the accuracy, completeness and timeliness of such information among State and Federal CMV safety enforcement partners. 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 may progress by merit through a three-phase program. Each phase must be completed successfully before a project progresses to the next phase.

There are currently three SBIR projects underway within the R&T Program:

- Deployment of Traffic Warning Devices: The objective of this project is to develop a method for automatically deploying the required warning devices in the event that an automated CMV must stop upon the traveled portion or the shoulder of a highway for reasons other than necessary traffic stops. This project successfully completed Phase I and has been recommended to proceed to Phase II.
- Driver Readiness Assessment Technologies – There are two SBIR efforts underway in this area with a goal of creating an objective quantifiable measure that can assess a driver’s alertness before driving a CMV. This measure would be used to identify and help mitigate driver fatigue. The first approach utilizes the psycho-motor vigilance test (PVT) to assess the alertness of drivers. The second effort uses wrist-worn sensors to capture data directly relevant to CMV drivers’ alertness, such as quantitative sleep information via actigraphy and quantitative stress information via an analysis of heart-rate variability using onboard pulse photoplethysmography (PPG) sensors. In each case the objective is to obtain a real-time objective quantification of driver readiness. Both projects have successfully completed Phase I and have been recommended to proceed to Phase II.

T2 Audience and Dissemination of Program Results

The R&T Program supports other FMCSA program offices, including Enforcement, Policy, Safety, and Field offices. The intended audience therefore includes FMCSA “internal” customers in these other offices, but also States’ CMV law enforcement and Inspection activities, as well as CMV fleets and drivers. Occasionally, R&T’s work is of particular interest to CMV original equipment manufacturers and system suppliers (e.g., investigation of leading-edge braking technologies). For projects where the outcome is a final report, the agency will publish the final report via the FMCSA website and the National Transportation Library (NTL). Depending on agency communication 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 and the Analysis, Research, and Technology Forum). For projects where the outcome is a technology intended for motor carrier use, outreach efforts to specific motor carriers or motor carrier market segments are initiated. 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 the technology) through the annual ITD Grant Program Notice of Funding Availability. Table I shows the methods FMCSA uses to disseminate R&T Program results.

Table I. Methods Used by FMCSA’s R&T Program to Disseminate Program Results, FY 2023

R&T Program Results Dissemination Methods
Technical publications made available to public via the FMCSA website
Technical publication downloads–NTL
In-person or webinar presentations delivered to foster T2
Workshops or demonstrations to foster T2
Research agreements with T2 requirements
Annual ART Forum

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 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. In FY 2023, FMCSA is planning to conduct a safety, efficiency, and effectiveness study on the ITD program elements—safety information exchange, electronic online permitting, and e-clearance/pre-screening systems—as an update to the last assessment conducted in 2009. Additionally, during the commercialization phase of SBIR projects, FMCSA regularly receives deployment metrics from awardees.

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 high-level project summaries link directly to the master project summaries on the FMCSA website, which are updated regularly 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 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 sample success stories from each of the modes. The annual report is submitted to the U.S. Department of Commerce, pursuant to 15 U.S.C. 3710(g)(2).

Anticipated Outcomes

FMCSA’s R&T Program develops the knowledge, practices, and technologies needed to address safety challenges and answer questions that arise in prioritizing enforcement resources and improving the safety of commercial drivers, vehicles, and carriers. Crashes involving CMVs carry significant human costs in the form of injuries and fatalities. These human costs are also economically significant; specifically, in 2019, there were 5,290 fatalities associated with large truck and bus crashes, and the estimated cost of all large truck and bus crashes was \$163 billion (see Table II)(FMCSA, 2020 Pocket Guide to Large Truck and Bus Statistics).

Table II. Estimated Costs of Large Truck and Bus Crashes, 2016-2019 (2016 Dollars)

Year	Truck Crashes	Truck Crashes (FNU)	Truck Crashes	Bus Crashes
2016	\$57 Billion	\$60 Billion	\$29 Billion	\$145 Billion
2017	\$60 Billion	\$62 Billion	\$29 Billion	\$151 Billion
2018	\$61 Billion	\$65 Billion	\$33 Billion	\$158 Billion
2019	\$61 Billion	\$68 Billion	\$34 Billion	\$163 Billion

Notes: A large truck is defined here as a truck with a GVWR greater than 10,000 pounds. A bus is defined as a vehicle with seats for at least nine people, including the driver. The total costs may not add up exactly due to rounding. Changes to past years are the result of updating for inflation and changes in guidance from the Office of the Secretary of Transportation on how to value fatalities and injuries. Estimates are based on fatal crash data from the Fatality Analysis Reporting System (FARS) and injury crash and PDO crash data from CRSS.
 Data Sources: T. Miller, E. Zaloshnja, and R. Spioer, Revised Cost of Large Truck and Bus Involved Crashes (2002), adjusted to 2015 dollars, and a year 2015 value of a statistical life (VSL) (as published on August 8, 2016, by the Office of the Secretary of Transportation); NHTSA, FARS, and CRSS.

In general, research conducted by FMCSA contributes to 1) development of safety technologies for use by enforcement and commercial carriers, and 2) recommending 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 research activities, FMCSA will:

- Better understand the causes and impacts of CMV crashes and inform efforts to develop safety countermeasures to reduce crashes and remove unsafe drivers, vehicles, and carriers from the Nation’s roads,
- Better understand the safety impacts associated with the adoption of automated CMVs,
- Support continued progress in the development and testing of CMV safety technologies, and
- 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 associated economic costs.

Evaluation and Performance Measurement

FMCSA's R&T Program focuses on (1) supporting the safety goals and regulatory 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

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. To ensure continuing integration with Departmental objectives, and to prevent duplicative research, the R&T Program participates in OST-R biannual research reviews.

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

The R&T Program establishes performance benchmarks, both at the program level and at the project level. Project statements of work establish deliverables, milestones, and monitoring plans. Contracted research teams submit monthly reports detailing progress and R&T Program staff continually monitor these 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 modes, participating in multiple working groups and coordinating joint research efforts when developing annual research plans. By participating in the USDOT RD&T Planning Team, the R&T Program works to harmonize its efforts with those of other USDOT modes, ensuring cross-modal collaboration and efficient use of Federal resources.

Next, the agency's Research Executive Board (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 or State agencies, 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 2023 RD&T Program Funding Details

RD&T Program Name	FY 2023 Pres. Budget (\$000)	Applied (\$000)	Technology Transfer (\$000)	Facilities (\$000)	Experimental Development (\$000)	Major Equipment, R&D Equipment (\$000)
Research and Technology	17,083	16,639		-	444	
Totals	17,083	16,639		-	444	

The AMRP reflects funding as found in the FY 2023 President's budget request per 49 U.S.C. Chapter 65 Sec. 6501 Research Planning. The FY 2023 enacted numbers will be posted as part of the FY2024 President's budget request.

Table 2 - FY 2023 RD&T Program Budget Request by DOT Strategic Goal

RD&T Program Name	FY 2023 President's Budget Request (\$000)	Safety (\$000)	Economic Strength and Modernization (\$000)	Equity (\$000)	Climate and Sustainability (\$000)	Transformation (\$000)	Organizational Excellence (\$000)
Research and Technology	17,083	9,930	459	393	788	4,434	1,078
Totals	17,083	9,930	459	393	788	4,434	1,078

The AMRP reflects funding as found in the FY 2023 President's budget request per 49 U.S.C. Chapter 65 Sec. 6501 Research Planning. The FY 2023 enacted numbers will be posted as part of the FY2024 President's budget request.

Chapter 1 – FY 2023 RD&T Programs

Program Name: Research & Technology

(\$17,083,000)

Program Description:

The Federal Motor Carrier Safety Administration's (FMCSA) Research and Technology (R&T) Program provides scientific safety research on driver behavior, vehicle and carrier operations, and relevant technology. These contributions have proven critical in supporting agency safety rulemakings, identifying enforcement priorities, and facilitating technology transfer to the marketplace. Program activities include 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. The R&T Program is mandated under 49 USC 31108. It advances FMCSA focus areas and USDOT strategic goals of Safety, Economic Strength and Global Competitiveness, Equity, Climate and Sustainability, Transformation, and Organizational Excellence.

Major Program Objectives:

- **Produce Safer Drivers:** Develop driver-based safety countermeasures to reduce crashes
- **Improve Safety of Commercial Motor Vehicles (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 working 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:

Data-Driven Activities

R&T Program data-related activities receiving new funding in FY 2023 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. (US DOT Strategic Goals supported: Safety, Transformation)

Automated Vehicle Technology Activities

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

The R&T Program'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 in Maryland, SunTrax in Florida, and at the Virginia Tech Smart Road in Virginia. 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.

Using the Safe System approach, the ACE program team will conduct operational safety tests by using its fleet of ACE ADS-equipped research vehicles: three class 8 heavy trucks and a new Smart Trailer, which is equipped with multiple sensors to monitor brake, tire, wheel, lights, and other critical vehicle safety systems as well as a controller area network connection with the tractor. Currently, there is a 3:1 trailer to tractor ratio in existing commercial fleets with little or no sensor connectivity between tractors and “dumb” trailers. FMCSA will use its new Smart Trailer to identify and demonstrate how future automated trucks can be alerted to trailer equipment problems such as a tire blowout or brake malfunction. (US DOT Strategic Goals supported: Safety, Transformation)

General Technology Activities

The **Commercial Motor Vehicle Roadside Technology Consortium (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. (US DOT Strategic Goals supported: Safety, Transformation, Climate)

The **Innovative Technology Deployment (ITD) Grant Program** will continue to foster wider deployment across the country of advanced enforcement technologies such as queue warning systems for truck drivers approaching slower traffic, 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 CMVs from the road and effective enforcement against non-compliant carriers. (US DOT Strategic Goals supported: Safety, Transformation, Climate)

The **Small Business Innovation Research (SBIR) Program** will continue to stimulate technological innovation, utilize small businesses to meet Federal research and development needs, encourage participation by minority and disadvantaged businesses in technological innovation, and increase private sector commercialization of innovations made possible by Federal research funding. This program helps ensure that

small businesses continue to play a key role in technological transformation. (US DOT Strategic Goals supported: Safety, Transformation, Climate, Equity)

Regulatory Activity, Enforcement, and Safety Activities

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 frequency and severity of detention time 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. (US DOT Strategic Goals supported: Safety)

Section 23022 of the Bipartisan Infrastructure Law requires FMCSA to establish an apprenticeship pilot program that would allow drivers between the ages of 18-20 with an intrastate commercial driver's license (CDL) to operate commercial motor vehicles in interstate commerce under very specific conditions. On January 14, 2022, FMCSA announced in the Federal Register the establishment of the **Safe Driver Apprenticeship Pilot (SDAP)** program, which will allow certain 18-, 19-, and 20-year-old drivers to operate CMVs in interstate commerce. (US DOT Strategic Goals supported: Safety)

Section 23022(i) of the BIL further requires FMCSA to establish a contract with the National Academies Transportation Research Board (TRB) to study the **Impact of Driver Compensation on Safety and Retention** to determine how various methods of driver compensation impact driver safety and retention. Compensation methods studied will include hourly pay, payment on a per-mile basis, payment for detention time and any other compensation methods used by the industry. (US DOT Strategic Goals supported: Safety)

Potential Economic or Societal Impacts

Climate Related Activities

The **Initiating Certified Highway Electronic Inspections to Enhance Safety and Reduce Large Truck Emissions** project represents FMCSA's response to Secretary Buttigieg's Climate Challenge Initiative that he issued to all of the Department's modal administrations. Each year, State and local truck inspectors conduct approximately 2.9 million roadside inspections and screen approximately 100 million CMVs, causing and excessive idling. This project will require or incentivize the implementation of electronic in-motion CMV inspections to reduce idling time (and therefore emissions) at State roadside inspection stations.

Additionally, 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 on electric CMVs. General fields of interest include where and how electric CMVs can reduce carbon emissions, how electric vehicles may shape the CMV industry and affect ways FMCSA fulfills its safety mission, and how electric vehicles may interact with established and fledgling safety technologies.

CMV Driver Medical Certification Related Activities

Investigating the Safety of CMV Operation by Deaf and Hard of Hearing Drivers

project is being conducted as part of FMCSA's ongoing research into medical exemptions to determine if, and how, the hearing standard found in 49 CFR 391.41(b)(11) should be updated; to determine if, and how, the process for hearing standard exemptions should be changed; and lastly, to identify, document and test procedures and recommendations that can be safely and effectively used with deaf and hard of hearing students during behind-the-wheel, on-road CDL training and testing. (US DOT Strategic Goals supported: Safety, Equity)

The objective of the **Hypertension and Medical Certification of CMV Drivers** project is to identify the most current literature with respect to definitions of high blood pressure, treatment of high blood pressure, and the measurement at which high blood pressure is likely to interfere with a driver's ability to operate a CMV safely. The second objective of the project is to evaluate the likelihood of individuals with high blood pressure being involved in a motor vehicle crash. Finally, the third objective of the project is to evaluate whether guidance on high blood pressure that is currently available to medical examiners who conduct physical qualification examinations of CMV drivers is consistent with the current literature.

Progress Made Toward Achieving Strategic Goals

FMCSA's R&T program is integral to the mission of the Agency. The R&T activities conducted by the agency are primarily focused on CMV safety, and in turn reducing CMV-related fatalities and injuries. Oftentimes CMV safety-related research is transformative in nature, such as AV-related research or research supporting the ITD and SBIR programs, thereby serving DOT's transformation strategic goal. FMCSA's FY23 research portfolio also directly and indirectly supports the principles of the National Roadway Safety Strategy: Safer People, Safer Roads, Safer Vehicles, Safer Speeds, and Post-Crash Care. FMCSA's research efforts are focused, results-based, measurable, and result in documented and communicated findings.

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. 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. FMCSA also participates in the Department's multimodal intersection safety initiatives including the "10K Challenge" focused on reducing costs of advanced intersection safety technologies, and on the "Public Safety Awareness Technology Evaluation" (PSATE) program which focuses on identifying and evaluating emerging safety technologies—with an initial focus on technologies that address pedestrians, cyclists and other vulnerable road users (VRUs).

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 Program's 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 2024 RD&T Programs Research & Technology Program

The AMRP FY 2024 outlook year chapter in the annual plan is not developed in alignment with the President’s budget request of the same year due to the AMRP development schedule per 49 U.S.C. Chapter 65 Sec. 6501 Research Planning.

Program Description:

FMCSA’s R&T 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. The R&T Program is mandated under 49 USC 31108. It advances FMCSA focus areas and USDOT strategic goals through pursuit of its program objectives.

Major 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:

Data-Driven Activities

Activities from 2023 are anticipated to extend into 2024, continuing to address focus areas such as improving and expanding upon current data collection capabilities. This includes considering research activities to improve linking crash data among existing crash databases, such as the Motor Carrier Management Information System and the Fatality and Analysis Reporting System.

AV Technology Activities

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 2024, the R&T Program will work with FHWA and State Departments of Transportation on developing a national framework for sharing standard data elements and following uniform operational procedures to reduce CMV crashes in work zones. These efforts will enable existing connected CMVs and future semi- and fully automated CMVs to safely navigate work zones and be alerted to slow moving traffic ahead due to other incidents and congestion.

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 Activities

FMCSA will continue research beginning in FY 2023, including the **Impact of Driver Compensation on Safety and Retention**, the **Impacts of Driver Detention Time on Safety**, and the **SDAP**. In addition, the R&T Program will continue researching the effectiveness of medical exemption programs to support regulatory activities.

Climate Related Activities

FMCSA will continue research on electric vehicles, including considering research on how CMV drivers may need to adjust their operations and training to accommodate charging of electric CMVs during trips. Additionally, FMCSA will continue research on automated enforcement technologies to reduce emissions caused by vehicle idling and waiting.

FMCSA will also undertake research on the potential for Level VIII inspections to enhance safety and reduce truck emissions.

General Technology Activities

The **ITD Program** will continue to foster State agencies' use of advanced technologies to improve their core safety infrastructure, and the **SBIR Program** will continue to promote small business involvement in rolling out new technologies.

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