

**United States Department of Transportation
Annual Modal Research Plans FY 2021
Program Outlook FY 2022**

Cover Page

FMCSA Research & Technology Program

January 2021

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Chapter 1—Executive Summary

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 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 and the overall Departmental goals of *Safety* and *Innovation*. 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 2021 R&T activities, which align primarily with the USDOT Strategic Goals of *Safety* and *Innovation*, have three key focus areas: (1) automated CMV research and development; (2) research to support Agency efforts to produce safer commercial drivers, carriers, and vehicles; and (3) deployment of advanced technology via the Innovative Technology Deployment (ITD) Grant Program.

Anticipated Outcomes

FMCSA’s R&T Program develops the knowledge, practices, and technologies needed to solve problems that arise in prioritizing Agency resources and improving the safety of commercial drivers, vehicles, and carriers. Crashes involving CMVs are extremely costly; in 2017, the estimated cost of all large truck and bus crashes was \$135 billion (see Table 1), and there were 4,455 fatalities involving large truck and bus crashes (FMCSA, 2019

Table 1. Estimated Costs of Large Truck and Bus Crashes, 2014-2017 (2015 Dollars)

Year	Fatal Crashes	Injury Crashes	Property-Damage-Only (PDO) Crashes	All Large Truck and Bus Crashes
2014	\$42 Billion	\$44 Billion	\$28 Billion	\$114 Billion
2015	\$44 Billion	\$46 Billion	\$28 Billion	\$118 Billion
2016*	\$47 Billion	\$53 Billion	\$29 Billion	\$129 Billion
2017*	\$51 Billion	\$55 Billion	\$29 Billion	\$135 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: 2019 Pocket Guide to Large Truck and Bus Statistics, Table 4-22.

Pocket Guide to Large Truck and Bus Statistics). In general, research conducted by FMCSA contributes to the development of safety technologies for use by enforcement and commercial carriers, and to 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:

- 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.

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, reducing costs to the American public and saving lives.

Certification of Non-Duplicative Activities

The R&T Program conducts unique, non-duplicative 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 modes and learn about other modal partners' 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 no duplication of research and will build a safe future that incorporates automation for both commercial and passenger vehicles.

Collaboration Efforts

FMCSA collaborates closely with product end-users—including internal FMCSA program offices and other USDOT modes—to identify common research needs and streamline existing and planned research efforts. The Agency works closely with NHTSA on crash data collection. Specifically, FMCSA is working with NHTSA on a project to complete the picture 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 to accelerate the deployment of CMV safety technologies.

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). In FY 2021, FMCSA will continue to share and coordinate its research activities through these TRWGs. For example, in support of the Executive Order on Maintaining American Leadership in

Artificial Intelligence (AI) issued on February 11, 2019, FMCSA, as a member of the Emerging/Enabling Technologies TRWG, will be sharing lessons learned from a project that will work with State partners to develop AI-driven tools for crash report processing and analysis.

FMCSA also collaborates with external stakeholders and partners. The Agency 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, 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.

Technology Transfer (T2)

FMCSA's technology transfer (T2) activities involve Federal R&T Program staff, partner modes, contracted research and support staff, Small Business Innovation Research (SBIR) awardees, technology vendors, original equipment manufacturers, State partners, motor carriers, and industry associations. T2 beneficiaries include State and local governments, law enforcement, Federal and State commercial vehicle inspectors, motor carriers, and CMV drivers. These beneficiaries receive published research, best practices guidance, or grants aimed to increase or ease adoption of safety technologies. These activities span three main programs and rely on coordination with partner organizations.

Coordination of T2 Activities

In addition to consulting with the FMCSA Research Executive Board (REB) (a committee of representatives from across the FMCSA staff that have research and technology interests) when planning its portfolio of projects (to include T2 activities), the R&T Program also participates in the USDOT Research, Development, and Technology (RDT) Planning Team, which includes representatives from all the USDOT modes. Beyond this, R&T Program leadership participates in ITS/JPO working groups and meetings and conducts joint research projects with other agencies, such as FHWA and NHTSA. Through the ITD Program, the R&T Program collaborates closely with States on technology deployment activities, data exchange, etc. These activities 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., promoting 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 to upcoming work zones.
- Facilitate training or education of CMV safety personnel—e.g. developing best practices for cybersecurity for aftermarket devices for fleet operators.

ITD Grant Program: The ITD Grant Program provides funding for States 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. Examples of 2020 ITD grant priorities include intelligent transportation system applications for CMV operations, support/maintenance of CMV information systems and networks, the linking of FMCSA and State information systems, the improvement of safety and productivity of CMVs and commercial drivers, and the reduction of costs associated with CMV operations and regulatory requirements. Each year, through the High Priority (HP) Grant, the ITD Program provides up to \$20M in 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. For example, out of 229,190 eScreen inspections in FY19, 66,471 vehicles and 11,073 drivers were placed OOS. Vehicle OOS rate was 21.19 percent and Driver (out-of-service) OOS rate was 6.68 percent resulting in an overall violation rate of 49.12 percent.

USDOT Small Business Innovation Research (SBIR) Program: This 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-phased program. Each phase must be successful in order to progress to the next phase.

SBIR projects include fostering further industry adoption of the Trucking Fatigue Meter, a technology designed to reduce crashes caused by driver fatigue; 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 under a wide variety of operating conditions; and research into the feasibility using blockchain technology to create a secure transaction platform with a distributed ledger, a method that would improve security of information passing between FMCSA and its partners and stakeholders.

T2 Audience and Dissemination of Program Results

The R&T Program largely 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 inspectors, and 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, News Digest item, or social media post. Findings may also be shared in public forums (e.g., CVSA meetings, the TRB Annual Meeting, 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 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 2020

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

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 the States are implementing with ITD Grant Program funds. Next, during the commercialization phase, FMCSA regularly receives deployment metrics from SBIR awardees. For example, sales for the Trucking Fatigue Meter have doubled every year since 2016 and currently exceed 4,000 drivers at 11 different carriers across various size categories. For automated vehicle (AV) related technology transfer activities, the R&T Program will seek 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 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 modes. 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. The R&T Program has an established set of annual performance baselines and produces an annual internal report detailing yearly accomplishments.

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. The R&T Program reports its annual accomplishments in an internal annual report, produced at the end of each calendar year. Performance baselines at the project level vary based on the work being conducted. 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 DOT-sponsored research. First, the R&T Program collaborates closely with other USDOT modes, 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 Council, 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 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 the States 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. The Agency is a member of the Committee on Truck & Bus Safety (ANB70) of the Transportation Research Board. This committee is made up of many organizations interested in truck and bus safety. As members of this committee, FMCSA provides briefs on upcoming research and technology projects and plans; similarly, FMCSA learns about emerging research trends and the research efforts of other organizations on the committee. By maintaining regular communication with the States, independent committees, and industry stakeholders, FMCSA stays apprised of non-Agency-funded research efforts, using that knowledge to inform its research plans.

Performance Against Metrics

The R&T Program complies with annual targets, sufficiently responding to Agency priorities, Departmental research and budget requirements, Congressional mandates, Office of Inspector General and GAO directives, etc. The R&T Program conducts a significant amount of safety research with limited resources. Research findings and technology outputs support the efforts of other program offices and benefit the States, the motor carrier industry, and the motoring public in general, through increased roadway safety.

For example, in April 2019 the R&T Program published the Motor Carrier Hazardous Materials Safety Permits Study. This report summarizes information from interviews with internal FMCSA staff and external industry stakeholders; outlines the history and similarities and differences of Federal Hazardous Materials Safety Permit (HMSP) and State Uniform Hazardous Materials (HM) programs; discusses the list of materials subject to HMSPs; analyzes the demographics and safety performance of permittees; and addresses the overall safety effectiveness of the HMSP program. Key findings from the report inform ways FMCSA could improve identification of high-risk carriers and target enforcement resources.

In June 2019, the program published the Accelerating SmartPark Deployment Strategic Plan, which describes a plan for USDOT to promote wider deployment of SmartPark systems to provide truck drivers with real-time parking information. The plan maps out

barriers to deployment, including financial, institutional, technical, and user-acceptance considerations, along with means of overcoming or mitigating these barriers. The plan concludes with nine recommended steps to accelerate SmartPark system deployment.

In November 2019, the program published a report titled Examining the FMCSA Vision Standard for Commercial Motor Vehicles. This study measured the safety efficacy of current FMCSA visual performance standards, and the availability and efficacy of additional tests used to measure visual performance components essential for safe CMV driving. Results validated several of FMCSA’s current vision standards and identified which ocular issues correlate with higher crash rates.

Accessibility of Data for Evaluations

The Agency maintains a research and technology project database, which houses data for all funded and in-house R&T projects. Additional data is available from research contractors and partners upon request. These data can be used for evaluations (case studies) as needed.

Responses to COVID-19

Changes in Operations

Like the rest of the Department, FMCSA has modified its day-to-day operations to protect the safety of its personnel and the public. To date, the COVID-19 pandemic has not negatively affected FMCSA’s research program. In the near-term, R&T anticipates the research program to continue operating effectively, though adaptations may be made to reduce in-person contact and to accommodate safety protocols developed by R&T’s partners. These adaptations could result in the need to re-plan projects and to modify project budgets and deliverables.

COVID-19 Research

The pandemic has occasioned responses from FMCSA, including the granting of waivers and exemptions to carriers calculated to protect vital supply chains by easing burdens on drivers and carriers. R&T has proposed a study to examine the both the direct effects of the pandemic on truck and bus safety and the safety effects of exemptions and waivers granted due to these unusual circumstances. The goal of this study is to produce quantified accounts of safety impacts and describe lessons learned during the pandemic.

Research and Technology Funding

FY 2021 RD&T Program Funding Details

Table 3. FY 2021 RD&T Program Funding Details

RD&T Program Name	FY 2021 Enacted (\$000)	Basic (\$000)	Applied (\$000)	Development (\$000)	Technology (\$000)
R&T Program	11,783*	-	10,484	1,299	-
Totals	11,783*	-	10,484	1,299	-

*Includes \$2,710,000 for administrative and general operating expenses.

Note: The FY 2021 Enacted Budget included \$30M of funding, available until expended, for the Large Truck Crash Causal Factors Study. This funding is not categorized as RD&T funding.

Table 4. FY 2021 RD&T Program Budget Request by DOT Strategic Goal

RD&T Program Name	FY 2021 Enacted (\$000)	SAFETY (\$000)	INFRASTRUCTURE (\$000)	INNOVATION (\$000)	ACCOUNTABILITY (\$000)
R&T Program	11,783*	4,357	-	6,406	1,019
Totals	11,783*	4,357	-	6,406	1,019

*Includes \$2,710,000 for administrative and general operating expenses.

Note: The FY 2021 Enacted Budget included \$30M of funding, available until expended, for the Large Truck Crash Causal Factors Study. This funding is not categorized as RD&T funding.

Chapter 2—FY 2021 RD&T Programs

Research and Technology Program

(\$11,783,000)

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 (e.g., integrating safety compliance checks with over-size/over-weight permitting), demonstrating the efficacy of truck drivers getting proper rest, evaluating the safety implications of automated and semi-automated vehicles, and understanding how commercial motor vehicles can safely use alternative fuels. These projects provide the underpinnings for the Agency's rulemaking and enforcement priorities.

Program Objectives:

- **Produce Safer Drivers:** Develop driver-based safety countermeasures to reduce crashes such as the recently completed Phase II SBIR project: Multi-Modal Driver Distraction and Fatigue Detection and Warning System.
- **Improve Safety of CMVs:** Improve truck and motorcoach safety through vehicle-based research and the deployment of CMV safety technologies, such as a dynamic real-time braking assessment algorithm that measures a CMV's current braking capability and shares this information with the driver, vehicle inspectors, or safety systems.
- **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, such as automatic emergency braking (AEB) systems, steering assistance technologies, and camera based onboard driver safety monitoring.
- **Advance Safety through Information-Based Initiatives:** Support Agency enforcement 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 to understand and respond to their impact on safety, and (3) exploring the feasibility and utility of using multiple measures as a basis for calculating crash statistics and setting safety goals. This strategic objective encompasses automated commercial vehicle research and support for the ITD Grant Program, the Agency's key mechanism for transferring proven enforcement technologies into operational systems for the States.
- **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:

The R&T Program's legislative mandate includes requirements to investigate the causes of crashes and to reduce the number and severity of accidents, injuries, and fatalities

involving CMVs. Accordingly, anticipated activities in FY 2021 include research to enhance FMCSA's understanding of crash causality and initiatives to foster development and deployment of technologies to make CMV operations safer. Technology initiatives will include both improvements to CMVs and advances in inspection and other enforcement related technologies.

Supporting the USDOT Strategic Goal of *Safety*

Current crash data collections tend to focus on survivability rather than underlying causes. The most recent FMCSA large truck causal study was completed in 2003, and changes in technology, practices, and infrastructure create both the opportunity and need for a re-examination of crash causality. In January 2020, the R&T Program released a request for information (RFI) on how best to design and conduct the Large Truck Crash Causal Factors Study (LTCCFS), a study which will identify factors contributing to large truck fatal, injury and tow-away crashes. This RFI elicited more than 160 comments. The prospect of more focused research into crash causes elicited broad support from stakeholders, including the Insurance Institute for Highway Safety's Highway Loss Data Institute, SAE International, the Commercial Vehicle Safety Alliance, Owner-Operator Independent Drivers Association, and the National Institute for Occupational Safety and Health. The Consolidated Appropriations Act, 2021, provided \$30 million to conduct the LTCCFS.

Taking into account input from these stakeholders, FMCSA will collaborate with NHTSA and coordinate with the Office of the Secretary for Research to advance LTCCFS and the Completing the Crash Picture project throughout FY 2021. The LTCCFS will address criticisms of the previous causal study by improving the level of detail and sample size, collecting data on 2,000 crashes (over twice the number in the previous study) via on-site research teams. These data will be made available in a published report and will inform efforts to develop safety countermeasures and otherwise reduce crashes.

Hours-of-service (HOS) regulations and practices continue to shape safe carrier and driver operations across the industry. Through the HOS Split Duty Period Pilot program, the R&T Program will research alternative HOS rest period divisions—the ways in which drivers divide their time spent recuperating from work and their time driving. This research will support the development of HOS practices that promote safety, driver and carrier compliance, and sound regulatory policy.

The R&T Program will conduct research into medical card recertification periods based on health conditions. In addition, research will examine the safety of CMV drivers who have experienced a seizure or have been diagnosed with a seizure disorder. Further research conducted through the Military Under 21 CMV Driver Pilot Program will examine the safety implications of licensing drivers under 21 years of age with driving-relevant military training for interstate operation.

The R&T Program will also begin a study of COVID-19 in relation to truck and bus safety. The vital role of the trucking industry in preserving supply chains led the agency to implement regulatory waivers including hours of service, CDL renewal extensions,

expanded third-party CDL testing, temporary operating authority, and other flexibilities. The COVID-19 pandemic also reduced congestion on the Nation's roadways. Over the next several fiscal years, depending on the duration of the pandemic and scope of effects, R&T will examine both COVID-19's direct safety effects and the safety outcomes of agency responses.

Supporting the USDOT Strategic Goal of *Innovation*

The R&T Program will continue supporting the advancement of automated vehicle (AV) technology at both high and low levels of automation. Key areas of research in FY 2021 include the project called Tech-Celerate NOW—an effort to accelerate the voluntary adoption of advanced driver assistance systems (ADAS) by fleets. Some large fleets have reported benefits from ADAS, with one trucking company experiencing a 69 percent decrease in rear-end crashes since it began equipping all new tractors with AEB in 2012. Another large motor carrier saw a 71 percent reduction in rear-end collisions involving trucks equipped with AEB, electronic stability control, and lane departure warning systems compared to their trucks without these safety systems. In this project, FMCSA is partnering with ITS/JPO in addition to the trucking industry, truck manufacturers, and ADAS suppliers to provide outreach and education to fleets on ADAS and to promote their safety and efficiency benefits.

The R&T Program will also work closely with FHWA and the Department's ITS/JPO to establish an AV data sharing technical platform using the Department's collaborative multi-modal open-source AV software (i.e., CARMA). Using open-source software will enable USDOT modes to exchange AV safety metrics data and other results from research projects with AV developers and traditional truck manufacturers without putting private-sector intellectual property or proprietary data at risk. This collaboration platform will help accelerate critical safety testing and metrics development truck manufacturers need to deploy AVs and realize potential crash reduction safety benefits.

AV initiatives will also support the deployment of automated driving systems (ADS) through two ADS Demonstration Grants to the Virginia Tech Transportation Institute and the Ohio Department of Transportation's DriveOhio AV team. These multi-year grants will provide new datasets to inform the minimum safety performance metrics needed for the safe deployment of automated CMV operations.

The R&T Program will continue to use the ITD Grant Program as a vehicle for fostering deployment of enforcement technologies across State agencies.

Supporting the USDOT Strategic Goal of *Accountability*

In FY 2021, as in previous years, the R&T Program will host a forum at the TRB Annual Meeting. This forum will offer industry stakeholders and safety advocates visibility into R&T Program research and include opportunities to provide feedback.

The ITD Grant Program includes mechanisms to promote accountability, including regular communication to stakeholders of when new technologies are ready for deployment and continuing research into the efficacy of technologies fostered under the program.

Expected Program Outcomes:

Research conducted by the R&T Program will shape regulatory reform by deepening institutional insight into crash causality, safe and efficient HOS practices, and medical standards for driver certification.

R&T Program AV technology initiatives will increase voluntary ADAS adoption by fleets and resulting safety benefits. R&T Program support for ADS adoption will, in the short term, promote safe testing and smooth the path to widespread deployment. In the long term, deployment of ADS technologies will reduce crashes due to human error.

Collaboration with NHTSA and FHWA will also facilitate the parallel development of ADAS and ADS technologies across CMVs and the non-commercial vehicles—such as passenger cars—with which they share the road.

The 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 and communicate OOS data on non-compliant motor carriers to identify and remove them from operation.

The growing prevalence of these technologies will enhance CMV safety and consistent, efficient enforcement efforts within and among State agencies.

Collaboration Partners:

As described above, key collaboration partners will include NHTSA, FWHA, ITS/JPO, and State agencies reached through the ITD Grant Program.

Chapter 3—FY 2022 RD&T Programs

Research and Technology Program

Program Description:

FMCSA's Research and Technology Program provides scientific safety research on driver behavior, 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, demonstrating the efficacy of truck drivers getting proper rest, and evaluating the safety implications of automated and semi-automated vehicles. These projects provide the underpinnings for the Agency's rulemaking and enforcement priorities.

Program Objectives:

The R&T Program's overall Program Objectives will not change in FY 2022:

- **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, such as AEB systems.
- **Advance Safety through Information-Based Initiatives:** Support Agency enforcement 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 to understand and respond to their impact on safety, and (3) exploring the feasibility and utility of using multiple measures as a basis for calculating crash statistics and setting safety goals. This strategic objective encompasses automated commercial vehicle research and support for the Innovative Technology Deployment (ITD) Grant Program, the Agency's key mechanism for transferring proven enforcement technologies into operational systems for the States.
- **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:

Supporting the USDOT Strategic Goal of Safety

In FY 2022, the FMCSA, in partnership with NHTSA, will continue the LTCCFS project. A key activity in FY2022 will be piloting the data collection methodology and data analysis processes. When completed, this resource will inform crash prevention efforts spanning technology, best practices, and policy.

In FY 2022, the R&T Program will focus on better understanding and identifying activities to reduce fatal crashes involving Class 3 trucks (medium/heavy duty pickup trucks over

10,000-14,000lbs) and Class 4 trucks (single unit trucks 14,001-19,500lbs), pedestrian fatalities involving large trucks, and rear-end crashes (particularly in work zones). These fields accounted for hundreds of fatalities in 2018 and merit close study to derive prevention strategies.

To this end, in pursuit of its standing mandate, the R&T Program will also undertake a case study of States that have succeeded in reducing truck crashes. This case study will identify effective crash-prevention strategies and then document and distribute best practices.

Research into the safety impacts of the COVID-19 pandemic will continue into FY 2022.

Supporting the USDOT Strategic Goal of *Innovation*

Other research already in motion will continue, including R&T efforts centered on ADAS and ADS. These will include the ADS Demonstration Grants, collaborative work with NHTSA and FHWA, and exploration of technologies like artificial intelligence.

The ITD Grant Program will continue to foster State deployment of advanced enforcement technologies.

Supporting the USDOT Strategic Goal of *Accountability*

Both the TRB R&T forum and ITD Grant Program are expected to perform as before in FY 2022.

[END]