



**U.S. Department of Transportation
Federal Motor Carrier Safety Administration**

**RESEARCH AND TECHNOLOGY FUNDING
REPORT TO CONGRESS**

Pursuant to the Explanatory Statement Accompanying the
Transportation, Housing and Urban Development, and
Related Agencies Appropriations Act, 2009 (P.L. 111-8, division I)

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EXECUTIVE SUMMARY

The Federal Motor Carrier Safety Administration (FMCSA) is entering its tenth year as a separate operating administration of the U.S. Department of Transportation (DOT). Established in 2000 by the Motor Carrier Safety Improvement Act of 1999, the Agency is dedicated to the mission of improving commercial motor vehicle (CMV), driver, and carrier safety by reducing crashes, injuries, and fatalities involving large trucks and buses. To meet its mission, FMCSA invests in the development of new technologies with important safety benefits. Advances in technology are important complements to the work FMCSA conducts every day through its research initiatives, in its enforcement programs, in rulemaking activities, and in strengthening its partnerships with the States and local municipalities, as well as with all of its stakeholders.

The Explanatory Statement accompanying the Transportation, Housing and Urban Development, and Related Agencies Appropriations Act, 2009 (P.L. 111-8, division I), requested a report that outlines how all of FMCSA's research and technology funding will be utilized. To illustrate this leadership role, this report is organized into seven sections that will:

- Highlight recent data on crashes involving large trucks that led to fatalities and injuries.
- Demonstrate how the FMCSA's Office of Analysis, Research, and Technology (ART) programs maintain their strategic focus through the development of strategic plans and their related safety-goal focused "roadmaps."
- Outline the unique program development methodology of the ART Office. The culmination of this process is the development of a detailed Budget and Budget Appendix that provide specific details about projects FMCSA plans to fund in that fiscal year (FY).
- Highlight four recently completed technology projects (roll stability control, lane departure warning, forward collision warning, and wireless roadside inspection systems) that demonstrate how public safety can be significantly improved as technology is adopted and deployed on commercial vehicles or used in enforcement of the Federal Motor Carrier Safety Regulations (FMCSRs).
- Summarize how all research and technology funding will be utilized in FY 2009.
- Describe a new program developed in partnership with the National Surface Transportation Safety Center for Excellence (NSTSCE) at the Virginia Tech Transportation Institute (VTI) to test low-cost safety technologies. This program should greatly reduce both the time and the resources required to conduct tests and independent evaluations of potentially life-saving safety technologies.
- Provide a summary of this report regarding FMCSA's research and technology initiatives and FY 2009 funding.

LATEST CRASH TREND DATA

The fatalities resulting from crashes that involve large trucks and buses are in a downward trend. Fatalities have declined between 2005 and 2007, from 5,539 in 2005 to 5,099 in 2007 (the most recent year for which data are available). The number of people injured in large truck and bus crashes also dropped, from an estimated 136,000 in 2005 to 124,000 in 2007.

Fatality rates for crashes involving large trucks and buses have also dropped. The 2007 fatality rate of 0.168 fatalities per 100 million total vehicle miles traveled was nearly 10 percent lower than the 2005 fatality rate of 0.185. The large truck and bus injury rate experienced a similar drop, from 4.56 injuries per 100 million total vehicle miles traveled in 2005 to 4.09 in 2007.

While these statistics indicate that significant progress toward the FMCSA safety goal has been made, much work remains to be done. The Agency's efforts include testing and promoting the development and incorporation into CMVs of advanced safety technologies that have the proven capability to reduce still further large-truck and bus crashes, injuries, and fatalities.

STRATEGIC FOCUS OF THE ANALYSIS, RESEARCH, AND TECHNOLOGY OFFICE'S PROGRAMS

The ART Office's programs fulfill two fundamental roles for FMCSA. In the first role, the ART Office contributes to the development of expertise, ideas, and tools to advance the state-of-the-art in CMV safety on the Nation's highways. The second role is that of the developing and evaluating future Agency regulations, programs, and methodologies. By collaborating with internal and external stakeholders, the ART Office's programs balance these two roles to achieve the greatest impact on public safety, weighing and considering aspects of feasibility, cost, and the time it will take to realize public benefits.

To this end, the ART Office has developed a series of "roadmaps" that serve as planning tools to help identify and prioritize the ART Office's programs and initiatives between now and 2013. These roadmaps are an extension of the Research and Technology Five-Year Strategic Plan,¹ which established the Agency's strategic research and technology priorities for FY 2005–2009. This strategic plan supports FMCSA's strategic plan and the Agency's safety mission.² The Research and Technology Strategic Plan focuses on six strategic areas to help FMCSA achieve its safety goals:

- ***Produce Safer Drivers:*** Ensure that commercial drivers are physically qualified, trained to perform safely, and mentally alert.
- ***Improve Safety of CMVs:*** Improve truck and motorcoach performance through vehicle-based safety technologies and infrastructure.

¹ Federal Motor Carrier Safety Administration Research and Technology 5-Year Strategic Plan (2005–2009). Online at: <http://www.fmcsa.dot.gov/facts-research/research-technology/rt-5year-strategicplan.htm>

² U.S. Department of Transportation, Federal Motor Carrier Safety Administration Strategic Plan (2006–2011). Online at: <http://www.fmcsa.dot.gov/fmcsa-strategic-plan-102907.htm>

- ***Produce Safer Carriers:*** Support efforts to improve carrier safety by applying safety management principles, compiling best management practices, communicating best practices, and supporting the Agency's enforcement of carrier-related regulations.
- ***Advance Safety through Information-Based Initiatives:*** Improve the safety and productivity of CMV operations through the application of information systems and technologies.
- ***Improve Security through Safety Initiatives:*** Develop and implement, in conjunction with the U.S. Department of Homeland Security's Transportation Security Administration, safety initiatives that also have security benefits for truck and motorcoach operations.
- ***Enable and Motivate Internal Excellence:*** Improve performance to serve the customers of the ART Office more effectively and economically.

The FMCSA is currently updating this strategic plan to encompass all analysis, research, and technology activities. The updated plan will identify the most promising analysis, research, and technology initiatives to be explored in the next several years under the above strategic areas. Once the new ART strategic plan is developed, the roadmaps will be updated based on the elements of the new strategic plan. The new ART strategic plan will be completed in December 2009.

PROGRAM DEVELOPMENT METHODOLOGY

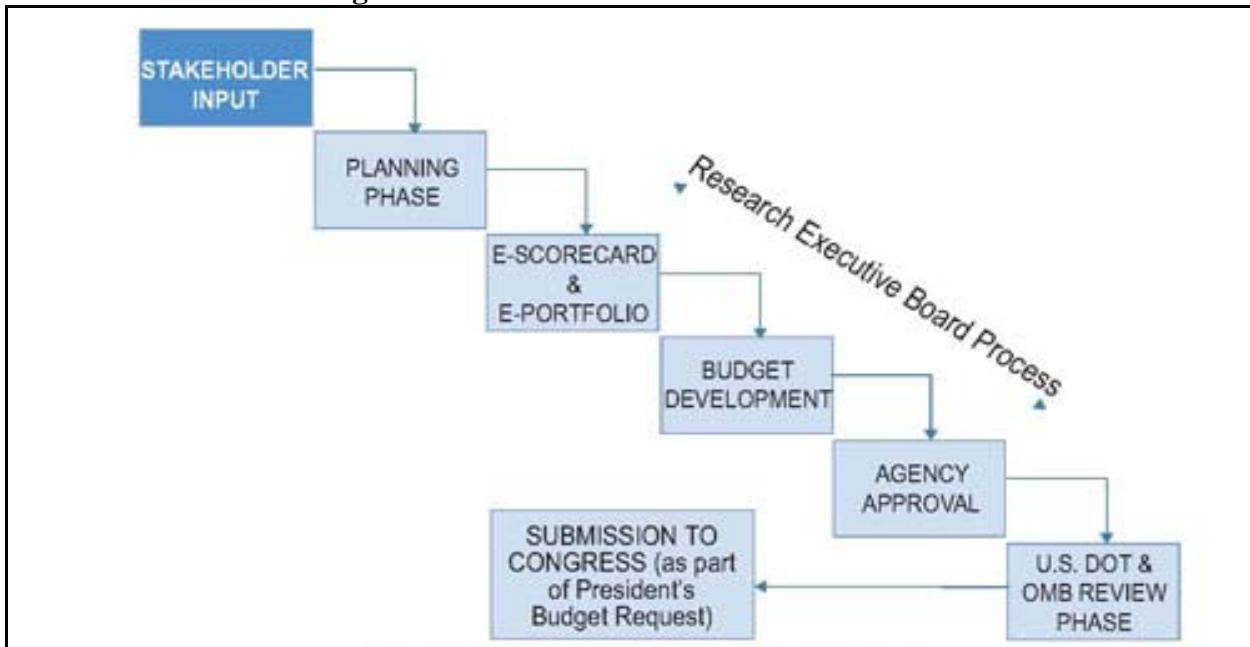
The ART Office has developed a unique program development methodology to identify, evaluate, and select candidate analysis, research, and technology projects. This methodology enables FMCSA to combine stakeholder interests with Agency goals and priorities and translate them into projects to be funded annually. Stakeholder input is collected in meetings where FMCSA elicits ideas and suggestions from stakeholders representing all sectors of the CMV industry on factors that affect CMV safety and on the choice of initiatives the ART Office should conduct to address those factors. These meetings feature roundtable discussions to identify safety concerns and possible solutions and draw participants from the trucking industry, motorcoach operations, insurance companies, State enforcement and regulatory agencies, safety advocacy groups, academia, safety consultants, and vendors with systems and services tailored for CMV safety and improvement.

Figure 1 shows the steps followed by FMCSA to identify the most relevant research areas. The process begins with the analysis of data and experiences gathered from the transportation industry. Root causes of crashes are documented and potential countermeasures specified and evaluated. Based on this evaluation, FMCSA and the stakeholders identify relevant analysis, research, and technology program areas. The FMCSA's program managers then develop analysis, research, and technology proposals based on this input, as well as on the concepts and priorities developed within FMCSA and DOT.

A key element of the ART Office's program development methodology is the role of the Research Executive Board (REB). The REB members are drawn from the FMCSA's Headquarters and Field offices and, if appropriate, are appointed from other DOT Agencies. The REB is responsible for the following:

- Evaluating, prioritizing, and approving submitted analysis, research, and technology proposals.
- Adding approved projects to the FMCSA's Research Portfolio.
- Ensuring that proposals in the Portfolio are aligned with Agency priorities and consistent with budget objectives.

Figure 1. Research Executive Board Process



The REB meets annually during the budget formulation process to prioritize and approve proposal submissions and to develop the Agency's ART budget submission. An FMCSA intranet-based tool (the ePortfolio) supports this process and provides a scorecard that evaluates safety impact or security risk, feasibility, and cost for each proposed project. The measures used by the scorecard are based on current data from safety databases, such as the National Highway Traffic Safety Administration's (NHTSA) Fatality Analysis Reporting System and the FMCSA Motor Carrier Management Information System Crash File. The REB recommendations are presented to the FMCSA's senior management. Upon their approval of the recommendations, the ART Office develops its budget appendix. This ART Office budget appendix is normally part of FMCSA's budget request, which is reviewed by the Office of the Secretary of Transportation and the Office of Management and Budget (OMB). The 2009 DOT budget request was abbreviated; the ART Office budget appendix was not included in the President's Budget Request for DOT.

RECENTLY COMPLETED ADVANCED TECHNOLOGY PROJECTS

Over the past several years, FMCSA has been a strong proponent of the development and deployment of advanced technologies in onboard safety systems. The FMCSA took a leadership role in working with its industry partners to test, evaluate, and promote the deployment of several onboard safety and security systems. These include collision warning systems with adaptive cruise control, stability control systems, lane departure warning systems, and vehicle

tracking systems. Through this collaboration, functional specifications were developed to provide a better understanding of these onboard safety and security systems and to promote their deployment within the industry. These functional specifications were developed into Commercial Motor Vehicle Onboard Safety and Security Systems Technology Product Guides, which are posted on the ART Office Web site (<http://www.fmcsa.dot.gov/facts-research/art-productguides.htm>). These product guides provide information to assist carriers, drivers, fleet managers, and other stakeholders in learning more about the functionality of currently available safety and security systems.

The FMCSA and NHTSA programs and activities directly support the DOT's efforts to reduce the large-truck and bus fatality rate. With regard to setting and enforcing regulations, FMCSA is the operating administration within DOT responsible for setting and enforcing regulations directly related to motor carrier operations and the use of commercial vehicles. The NHTSA's authority extends beyond commercial vehicles by being responsible for setting and enforcing safety regulations for motor vehicles and motor vehicle equipment subsequent to initial manufacture. The FMCSA has conducted tests and evaluations of several onboard safety systems in partnership with NHTSA and the Research and Innovative Technology Administration. From these evaluations, FMCSA has identified onboard safety systems that show significant promise in reducing crashes involving CMVs. These systems include stability control systems, lane departure warning systems, collision warning systems with adaptive cruise control, and integrated warning systems.

As part of its ongoing effort to help promote and facilitate voluntary adoption by the industry of these technologies, FMCSA recently conducted analyses of the economic benefits, expected costs, and industry returns on investment for three of these systems. On an annual basis, roll stability control systems are estimated to have the potential to reduce the number of rollovers by 1,000 to 2,000;³ lane departure warning systems are estimated to have the potential to reduce collisions by 4,000 to 8,000;⁴ and forward collision warning systems are estimated to have the potential to reduce rear-end crashes by 9,000 to 18,000.⁵ Currently, FMCSA is assessing the use of these systems by the industry.

The FMCSA is also advancing a number of technologies to help law enforcement officials perform their duties more effectively, given their current resource constraints. The number of trucks and buses on the road and the number of miles they travel has increased over time, while roadside safety inspection resources remained relatively constant. The likelihood of a truck

³ Murray, D., Shackelford, S., & Houser, A. (2009). Analysis of Benefits and Costs of Roll Stability Control Systems for the Trucking Industry (FMCSA Publication No. FMCSA-RRT-09-020). American Transportation Research Institute; U.S. Department of Transportation. Online at: <http://www.fmcsa.dot.gov/facts-research/research-technology/report/09-020-RP-Roll-Stability.pdf>

⁴ Murray, D., Shackelford, S., & Houser, A. (2009). Analysis of Benefits and Costs of Forward Collision Warning Systems for the Trucking Industry (FMCSA Publication No. FMCSA-RRT-09-021). American Transportation Research Institute; U.S. Department of Transportation. Online at: <http://www.fmcsa.dot.gov/facts-research/research-technology/report/09-021-RP-Forward-Collision.pdf>

⁵ Houser, A., Murray, D., Shackelford, S., Kreeb, R., & Dunn T. (2009). Analysis of Benefits and Costs of Lane Departure Warning Systems for the Trucking Industry (FMCSA Publication No. FMCSA-RRT-09-022). American Transportation Research Institute; U.S. Department of Transportation. Online at: <http://www.fmcsa.dot.gov/facts-research/research-technology/report/09-022-RP-Lane-Departure.pdf>

receiving a roadside safety inspection is far less than the likelihood of its being weighed and, when violation rates are compared, does not appear to have the same deterrent effect. In 2007, more than 3 million truck inspections were conducted with a violation rate of 70 percent (including a 23 percent out-of-service rate for vehicle violations). In the same year, 216 million roadside truck weights were captured, with a violation rate of 0.22 percent.

New technologies and enforcement strategies could dramatically increase the number of times a CMV and driver are examined, thus creating a greater deterrence against carriers operating unsafely. The FMCSA's wireless roadside inspection program is currently evaluating the feasibility and value of assessing truck and bus drivers and vehicles up to 100 times more often than is possible using today's approaches. In August 2007, FMCSA partnered with the Tennessee Department of Safety and the Tennessee Department of Transportation to launch a CMV roadside technology corridor at operational weigh and inspection stations. The corridor was established to test, evaluate, and showcase advanced truck and bus inspections and enforcement technologies. Advanced systems that go beyond the traditional roadside inspection program (e.g., performance-based brake testers and an infrared inspection system) are being used to test brake performance, and wireless technologies are being evaluated to identify commercial vehicles, the vehicles' operating carriers, and the vehicles' drivers.

The estimated safety benefits of a fully deployed nationwide wireless roadside inspection system would include more than 250 lives saved, more than 6,000 injuries avoided, and more than 17,000 property-damage-only crashes prevented each year.⁶

RESEARCH AND TECHNOLOGY 2009 BUDGET DETAILS

Table 1 identifies the FMCSA Research and Technology Division's strategic objectives. The table also reflects the FY 2009 proposed projects that support each objective. The FY 2009 budget submission is based on the Agency's REB review and prioritization of proposed projects. The REB took into consideration DOT and FMCSA safety priorities, the Research and Technology Five-Year Strategic Plan and "roadmaps" for ART programs, the Agency's rulemaking plans and activities, and input from the most recent stakeholder forums.

The FY 2009 Research and Technology budget submission is consistent with the initiatives established in DOT's Research, Development, and Technology Strategic Plan, ART roadmaps, and the requirements of the Performance and Assessment Rating Tool established by OMB.

This document describes each proposed FY 2009 project with its objective, output(s), and requested funding level.

⁶ Kreeb, R. M., Nicosia, B. T., Alibrahim, H. S., & Silvani, S. (2007). Development and Evaluation of Alternative Concepts for Wireless Roadside Truck and Bus Safety Inspections (FMCSA Publication No. FMCSA-RRT-07-005). Booz Allen Hamilton Inc.; U.S. Department of Transportation. Online at: <http://www.fmcsa.dot.gov/facts-research/research-technology/report/wireless-inspection-report.pdf>

**Table 1. Support of the FMCSA Strategic Objectives by Research and Technology,
FY 2009 Initiatives: Research (R), Technology (T)**

FMCSA Strategic Objective	Projects	FY Funding
1. Produce Safer Drivers	Safety Data Risk Study, Phase III (R)	\$900,000
	Analysis of Large Truck Crash Causation Study (R)	\$100,000
	Advanced Driver Warning System for Driver Fatigue – Small Business Innovation Research Program (R)	\$250,000
	Analysis of High Risk vs. Low Risk CMV Driver Behaviors (R)	\$400,000
	Annual Driver Survey (R)	\$200,000
	Training Interventions to Prevent Hazardous Materials Rollovers (R) (NEW)	\$225,000
	Safety Belt Countermeasure Technology, Phase II – Small Business Innovation Research Program (R)	\$200,000
	Employer Notification Service, Phase III (T)	\$400,000
	Roadside/On-Board Safety Technology Countermeasures/Wireless Inspection Pilot Test (T)	\$425,000
	SmartPark: Real-Time Parking Availability (T)	\$775,000
Produce Safer Drivers Total		\$3,875,000
2. Produce Safer Carriers	Research to Support FMCSA Rulemaking Activities (R)	\$775,000
	Engineering and Analysis of the Causes and Preventions of Bus Fires (R) (NEW)	\$500,000
	Produce Safer Carriers Total	\$1,275,000
3. Improve Safety of CMVs	Safety and Security Technology Deployment (T)	\$800,000
	Indirect Viewing System Field Test – Phase III (T)	\$325,000
	FMCSA Advanced System Testing utilizing a Data Acquisition System on the Highways (FAST DASH) (T) (NEW)	\$250,000
	Improve Safety of CMVs Total	\$1,375,000
4. Advance Safety Through Information-Based Initiatives	Transportation Research Board/FMCSA Partnerships (R)	\$500,000
	Commercial Vehicle Information System and Networks Deployment Program, Support for Expanded Capabilities (T)	\$700,000
	Advance Safety Through Information-Based Initiatives Total	\$1,200,000
5. Improve Security Through Safety Initiatives	Commercial Drivers License Third-Party Testing Anti-Fraud Software (T)	\$275,000
	Improve Security Through Safety Initiatives Total	\$275,000
6. Enable and Motivate Internal Excellence	FMCSA Program Management (R)	\$250,000
	FMCSA Program Management (T)	\$250,000
	Enable and Motivate Internal Excellence Total	\$500,000
Research TOTAL		\$4,300,000
Technology TOTAL		\$4,200,000
RESEARCH AND TECHNOLOGY TOTAL		\$8,500,000

Objective: Produce Safer Drivers**Amount Requested for FY 2009: \$3,875,000****Project: Safety Data Risk Study, Phase III**

Objective: To investigate the feasibility of identifying CMV driver factors that increase the risk of large truck crashes.

Description: A pilot study was recently completed in order to test the methodology and produce some preliminary findings. However, the sample size is not sufficient for statistical significance. The current funding request is for completing the implementation of a full-scale CMV driver case-control study. The study will collect detailed data on more than 2,000 CMV drivers at geographically dispersed locations. This data collection will include surveys, data from carriers and CMV medical examiners, and possibly performance testing for CMV drivers. The data will be collected longitudinally and will likely include sleep apnea screening. The FMCSA representatives plan to discuss the feasibility of partnering with NHTSA on this project.

Output(s):

- Tools to help motor carriers evaluate drivers for risk factors and assess their driving performance.
- Publish a report to help the motor carrier industry identify risk factors when hiring CMV drivers.

FY 2009 Funding: \$900,000

Project: Analysis of Large Truck Crash Causation Study (LTCCS)

Objective: To gain a better understanding of traffic crashes and incidents for three specific scenarios that have their own distinctive blend of key events and contributing factors, as well as findings that will generalize assumptions across all events.

Description: The LTCCS and the large truck naturalistic driving data gathered in the Drowsy Driver Warning System Field Operational Test (DDWS FOT) will be analyzed. A sophisticated understanding of traffic crashes and incidents recognizes that each specific scenario has its own distinctive blend of key events and contributing factors. Both the LTCCS and naturalistic driving data address full arrays of crash or incident scenarios, contributing factors, and conditions of occurrence. Some comparative findings may be applicable to traffic events in general, but the most important findings will likely be specific to particular scenarios. Accordingly, this project will focus primarily on several selected scenarios, although it will also include generalized comparisons. This project will include a generalized comparative analysis of the two data sets and then focus on the following three distinct and separate analyses: a crash or incident scenario (rear-end truck striking), a contributing factor (truck driver fatigue), and an environmental condition of occurrence (high traffic density). Each type of analysis will involve unique comparisons and should serve as a prototype for other analyses of similar nature within that dimension.

This LTCCS effort is different from the Analysis Division's proposed work with LTCCS outlined in the Agency's Information Management budget request. This effort will involve data from DDWS FOT with the LTCCS data while the Analysis Division's work will only use data from LTCCS to study certain safety issues.

Output(s):

- Analyses of rear-end truck striking, truck driver fatigue as a contributing factor, and an environmental-based factor such as high traffic density.
- Publish a report, which includes a comparative analysis of LTCCS and DDWS FOT.

FY 2009 Funding: \$100,000

Project: Advanced Driver Warning System for Driver Fatigue – Small Business Innovation Research Program

Objective: To develop and test a prototype system (hardware and software), which can unobtrusively detect and alert drowsy drivers to avoid hazardous conditions.

Description: Participation in the Small Business Innovation Research (SBIR) program is congressionally directed. The existing detection system uses a smart neural network algorithm to monitor a driver's steering activity. It detects steering anomalies caused by drowsiness and indicates if a warning is required. This project will accomplish many tasks, including to further develop, validate, and refine the existing neural network detection algorithm; select the most effective warning method; design and develop items required to assemble and construct the system; conduct a preliminary test of the system; install the prototype system; and test the prototype model in the instrumented vehicle on a test track.

The prototype development may involve partnering with a commercial company with expertise in automotive products development. Controlled track testing of the prototype system will determine the effectiveness and safety benefits of the driver drowsiness detection and warning system. It will demonstrate (in safe experiments) how increasing driver alertness and warning can reduce drowsiness-related incidents and crashes.

Output(s):

- Complete prototype system for driver drowsiness detection and warning.
- Publish a report addressing the development and evaluations of the prototype system.

FY 2009 Funding: \$250,000

Project: Analysis of High Risk vs. Low Risk CMV Driver Behaviors

Objective: To assess the behavior, performance, and outcome similarities and differences of high risk and low risk drivers.

Description: The research will be conducted in two phases. Phase I, Analysis of Existing Data, is expected to last 1 year and will leverage data from two different driving studies—Simulator Validation Project Phase II (SimVal II), and DDWS FOT. The SimVal II study is expected to collect data on novice CMV drivers using instrumented trucks. The DDWS FOT collected data on 103 CMV drivers, each for approximately 12 weeks, as they made their normal delivery runs. The data from the DDWS FOT includes drivers with various

experience and risk levels. The highest risk and the lowest risk drivers will be characterized with regard to involvement in critical incidents. In addition, the driving behavior and performance data for both groups will be compared with each other and with the data collected on the novice drivers in the SimVal II study. Data from these three groups (low risk, high risk, novice drivers) will be analyzed to assess discrepancies and similarities.

Phase II, the Naturalistic Driving Study with “million-milers,” is expected to last 2 years and will involve a new naturalistic data collection effort and subsequent analysis. Some of the safest CMV drivers in the industry (“million-milers” or drivers who have driven 1 million crash-free miles) will be involved in naturalistic on-road data collection for approximately 1 year. This data will be analyzed to assess the behavior, performance, and outcome characteristics of these elite drivers. The analysis will follow the same method as that conducted in Phase I, and a comparison will be made between the three original groups of drivers and the million-milers.

Output(s):

- Recommendations for driver screening and training.
- Publish a report describing the characteristic similarities and differences between high risk and low risk drivers.

FY 2009 Funding: \$400,000

Project: Annual Driver Survey

Objective: This project supports FMCSA in obtaining an understanding of the impact of changes in the commercial driver workforce to ensure its safety and well-being. The results will be used to develop rules and regulations for the commercial trucking and motorcoach industries.

Description: These annual surveys provide a means for FMCSA to canvas CMV drivers to obtain demographic information as well as information pertinent to upcoming rulemakings.

Output(s):

- Publish a report describing the characteristic of CMV drivers as wells as responses to specific policy-related questions.
- Database enabling the assessment of trend data.

FY 2009 Funding: \$200,000

Project: Training Interventions to Prevent Hazardous Materials Rollovers

Objective: The project will compare the effectiveness of applying alternative instructional technologies in otherwise comparable behavioral training programs to prevent hazardous material cargo tank rollovers. In addition, guidelines will be developed for carriers and schools to use in selecting the appropriate instructional program and technologies to provide cost-effective rollover prevention training.

Description: A recent study for FMCSA concluded that the large majority of cargo tank rollovers are caused at least in part by human error – vehicle operators perform or fail to perform actions that result in vehicle instability and then roll over. Much of the current operator training to prevent rollovers tends to be either informational (e.g., the effects of

fatigue, the physics of rollovers) or motivational (e.g., your family deserves you to come home safely, so stay alert and pay attention). There is little evidence of specific behavioral training of operators to prevent rollovers.

Large carriers have reported benefits in overall safety from using simulators as part of their training. This leads to the research question of how simulators can best be used to train rollover avoidance. The parallel question is how similar training can best be delivered by carriers and schools unable to afford the capital investment of simulators. Carriers that are contemplating an investment in a simulator would benefit from a comparison of the effectiveness of instructional programs that employ simulator technology at one or more levels.

Output(s):

- Define the specific cargo tank operator performance objectives associated with rollover prevention. These would be based on tasks noted in the recent studies, including judging speeds for curves and handling accidental pavement drop-offs.
- Identify applicable instructional technologies and select two or more alternatives that represent appropriate trade-offs of expected costs and potential effectiveness. At least one alternative will make full use of simulators and one other alternative will require little or no capital investment and be within the financial reach of the majority of carriers.
- Design parallel comprehensive cargo tank truck rollover prevention instructional programs that fully integrate the instructional objectives, training activities, and selected instructional technologies.
- Design a comprehensive, performance-based assessment procedure that can be used to assess the effectiveness of any cargo tank truck rollover prevention training program. Anticipated components of this assessment procedure include knowledge-based tests, perception and judgment tests, daily driving performance measures, and incident outcome measures.
- Implement each alternative training program at participating schools and carriers through pilot testing, refinement, and field testing.
- Assess the effectiveness of the alternative training programs.
- Develop a set of guidelines for industry identifying the effectiveness and costs of the alternative cargo tank truck rollover prevention instructional programs.

FY 2009 Funding: \$225,000

**Project: Safety Belt Countermeasure Technology, Phase II –
Small Business Innovation Research Program**

Objective: To explore a low cost, easily installed device to increase the use of safety belts by CMV drivers.

Description: Participation in the SBIR Program is congressionally directed. This project will pursue the development of a technology identified in the Safety Belt Technology Countermeasures Study (December 2006) to increase safety belt use and improve the comfort level of safety belts in CMVs, particularly for smaller stature and larger drivers. Two Phase I initiatives will be pursued in order to select the best approach in Phase II. Phase II will start in FY 2009.

Output(s):

- Create a commercial ready, safety belt technology to improve the use and comfort level of safety belts in CMVs.
- Publish a report documenting the development and testing of the identified safety belt technology.

FY 2009 Funding: \$200,000

Project: Employer Notification Service, Phase III

Objective: To more closely examine issues related to implementation of the Employer Notification Service (ENS) system in more States and expand knowledge of the legal, information technology (IT) infrastructure, budgetary, and administrative issues related to ENS. In addition, the effort will examine issues related to the amendment of FMCSA regulations requiring carriers to periodically check driver records.

Description: Provide funding, training, and administrative assistance to States that are interested in implementing the system developed on the basis of pilot tests done in Phase II of the project. This will allow FMCSA to more closely examine issues related to implementation and integration in specific State IT infrastructures as well as possibly amend existing regulations. Ultimately, an effective ENS system would decrease industry costs significantly.

The feasibility of amending or eliminating FMCSA's current regulations that require carriers to perform annual checks of a drivers' commercial drivers license (CDL) status will also be examined. Since the ENS system would perform this task in real time, there may be a rationale for modifying or eliminating this requirement. It will need to be determined if the implementation of a national ENS system would warrant such an action.

A significant benefit of a national ENS system may be for carriers that only would have to check motor vehicle records for their drivers who have a record change instead of the FMCSA-required annual check on all drivers. This would be a major cost savings for the industry. A major overnight delivery trucking company estimated cost savings of 80 percent from such a program.

Output(s):

- Prepare an implementation plan outlining key driver information, budgetary, and administrative issues to facilitate the deployment of ENS from each participating State.
- Publish a report with specific recommendations pertaining to amendment of the regulations that require annual driver record checks by carriers.

FY 2009 Funding: \$400,000

**Project: Roadside/On-Board Safety Technology Countermeasures/
Wireless Inspection Pilot Test**

Objective: To install, test, and evaluate the safety benefits of a statewide wireless inspection network where drivers' logs and vehicle fault codes are electronically checked on a weekly basis.

Description: The purpose of this field operational test (FOT) is to install and test a statewide network of fixed, mobile, and virtual roadside safety inspection sites. This FOT would provide critical real-world information for national expansion of such a network to support the agency goals to target unsafe drivers. A national network could generate an estimated 300 to 500 million electronic CMV driver and vehicle inspections or checks.

These sites, one of them being FMCSA's Roadside Test Lab, would conduct wireless inspections on a fleet of participating trucks and buses. The test will collect valuable real-world data and lessons learned regarding the following: 1) technologies to use; 2) IT infrastructure requirements to upload electronic inspections to state and FMCSA safety databases; 3) technology and procedural standards development to be integrated with out-of-service criteria, 4) data collection and generation implications in support of new rating methodologies under consideration as part of the Comprehensive Safety Analysis 2010; and 5) an enforcement concept of operations and protocols.

Output(s):

- Report documenting the conduct and results of the FOT.
- Propose technology standards, enforcement operations, and institutional protocols for virtual roadside safety inspection sites.

FY 2009 Funding: \$425,000

Project: SmartPark: Real-Time Parking Availability

Objective: The FMCSA has undertaken an initiative called SmartPark to demonstrate whether an intelligent transportation system technology for providing parking availability information in real time to truckers on the road will work for diverting trucks from filled to unfilled parking areas. A secondary benefit for drivers is that SmartPark can help them to manage fatigue.

Description: Phase I of the project has begun with two contractors using different technologies to collect data on space occupancy and to analyze the collected data to determine truck parking availability. Phase II will occur between FY 2008 and FY 2010 and will include tasks for calibrating parking count, disseminating real-time truck parking availability information, making truck parking reservations, forecasting truck parking availability based on past usage, equipping adjacent truck parking areas in a corridor or region to divert trucks from overfilled to under-filled lots, converting temporary to permanent installation, assigning truck parking based on departure, and compiling a business plan for self-sustainability.

Output(s):

- Assess current truck parking availability.
- Prepare plan for the forecasting of truck parking availability.
- Propose a truck parking reservation system.
- Recommend dissemination mechanisms for real-time truck parking availability.
- Propose ways to divert truckers from overfilled to under filled lots.
- Compile a business plan for self-sustainability.

FY 2009 Funding: \$775,000

Objective: Produce Safer Carriers**Amount Requested for FY 2009: \$1,275,000****Project: Research to Support FMCSA Rulemaking Activities**

Objective: To fund an Indefinite Delivery Indefinite Quantity (IDIQ) contract for research to support FMCSA's rulemaking activities.

Description: The FMCSA is currently engaged in active rulemaking regarding specific areas of CMV operations. Funding will be used to review, consolidate, and document the research on these areas, as well as to support other FMCSA Research Division projects. Rulemakings that the project may support in FY 2009 include Safety Programs for New CMV Drivers; Certification of Safety Auditors, Safety Investigators, and Safety Inspectors; Patterns of Safety Violations by Carrier Management; and Diabetes: Qualifications of Drivers, and Diabetes Standard.

Output(s):

- Publish research reports and literature review conducted under the auspices of the IDIQ.
- Reports will identify problems, alternatives, and a means to evaluate the implemented solutions.

FY 2009 Funding: \$775,000

Project: Engineering and Analysis of the Causes and Preventions of Bus Fires

Description: Some 2,210 bus or school bus fires, on average, were reported annually from 1999 to 2003. These fires caused an estimated annual average of three civilian deaths, 30 civilian injuries, and \$24.2 million in direct property damage. From 1999 to 2003, bus or school bus fires accounted for 1 percent of the total reported vehicle fires, 1 percent of the vehicle fire deaths, 2 percent of the vehicle fire injuries, and 2 percent of the vehicle fire property damage. On average, six bus or school bus fires were reported every day (NFPA Journal, 2006).

Objective: The purpose of this research is to conduct a multimodal (NHTSA, FMCSA) sponsored study of bus and motorcoach fires. The contractor will be required to investigate 100 incidents and conduct a detailed engineering root cause analysis. Root cause analysis is a proven method for investigating, categorizing, and ultimately eliminating, root causes of incidents with safety, health, environmental, quality, reliability, and production-process impacts. Root Cause Analysis System enables the generation of specific, concrete recommendations to prevent incident recurrences. Using the factual data of the incident, the system also allows quality, safety, and risk and reliability managers an opportunity to implement potentially more reliable and more cost-effective policies. Such process improvements may increase a passenger carrier's ability to recover from and prevent disasters with financial, health, and safety implications.

Output(s): This study will determine the root cases of 100 bus and motorcoach fires and generate specific, concrete recommendations for preventing incident recurrences. Specifically, the following questions will be addressed with the effort:

- What was the root cause of each of the fires investigated?
- What were the recommended maintenance practices and were those practices followed by the local government or passenger carrier?
- What changes in maintenance practices are needed to reduce the incidences of fires?
- What changes are needed to motorcoach inspection practices to detect potential fires?
- What design changes are needed for manufacturing buses and motorcoaches?
- What design changes are needed to improve egress in case of a fire on a bus or motorcoach?
- What design specifications appear to be correlated to fires?

FY 2009 Funding: \$500,000

Objective: Improve Safety of Commercial Motor Vehicles

Amount Requested for FY 2009: \$1,375,000

Project: Safety and Security Technology Deployment

Objective: To increase deployment and use of CMV systems and technologies that address safety and security needs, support nationwide deployment of technology (including the implementation of integrated information systems and networks), and use technology solutions as a means to monitor and evaluate motor carrier safety performance.

Description: This ongoing project is at a new stage in which it will work with the motor carrier industry and other stakeholders to understand deployment trends and to facilitate further adoption of cost-effective technologies that have shown benefits. A major component of this project will be to monitor deployment and help the trucking industry increase its awareness of the technologies that could improve the safety and security of CMV operations and the movement of high-value and high-security risk shipments.

Output(s):

- Publish an assessment report of the costs and benefits of new advanced vehicle technologies that are entering, or about to enter, the marketplace.
- Complete evaluations and assessments of on-board safety systems.
- Initiate field tests of next generation safety systems.

FY 2009 Funding: \$800,000

Project: Indirect Viewing System Field Test, Phase III

Objective: To test and evaluate an all-weather indirect viewing system with 360-degree vision capability, and further the development of the enhanced vision system in Phase III of this ongoing project.

Description: This Phase III FOT is derived from recommendations from Phase II with regard to the information learned from the on-road tests and will be incorporated into an improved design that includes digital video presentation and autonomous data acquisition capabilities. In addition, to ready the system for an over-the-road test, the system will be made sufficiently rugged. A test plan will be developed detailing how the enhanced vision system will be tested and evaluated, as well as test materials required, and the over-the-road test data

acquisition system. Drivers recruited for this study will participate in a training session on the operation of the enhanced vision system. Trucks will be instrumented with the enhanced vision system and the data acquisition system.

The enhanced vision system will be comprised of right- and left-side convex mirror surrogate systems and enhanced rearview systems. It is expected that the system specification will be used by industry and foster the development and implementation of enhanced visibility technologies. In addition, this research supports NHTSA rulemaking efforts with regard to future modifications to Federal Motor Vehicle Safety Standard 111, which specifies requirements for the performance and location of rearview mirrors.

Output(s):

- Test plan detailing how the enhanced vision system will be tested and evaluated.
- Publish a report documenting results of the field test.

FY 2009 Funding: \$325,000

Project: FMCSA Advanced System Testing utilizing a Data Acquisition System on the Highways (FAST DASH)

Objective: To conduct a fast turnaround and independent evaluation of promising safety technologies aimed at commercial vehicle operations (CVO).

Description: Each year, NSTSCE will request, via its Web site, that original equipment manufacturers and technology vendors submit promising safety technologies for testing and evaluation. Selection will be based on the technologies' potential safety benefits. It is anticipated that FMCSA will fund the evaluation, and that the technology developer will partner with the Agency to provide the technology for testing. The FMCSA envisions that individual test and evaluation programs could be completed in 6 to 12 months. This program should greatly reduce both the time and the resources required to conduct tests and independent evaluations of potentially life-saving safety technologies.

Output(s):

- Test plan development and modification.
- Institutional Review Board submission.
- Truck instrumentation.
- Results and potential benefits.
- Letter report documentation including recommendations.

FY 2009 Funding: \$250,000

Objective: Advance Safety Through Information-Based Initiatives
Amount Requested for FY 2009: \$1,200,000

Project: Transportation Research Board/FMCSA Partnerships

Objective: To broaden the participation and use the expertise of the Transportation Research Board (TRB) in FMCSA's ART programs.

Description: The National Academies, through TRB, will provide personnel, facilities, services, and materials to assist FMCSA in carrying out and fulfilling its various goals and obligations mandated by legislation and regulations. The TRB's efforts to stimulate transportation research, correlate this research, and disseminate results have been developed and refined over many years and are continuous.

Output(s):

- Perform TRB activities, including TRB Core Technical Activities (the TRIS—databases, publications).
- Publish Truck and Bus Synthesis Reports and special reports; conduct conferences.
- Publish reports from the Innovations Deserving Exploratory Analysis Program.

FY 2009 Funding: \$500,000

Project: Commercial Vehicle Information System and Networks Deployment Program, Support for Expanded Capabilities

Objective: To work with eligible States and motor carrier industry stakeholders to implement expanded Commercial Vehicle Information System and Networks (CVISN) capabilities that improve the safety and productivity of CMV operations, and enhance transportation security in four primary areas including driver information sharing, enhanced safety information exchange, smart roadside, and expanded electronic credentialing.

Description: States collect safety, security, and other CVO-related data electronically and share that information among authorized stakeholders. Expanded CVISN deployment will examine how information can be integrated to improve the accuracy, integrity, and verifiability of motor carrier, CMV, driver, and cargo data. More effective and efficient safety inspection and enforcement activities on high-risk and potentially suspect motor carriers, CMVs, and drivers will result. Government and motor carrier productivity will increase as a result of the electronic application and issuance of credentials and electronic screening of CMVs.

The expanded CVISN deployment program will provide States assistance and technical support for the sharing of commercial driver data. The driver area is likely to have a large impact on CMV safety, given that high-risk drivers are involved in a disproportionate number of crashes. The FMCSA's investment in this area will improve the sharing of commercial driver information across Federal and State jurisdictions, as well as the motor carrier industry. Technical support and assistance will also be provided for States to develop their Expanded CVISN Program Plan, which will describe the capabilities to be funded and include a business case for deployment, as well as the project objectives, technical approach, schedule, and system design, as well as identify expected benefits and project participants. It will provide an estimated budget including State and private sector anticipated contributions

needed for the match. The plan will also certify that its activities for expanded deployment will be consistent with the National ITS Architecture and standards, and commit to executing interoperability tests.

Funding in FY 2009 will be used to initiate the planning for a Research and Analysis Deployment Forum in FY 2009. The event will build on the first forum and showcase technologies deployed by States, the motor carrier industry, and other stakeholders in their efforts to meet FMCSA's national safety and security goals.

Output(s):

- Prepare and distribute CVISN training and implementation guides including the identification of "lessons learned" and best practices.
- Prepare report documenting the deployment of expanded CVISN capabilities through interoperability tests.
- Accept CVISN program plans for expanded capabilities from 11 States.
- Provide CVISN deployment program grants to 11 States to implement expanded CVISN capabilities.
- Certify deployment of at least one expanded CVISN capability in six States.
- Plan for a Research and Analysis Deployment Forum.

FY 2009 Funding: \$700,000

Objective: Improve Security Through Safety Initiatives

Amount Requested for FY 2009: \$275,000

Project: Commercial Driver License Third-Party Testing Anti-Fraud Software

Objective: To design, create, and pilot-test software for detecting and deterring fraud perpetrated during CDL skills testing activities. The long-term goal is to reduce fatalities, injuries, and crashes resulting from drivers who fraudulently obtain CDLs.

Description: This project leverages existing data on State licensing practices to audit testers for identifying potential fraud while developing new information technology system-based strategies to monitor CDL testing. While the original focus was on third-party testers, the project also covers fraud perpetrated by testers who are employees of State motor vehicle administrators. This continuation will enable the software to be fully implemented, so that State vehicle administrators will be more likely to adopt it. A couple of refinements will make the scheduling process for examiners more user-friendly by creating a simpler, more basic summary schedule report. The software will also incorporate the ability to show the available time for examiners in a particular location for an appointment to conduct a commercial driving skills test as requested by an applicant.

Output(s):

- Produce Web-based software for use by State motor vehicle administrators to manage the skills testing portion of the CDL application process.
- Reports addressing the development and testing of the enhanced software.

FY 2009 Funding: \$275,000

Objective: Enable and Motivate Internal Excellence

Amount Requested for FY 2009: \$500,000

Project: FMCSA Program Management – Research and Technology

Objective: To improve the performance and excellence of the ART Office as well as the Agency.

Description: The FMCSA will continue to provide and maintain ART stakeholder forums, reports, enhance the project and budget tracking processes, and respond to various data requests, such as those from OMB. The FMCSA will continue to publish ART findings and provide visibility for FMCSA through ART products such as electronic, print, audiovisual, and conference deliverables.

These resources are critical for coordinating, writing, editing, publishing, and disseminating ART funded research and technology information and results. The strategic and tactical plans for the ART Program will be updated and measures will be defined and collected in order to ensure the relevance, quality, and performance of the program.

Output(s):

- Development of FMCSA strategic and tactical plans for the ART Office.
- Programs designed to engage stakeholders and promote national and international cooperation and meet strategic objectives of ART Office.
- ART Program development, monitoring, and tracking for fiscal and performance accountability.
- Development and coordination of presentations for senior management and other stakeholders and partners on ART analysis projects.
- Publish technical briefs, program and project reports, update Web page, prepare internal newsletters.

FY 2009 Funding: \$500,000 (split evenly between the Research and Technology Divisions)

A NEW PARADIGM IN TECHNOLOGY TESTING

With the additional FY 2009 funds provided by Congress, FMCSA will increase research into low-cost technologies that promise safety benefits. The Agency will establish a cooperative agreement with NSTSCE at VTTI to test safety technologies. One of the goals of NSTSCE is to develop and disseminate advanced transportation safety techniques and innovations. The NSTSCE uses a controlled-access highway with state-of-the-art features to test safety devices and techniques that enhance driver performance. Former Senator John Warner was instrumental in designating VTTI as a Center for Excellence in the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users.

The FMCSA will establish an FMCSA Advanced System Testing utilizing a Data Acquisition System on the Highways (FAST DASH) program at NSTSCE. The goal of the FAST DASH program will be to conduct a fast-turnaround and independent evaluation of promising safety technologies aimed at CVOs. Given the expertise in CVO-focused research and testing at NSTSCE, this congressionally designated center will provide an ideal mechanism to conduct the FAST DASH program.

Each year, NSTSCE will request, via its Web site, that original equipment manufacturers and technology vendors submit promising safety technologies for testing and evaluation. Selection will be based on the technologies' potential safety benefits. It is anticipated that FMCSA will fund the evaluation and that the technology developer will partner with the Agency to provide the technology for testing. The FMCSA envisions that individual test and evaluation programs could be completed in 6 to 12 months. This program should greatly reduce both the time and the resources required to conduct tests and independent evaluations of potentially life-saving safety technologies.

A generic model and protocol to conduct the independent evaluation will be developed in the initial study and will include the following elements:

- Test plan development and modification.
- Institutional Review Board submission.
- Truck instrumentation.
- Subject recruitment.
- Data collection.
- Data analysis.
- Results and potential benefits.
- Letter report documentation including recommendations.

This generic protocol will then be adapted, as necessary, for specific test applications. As a potential project for the FAST DASH program, Volvo Trucks would like FMCSA to participate and test, for the U.S. road market, their Driver Alert System. The Driver Alert System monitors and alerts tired drivers. Volvo was the first in Europe to introduce this system for trucks. Using a camera, the system monitors how the vehicle is being driven by constantly relating to the road markings. If the vehicle's progress is perceived as erratic, the driver is alerted via an audible

signal and a text message. If the pattern of progress is not changed, the driver is alerted to stop and take a break. This particular technology was recently released in Europe for production in large trucks and would be an ideal test case for the FAST DASH program.

SUMMARY

The FMCSA is committed to providing national leadership for research and technology initiatives supporting the DOT's strategic safety objectives and is committed to reducing crashes, injuries, and fatalities by preventing and minimizing the severity of large-truck and bus crashes. Through the ART Office's strategic focus and unique program development methodology, FMCSA will continue to increase research into technologies that hold the most potential for saving lives and reducing injuries on the Nation's highways.

The FY 2009 Research and Technology budget submission is consistent with the initiatives established in DOT's Research, Development, and Technology Strategic Plan and ART roadmaps, and the requirements of the Performance and Assessment Rating Tool established by OMB. The FY 2009 funding of \$8.5 million supports various projects that will enable FMCSA to pursue the strategic objectives by Research and Technology.

ACRONYMS

ART	Analysis, Research, and Technology
CDL	Commercial drivers license
CMV	Commercial motor vehicle
CVISN	Commercial Vehicle Information System and Networks
CVO	Commercial vehicle operations
DDWS FOT	Drowsy Driver Warning System Field Operational Test
DOT	U.S. Department of Transportation
ENS	Employer Notification Service
FMCSA	Federal Motor Carrier Safety Administration
FMCSR	Federal Motor Carrier Safety Regulations
FOT	Field operational test
FY	Fiscal year
IDIQ	Indefinite Delivery Indefinite Quantity
IT	Information technology
LTCCS	Large Truck Crash Causation Study
NHTSA	National Highway Traffic Safety Administration
NSTSCE	National Surface Transportation Safety Center for Excellence
OMB	Office of Management and Budget
REB	Research Executive Board
SBIR	Small Business Innovation Research
SimVal II	Simulator Validation Project Phase II
TRB	Transportation Research Board
VTTI	Virginia Tech Transportation Institute