Initial Review of Research and Technology Program of the Federal Motor Carrier Safety Administration

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Chairwoman Fischer, Ranking Member Booker and committee members, I am honored to be asked to testify about this important topic.

Background

This testimony summarizes the report of the first meeting of the Motor Carrier Safety Research Analysis Committee (NASEM, 2017), held on December 15–16, 2016, at the National Academy of Sciences building in Washington, D.C. The committee's primary charges are to "assist the Federal Motor Carrier Safety Administration (FMCSA) to strengthen FMCSA's research and technology (R&T) program to better meet the needs of the Agency's safety mission as well as to inform commercial motor vehicle carrier enforcement, the research community, safety advocates, and industry of active and planned projects" and "(*a*) assist FMCSA in refining its research methodologies; (*b*) assist in identifying and utilizing current research in the transportation and related communities; and (*c*) promote transparency of the FMCSA R&T activities."

The committee is a group of individuals free of conflicts with regard to FMCSA's R&T program and with expertise in truck safety (both researchers and motor carrier operators), truck safety program management, technology, labor, statistics, sleep, and human factors (see attached committee membership). Initiated at the request of FMCSA to encourage independent program review, the committee expects to meet semi-annually as we seek to better understand the opportunities and constraints of the R&T program.

During the open sessions of our meeting, two points were made that focused the committee's thinking in the preparation of this report. First, the committee was asked to consider whether FMCSA is doing the right things in the right areas. Second, we were asked to consider the recommendations concerning data set forth in the 2016 report of the National Academies of Sciences, Engineering, and Medicine on motor carrier operator fatigue and health (NASEM 2016). Discussion of these two questions was the organizing principle for our letter report. The committee developed consensus recommendations intended to initiate a dialogue with FMCSA staff on suggestions for actions to be taken consistent with our committee statement of task.

Strategic Planning for FMCSA's R&T Program

In responding to the question concerning whether FMCSA is "doing the right things," the committee identified at least two safety goals, each with different implications concerning priorities for research and data analysis. The first is to strengthen FMCSA's R&T with regard to the agency's policies and regulatory authorities, such as by addressing fatigue through improved hours of service (HOS) regulation or reducing crashes through increased effectiveness of vehicle inspection policies. The second is to conduct research and assist in technology development to reduce the frequency and severity of large truck and bus crashes, consistent with FMCSA's primary mission.[1]

Although these goals are clearly related, the second is broader, and was the subject of additional committee discussion. The bulk of FMCSA's R&T appears to address the first goal. As explained in the paragraphs that follow, the committee raised a question concerning whether the agency is missing an opportunity to ascertain more broadly the

[1] https://www.fmcsa.dot.gov/mission

factors contributing to large truck and bus crashes and to identify, evaluate, and implement suitable countermeasures.

The committee learned from staff presentations that the R&T program has focused over the past decade or so on serving internal FMCSA R&T customers such as program managers in rulemaking and enforcement and responding to congressional mandates for specific projects. This implies that the R&T program is addressing the first safety goal identified above. The resulting projects include important safety concerns but appear to give less attention to the second goal. The committee appreciates the need for FMCSA to study specific areas related to driver behavior and fatigue, as recommended in the National Academies' driver fatigue and health report.[2] However, addressing such priorities should not preclude modest investments in data gathering and analysis to understand risks of large truck and bus crashes more broadly (i.e. goal 2).

Studies based on available data can yield important insights into risk and where safety agencies should target their efforts and can thereby inform strategic planning for future research. For example, an analysis by Medina-Flintsch et al. (2012), which was discussed during the meeting, indicates that most fatal truck crashes in two states occurred on state roads and highways rather than on Interstate highways, where most truck inspection enforcement activity is focused. Furthermore, the non-Interstate fatal crash rate per truck mile traveled is roughly two and one-half times that of the Interstate crash rate. If this experience is typical of national trends, a targeted effort to identify and enforce appropriate countermeasures is needed to reduce fatal truck crashes off the Interstate system. Even off the Interstates, a substantial portion of truck-involved fatal crashes

[2] See Recommendation 12.

involve interstate carriers, which implies that a substantial share of this safety problem is within FMCSA's responsibility.

The committee appreciates that the authorities and policies available to FMCSA are limited to drivers, vehicle maintenance, and carrier safety performance, which understandably causes the agency to focus its efforts in these areas. Nonetheless, the committee recommends that FMCSA consider a program of study that includes consideration of the effect of environmental factors, traffic levels, vehicle technologies, and roadway design on large truck and bus crashes in addition to their current set of contributing factors. Although these additional areas are primarily the responsibility of other entities,[3] follow-up research on the Medina-Flintsch et al. study mentioned above could also have implications for FMCSA's inspection and enforcement programs. The committee was pleased to learn in this regard that FMCSA, NHTSA, and FHWA have a history of collaboration on motor carrier safety issues.

The committee encourages FMCSA to consider (*a*) setting priorities through strategic analysis to identify possible problem areas, then (*b*) analyzing data to refine problem descriptions and explore possible countermeasures, and finally (*c*) carrying out pilot tests of countermeasures with evaluations of effectiveness. FMCSA's R&T program has used elements of this process in investigations of driver fatigue and distraction. The committee encourages the agency to broaden its view to consider risk more holistically rather than to focus on aspects of drivers, vehicle maintenance, and carrier performance to identify the highest areas of risk or the most cost-effective countermeasures. To the extent that a cost-

[3] NHTSA (for crash avoidance technologies), Federal Highway Administration (FHWA) (for highway safety countermeasures), and localities and states (for highway design, enforcement, traffic control, and emergency response).

effective countermeasure is the responsibility of other modal administrations, FMCSA could cooperate with the appropriate agency. The next section addresses how risk might be considered more broadly through the provision of enhanced data for analysis.

Enhanced Crash Data

FMCSA countermeasures focus on drivers, vehicles, and carriers. FMCSA R&T appears to do so as well, but this focus leaves out the interacting effects of the environment and the roadway. In view of FMCSA's limited R&T budget for data (about $3 million annually), the committee is suggesting not the collection of new data but the assembly of relevant information concerning motor coach and truck crashes from existing data sets.

The concept is to continue to seek opportunities to develop and provide researchers with access to a sustainable data set that can be used to conduct a range of safety analyses requiring multiple variables. A similar recommendation is contained in the National Academies' driver health and fatigue report.[4] In this regard, FMCSA's plan to create a database repository for data collected by FMCSA[5] is appropriate and should be conducted in a manner consistent with federal data standards and protocols established through the data.gov program.[6]

In addition, the committee recommends that FMCSA consider the assembly of a sustainable database of large truck and bus crashes and their attributes. The data set should include as many crash location, severity of outcome, contributing crash factors, and crash (number of vehicles, time of day, weather), vehicle, roadway, driver, and carrier attributes as can be obtained by full integration of available data sources. Several

[4] See pages 189–190.
[5] https://www.fmcsa.dot.gov/safety/research-and-analysis/data-repository-naturalistic-driving-and-other-datasets.
[6] https://www.data.gov/safety.

data sets can serve as starting points for such a sustainable data set; the details can be developed through the conduct of the research. The point is to use such a data set to support the conduct of motor carrier safety research throughout the United States.

As a secondary benefit to FMCSA, expansion and availability of data sets over time could enlarge the community of researchers interested in and knowledgeable about truck safety. These researchers would not necessarily be under contract to FMCSA. For example, they might be academic researchers, including doctoral students preparing dissertations, whose work is made possible by the availability of data. At present, the number of researchers knowledgeable about motor carrier safety is limited, which restricts FMCSA's options when it seeks contractors to compete for research proposals or for assistance in peer review.

Safety Research Methods

The committee appreciates FMCSA's methodological challenges in studying driver and vehicle safety issues. For example, for studies in the area of fatigue, FMCSA relied on data provided by cooperating carriers, which may involve biases because they tend to be the largest, most safety-conscious carriers.

Alternatively, FMCSA has relied on naturalistic driving studies (NDS) to examine driver behavior. This method uses trucks instrumented with cameras, global positioning systems and vehicle sensing hardware to observe driver behavior and vehicle response continuously in real time. While providing useful information about the actions of the driver of the instrumented commercial vehicle, the method is costly and results difficult to generalize because they are not random samples (and often again rely on data from the most safety-conscious carriers) and typically lack crashes or even large numbers of near

crashes. The committee will have more comments in this area in subsequent letter reports as it learns more about FMCSA's safety priorities, data constraints, and emerging concerns.

The committee report provides additional discussion of methodological opportunities available to the agency including naturalistic driving study methods already in use by the agency, epidemiological methods, and other techniques. One specific suggestion is to convene a workshop, which would bring together top safety methodologists across several fields (e.g. statistics, epidemiology, road safety, human factors) to provide focused advice on the use of naturalistic driving methodologies. There is an emerging literature that forms a foundation for discussion on this topic (e.g., Jonasson and Rootzén 2014; Wu and Jovanis 2012; Tarko 2012; Guo et al. 2010; Bärgman et al. 2015). Further details about methodological opportunities are contained in the committee report.

Driver Behavior

Prior convictions for moving traffic violations are a good predictor of subsequent crash risk [Lueck and Murray (2011), IIHS (1990)]. A long-term effort to collect data on moving violations could build on the recently completed FMCSA R&T report concerning the underreporting of commercial motor vehicle driver convictions by courts and states.[7] States receive incomplete reporting from their court systems, and some judges are reluctant to penalize motor carrier drivers through convictions that could take away their means of earning a living. In addition, first-time offenders sometimes receive a referral to training rather than a conviction, despite evidence that this practice poses a risk to other

[7] https://www.fmcsa.dot.gov/research-and-analysis/research/assessment-commercial-driver%E2%80%99s-license-cdl-holders%E2%80%99-traffic.

drivers (Gebers 2007). However, all states record convictions for moving violations on driver records, so collection of data on moving violation convictions is feasible.

Advanced Technology

Committee discussions concerning advanced technology systems for motor carriers included studies of Wireless Roadside Inspection (WRI), automation and collision avoidance systems. The committee was pleased to learn about FMCSA's large-scale research project addressing wireless roadside inspections.[8] If most fatal truck crashes occur off the Interstates, as indicated by the Medina-Flintsch et al. (2012) results described above, WRI capability would allow inspections to be conducted where risks appear to be highest. In view of the potential safety gains and issues associated with connected and autonomous vehicle technologies, the committee is interested in knowing more about (*a*) FMCSA and NHTSA efforts to track market penetration of different technologies and (*b*) early evaluations of the safety efficacy of these technologies.

Summary

The committee's 5 recommendations may be summarized as:

1. The committee suggests a strategic assessment of FMCSA's R&T program. In addition to addressing the needs of internal customers and responding to congressional mandates for specific projects, the agency should consider committee recommendations to develop, over time, a broader program to reduce large truck and bus crash frequency and the associated fatalities and injuries.
2. The committee recommends that FMCSA consider a program concerning the effect on large truck and bus crashes of environment, traffic, vehicle technologies,

[8] This multiyear, nearly $5 million effort is described at https://www.fmcsa.dot.gov/research-and-analysis/technology/wireless-roadside-inspection-wri-research-project.

and road design in addition to the currently recognized factors. The program should include a sustainable, annually produced national data set of large truck and bus crashes for safety analysis.

3. The committee notes that FMCSA has made substantial use of the naturalistic driving study (NDS) technique. The committee suggests that FMCSA convene a workshop of safety experts, epidemiologists, and statisticians to suggest improvements to NDS analysis to improve their use as a safety methodology (especially the use of proxy measures and crash surrogates). The interest of FHWA, NHTSA, and TRB technical committees indicates possible partners in such an endeavor.
4. The National Academies' driver fatigue and health report recommended that evaluation of the effectiveness of a program designed to reduce crashes can be more feasible and relevant than an attempt to quantify the multiple causes of crashes.
5. The committee discussed the influence of driver compensation on driver behavior. The committee realizes the complexity and contentiousness of this topic, desiring to develop a deeper understanding of the issue before offering advice.

Finally, on behalf of the entire committee, I express my appreciation to the FMCSA staff, which gave generously of their time during our meetings. They are to be commended for engaging the National Academies for this purpose.

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Wu, K.-F., and P. P. Jovanis. 2012. Crashes and Crash-Surrogate Events: Exploratory Modeling with Naturalistic Driving Data. *Accident Analysis and Prevention*, Vol. 45, pp. 507–516.

Committee Members

Committee Members in Attendance*
Axdahl, Lee, South Dakota Department of Public Safety
Bishop, Richard, Bishop Consulting
Byrd, LaMont, International Brotherhood of Teamsters
Campbell, John, Battelle Memorial Institute
Clarke, Robert, R.M. Clarke Consulting
Ferro, Anne, American Association of Motor Vehicle Administrators
Garber, Nicholas, University of Virginia
Jovanis, Paul, *committee chair,* Pennsylvania State University (emeritus)
McCartt, Anne, Insurance Institute for Highway Safety (retired)
Collin Mooney, Commercial Vehicle Safety Alliance**
Stern, Hal, University of California, Irvine
Thiese, Matthew, University of Utah
Van Dongen, Hans, Washington State University
Woodruff, Greer, J.B. Hunt Transport Services, Inc.

*Unable to attend: Dan Blower, University of Michigan Transportation Institute, and Linda Boyle, University of Washington
**Mr. Mooney resigned from the committee in January 2017.