

Programs of the Federal Motor Carrier Safety Administration (FMCSA) encompass a range of issues and disciplines, all related to motor carrier and bus safety and security. FMCSA's Office of Research and Analysis, which includes the Research, Technology, and Analysis Divisions, defines a "research program" as any systematic study directed toward fuller scientific discovery, knowledge, or understanding that will improve safety, and reduce the number and severity of commercial motor vehicle crashes. Similarly, a "technology program" is a program that adopts, develops, tests, and/or deploys innovative driver and/or vehicle best safety practices and technologies that will improve safety and reduce the number and severity of commercial motor vehicle crashes. An "analysis program" is defined as economic and environmental analyses done for the agency's rulemakings, as well as program effectiveness studies, state-reported data quality initiatives, and special crash and other motor carrier safety performance-related analyses. A "large truck" is any truck with a Gross Vehicle Weight rating or Gross Combination Weight rating of 10,001 pounds or greater.

Currently, FMCSA's Analysis, Research and Technology Divisions are conducting programs in order to produce safer drivers, improve safety of commercial motor vehicles, produce safer carriers, advance safety through information-based initiatives, and improve security through safety initiatives. The study described in this Tech Brief was designed and developed to support the strategic objective to produce safer carriers. The primary goals of this initiative are to 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.



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Effective Commercial Truck and Bus Safety Management Techniques

Background

This Tech Brief is a review of the synthesis study, "Effective Commercial Truck and Bus Safety Management Techniques," published by the Transportation Research Board (TRB) and sponsored by Federal Motor Carrier Safety Administration (FMCSA). This synthesis study identified major safety management problems of concern to motor carrier (large truck and bus) safety managers and other industry experts. More importantly, it described available approaches to enhanced safety, cited evidence for their effectiveness, and generated hypotheses for new research and development (R&D) on commercial truck and bus fleet safety management practices. Truck driving is the most hazardous occupation in the United States; more than 5,000 fatalities occur annually in truck crashes, and per-vehicle crash costs for tractor-trailers are more than four times those of other vehicle types.

Many commercial motor vehicle (CMV) safety managers are former drivers who have moved up "through the ranks" to a management position. Many progressed from being independent owner-operators to owning and managing their own fleet. Safety, proficiency, and productivity as a driver are likely to be factors that enable these individuals to progress to fleet ownership or a management position. The lessons they have learned on the job are applied to their management of others. However, many CMV safety managers have not had formal training in management, system safety, or the human factors of driving safety. Thus, their effectiveness as safety managers is likely to vary widely, with gaps in their knowledge of various safety problems or available management solutions. A necessary step toward making such knowledge available to carrier safety managers is the systematic compilation of information relating to CMV safety management and the establishment of a common body of knowledge to serve as the basis for improved training for managers or other means of disseminating safety management information to them.

Scope

The scope of the study included safety management issues and approaches applicable to CMV transportation. The research project focused on the "what" and the "how" of CMV safety management. "What" referred to the principal safety issues, problems, or sources of crash risk that must be addressed by CMV safety management practices. This included deficiencies in driver skills, knowledge, or safety behavior; fatigue and other sources of impairment; physical and medical problems, attitudes, morale, and turnover; vehicle inspection and maintenance; and the problem of high risk drivers associated with any of these problem areas. "How" referred to the techniques and approaches employed. In some cases, there was a one-to-one correspondence between issues and approaches; thus, for example, CMV driver fatigue was addressed as an issue, while fatigue management programs were addressed as safety management approaches. In most cases, however, the techniques and approaches applied to more than one specific safety issue.

Principally, this research project related to CMV operations that transport cargo or passengers in interstate commerce, and to which the FMCSRs are applicable. However, the synthesis did not primarily address the management of compliance with Federal and other motor carrier safety regulations. In the research project, regulatory compliance was viewed as an essential prerequisite for safe commercial vehicle operations, but not as sufficient to ensure safe operations. It was assumed that active safety management approaches going beyond compliance are necessary to achieve high operational safety.

CMV safety management is a broad and loosely defined topic. This research project was not intended to address the broad spectrum of motor carrier safety issues. In particular, the research project did not address government or industry policy issues.

Safety: Problems and Management Methods

This research project focused on motor carrier fleet safety management, namely the problems fleet managers confront and the methods that are available to address these problems. The authors conducted a literature review, held discussions and did interviews with experts, and solicited suggestions from the TRB synthesis panel. Twenty discrete safety problems and 28 safety management methods were identified based on this research information and the knowledge and experience of the authors. Problems addressed encompassed driver safety, knowledge, skills, behaviors, alertness, physical/medical condition, and attitudes. In addition, several vehicle-related problem areas, such as vehicle maintenance and inspection, were considered. Major safety management approaches addressed included:

- Driver recruiting
- Selection
- Carrier-based training
- Management-driver communications
- Driver safety-performance evaluation
- Safety incentives
- Behavior-based safety
- On-board safety monitoring
- Event-data recorders
- Accident investigation
- Improved driver scheduling and dispatching
- Fatigue management
- Carrier-based medical programs
- Preventive maintenance and vehicle inspection
- Advanced safety technologies
- Industry-based safety standards and certification

The following table lists the **most important safety problems** cited by fleet safety managers and other expert respondents:

Rating	Fleet Safety Managers	Other Expert Respondents
1	At-risk driving behaviors (such as speeding and tailgating)	High-risk drivers (all causes combined)
2	High-risk drivers (all causes combined)	Driver fatigue/drowsiness
3	Driver health and wellness, lifestyle, and general health	At-risk driving behaviors (such as speeding and tailgating)
4	Lack of defensive driving skills	Delays associated with loading and unloading (resulting in long working hours)
5	Delays associated with loading and unloading (resulting in long working hours)	Driver turnover resulting in unstable workforce
6	Driver fatigue/drowsiness	Driver health and wellness, lifestyle, and general health [tie]
7	Aggressive driving (“road rage”)	Sleep apnea [tie]

Much of the information for the study was collected through survey questionnaires from fleet safety managers and other experts in motor carrier safety. Safety manager surveys were distributed primarily through industry trade associations (to their safety council members). The “other expert” survey was distributed through professional organizations, to attendees at recent motor carrier safety conferences, and to colleagues of the authors. Two parallel survey forms were used; one for current CMV fleet safety managers (139 respondents) and one for other experts in motor carrier safety (57 respondents). For the problem areas, the key question was “importance.” For the methods, it was “effectiveness.”

The following table lists the **most effective safety methods** cited by fleet safety manager and the other expert respondents:

Rating	Fleet Safety Managers	Other Expert Respondents
1	Regularly scheduled vehicle inspection and maintenance	Continuous tracking of drivers' crashes/incidents/violations
2	Hiring based on criteria related to driver crash, violation, or incident history	Hiring based on criteria related to driver crash, violation, or incident history [4-way tie]
3	Continuous tracking of drivers' crashes/incidents/violations	Apprenticeship and “finishing” programs for new drivers [4-way tie]
4	Requiring that new hires meet or exceed a minimum number of years of driving experience	Standardized training for all new hires [4-way tie]
5	Crash and incident investigation by carrier management	Regular refresher training for all drivers [4-way tie]
6	Standardized training for all new hires	Remedial training programs for problem drivers
7	Within carrier management, alignment of operational and safety functions	Fatigue management programs

There are many different safety problems that need to be addressed, and many worthwhile management techniques that can contribute to enhanced fleet safety. The project team selected four study topics for more in-depth discussion, which were regarded as areas of great safety opportunity for truck and bus transportation. For all four topics, research literature and other information about the industry indicated that significant safety gains are possible by focusing on the issue or employing the safety management methodology. The topics identified were driver health, wellness, and lifestyle; high risk drivers; behavioral safety management; and safety management professionalism.

The first two topics are problem areas receiving high importance ratings in the survey and for which there is also strong research evidence and industry consensus that highlights their importance. The second two are general approaches to improved safety management, both of which involve various specific techniques. Although all of these topics were not frequently practiced by safety manager respondents nor rated among the most effective methods in the survey, there is much scientific literature and other rationales to indicate they could have a significant positive impact on the CMV industry if employed. These four topics (and others) provide many R&D needs and opportunities for government, industry, and academia. A common theme of this discussion of R&D needs was that motor carrier safety management must be elevated to a mature science which conducts sophisticated studies to elucidate and quantify risk factors, develops more innovative and comprehensive methods, and experimentally compares and evaluates these methods in fleet-based safety intervention studies.

Conclusion

The synthesis study concluded with recommendations for R&D that might be performed to create new knowledge and tools to address specific issues and safety opportunities identified in the synthesis. Both “research” and “development” were conceived broadly and may include many different types of initiatives undertaken by various parties and stakeholders involved in motor carrier safety.

Availability: The synthesis report "Effective Commercial Truck and Bus Safety Management" is available at the Transportation Research Board and can be found at www.trb.org.

Key Words: Bus Safety, Carrier Safety, Motorcoach Safety, Safety Management, Truck Safety

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