Commercial Truck and Bus Safety

Synthesis 1

Effective Commercial Truck and Bus Safety Management Techniques

A Synthesis of Safety Practice

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COMMERCIAL TRUCK AND BUS SAFETY SYNTHESIS PROGRAM

Synthesis 1

Effective Commercial Truck and Bus Safety Management Techniques

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COMMERCIAL TRUCK AND BUS SAFETY SYNTHESIS PROGRAM

Safety is a principal focus of government agencies and private-sector organizations concerned with transportation. The Federal Motor Carrier Safety Administration (FMCSA) was established within the Department of Transportation on January 1, 2000, pursuant to the Motor Carrier Safety Improvement Act of 1999. Formerly a part of the Federal Highway Administration, the FMCSA's primary mission is to prevent commercial motor vehicle-related fatalities and injuries. Administration activities contribute to ensuring safety in motor carrier operations through strong enforcement of safety regulations, targeting high-risk carriers and commercial motor vehicle drivers; improving safety information systems and commercial motor vehicle technologies; strengthening commercial motor vehicle equipment and operating standards; and increasing safety awareness. To accomplish these activities, the Administration works with federal, state, and local enforcement agencies, the motor carrier industry, labor, safety interest groups, and others. In addition to safety, security-related issues are also receiving significant attention in light of the terrorist events of September 11, 2001.

Administrators, commercial truck and bus carriers, government regulators, and researchers often face problems for which information already exists, either in documented form or as undocumented experience and practice. This information may be fragmented, scattered, and underevaluated. As a consequence, full knowledge of what has been learned about a problem may not be brought to bear on its solution. Costly research findings may go unused, valuable experience may be overlooked, and due consideration may not be given to recommended practices for solving or alleviating the problem.

There is information available on nearly every subject of concern to commercial truck and bus safety. Much of it derives from research or from the work of practitioners faced with problems in their day-to-day work. To provide a systematic means for assembling and evaluating such useful information and to make it available to the commercial truck and bus industry, the Commercial Truck and Bus Safety Synthesis Program (CTBSSP) was established by the FMCSA to undertake a series of studies to search out and synthesize useful knowledge from all available sources and to prepare documented reports on current practices in the subject areas of concern. Reports from this endeavor constitute the CTBSSP Synthesis series, which collects and assembles the various forms of information into single concise documents pertaining to specific commercial truck and bus safety problems or sets of closely related problems.

The CTBSSP, administered by the Transportation Research Board, began in early 2002 in support of the FMCSA's safety research programs. The program initiates three to four synthesis studies annually that address concerns in the area of commercial truck and bus safety. A synthesis report is a document that summarizes existing practice in a specific technical area based typically on a literature search and a survey of relevant organizations (e.g., state DOTs, enforcement agencies, commercial truck and bus companies, or other organizations appropriate for the specific topic). The primary users of the syntheses are practitioners who work on issues or problems using diverse approaches in their individual settings. The program is modeled after the successful synthesis programs currently operated as part of the National Cooperative Highway Research Program (NCHRP) and the Transit Cooperative Research Program (TCRP).

This synthesis series reports on various practices, making recommendations where appropriate. Each document is a compendium of the best knowledge available on measures found to be successful in resolving specific problems. To develop these syntheses in a comprehensive manner and to ensure inclusion of significant knowledge, available information assembled from numerous sources, including a large number of relevant organizations, is analyzed.

For each topic, the project objectives are (1) to locate and assemble documented information; (2) to learn what practice has been used for solving or alleviating problems; (3) to identify all ongoing research; (4) to learn what problems remain largely unsolved; and (5) to organize, evaluate, and document the useful information that is acquired. Each synthesis is an immediately useful document that records practices that were acceptable within the limitations of the knowledge available at the time of its preparation.

The CTBSSP is governed by a Program Oversight Panel consisting of individuals knowledgeable in the area of commercial truck and bus safety from a number of perspectives—commercial truck and bus carriers, key industry trade associations, state regulatory agencies, safety organizations, academia, and related federal agencies. Major responsibilities of the panel are to (1) provide general oversight of the CTBSSP and its procedures, (2) annually select synthesis topics, (3) refine synthesis scopes, (4) select researchers to prepare each synthesis, (5) review products, and (6) make publication recommendations.

Each year, potential synthesis topics are solicited through a broad industry-wide process. Based on the topics received, the Program Oversight Panel selects new synthesis topics based on the level of funding provided by the FMCSA. In late 2002, the Program Oversight Panel selected two task-order contractor teams through a competitive process to conduct syntheses for Fiscal Years 2003 through 2005.

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The members of the technical committee selected to monitor this project and to review this report were chosen for recognized scholarly competence and with due consideration for the balance of disciplines appropriate to the project. The opinions and conclusions expressed or implied are those of the research agency that performed the research, and, while they have been accepted as appropriate by the technical panel, they are not necessarily those of the Transportation Research Board, the National Research Council, or the Federal Motor Carrier Safety Administration of the U.S. Department of Transportation.

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The following organizations provided more extensive support, either by scheduling focus groups, participating in interviews, providing research reports, providing sample safety management tools (see Appendix E), and coordinating the distribution and collection of safety manager survey forms:

- American Bus Association
- American Transportation Research Institute (formerly the American Trucking Associations Foundation)
- American Trucking Associations
- D. M. Bowman, Inc.
- Colorado Department of Transportation
- Colorado Motor Carriers Association
- Contract Freighters, Inc.
- Federal Motor Carrier Safety Administration
- Flood and Peterson Insurance
- Great West Casualty Company
- Liberty Mutual
- Motor Freight Carriers Association
- National Association of Small Truck Companies
- National Industrial Transportation League
- National Private Truck Council
- Praxair Distribution, Inc.
- TRB Truck and Bus Safety Research Task Force (A3B57)
- Truckload Carriers Association
- Virginia Trucking Association
- Zurich Services Corporation

FOREWORD

By Christopher W. Jenks
CTBSSP Manager
Transportation Research Board

This synthesis, the first in the CTBSSP series, will be of use to commercial truck and bus carriers and others interested in improving commercial vehicle safety. It provides a useful summary of practice in the area of commercial truck and bus safety management techniques. The synthesis focuses on the problems fleet managers confront and the methods that are available to address these problems. Twenty discrete safety problems and 28 safety management methods are identified. Problems addressed encompass driver-safety knowledge, skills, alertness, physical/medical condition, attitudes, and driving behaviors. In addition, several vehicle-related problem areas, including vehicle maintenance and inspection, are discussed. Major safety management approaches addressed include driver recruiting and 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, and industry-based safety standards and certification. The synthesis is based on a review of relevant literature, as well as a survey of commercial motor vehicle safety managers (139 respondents) and other experts in motor carrier safety (57 respondents).

Administrators, commercial truck and bus carriers, government regulators, and researchers often face problems for which information already exists, either in documented form or as undocumented experience and practice. This information may be fragmented, scattered, and underevaluated. As a consequence, full knowledge of what has been learned about a problem may not be brought to bear on its solution. Costly research findings may go unused, valuable experience may be overlooked, and due consideration may not be given to recommended practices for solving or alleviating the problem.

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For each topic, the project objectives are (1) to locate and assemble documented information; (2) to learn what practice has been used for solving or alleviating problems; (3) to identify all ongoing research; (4) to learn what problems remain largely unsolved; and (5) to organize, evaluate, and document the useful information that is acquired. Each synthesis is an immediately useful document that records practices that were acceptable within the limitations of the knowledge available at the time of its preparation.

CONTENTS

Abbreviations used without definitions in TRB publications:

AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
IEEE	Institute of Electrical and Electronics Engineers
ITE	Institute of Transportation Engineers
NCHRP	National Cooperative Highway Research Program
NCTRP	National Cooperative Transit Research and Development Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
SAE	Society of Automotive Engineers
TCRP	Transit Cooperative Research Program
TRB	Transportation Research Board
U.S.DOT	United States Department of Transportation

EFFECTIVE COMMERCIAL TRUCK AND BUS SAFETY MANAGEMENT TECHNIQUES

SUMMARY

This research project focuses on motor carrier (large truck and bus) fleet safety management: the problems fleet managers confront and the methods that are available to address these problems. Based on the knowledge and experience of the authors, a literature review, discussions and interviews with experts, and suggestions from the TRB synthesis panel, 20 discrete safety problems and 28 safety management methods were identified. Problems addressed encompass driver-safety knowledge, skills, driving 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 include those relating to driver recruiting, selection, carrier-based training, management-driver communications, driver safety-performance evaluation, safety incentives, behavior-based safety (BBS), on-board safety monitoring (OBSM), event-data recorders, accident investigation, improved driver scheduling and dispatching, fatigue management, carrier-based medical programs, preventive maintenance and vehicle inspection, advanced safety technologies, and industry-based safety standards and certification.

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 (e.g., to their safety council members). Thus, the sample is biased toward safety-conscious managers. 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 Commercial Motor Vehicle (CMV) fleet safety managers (139 respondents) and one for other experts in motor carrier safety (57 respondents). The 20 specific problem areas and 28 specific safety management solutions (i.e., practices) listed were identical on the two forms. For the problem areas, respondents were asked to rate the relative importance of the areas on a 5-point scale, and then to identify the five most important problem areas. Safety managers were asked to respond in relation to their own fleets; other experts were asked to respond in relation to commercial vehicle operations (CVO) in general. For the 28 solutions, safety managers were first asked to indicate "yes" or "no" whether they currently used the safety management method with their fleets. If "yes," they rated the effectiveness

of the method in their fleet using the same 5-point scale, and then selected the five most effective methods. For the other experts, there was no "yes" or "no" question; instead, they simply rated each method in terms of its general effectiveness in carrier safety management and selected their "Top 5" methods.

The survey results are presented in Chapters 3 and 4 on safety management problem areas and methods, respectively. For the problem areas, the key question was "importance." For the methods, it was "effectiveness." For each of the 20 problem areas and 28 methods, a short discussion is provided, including major findings from the literature, and the survey results are shown. Both mean ratings and rankings are provided, as well as selected comments by respondents. To supplement the safety management methods discussion, 16 safety management "tools" or job aids are provided (courtesy of various contributors) in Appendix E.

The following were the most important safety problems for fleet safety manager respondents, based on their mean 5-point scale ratings:

1. At-risk driving behaviors (e.g., speeding, tailgating);
2. High-risk drivers (all causes combined);
3. Driver health and wellness, lifestyle, and general health;
4. Lack of defensive driving skills;
5. Delays associated with loading and unloading (resulting in long working hours);
6. Driver fatigue/drowsiness; and
7. Aggressive driving ("road rage").

The following were the most important safety problems for other expert respondents, based on their mean ratings:

1. High-risk drivers (all causes combined);
2. Driver fatigue/drowsiness;
3. At-risk driving behaviors (e.g., speeding, tailgating);
4. Delays associated with loading and unloading (resulting in long working hours);
5. Driver turnover resulting in unstable workforce;
6. Driver health and wellness, lifestyle, and general health [tie]; and
7. Sleep apnea [tie].

These were the most widely practiced methods, per the safety managers:

1. Continuous tracking of drivers' crashes/incidents/violations: 92%;
2. Regularly scheduled vehicle inspection and maintenance: 91%;
3. Hiring based on criteria related to driver crash, violation, or incident history: 90%;
4. Tracking of overall fleet safety statistics (e.g., crash/violation rate): 88% [tie];
5. Safety-related basic equipment specifications on new vehicles: 88% [tie];
6. Standardized training for all new hires: 87% [tie]; and
7. Trip sheets (e.g., driver documentation of pre- and post-trip inspections: 87% [tie].

The following were the most effective safety methods for fleet safety manager respondents, based on their mean ratings:

1. Regularly scheduled vehicle inspection and maintenance;
2. Hiring based on criteria related to driver crash, violation, or incident history;
3. Continuous tracking of drivers' crashes/incidents/violations;

4. Requiring that new hires meet or exceed a minimum number of years of driving experience;
5. Crash and incident investigation by carrier management;
6. Standardized training for all new hires; and
7. Within carrier management, alignment of operational and safety functions.

The following were the most effective safety management methods for the other expert respondents, based on their mean ratings:

1. Continuous tracking of drivers' crashes/incidents/violations;
2. Hiring based on criteria related to driver crash, violation, or incident history [tie];
3. Apprenticeship and "finishing" programs for new drivers [tie];
4. Standardized training for all new hires [tie];
5. Regular refresher training for all drivers [tie];
6. Remedial training programs for problem drivers; and
7. Fatigue management programs.

As one safety manager respondent pointed out, effective carrier safety management "is not one thing—it's many things." There are many different safety problems 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; they are regarded by the project team as areas of great safety opportunity for truck and bus transportation. For all four topics, the research literature and other information about the industry indicate that significant safety gains are possible by focusing on the issue or employing the safety management methodology. The four issues are (1) driver health, wellness, and lifestyle; (2) high-risk drivers; (3) behavioral safety management; and (4) safety management professionalism.

The first two of these issues are problem areas receiving high importance ratings in the survey and for which there is also strong research evidence and industry consensus, highlighting their importance. The second two are general approaches to improved safety management, both of which involve various specific techniques. Although these methods 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 research and development (R&D) needs and opportunities for government, industry, and academia. A common theme of this discussion of R&D needs is 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.