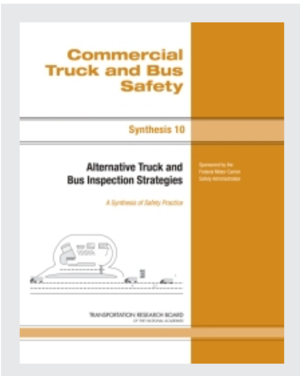

Alternative Truck and Bus Inspection Strategies

DETAILS

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COMMERCIAL TRUCK AND BUS SAFETY SYNTHESIS PROGRAM

Synthesis 10

Alternative Truck and Bus Inspection Strategies

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Subject Areas
Operations and Safety • Public Transit • Freight Transportation

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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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NOTICE

The project that is the subject of this report was a part of the Commercial Truck and Bus Safety Synthesis Program conducted by the Transportation Research Board with the approval of the Governing Board of the National Research Council. Such approval reflects the Governing Board's judgment that the program concerned is appropriate with respect to both the purposes and resources of the National Research Council.

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.

Each report is reviewed and accepted for publication by the technical panel according to procedures established and monitored by the Transportation Research Board Executive Committee and the Governing Board of the National Research Council.

To save time and money in disseminating the research findings, the report is essentially the original text as submitted by the research agency. This report has not been fully edited by TRB.

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FOREWORD

By Christopher W. Jenks
CTBSSP Manager
Transportation Research Board

This synthesis will be useful to federal and state agencies, commercial truck and bus operators, and others interested in improving commercial vehicle safety. The synthesis identifies and describes the characteristics of the various types of alternative commercial truck and bus inspection strategies currently being used by law enforcement agencies. It segments the inspection process into three components—how vehicles are selected for inspection; how, when, and where vehicles are inspected; and the consequences of violations. The synthesis also provides information on the effectiveness of the inspection strategies, documenting benefits such as reduced costs and improved resource allocation. Information provided in the synthesis is based on a literature review of current practice; a survey of state inspection personnel; and interviews with key stakeholders, including state enforcement personnel and commercial motor carrier truck and bus representatives from around the country.

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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The CTBSSP, administered by the Transportation Research Board, was authorized in late 2001 and began in 2002 in support of the FMCSA's safety research programs. The program initiates several synthesis studies annually that address issues 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.

This synthesis series reports on various practices; 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 is analyzed.

For each topic, the project objectives are (1) to locate and assemble documented information; (2) to learn what practices have been used for solving or alleviating problems; (3) to identify relevant, 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

ALTERNATIVE TRUCK AND BUS INSPECTION STRATEGIES

SUMMARY

Roadside inspections are a key element of federal and state commercial vehicle safety programs. Designed to ensure compliance with federal and state safety, credentialing, and administrative (e.g., weight) regulations, these inspections have traditionally been conducted at fixed facilities located on select major highways. A variety of factors (e.g., increasing freight volumes, stagnant or declining enforcement resources, and increased responsibilities for the roadside enforcement personnel) are forcing the typical enforcement model to be reconsidered. This study was designed to identify and describe the characteristics of the various types of alternative commercial truck and bus inspection strategies currently being used by enforcement agencies.

This study employed a multifaceted approach to collect the most current information related to commercial vehicle inspections. Specifically, the approach contained the following elements:

- Literature review,
- Survey of state inspection personnel, and
- Interviews with public- and private-sector stakeholders.

The interviews were used to augment the literature review and survey data. Where possible, quantitative measures are cited to document the benefits of traditional and alternative inspection strategies.

On the basis of stakeholder survey and interview results, the following key findings were identified:

- Alternative inspection strategies offer benefits to state stakeholders (e.g., increased effectiveness, maximized resources), as well as to the industry (e.g., level playing field, improved productivity).
- All stakeholder groups agree that alternative inspection strategies should be employed.
- There are a variety of strategies and automated inspection tools that are being used by the enforcement community today, including selection algorithms, software to automatically capture inspection data, and electronic screening systems.

- Stakeholders agree that many of the current alternative inspection strategies are not performing at their optimal level because of data quality issues (e.g., accuracy, timeliness, integrity).
- Roughly 60% of stakeholders indicated that their top priority is removing unsafe commercial vehicle drivers from the road because drivers are often at fault when accidents occur.
- Jurisdictions' communication networks should be upgraded, in order to provide the level of access to data that is critical for supporting mobile and virtual enforcement activities.
- The inclusion of security-related activities in the roadside enforcement process dictates the development of new driver and cargo-based screening tools and the sharing of security-related data. There appears to be strong support for the continuation of research aimed at identifying technology that facilitates the screening of drivers, carriers, and vehicles at highway speeds.

Based on the key findings, the research team reached the following conclusions:

- The use of on-board vehicle sensors, as part of the inspection process, should be studied further.
- It is important for stakeholders to work together to identify the data that are critical to supporting roadside enforcement needs and issues with these data that should be addressed through a structured process.
- State commercial vehicle enforcement agencies should be actively involved in their state's Commercial Vehicle Information Systems and Networks (CVISN) programs and should support the development of state CVISN program plans that meet the needs of the roadside personnel. These program plans establish the state's funding priorities for federal CVISN deployment grants and are required by (Federal Motor Carrier Safety Administration (FMCSA).
- Although the industry representatives that were interviewed during this project are very receptive to increasing safety, agencies responsible for commercial vehicle inspections should demonstrate to the industry that by working together there will be tangible, monetary benefits that will accrue to the trucking industry at large.
- Research regarding new alternative inspection technologies (e.g., wireless bus and truck inspections) should continue.
- Privacy concerns should be considered when contemplating new enforcement strategies.

CHAPTER 1

INTRODUCTION

BACKGROUND

Roadside inspections are a key element of federal and state commercial vehicle safety programs. Designed to ensure compliance with federal and state safety, credentialing, administrative (e.g., weight) regulations, these inspections have traditionally been conducted at fixed facilities located on select major highways. A variety of factors, however, are forcing government agencies to consider alternatives to the traditional inspection processes. These factors include drastically increasing commercial vehicle volume and vehicle miles traveled, stagnant or reduced commercial vehicle safety funds and/or staffing levels, an expanded focus (e.g., security) for roadside enforcement personnel, as well as operational enhancements offered by automating and streamlining select processes.

SCOPE

This study was designed to identify and describe the characteristics of the various types of alternative commercial truck and bus inspection strategies currently being used by enforcement agencies. The study segmented the inspection process into three components: (1) identification (e.g., how vehicles were identified are selected for inspections), (2) inspection (e.g., how, when, and where vehicles are inspected), and (3) enforcement (e.g., how violations are enforced). The study also gathered available information on the effectiveness of the inspection strategies. This portion of the study was structured to document the benefits (e.g., reduced costs, improved resource allocation) of the alternative inspection processes.

APPROACH

This study employed a multifaceted approach to collect the most current information related to commercial vehicle inspections. The study was designed to ensure that a variety of stakeholder view points—such as federal-level regulators, state enforcement personnel, and motor carrier/motor coach industry representatives—were included. Specifically, the approach contained the following elements:

- **Literature Review**—Designed to identify the current state of the roadside enforcement practice (e.g., technologies currently used to select vehicles for inspection, technologies used to expedite the inspection process and/or share the inspection results), as well as future trends (e.g., emerging technologies) that could improve the inspection process. The literature review also documented issues (e.g., an increased focus on commercial vehicle security, increased commercial vehicle volume, budget constraints) that are changing the roadside enforcement landscape.
- **Survey of State Inspection Personnel**—Designed to augment the literature data, the surveys documented specific states' enforcement models (e.g., strategies employed, technologies used, and inspection facilities used), the industry's response to their inspection processes, as well as their plans to improve their roadside inspection capability. The survey questions, as well as the detailed survey results are included in Appendix B.
- **Interviews**—Designed to clarify and augment the data gathered through the surveys and literature review. A series of interviews was conducted with stakeholders, including state enforcement personnel and motor carrier representatives. The interviews were conducted with state personnel from across the country and representatives from motor carrier and motor coach operations.

REPORT ORGANIZATION

This report is designed to be a synthesis of information gleaned from a variety of data sources. Although specific references to specific reports or surveys represent the majority of the study, the intent is to present a comprehensive overview of the topic. The remaining sections of this report include the following:

- Alternative Commercial Vehicle Inspection Strategies Survey;
- Literature Review;
- Trends Affecting Commercial Vehicle Inspection Strategies;
- Characteristics of Truck and Bus Inspection Strategies;
- Effectiveness of Current Systems;
- Key Findings and Conclusions;
- Bibliography;
- Contributing Organizations and Individuals;
- Enforcement Agencies Survey Questionnaires/Results; and
- Interview Guides.

CHAPTER 2

ALTERNATIVE COMMERCIAL VEHICLE INSPECTION STRATEGIES SURVEY

METHOD

The researcher team coordinated the survey that was administered under this project with a survey that was being administered by the Commercial Vehicle Safety Alliance (CVSA) on behalf of FMCSA. The FMCSA project is exploring what role existing or emerging wireless technology can play in the commercial vehicle safety inspection process.

Once the survey questions were finalized, staff from CVSA developed an on-line version of the survey. The survey was distributed to 69 CVSA member jurisdictions via e-mail. Respondents simply needed to click on a link to the survey that was included in the e-mail message in order to respond to the questions. A total of 25 responses were received—representing a 36% response rate.

The final survey that was distributed included 28 questions, primarily multiple choice, for respondents to reply to. Several of the questions were open-ended and provided respondents an opportunity to provide more detail about what enforcement strategies they are using, how effective these strategies are, and the areas that they wish to improve.

The survey results were augmented with interviews with a series of stakeholders. The interviews included a geographic and demographic cross section of the enforcement community, as well as the motor carrier and motor coach industries. Interviews were conducted with the following:

- Representatives from 11 state agencies responsible for the regulation of the motor carrier and motor coach industries;
- Four state trucking associations;
- Two national industry associations—one representing the motor carrier industry and one representing the motor coach industry; and
- Representatives from FMCSA.

Some of these interviews were conducted exclusively for this project, while others were done in conjunction with related studies.

PRINCIPAL RESULTS

The survey results confirmed that a majority of jurisdictions are struggling to keep pace with increasing commercial truck/bus traffic and shrinking enforcement resources. These trends, in large part, are driving jurisdictions to adopt more alternative inspection strategies. The highlights of the survey results include the following findings:

- A trend toward conducting roadside inspections at mobile or virtual inspection facilities, as opposed to fixed weigh stations;
- Vehicles are targeted for inspection predominantly to find "high-risk" drivers. Identifying at-risk vehicles and carriers is a lesser priority to enforcement personnel—as is identifying high-risk cargo;
- Jurisdictions use a broad range of tools used to select a vehicle for inspections, including visual inspection of the vehicle, electronic screening technologies (e.g., PrePass), weigh-in-motion (WIM) sensors, and advanced sensing technologies (e.g., detecting radiological, biological or chemical cargo);
- Approximately 58% of the respondents use an electronic screening algorithm (e.g., ISS, SafeStat) to help them determine which vehicles to target; and
- When asked what technologies are needed in the future, the majority of respondents indicated the need for enhanced on-board sensors that would notify field personnel of potential problems with the vehicle or driver.

The survey results are tabulated in Appendix C.

DISCUSSION

On the basis of survey results and supporting interviews, there appears to be consensus that alternative inspection technologies are necessary and the desired trend for future enforcement activities. State personnel perceive these alternative technologies as a key strategy to "do more with less" as they are confronted with rapid growth in commercial vehicle traffic and stagnant or declining enforcement resources. The industry perceives these alternative strategies as a means to "level the playing field" and ensure that carriers that are not meeting their safety obligations do not receive an unfair competitive advantage over those that do.

There also appears to be consensus among the stakeholders that the current alternative inspection strategies for selecting commercial vehicles and drivers for an inspection are insufficient. Seventy-four percent of respondents indicated that they rely on a visual inspection of a vehicle/driver to determine the type (level) of inspection that should be performed, even though a majority (58%) of them use a screening algorithm as part of their roadside operations. This indicates that roadside personnel do not have sufficient confidence in the roadside tools to use them exclusively. Industry representatives noted a similar level of skepticism regarding the current set of screening tools. In particular, industry representatives noted the following concerns:

- The "rules of the game" (e.g., how the selection algorithms work, the data used in the current screening algorithms) are not widely known and/or understood by the industry;
- The current inspection selection aids may not identify the correct vehicles for targeted enforcement;
- Quality issues (e.g., associating a crash with the wrong motor carrier) in the data used by FMCSA to calculate the screening algorithms undermines the accuracy of the screening decisions;
- The lack of "at fault" determinations for the crash data used in the calculation of screening algorithms is unfair and may result in a carrier being targeted for enforcement actions based on incidents that were beyond its controls (e.g., having its vehicles rear-ended by another vehicle);
- Once a carrier is deemed "high-risk" by the screening algorithm and targeted for enforcement, it is difficult to be removed from the list because the "high-risk" determination is a "self-fulfilling prophecy" in that a roadside inspector will be predisposed to look for a violation on a vehicle of a "high-risk" carrier; and
- The varying frequency in which states submit their safety data to FMCSA creates an "uneven playing field," whereby carriers operating in states that update FMCSA more frequently are at a disadvantage as compared to carriers operating in states with less frequent updates that enjoy a "grace period" between when a crash or inspection occurring and their being reported to FMCSA and included in the screening algorithm calculation.

It is important to note that the state personnel also noted a concern about data quality. Obtaining more robust data (67%) was listed second only to decreasing crashes (88%) as a priority for a respondent's inspection program.

Further, the survey results indicate that the alternative strategies currently available may not meet the operational realities of roadside enforcement. Sixty percent of respondents indicated that their "jurisdiction's commercial vehicle inspection program (is) aimed at identifying" high-risk drivers. Unfortunately, there currently is no driver-focused alternative strategy and only 8% of respondents indicated that their current selection tools are most effective at identifying high-risk drivers. FMCSA currently is working to develop a driver-focused algorithm (Inspection Selection System-Driver [ISS-D]) and is augmenting the Commercial Vehicle Information Systems & Networks (CVISN) architecture to improve the sharing of commercial vehicle driver data.

The survey also indicated that states are modifying their enforcement strategies to include mobile and virtual enforcement operations. These operations—made possible through in-vehicle and roadside-based technology—are allowing jurisdictions to expand their enforcement efforts off of the highways and onto smaller roads, including roads that are known bypass routes around fixed inspection stations. Stakeholders have recommended that FMCSA support the development of virtual roadside sites through the development of deployment templates and identification of "best practices." The movement toward mobile inspection facilities also reveals a need to improve wireless communications.

CHAPTER 3

LITERATURE REVIEW

METHOD

The research team reviewed a variety of literature as part of this effort. Sources included the following:

- State commercial vehicle safety plans;
- State commercial vehicle operations business plans;
- State Commercial Vehicle Information Systems and Networks (CVISN) program plans;
- Conference proceedings (e.g., ITS/CVO Deployment Showcase);
- CVISN Program Review Summary Report; and
- U.S. DOT, FMCSA, and state program evaluations/assessments.

The research team also reviewed preliminary results from a variety of related FMCSA initiatives, including the Wireless Bus and Truck Inspection study (2005), the expanded CVISN initiative, and the Comprehensive Safety Analysis for 2010.

The research team conducted an Internet search for relevant materials. While hundreds of potentially relevant papers were found, the number was distilled based on the following criteria:

- Papers that discussed the current and future issues associated with commercial motor vehicle safety, which were used to establish a baseline for current strategies and to evaluate the trends that are likely to occur in the future;
- Papers that discussed the current and future issues associated with the technology used to ensure CMV safety; and
- Research into mathematical models that can serve as predictors of the effectiveness of inspection strategies.

DATA SOURCES

A complete bibliography of the final papers that were included in this study can be found in Appendix A. Key sources used in this analysis include the following:

- Baron, William, *Roadside Vehicle Identification Technologies—Final Report,* U.S. DOT Research & Special Program Administration, Cambridge, MA, June 20, 2001.
- Hughes, Dr. Ronald; Keppler, Steve; Yeakel, Skip; Deedy, Conal; and Moses, Tom. *The Context for Commercial Vehicle Enforcement Activity in 2020: Forecast of Future Directions in Truck Safety and Security,* Future Truck and Bus Safety Research Directions Conference, Arlington, VA, March 23–24, 2005.
- *FMCSA Safety Program Performance Measures—Intervention Model: Roadside Inspection and Traffic Enforcement Effectiveness Assessment,* John A. Volpe National Transportation System Center Motor Carrier Safety Assessment Division, Cambridge, MA, September 2002.
- *Freight Analysis Framework,* Federal Highway Administration. Freight Analysis Framework, available at: http://ops.fhwa.dot.gov/freight/freight_news/FAF/talkingfreight_faf.htm.
- *Integrating Freight in the Transportation Planning Process,* Federal Highway Administration training course.
- *North American Free Trade Agreement: Coordinated Operational Plan Needed to Ensure Mexican Trucks Compliance with U.S. Standards,* United States General Accounting Office, Washington, D.C., December 2001.
- *ISS-2: The Integration of the Motor Carrier Safety Status Measurement System (SAFESTAT) into the Roadside Inspection Selection System (ISS) Final Report,* The Upper Great Plains Transportation Institute, Fargo, North Dakota, January 2000.

DISCUSSION

The results from the literature survey confirmed many of the results from the enforcement survey and supporting interviews. The literature review identified the key themes:

- Enforcement personnel are being asked to "do more" with limited resources;
- Alternative enforcement strategies are needed to accommodate an increase in commercial motor vehicle traffic and a reduction in enforcement personnel;
- Alternative enforcement strategies (e.g., use of ASPEN inspection software) already are widely used by jurisdictions and in some cases have been mainstreamed into standard practice through federal incentives and/or programmatic requirements (e.g., CVISN program requirements);

- New alternative enforcement strategies (e.g., wireless inspections, new technologies to identify commercial vehicles at highway speeds) are being considered and actively developed by FMCSA, state agencies, and private-sector vendors;
- While qualitative information is limited, existing data do support the use of alternative technologies; and
- Data currently used in the calculation of safety ratings and selection algorithms need to be improved, in order to provide the intended benefits and results.

Specific data collected through the literature review are included in the analysis presented in later sections of the document.

CHAPTER **4**

TRENDS AFFECTING COMMERCIAL VEHICLE INSPECTION STRATEGIES

SUMMARY OF INDUSTRY TRENDS

Commercial motor vehicle operations are modified continually in response to the changing economy and the demands of customers. As such, economic trends have a key impact on the motor carrier and motor coach industries. Key trends currently affecting the industries include:

- Increasing freight volumes,
- Increasing international shipments,
- Changing logistics patterns, and
- Increasing fuel prices.

These trends and their effects on commercial vehicle operations and safety are described below. These trends will play a key role in driving the demand for and placement of roadside enforcement resources, as well as the use of alternative inspection strategies.

Increasing Freight Volume

In 1998, freight movements in the United States (including exports and imports) totaled approximately 15.2 billion tons with a combined value of $9.3 billion [FHWA, *Freight Analysis Framework*]. Of this total, commercial trucks were responsible for moving 71% of the tonnage (10.9 billion tons) and 80% of the value ($7.4 billion). These freight volumes are anticipated to nearly double by 2020–25.8 billion tons and $30 billion. Commercial trucks are projected to remain the dominant mode of freight movement in the United States—accounting for 74.2% of the 2020 tonnage and 78% of the 2020 value.

In order, to accommodate these rapid increases in freight volumes, the number of commercial vehicle miles driven also will increase dramatically. Commercial vehicle freight traffic is projected to increase by nearly 90% by 2020. This increase is in addition to other sizable increases in commercial vehicle miles traveled that have occurred since 1980. Figure 1 illustrates the past and projected dramatic rises in commercial vehicle (i.e., a straight truck with two or more axles and six tires, a combination vehicle) miles driven [FHWA, *Integrating Freight in the Transportation Planning Process* training course, slide 7 (NHI Course 139001, Publication #: NHI-FHWA-04-130, February 2004.)].

Enforcement resources likely will be unable to keep pace with this rapid growth in commercial vehicle traffic. Concern about this trend was illustrated in the state survey results. The top two issues that were identified as burdening the jurisdictions' commercial vehicle inspection program were: "increases in commercial truck/bus traffic" (61%) and "availability of jurisdiction enforcement resources" (57%).

Increasing International Shipments

The enactment of international trading agreements and the globalization of trade will dramatically increase the number of international shipments entering/exiting the United States. In 1998, international freight totaled one billion tons. This freight is expected to double to two billion tons by 2020 [FHWA, *Freight Analysis Framework*]. This increase in international shipments will precipitate an increase in truck traffic delivering goods to/from the United States' North American trade partners. In particular, North–South trade corridors in North Dakota, Minnesota, Illinois, Indiana, Missouri, Ohio, New York, New England, and the Pacific Northwest are expected to experience significant growth to support United States–Canada trade [FHWA, *Integrating Freight in the Transportation Planning Process* training course, slide 16]. The I-10 and I-35 trade corridors in the southern United States are forecast to experience significant growth in support of United States-Mexico trade [FHWA, *Integrating Freight in the Transportation Planning Process* training course, slide 17]. Ports on the United States northern and southern border will see corresponding increases in truck traffic—as shipments transit into/out of Mexico and Canada.

In addition to increased highway and port of entry traffic, international trade will impact commercial vehicle operations at and around maritime ports across the United States. Congestion at ports, as commercial vehicles wait to be loaded and unloaded, is projected to worsen as port shipments increase without a corresponding increase in capacity. Further, "larger trucks operating on older access routes often have to deal with short signal times, inadequate roadway geometrics, and other local roadway conditions" [FHWA, *Trade: From National Markets to Global Markets,* available: http://ops.fhwa.dot.gov/freight/theme_papers/final_thm1_v3.htm)].

Since the enactment of the North American Free Trade Agreement, the number of Canadian and Mexican registered

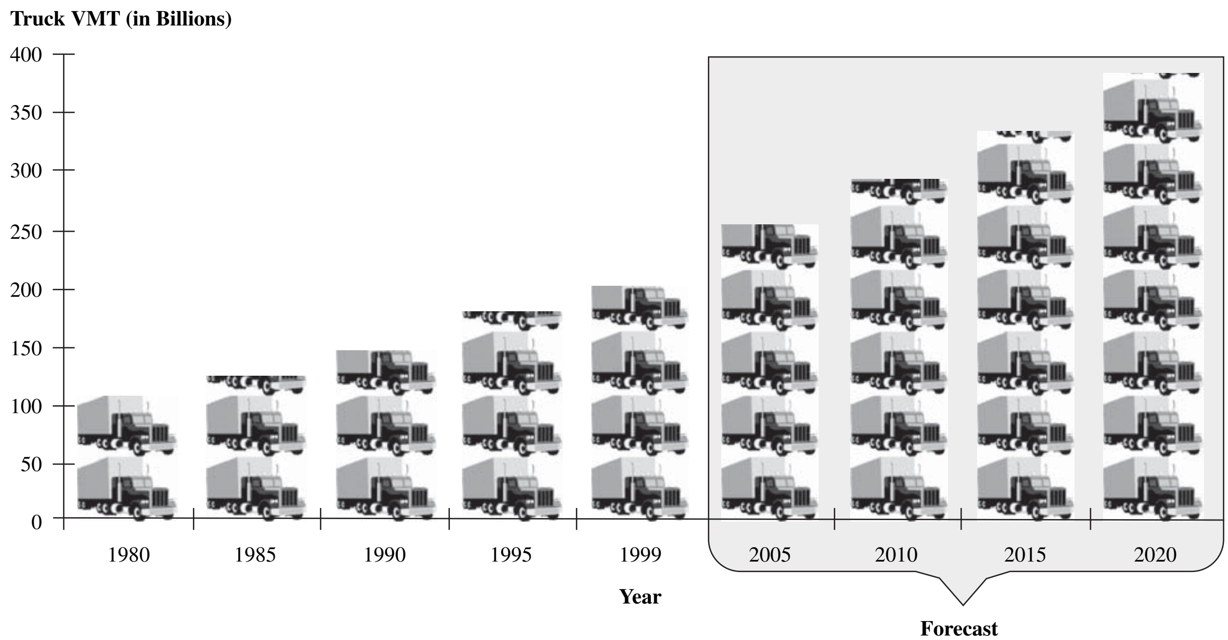

Figure 1. Truck vehicle miles traveled 1980–2020.

vehicles operating in the United States has increased. Concerns about the safety of Mexican commercial vehicles (e.g., they suffered from an out-of-service rate 36 to 44% higher than the United State's national average [United States General Accounting Office, *North American Free Trade Agreement: Coordinated Operational Plan Needed to Ensure Mexican Trucks Compliance with U.S. Standards,* December 2001, page 6] resulted in the limiting of these vehicles' operations to commercial zones near the border. Mexican carriers can now operate outside of the commercial zones by using FMCSA form OP-1 MX to apply for the appropriate operating authority.

Changing Logistics Patterns

The motor carrier industry continues to refine its logistics in response to changes in the U.S. economy. As the economy evolves from one based on manufacturing to one based on service industries, demand for smaller (less-than-truckload) and higher value shipments has increased. Even within the manufacturing industries shippers' demands have changed. Manufacturers now require more flexible and predictable shipments of raw materials and parts, in order to support their just-in-time supply chains. Motor carriers and air freight companies are best suited to meet these new demands. In either case, the demand for commercial vehicles is increasing.

Rising Fuel Costs

The rising cost of diesel fuel has the potential to be a key factor affecting commercial vehicle safety. Diesel fuel costs are a motor carrier's second largest cost component—behind only labor [Bodipo-Memba, Alejandro, "Diesel Jumps Higher than Gas: Trucking Expenses to Trickle Down to Consumers," *Detroit Free Press,* October 27, 2004]. As such, when these costs rise dramatically, some motor carriers feel pressure to cut back on other costs—including maintenance and safety programs ["Higher Fuel Costs Put Pressure on Truck Safety," *National Union of Public and General Employees Newsletter,* September 12, 2005]. Being that diesel prices have increased by a one-third in the past year (national average of $3.144 for the week of October 3, 2005 compared to a national average of $2.053 for the week of October 4, 2004) this type of pressure is possible.

INSPECTION CHALLENGES

Inspection agencies are confronted with numerous challenges, in addition to those posed by a growing and changing industry. These challenges are technical, institutional, and budgetary in nature. Each challenge is described below.

Technical

A variety of technical challenges confront enforcement personnel as they attempt to conduct commercial vehicle inspections. These challenges include the following:

- Accurately identifying commercial vehicle;
- Accurately selecting vehicles for inspection; and
- Uploading inspection data, in a timely fashion.

These challenges are described below.

Vehicle Identification—A series of unique identifiers have been adopted to support the identification of a motor carrier (e.g., U.S. DOT numbers), a commercial vehicle (e.g., vehicle identification numbers, license plates), and commercial drivers (e.g., commercial drivers license numbers). These identifiers, however, are designed to be read and interpreted by a human. As such, jurisdictions have encountered technical challenges with accurately identifying commercial vehicles at highway speeds as they attempt to employ alternative inspections strategies.

In 2001, William Baron [2] reported the results of a series of tests performed on various identification systems using commercially available technologies. Two of these technologies—license plate readers, and optical character recognition (OCR) devices—attempted to detect the carrier and vehicle identifiers already deployed on commercial vehicles (e.g., license plates and U.S. DOT numbers). Baron's tests indicated disappointing results for the license plate readers (LPR). Many issues hampered the LPRs performance.

A primary factor affecting the utility of LPRs was the varying design of jurisdictions' license plates. Factors such as the type of characters used on a jurisdiction's license plate (e.g., raised characters, embossed characters, painted on characters); the placement of a jurisdiction's name on the license plate; and the type and color of paint on a license plate all affected the accuracy of the readers. These factors combined with the need to read the license plate at speed, in all weather conditions led Baron to conclude that there was no viable LPR system at the time. Similarly, the use of OCR devices to detect and interpret the U.S. DOT number from the side of a commercial vehicle have been hampered by the lack of uniformity in sizing and placement of the motor carrier information on the vehicle. Also affecting OCR performance is the placement of some commercial vehicles' mirrors and the shadows that they cast on the writing.

Baron concluded that a bar code reader was the most appropriate technology to meet FMCSA's requirements. Using a system from Pearpoint Inc., Baron observed success rates between 65% and 100% depending on vehicle speeds, barcode sizes, placement of the barcode, contamination (e.g., dirt), and simulated weather conditions (e.g., plastic applied to the bar code to simulate fog). The major concern regarding barcodes was (is) that they must be retrofitted to all commercial motor vehicles and therefore require the cooperation of the carrier community.

At the time of Baron's test, Radio Frequency Identification (RFID) tags were deemed insufficient for identifying commercial vehicles at speed. Issues with sensor distance, interference from an adjoining E-ZPass system that operated at a frequency close to that of the RFID transponder, and the inability to record both the transponder ID and associated data packet at normal vehicle speeds led to Baron's assessment. It should be noted, however, that RFID tags, have been successfully deployed and currently are the most widely (and successfully) used means of identifying commercial vehicles. This technology is used in both electronic toll collection and electronic screening systems. The issue noted by Baron regarding interference from other systems/tags operating at the same frequency remains a concern and is one reason that stakeholders continue to work toward interoperability and the goal of "one truck—one transponder." The adoption of 5.9 GHz as the communication standard for dedicated short-range communications may help this issue.

Vehicle Selection—As noted earlier, approximately 58% of the respondents to this project's survey noted the use of a screening algorithm to select commercial carriers and vehicles for inspections. Fifty-four percent of respondents, however, reported that the algorithms currently do not meet the needs of law enforcement; a fact that may be driven by the fact the no algorithm currently is designed to target high-risk drivers. Accordingly, 74% of respondents noted that visual inspections are a primary method for either selecting a commercial vehicle for inspection or determining the type/level of inspection to be conducted.

Uploading Inspection Data—In order to standardize the data collected during the inspection process, FMCSA developed the ASPEN inspection software. This software allows enforcement personnel to electronically record a commercial vehicle inspection. The system's built-in validation also was designed to improve the quality of data collected at the roadside. To date, the majority of enforcement personnel have been satisfied with the software. Sixty-three percent of survey respondents reported that their current inspection tools (e.g., ASPEN) are meeting the needs of law enforcement.

As inspection operations become more decentralized, however, the need for improved communication networks to support the upload of inspection data from remote sites increases. Twenty-nine percent of respondents cited the need to upgrade the communication infrastructure in their jurisdiction. These communication upgrades also would allow roadside personnel to access federal and state safety data systems (e.g., SAFER, CVIEW) remotely.

Institutional

Industry concerns about privacy and "big brother" have been a key obstacle to the deployment of some enforcement technologies. In particular, technologies that could be used to monitor commercial drivers have raised privacy concerns. Likewise, some motor carriers have opted not to participate in electronic screening programs due to fears that enforcement agencies will use the transponder data to track commercial vehicles and enforce numerous laws/regulations (e.g., hours of service, speeding). These concerns must be considered when new strategies are being contemplated. Operators of some successful programs/services have assuaged these fears by promising not to use the system's data for enforcement purposes. Further, adherence to the ITS Guiding Principles—one of which requires that all systems be voluntary in nature—also will address the industry's fears.

The expanding responsibilities of roadside enforcement personnel also are an institutional issue. The terrorist attacks of September 11, 2001, have increased the nation's focus on commercial vehicle drivers and cargo. Unfortunately, these elements had not been incorporated into previous alternative inspection models and now are being retrofitted where possible. This new role also is requiring coordination with a variety of different federal agencies, including the Transportation Security Administration (TSA), United States Customs and Border Protection (CBP), and the United States Department of Agriculture (USDA), as well as with their states' departments of homeland security. These relationships continue to be defined/refined. Numerous states are participating in operational tests with these agencies, including a container tracking project in the State of Washington, and the monitoring of in-bound agricultural shipments transiting the United States from Laredo, Texas to Canada.

Industry Buy-In

One of the most important factors that must be considered when discussing changes in the commercial vehicle inspection process is the potential impact on the industry. The industry representatives that were interviewed agreed that the current inspection process must be augmented, in order to be more effective. They further agree that high-risk drivers, carriers, and vehicles must be taken off the road. The industry desires a "level playing field," in which all operators are held to the same safety standards. Further, the industry realizes that commercial vehicle crashes portray a negative image on their industry; one that they wish to dispel.

The survey of enforcement agencies identified several concerns regarding the inspection process that are often cited by the industry. These concerns include

- Travel delays associated with an inspection (58%);
- The number of inspections that they are subjected to (54%); and
- The lack of standardized inspection tools/practices from jurisdiction-to-jurisdiction (42%).

Working with industry representatives to demonstrate that changes in the inspection process will help to rectify these complaints will be key. There is no doubt that there will be numerous "cooperative technologies" employed that will require industry to do something that will cost them time and money. Government must be prepared to quantitatively show how incorporation of these technologies by carriers will in the long term reduce their operating costs of compliant carriers.

Budgetary

Many states have been confronted with declining revenues and budget shortfalls. These shortfalls, in many cases, have resulted in reduced commercial vehicle enforcement activities. Accordingly, 57% of survey respondents cited the lack of enforcement resources as a concern. This combined with the projected increases in commercial vehicle traffic and the increased responsibility of roadside enforcement personnel are primary reasons why jurisdictions are interested in adopting alternative technologies that improve the effectiveness of their resources by targeting them at "high-risk" vehicles.

Budgetary challenges also impact a jurisdiction's ability to deploy some alternative strategies. The strategies that have been most widely deployed are those that have been funded by FMCSA (e.g., ASPEN, screening algorithms) or involve a private-sector partner (e.g., PrePass). The recent passage of the highway reauthorization bill (SAFTEA-LU) will make additional funds available to jurisdictions for the implementation of inspection technologies (e.g., electronic screening systems, virtual inspection sites). Under this new law, each state is eligible to receive federal deployment grants up to $2.5 million (minus the total federal funds received previously) to deploy the core CVISN capabilities and an additional $1 million to deploy expanded CVISN functionality.

CHAPTER 5

CHARACTERISTICS OF TRUCK AND BUS INSPECTION STRATEGIES

This section describes the current and emerging technologies used in commercial vehicle inspections, as well as the findings of the survey and interviews that were conducted by the study team to develop a better understanding of the characteristics of truck and bus inspection strategies.

CURRENT TECHNOLOGIES USED IN COMMERCIAL VEHICLE INSPECTIONS

A variety of technologies are used routinely to identify, screen, and inspect commercial vehicle at the roadside. In some cases, these technologies have been mainstreamed into other programs (e.g., CVISN, Motor Carrier Safety Assistance Program), which has increased the number of jurisdictions using this technology. The most commonly used technologies include the following:

- Electronic screening, which combines vehicle identification, vehicle screening, and WIM technologies;
- Virtual weigh stations (VWS);
- ASPEN roadside inspection software; and
- Infrared brake detectors.

Each of these technologies is described below.

Electronic Screening Systems

Electronic screening systems are designed to target a jurisdiction's enforcement efforts at motor carriers, vehicles, and commercial drivers that are most likely to be in violation of federal, state and local regulations/laws. To achieve this goal, electronic screening systems combine a variety of technologies, as illustrated in Figure 2.

Figure 2 illustrates the implementation of the following steps:

1. Commercial vehicles that have been enrolled in an electronic screening program are identified using a windshield-mounted transponder. The transponder stores an identifier that is unique to each vehicle. The commercial vehicle is identified approximately one-quarter of a mile in advance of an inspection station.
2. As the commercial vehicle approaches the inspection facility, it also may be weighed via in-road scales. This WIM technology determines a vehicle's gross weight, as well as individual axle weights. In some deployments, vehicles are weighed at mainline speeds. In other deployments, this weighing is done at slower speeds on the ramp to the inspection facility.
3. Once the commercial vehicle is identified, the electronic screening system screens the vehicle and the carrier the vehicle is assigned to based on a state's unique screening algorithm. A variety of data are used to determine whether a vehicle should be pulled into an inspection station. These data include a carrier/vehicle's registration and fuel tax status, data gathered from the WIM, as well as data concerning the carrier/vehicle's past safety performance. Jurisdictions use numerous algorithms to determine a carrier's past performance, including Inspection Selection System (ISS), Inspection Selection System-2 (ISS-2), SAFESTAT, as well as state/e-screening system's proprietary algorithms. All of these algorithms analyze a carrier/vehicle's past inspection record, compliance review history, and safety history in order to calculate a numeric value that summarized the carrier's relative safety performance. For instance, any vehicle that is assigned an ISS-2 score greater than 75 is recommended for inspection.
4. Based on the data analyzed in step 3, the driver of the commercial vehicle is informed about whether the vehicle can bypass the inspection site or if it must pull into the site for further inspection. Vehicles that are allowed to bypass the site will be shown a green light on their in-cab transponder. Vehicles that must pull into the site are shown a red light on their transponder.

Electronic screening systems currently are deployed in 36 states.

Virtual Weigh Stations

Virtual weigh stations use technology to remotely monitor commercial vehicles and enforce commercial vehicle laws and regulations. The technologies used at each VWS vary depending on the focus of the enforcement activity (e.g., if they are screening trucks for weight violations, credential violations, etc.). The range of technologies employed at a VWS may include the following:

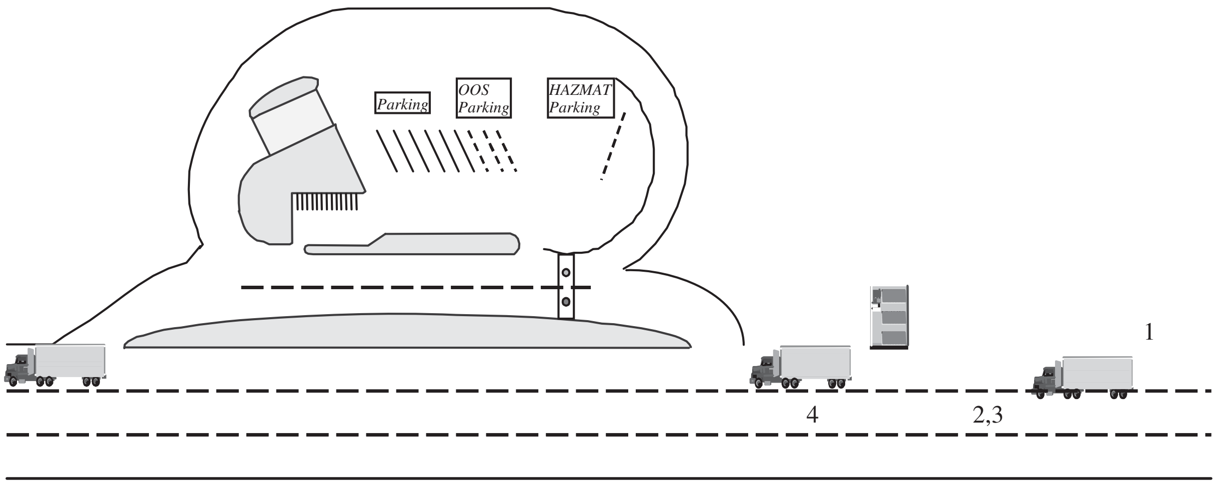

Figure 2. Typical electronic screening deployment: 1. Truck identified by transponder; 2. Truck weighed; 3. Inspection determination made; 4. Driver signalled to drive on or stop.

- Closed circuit television (CCTV),
- OCR,
- License plate readers,
- Weigh-in-motion (WIM),
- Overheight detectors,
- Overwidth detectors,
- Cargo seal readers, and
- High-speed cameras.

VWS allow states to monitor commercial vehicles on routes that typically would not have enforcement resources dedicated to them, which expands the states' enforcement presence. In most states, an enforcement officer is dispatched to inspect a vehicle that has been identified as problematic. Most jurisdictions currently do not utilize photo enforcement in support of VWS.

ASPEN Roadside Inspection Software

In order to standardize the data collected during roadside inspections, as well as the format in which the data is collected—FMCSA developed the ASPEN Roadside Inspection Software. ASPEN allows roadside inspection data to be collected electronically and includes data validation—which improves data accuracy and limits data entry errors. ASPEN also prints the inspection report and contains communication protocols that allow the roadside inspection data to be uploaded to FMCSA databases electronically. ASPEN (or an equivalent) currently is used by 48 states.

Infrared Brake Testers

The Infrared Inspection System (IRISystem) is a minivan equipped with an infrared camera on the roof and a display screen inside the vehicle. As a commercial motor vehicle decelerates to enter a roadside inspection facility, an IRISystem operator scans the wheels with the camera. A thermal image of the wheels, showing their relative temperature, is displayed on the screen inside the van. As the application of brakes creates heat, the wheels with functional (warm) brakes appear bright white in the infrared image, while the wheels with inoperative (cold) brakes appear dark. A color image enables the operator to easily identify a vehicle with functional or inoperative brakes (Federal Motor Carrier Safety Administration, *Evaluation of Infrared Brake Screening Technology,* July 2002, Publication No. FMCSA-MCRT-02-100).

EMERGING TECHNOLOGIES USED IN COMMERCIAL VEHICLE INSPECTIONS

In addition to the existing technologies used in commercial vehicle inspections, numerous emerging technologies also are being studied for use in commercial vehicle enforcement. These technologies include

- Wireless truck and bus inspections,
- Five and nine-tenths gigahertz (5.9 GHz),
- Inspection Selection System-Driver,
- Electronic citations, and
- Geo-fencing.

Wireless Truck and Bus Inspections

Technologies currently are being tested that will allow enforcement personnel to interrogate a commercial vehicle's on-board diagnostic systems, in order to identify vehicle-related concerns. For instance, a commercial vehicle's on-board diagnostic system could identify a brake malfunction. Information about this malfunction and the vehicle could be passed onto roadside enforcement personnel for purposes of targeting the vehicle for further inspection. Roadside personnel at fixed inspection sites or in mobile units could use this information in order to target their efforts. The first test of this kind was conducted by Volvo North America, the University of Tennessee, and the National Transportation Research Center in December 2004. FMCSA currently is conducting research in this area, as well.

Five and Nine-Tenths Gigahertz (5.9 GHz)

The Federal Communications Commission has allocated a new communication spectrum (5.9 GHz) to roadside-vehicle uses. This frequency may become the underlying technology for a variety of new commercial vehicle services, including improved electronic screening, cargo/freight tracking, and wireless inspections. To date, commercial vehicle stakeholders have not be actively involved in the planning for the use of this frequency but this community will be involved in future discussions—once the issues related to the use of this technology by passenger vehicles are addressed.

ISS-Driver (ISS-D)

FMCSA currently is developing a new screening algorithm that will integrate commercial driver data into existing screening algorithms. Known as the Inspection Selection System–Driver (ISS-D), this algorithm incorporates data regarding a carrier's historical driver safety management performance into its ISS score. Initial evaluation data has indicated that enforcement agencies that use this new measure are twice as likely to place a commercial driver out-of-service than when they do not use the algorithm.

Electronic Citations

Researchers at the University of Alabama recently developed software that can be used by the Alabama law enforcement community to automate citation issuance and to upload the citation information to a central data repository. The software allows Alabama officers to use their computers to quickly and accurately fill out citation forms and then print out the tickets. In the near future, the capability to automatically upload the citation data to a central citation data repository will be implemented.

In addition, troopers will also be able to swipe a driver's license with a magnetic code or bar stripe and have instant access on their computers to that motorist's driver and vehicle data, any violations, and the driver's picture. This data will be available from a database called the Law Enforcement Tactical System. With such a system, it will soon be feasible for an officer who just pulled over a motorist to know that this motorist, for example, was also pulled over 2 hours ago in a different part of the state. The repeated violation would then likely warrant a more severe punishment than a standalone violation (policeone.com website, "E-citations going statewide in Alabama," February 17, 2005, http://www.policeone.com/police-products/traffic-enforcement/articles/99313/).

Geo-Fencing

Satellite tracking systems currently are being tested to determine their effectiveness in monitoring the location of hazardous material shipments and notifying motor carrier and enforcement personnel if a shipment diverts from its approved route. This technology is being tested as part of the recent increased focus on commercial vehicle security. In a similar use of technology, transponders and cargo seals also are being used to ensure that commercial vehicles remain on predetermined routes. Tests of this transponder-based technology are being conducted in the State of Washington, as well as in the corridor between Laredo, Texas and Detroit, Michigan.

VEHICLE IDENTIFICATION

Nearly 60% of the survey respondents indicated that the highest priority for their commercial vehicle inspection program is identifying problem drivers. This was followed by 28% indicating that identifying problem carriers was the highest priority and 24% indicating that identifying problem vehicles was the highest priority. Only 8% of the respondents indicated that identifying problem cargo was their highest priority. (Note: Some respondents indicate multiple "number 1" priorities, which is why the totals do not equal 100%.)

When asked what factors are considered when selecting a vehicle for an inspection, 73.9% of the respondents indicated that they would look for an obvious vehicle defect. This implies some level of visual inspection once the vehicle has been stopped. However, the majority (64%) of respondents indicated that they use electronic means by which to screen vehicles. The implication of these values is that many jurisdictions rely on electronic screening tools for selecting vehicles in advance of a fixed site. Once vehicles have been pulled into a facility officers often rely on a visual inspection to determine what action to take next.

Once it is determined if there is a visible defect with the vehicle, enforcement agencies consider the safety history of the carrier/vehicle/driver (34.8%), whether they have a CVSA decal (26.1%), whether there is a traffic violation (21.7%), previous inspection results (13%), probable cause (8.7%), weight of the vehicle (8.7%) and status of operating credentials (4.3%) as the reasons that factor into the decision as to whether or not an inspection should be performed.

When industry representatives were asked to indicate what the number one priority should be for commercial vehicle inspection programs most indicated that targeting problem drivers should receive highest priority. Most of these representatives believe that drivers are the most likely to be responsible for an accident as opposed to the carrier they are operating for or the cargo they are hauling. One interviewee noted that a driver with a 50% out-of-service rate was involved in a recent bus crash that resulted in 23 deaths.

Interviewees noted that less than half of the states (24) inspect motor coaches. Given that passengers are the "cargo" on buses and are therefore at risk during a crash, many interviewees believe that more attention needs be paid to motor coaches.

Technologies That Are Employed

WIM devices (94.1%) are the most frequently used screening tools. Automatic vehicle identification (AVI) readers and overdimensional detectors are being used by 41.2% of the respondents, while 23.5% of the jurisdictions are using remote monitoring devices such as video surveillance cameras. A relatively small percentage (11.8%) or respondents use either automatic vehicle classification (AVC) or radiological, biological, or chemical sensing technologies. None of the respondents indicated that they use license plate readers. Of the individuals who indicated that they use electronic screening technologies, 62.5% are using third-party (e.g., PrePass) versus 50% that reported using an in-house developed systems, with several agencies using a mix of the two.

The use of a specific technology appears to be very much tied to the maturity of the technology. It is important to note that the technology that is in use today is not geared toward identifying problem drivers—which 60% of the respondents indicated is the priority for their program. In short, the screening tools that are being used in the field are geared toward identifying problem vehicles or carriers as opposed to problem drivers. Although there may be many reasons for this, there is a clear sense that there is a disconnect between enforcement priorities and the tools that are available.

Since commercial vehicle enforcement agencies are being asked to do more with less there is a greater reliance on the use of technology. This reliance has then brought with it the very common theme of a need for increased data quality. Improving the quality of information made available to inspectors was only second (66.7%) behind reducing crashes (87.5%) as the top priority for a respondent's inspection program. The robustness of the data made available to field personnel is one that is critical to increasing the effectiveness of automated screening and should be thought of in terms of a national scope. Bad data used in conjunction with high-tech screening methods could result in either false negatives, thus allowing problematic drivers, carriers and vehicles to continue on, or false positives which would tend to frustrate individuals with good records who could possibly be pulled over for an inspection that is not necessary. In addition to the accuracy issues, jurisdictions are also concerned about access to the data and resulting security concerns. Data security issues very much parallel data accuracy issues in that the ability of someone to falsify electronic data has of course a direct effect on the accuracy of the information. Means must be investigated that would provide the mechanisms by which data could not be tampered with, or at least provide roadside personnel the ability to determine if the original data has been intercepted and different data inserted.

The majority (58.3%) of jurisdictions currently are using an automated safety algorithm to support screening activities. Of those jurisdictions using an automated safety algorithm the overwhelming majority (71.4%) are using either ISS or ISS2. A significant number (42.9%) are using SafeStat, while 35.7% are using a locally developed algorithm. None of the respondents indicated that they are using PRISM target files. Also, 32% of the respondents currently have a Commercial Vehicle Information Window (CVIEW) system. (It must be noted that 40% of the respondents indicated that they intend to implement CVIEW in the future.)

Given the nature of ISS and SafeStat, it is not surprising that a combined 88% of the respondents indicated that their current tools are most effective at identifying high-risk carriers and vehicles. Respondents indicated that these tools are least effective at identifying high-risk drivers and cargo.

The response from the commercial vehicle industry concerning screening algorithms is identical to that of enforcement agencies. Industry has stated that although ISS is a good tool, it should be expanded to include driver data.

The vast majority (83.3%) of the respondents indicated that their inspection selection tools have not changed over the past few years. Despite this, 54% of the respondents indicated that the tools they employ are not meeting the needs of the enforcement community. Several respondents commented that they are not changing the tools they are using today because they do not view the other tools that are available as being any more effective. Of the respondents that had recently changed their screening tools, 55% indicated that the new tools they are using are not effective.

INSPECTIONS

Who Performs Them?

On the whole inspections are being performed by personnel who are fully sworn police officers. 67% of the respondents said that their inspectors have the ability to stop any vehicle. 67% also said that their inspectors are fully sworn police officers and carry firearms. Only 17% indicated that their inspectors are civilians with limited enforcement authority. Nearly 35% of the respondents indicated that probable cause is required in order to stop a commercial vehicle.

When industry representatives were asked about who should be conducting inspections, several indicated that all inspectors should receive mechanical training and implied that many of the inspectors in the field currently do not possess these skills. One individual indicated that he believed inspectors in New York and Michigan are well trained.

Where Are They Performed?

Almost two-thirds of the respondents said that commercial vehicle inspections are performed at fixed weigh stations. Approximately 30% are performed by mobile enforcement teams, while the remaining 4% are conducted at temporary facilities set up along the roadside. Although almost twice as many jurisdictions are performing inspections at fixed sites as opposed to relying on mobile units, 28.6% of the respondents indicated that their communications infrastructure should be targeted for improvement. Assuming that fixed weigh stations currently have an adequate communications infrastructure in place, this suggests that there is an increasing desire to improve the capabilities of mobile units.

How Are They Performed?

The overwhelming majority (92%) of agencies said that their inspectors have a laptop computer with ASPEN software or other inspection software installed, while only 4% of the respondents indicated that they are using personal digital assistant (PDA) technology in conjunction with ASPEN or other inspection software. Despite the widespread deployment of inspection software, respondents indicated that nearly 30% of inspections are conducted and recorded manually. Just over 20% of the respondents indicated that inspectors have access to vehicle diagnostic tools (e.g., brake testing equipment).

Almost two-thirds (63%) of the respondents indicated that today's inspection software tools are meeting their needs. Of the 37% that indicated that these tools do not meet their needs, 60% reported that they are not user friendly, are not effective for the purposes of identifying noncompliance issues, or do not improve the accuracy (i.e., data quality) of the inspection results.

Impact on Motor Carrier/ Motorcoach Productivity

Nearly 55% of the respondents indicated that the inspection selection tools and inspection tools they are using today have "some" negative impact on motor carrier productivity. Almost 15% of the respondents believe that these tools have a "significant" impact on motor carrier productivity, while slightly over 30% indicated they are unable to assess what impact the tools they are using have on motor carrier productivity.

ENFORCEMENT

Nearly 55% of the respondents indicated that the primary strategy behind their commercial vehicle safety program is getting problem drivers, vehicles, or carriers off the road through the issuance of out-of-service orders. One-quarter of the respondents indicated that their enforcement program was focused on educating the commercial vehicle community, while 21% of the respondents indicated that their enforcement strategy focuses on issuing citations. The spread in the responses to this question suggests that jurisdictions have fundamentally different approaches and strategies in place for their enforcement programs.

Not surprisingly, 92% of the respondents believe that the strategies they employ are effective at deterring carriers from operating a commercial vehicle illegally. Only 8% of the respondents think there strategies are not effective at deterring carriers from operating vehicles illegally. It is interesting to compare the response to this question to the response to the question about the effectiveness of the inspection tools that are available where nearly 60% of the respondents indicated that the tools that are available do not meet their needs yet 92% of the respondents believe there strategies are an effective deterrent.

CHAPTER 6

EFFECTIVENESS OF CURRENT SYSTEMS

Data to quantitatively evaluate the effectiveness of the roadside inspection program are limited. To support this portion of the analysis, the research team relied on evaluations conducted by FMCSA. A primary source of this data was the "FMCSA Safety Program Effectiveness Measurement: Intervention Model," prepared in December 2004. This model is used by FMCSA to assess the effectiveness of its roadside inspection and traffic enforcement programs. The model considers both direct effects (e.g., vehicle/driver defects discovered during inspections reducing the likelihood of crashes) and indirect effects (e.g., improved safety derived from a carrier's increased awareness of FMCSA's safety programs) of enforcement programs [John A. Volpe National Transportation Systems Center, *FMCSA Safety Program Effectiveness Measurement: Intervention Model; Roadside Inspections and Traffic Enforcement Annual Report,* December 2004, page i]. While empirical data currently is not available to support all elements of the model, it currently is the most robust source on the topic.

IMPACT ON COMPLIANCE AND VIOLATIONS

In 2004, 3,014,907 roadside inspections were performed. Of this total, approximately 2,957,827 included a driver inspection, 2,249,338 included a vehicle inspection, and 178,951 included a hazardous material inspection. Seventy-three percent (2,204,501) of the inspections identified a violation—27% of the inspections resulted in an out-of-service (OOS) order. Violations and OOS orders were most prevalent in vehicle inspections. Vehicle inspections identified a violation 69% of the time and an OOS order was issued during 23% of vehicle inspections. These rates are dramatically higher than observed during driver and hazardous material inspections. Thirty-six percent of driver inspections identified a violation; 6.5% of driver inspections resulted in an OOS order. Only 18.6% of hazardous material inspections identified a violation and 5.6% resulted in an OOS order.

The 2004 statistics are consistent with the number of violations and OOS orders recorded in 2002 and 2003. Research indicates that the use of a screening algorithm greatly increases the likelihood that a violation and/or an OOS order will be identified during an inspection. A study conducted by the Upper Great Plains Transportation Institute cites a "60% increase in the number of vehicles and drivers placed OOS" when there is a recommendation to inspect the vehicle from a screening algorithm [Upper Great Plains Transportation Institute, *ISS-2: The Integration of the Motor Carrier Safety Status Measurement System (SAFESTAT) Into the Roadside Inspection Selection System (ISS) Final Report,* January 2000, page 15]. Vehicles recommended for inspection by ISS were placed out of service 32.5% of the time; vehicles recommended for inspection by ISS-2 were placed out of service 30.4% of the time [Upper Great Plains Transportation Institute, *ISS-2: The Integration of the Motor Carrier Safety Status Measurement System (SAFESTAT) Into the Roadside Inspection Selection System (ISS) Final Report,* January 2000, page 11].

INCIDENT AND ACCIDENT TRENDS

In 2003, 4,986 fatalities occurred in crashes that involved a large truck. As such, 2.31 fatalities occurred per 100 million miles driven by large trucks. While the number of fatalities remains unacceptably high, the fatality rate for large trucks continues to decrease. Since 1983, the fatality rate associated with large truck crashes, has decreased from 4.2 fatalities per 100 million miles driven to 2.31 fatalities per 100 million miles driven—almost a 50% decrease.

The roadside enforcement programs of federal and state regulators appear to have had a direct impact on commercial vehicle safety. FMCSA's Intervention Model estimates that in 2003 17,151 commercial vehicle crashes were avoided through roadside inspection and traffic enforcement programs. These prevented crashes resulted in 722 fatalities and 13,062 injuries being avoided [John A. Volpe National Transportation System Center Motor Carrier Safety Assessment Division, *FMCSA Safety Program Performance Measures—Intervention Model: Roadside Inspection and Traffic Enforcement Effectiveness Assessment,* September 2002, page iii]. Roadside inspections alone are estimated to have prevented 12,667 crashes, 534 fatalities, and 9,647 injuries in 2003 [John A. Volpe National Transportation System Center Motor Carrier Safety Assessment Division, *FMCSA Safety Program Performance Measures—Intervention Model: Roadside Inspection and Traffic Enforcement Effectiveness Assessment,* September 2002, page iii].

CHAPTER 7

KEY FINDINGS AND CONCLUSIONS

The findings of this study show that the nation's roadside inspection resources are on the verge of being overwhelmed. The increase in commercial vehicle traffic combined with the decrease in enforcement resources and the addition of security-related responsibilities are straining the existing roadside system. Alternative inspection strategies offer the opportunity to maximize enforcement resources and improve the effectiveness of commercial vehicle safety inspection programs. Key findings from this study include:

- Despite significant increases in commercial vehicle miles traveled, there has been only a modest increase in the total number of fatalities over the last 10 years. During this same timeframe there has been a decrease in the frequency of accidents involving commercial vehicles. This finding suggests that the inspection strategies that are being employed are having a positive effect on commercial vehicle safety in general. Other factors such as on-board safety devices, driver training, and carrier safety management programs clearly could be helping to improve the overall safety of commercial vehicles as well.
- All stakeholders agree that alternative inspection strategies should be employed.
- Alternative inspection strategies offer benefits to state stakeholders (e.g., increased effectiveness, maximized resources), as well as to the industry (e.g., level playing field, improved productivity).
- There are a variety of strategies and automated tools that are being used by the enforcement community today. These strategies and/or tools include selection algorithms, software to automatically capture inspection data, and electronic screening systems. Despite the prevalence of screening tools, the decision on whether to conduct an inspection ultimately resides with the inspector and many inspectors continue to rely on their experience to make this decision as opposed to the screening tools at their disposal.
- Stakeholders agree that many of the current alternative inspection strategies are not performing at their optimal level because of data quality issues (e.g., accuracy, timeliness, integrity). As such, data quality improvement was noted as a priority for both enforcement and industry representatives.
- Roughly 60% of stakeholders indicated that their top priority is removing unsafe commercial vehicle drivers from the road because drivers are often at fault when accidents occur. Despite this, few of the inspection and screening tools that are in use today support the identification of unsafe drivers.
- Jurisdictions' communication networks should be upgraded, in order to provide the level of access to data that is critical for supporting mobile and virtual enforcement activities.
- State commercial vehicle enforcement agencies should be actively involved in their state's CVISN programs and should support the development of state CVISN program plans that meet the needs of the roadside personnel. These program plans establish the state's funding priorities for Federal CVISN deployment grants and are required by FMCSA.
- There appears to be strong support for the continuation of research aimed at identifying technology that facilitates the screening of drivers, carriers, and vehicles at highway speeds. There is growing interest in leveraging on-board sensors for purposes of collecting and assessing information about drivers' fitness for duty, vehicle diagnostics, etc. This information could be factored into the screening process.
- Research regarding new alternative inspection technologies (e.g., wireless bus and truck inspections) should continue.
- Privacy concerns should be considered when contemplating new enforcement strategies.
- The inclusion of security-related activities in the roadside enforcement process dictates the development of new driver and cargo-based screening tools and the sharing of security-related data.

Based on the key findings, the study team has reached the following conclusions:

- As inspectors become more mobile, and the amount of information available to them increases, the need for improved wireless communication will grow proportionally. When evaluating the wireless communication needs of the enforcement community, it will be important to consider the best practices for exchanging data and for interacting with on-board systems. To reduce costs and promote standardization, existing and emerging standards such as WiFi, WiMax, existing cellular networks, etc., should be evaluated.

- Research currently is being conducted on the use of on-board vehicle sensors, as part of the inspection process. Sensors that monitor brakes, tires, and lights are available today. The effectiveness of these systems, as well as the potential institutional issues associated with using them for enforcement purposes should be studied further.
- The need for timely and accurate information at the roadside is critical. Programs like the Commercial Vehicle Information Systems and Networks (CVISN) are supporting the deployment of centralized data repositories that contain driver, vehicle, and carrier safety data. The enforcement community should be actively involved in the design and deployment of these systems in order to ensure that their needs are met. In addition, it is important for stakeholders to work together to identify the data that are critical to supporting roadside enforcement needs and issues with these data that should be addressed through a structured process.
- Although the industry representatives that were interviewed during this project are very receptive to increasing safety, agencies charged with conducting commercial vehicle inspections should demonstrate to industry that by working together there will be tangible, monetary benefits that will accrue to the trucking industry at large. For instance, enforcement agencies could demonstrate that qualification for participation in an electronic screening program will result in a decrease in the number of inspections for a carrier.

APPENDIX A

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Evaluation of the Commercial Vehicle Information Systems and Networks (CVISN) Model Deployment Initiative, Battelle Memorial Institute, Columbus, Ohio, March 2002.

The following states' Commercial Vehicle Safety Plans also were reviewed:

- California;
- Colorado;
- Florida;
- Kansas;
- Minnesota;
- North Carolina;
- New Jersey;
- Texas;
- Vermont; and
- Washington.

The following states' CVISN Program Plans and/or Top-Level Designs also were reviewed:

- Connecticut;
- Florida;
- Georgia;
- Idaho;
- Iowa;
- Massachusetts;
- Missouri;
- New York;
- New Jersey;
- South Carolina;
- Texas;
- Vermont;
- Washington; and
- Wyoming.

APPENDIX B

CONTRIBUTING ORGANIZATIONS AND INDIVIDUALS

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APPENDIX C

SURVEY RESULTS

ALTERNATIVE TRUCK AND BUS INSPECTION STRATEGIES QUESTIONNAIRE

1. What trends are placing the most significant burden on your jurisdiction's commercial vehicle inspection program (please select two)?
   a) Increases in commercial truck/bus traffic __
   b) Availability of Federal enforcement resources __
   c) Availability of jurisdiction enforcement resources __
   d) New entrant program __
   e) More emphasis on security __
   f) Other (please specify) ______________________________

2. Which of the following are the top two priorities for your jurisdiction's commercial vehicle inspection program?
   a) Reducing crashes/incidents __
   b) Identifying and focusing resources on high-risk carriers, drivers, or vehicles __
   c) Security (e.g., focusing on high-risk drivers) __
   d) Data quality and uniformity of inspections/sanctions __
   e) Other (please specify) ______________________________

3. What percentage of commercial vehicle inspections in your jurisdiction are conducted (please indicate corresponding percentages)?
   a) At fixed weigh stations __
   b) At temporary roadside facilities (e.g., a designated pull-in area) __
   c) By mobile enforcement units/teams __
   d) Other (please specify) ______________________________

4. What authorities do inspectors in your jurisdiction possess (please select all that apply)?
   a) They have the ability to stop ANY vehicle (commercial vehicle or passenger vehicle) __
   b) They are fully sworn police officers and carry firearms __
   c) They have the ability to stop any commercial vehicle for any reason, without probable cause __
   d) They have the ability to stop any commercial vehicle, but require probable cause __
   e) Law enforcement officers must be present in order to stop a commercial vehicle __
   f) A law enforcement officer must assist in conducting/completing the inspection __
   g) Inspectors are civilians with limited enforcement authority __

5. Is your jurisdiction's commercial vehicle inspection program aimed at identifying (please rank in priority order where 1 is the highest priority and 4 is the lowest priority)?
   a) Problem drivers __
   b) Problem vehicles __
   c) Problem carriers __
   d) Problem cargo __

6. Does your jurisdiction screen vehicles electronically at fixed or mobile inspection sites (e.g., using automatic vehicle identification, classification and/or weigh-in-motion technology)?
   a) Yes __
   b) No __

7. If you answered "yes" on question 6 please indicate which electronic screening program your jurisdiction participates in (please select all that apply)?
   a) A program developed and operated by a third party (e.g., PrePass) __
   b) A program developed and operated by the jurisdiction __
   c) Other (please specify) ______________________________

8. If you are screening commercial vehicles electronically, what technology are you using to support these screening activities (please select all that apply)?
   a) Automatic vehicle identification (AVI) readers __
   b) Automatic vehicle classification (AVC) technology __
   c) Weigh-in-motion (WIM) sensors __
   d) Remote monitoring technology (e.g., video surveillance cameras) __
   e) License plate readers __
   f) Overdimensional technologies __
   g) Radiological/biological/chemical sensors __
   h) Other (please specify) ______________________________

9. Which factors are considered when selecting/screening a vehicle for inspection (Please rank in priority order where 1 is the highest priority and 10 is the lowest priority)?
   a) Safety history of carrier, driver, vehicle __
   b) Previous inspection results __
   c) Obvious vehicle defect __
   d) CVSA decal __
   e) Traffic enforcement __
   f) Probable cause __
   g) Weight of vehicle __
   h) Status of operating credentials __
   i) Familiarity with carrier, vehicle, and/or driver __
   j) Other (please specify) ______________________________

10. Is your jurisdiction using an automated safety algorithm(s) to support vehicle screening/inspection selection activities?
    a) Yes __
    b) No __

11. If you answered "yes" to question 10 please identify the automated safety algorithm(s) that are being used by the enforcement community in your Jurisdiction (check all that apply)?
    a) SafeStat __
    b) PRISM (PRISM target file) __
    c) ISS/ISS-2 __
    d) Jurisdiction-developed safety algorithm __
    e) Other (please specify) ______________________________

12. Does your jurisdiction have a Commercial Vehicle Information Exchange Window (CVIEW) or equivalent system that provides operating credential and safety-related information in one location (please select one)?
    a) Yes __
    b) No __
    c) No, but we are planning to deploy one in the future __

13. Are the inspection selection tools you are using today most effective at identifying (please select one)?
    a) High-risk drivers __
    b) High-risk vehicles __
    c) High-risk cargo __
    d) High-risk carriers/motorcoach operators __

14. What are the inspection selection tools you are using today least effective at identifying (please select one)?
    a) High-risk drivers __
    b) High-risk vehicles __
    c) High-risk cargo __
    d) High-risk carriers/motorcoach operators __

15. Have the inspection selection tools that you use changed over the last few years? If yes, how have they changed and why did you change?

16. Do inspection selection tools that are available today meet the needs of the enforcement community?
    a) Yes __
    b) No __

17. What tools are being used to conduct and record inspections results (please select all that apply)?
    a) Laptop computers with ASPEN or other inspection software __
    b) PDAs with ASPEN or other inspection software __
    c) Vehicle diagnostic tools (e.g., brake testing equipment) __
    d) Inspections are conducted and recorded manually __
    e) Other (please specify) ______________________________

18. Do the inspection tools that are available today meet the needs of the enforcement community?
    a) Yes __
    b) No __

19. If you answered "No" to question 18, what are the weaknesses of the inspection tools that are available today (please select one)?
    a) They are not user friendly __
    b) They do not improve officer productivity __
    c) They are not effective for purposes of identifying noncompliance issues __
    d) They do not improve the accuracy of the inspection results (e.g., data quality)__
    e) Other (please specify) ______________________________

20. What strategies are emphasized in your enforcement program (please rank in priority order where 1 is the highest priority and 6 is the lowest priority)?
    a) Warnings __
    b) Citations __
    c) Out of service orders __
    d) Fines __
    e) Education __
    f) Other (please specify) ______________________________

21. Are the enforcement strategies that are in place in your Jurisdiction an effective deterrent to operating a commercial vehicle illegally?
    a) Yes __
    b) No __

22. How do the inspection selection tools and inspection tools impact carrier/motorcoach operator productivity (please select one)?
    a) They have no impact __
    b) They have some impact __
    c) They have significant impact __
    d) Unable to assess __

23. Are the tools that are being used by the enforcement community creating a level playing field (i.e., are enforcement resources being focused on noncompliant carriers/motorcoach operators)?
    a) Yes __
    b) No __

24. What are the most frequent complaints from industry regarding vehicle inspections (check all that apply)?
    a) Time delays caused by inspections __
    b) Inspected too many times __
    c) Not enough "good" inspections __
    d) Resources not targeted at problem carriers __
    e) Selection criteria not applied in a consistent manner __
    f) Inspection tools/practices vary from Jurisdiction-to-Jurisdiction __
    g) Not issuing a CVSA decal for a passing inspection __
    h) Other (please specify) ______________________________

25. Which area(s) should be targeted most heavily for improvement in your Jurisdiction (please rank in priority order where 1 is the highest priority and 7 is the lowest priority)?
    a) Electronic screening tools/approaches __
    b) Vehicle inspection tools/approaches __
    c) Enforcement of violations __
    d) Tools must be more user friendly for officers __
    e) Tools for management to identify, track and manage enforcement activities __
    f) Upgrade communications infrastructure __
    g) Other (please specify) ______________________________

26. What specific tools/approaches would support these improvements? Examples include:
    a) "Virtual," electronic or photographic enforcement __
    b) New strategies for deploying enforcement resources __
    c) "Preferred" carrier programs (positive) for carriers meeting certain predefined safety criteria __
    d) "Targeted" carrier programs (negative) for carriers not meeting predefined safety criteria __
    e) New approaches unique to drivers, vehicles, and/or cargo __
    f) Being able to gather critical safety information directly from vehicles, similar to what is being done with diagnostic tools __
    g) Other (please specify) ______________________________

27. Please provide any general comments you may have regarding strategies or tools that would improve the effectiveness of vehicle selection or inspection practices.

28. What technical or institutional barriers may impact advances in the areas of inspection tools/approaches and enforcement? How can these be overcome?

ALTERNATIVE TRUCK AND BUS INSPECTION STRATEGIES QUESTIONNAIRE RESULTS

Results from the "Alternative Truck and Bus Inspection Strategies" Questionnaire

Question	Percent
1) What trends are placing the most significant burden on your jurisdiction's commercial vehicle inspection program (please select two)?	
a) Increases in commercial truck/bus traffic	60.9%
b) Availability of Federal enforcement resources	8.7%
c) Availability of jurisdiction enforcement resource	56.5%
d) New entrant program	26.1%
e) More emphasis on security	13.0%
f) Other (please specify)	30.4%
2) Which of the following are the top two priorities for your jurisdiction's commercial vehicle inspection program?	
a) Reducing crashes/incidents	87.5%
b) Identifying and focusing resources on high-risk carriers, drivers or vehicles	45.8%
c) Security (e.g., focusing on high-risk drivers)	4.2%
d) Data quality and uniformity of inspections/sanctions	66.7%
e) Other (please specify)	0.0%
3) What percentage of commercial vehicle inspections in your jurisdiction are conducted (please indicate corresponding percentages)?[a]	
a) At fixed weigh stations	65.2%
b) At temporary roadside facilities (e.g., a designated pull-in area)	4.3%
c) By mobile enforcement units/teams	30.4%
d) Other (please specify)	0.0%

[a] Only responses with the highest percentage have been counted.

Results from the "Alternative Truck and Bus Inspection Strategies" Questionnaire (continued)

Question	Percent
4) What authorities do inspectors in your jurisdiction possess (please select all that apply)?	
a) They have the ability to stop ANY vehicle (commercial vehicle or passenger vehicle)	66.7%
b) They are fully sworn police officers and carry firearms	66.7%
c) They have the ability to stop any commercial vehicle for any reason, without probable cause	62.5%
d) They have the ability to stop any commercial vehicle, but require probable cause	33.3%
e) Law enforcement officers must be present in order to stop a commercial vehicle	25.0%
f) A law enforcement officer must assist in conducting/completing the inspection	12.5%
g) Inspectors are civilians with limited enforcement authority	16.7%
5) Is your jurisdiction's commercial vehicle inspection program aimed at identifying (please rank in priority order where 1 is the highest priority and 4 is the lowest priority)?[b]	
a) Problem drivers	60.0%
b) Problem vehicles	24.0%
c) Problem carriers	28.0%
d) Problem cargo	8.0%
6) Does your jurisdiction screen vehicles electronically at fixed or mobile inspection sites (e.g., using automatic vehicle identification, classification and/or weigh-in-motion technology)?	
a) Yes	64.0%
b) No	36.0%
7) If you answered 'yes' on question 6 please indicate which electronic screening program your jurisdiction participates in (please select all that apply)?	
a) A program developed and operated by a third party (e.g., PrePass)	62.5%
b) A program developed and operated by the jurisdiction	50.0%
c) Other (please specify)	12.5%
8) If you are screening commercial vehicles electronically, what technology are you using to support these screening activities (please select all that apply)?	
a) Automatic vehicle identification (AVI) readers	41.2%
b) Automatic vehicle classification (AVC) technology	11.8%
c) Weigh-in-motion (WIM) sensors	94.1%
d) Remote monitoring technology (e.g., video surveillance cameras)	23.5%
e) License plate readers	0.0%
f) Overdimensional technologies	41.2%
g) Radiological/biological/chemical sensors	11.8%
h) Other (please specify)	5.9%
9) Which factors are considered when selecting/screening a vehicle for inspection (please rank in priority order where 1 is the highest priority and 9 is the lowest priority)?[c]	
a) Safety history of carrier, driver, vehicle	34.8%
b) Previous inspection results	13.0%
c) Obvious vehicle defect	73.9%
d) CVSA decal	26.1%
e) Traffic enforcement	21.7%
f) Probable cause	17.4%
g) Weight of vehicle	8.7%
h) Status of operating credentials	4.3%
i) Familiarity with carrier, vehicle and/or driver	0.0%
j) Other (please specify)	0.0%

[b] Only responses marked with a 1 have been counted.
[c] Only responses marked with a 1 or 2 have been counted.

Results from the "Alternative Truck and Bus Inspection Strategies" Questionnaire (continued)

Question	Percent
10) Is your jurisdiction using an automated safety algorithm(s) to support vehicle screening/inspection selection activities?	
a) Yes	58.3%
b) No	41.7%
11) If you answered 'yes' to question 10 please identify the automated safety algorithm(s) that are being used by the enforcement community in your Jurisdiction (check all that apply)?	
a) SafeStat	42.9%
b) PRISM (PRISM target file)	0.0%
c) ISS/ISS-2	71.4%
d) Jurisdiction-developed safety algorithm	35.7%
e) Other (please specify)	0.0%
12) Does your jurisdiction have a Commercial Vehicle Information Exchange Window (CVIEW) or equivalent system that provides operating credential and safety-related information in one location (please select one)?	
a) Yes	32.0%
b) No	28.0%
c) No, but we are planning to deploy one in the future	40.0%
13) Are the inspection selection tools you are using today most effective at identifying (please select one)?	
a) High-risk drivers	8.0%
b) High-risk vehicles	40.0%
c) High-risk cargo	4.0%
d) High-risk carriers/motorcoach operators	48.0%
14) What are the inspection selection tools you are using today least effective at identifying (please select one)?	
a) High-risk drivers	20.8%
b) High-risk vehicles	4.2%
c) High-risk cargo	58.3%
d) High-risk carriers/motorcoach operators	16.7%
15) Have the inspection selection tools that you use changed over the last few years? If yes, how have they changed and why did you change?	
a) Yes	16.7%
b) No	83.3%
16) Do inspection selection tools that are available today meet the needs of the enforcement community?	
a) Yes	45.8%
b) No	54.2%
17) What tools are being used to conduct and record inspections results (please select all that apply)?	
a) Laptop computers with ASPEN or other inspection software	91.7%
b) PDAs with ASPEN or other inspection software	4.2%
c) Vehicle diagnostic tools (e.g., brake testing equipment)	20.8%
d) Inspections are conducted and recorded manually	29.2%
e) Other (please specify)	4.2%
18) Do the inspection tools that are available today meet the needs of the enforcement community?	
a) Yes	62.5%
b) No	37.5%

Results from the "Alternative Truck and Bus Inspection Strategies" Questionnaire (continued)

Question	Percent
19) If you answered 'No' to question 18, what are the weaknesses of the inspection tools that are available today (please select one)?	
a) They are not user friendly	20.0%
b) They do not improve officer productivity	0.0%
c) They are not effective for purposes of identifying noncompliance issues	20.0%
d) They do not improve the accuracy of the inspection results (e.g., data quality)	20.0%
e) Other (please specify)	40.0%
20) What strategies are emphasized in your enforcement program (please rank in priority order where 1 is the highest priority and 5 is the lowest priority)?[d]	
a) Warnings	0.0%
b) Citations	20.8%
c) Out of service orders	54.2%
d) Fines	0.0%
e) Education	25.0%
f) Other (please specify)	0.0%
21) Are the enforcement strategies that are in place in your jurisdiction an effective deterrent to operating a commercial vehicle illegally?	
a) Yes	91.7%
b) No	8.3%
22) How do the inspection selection tools and inspection tools impact carrier/motorcoach operator productivity (please select one)?	
a) They have no impact	0.0%
b) They have some impact	54.2%
c) They have significant impact	12.5%
d) Unable to assess	33.3%
23) Are the tools that are being used by the enforcement community creating a level playing field (i.e., are enforcement resources being focused on noncompliant carriers/motorcoach operators)?	
a) Yes	75.0%
b) No	25.0%
24) What are the most frequent complaints from industry regarding vehicle inspections (check all that apply)?	
a) Time delays caused by inspections	58.3%
b) Inspected too many times	54.2%
c) Not enough 'good' inspections	12.5%
d) Resources not targeted at problem carriers	25.0%
e) Selection criteria not applied in a consistent manner	4.2%
f) Inspection tools/practices vary from Jurisdiction-to-Jurisdiction	41.7%
g) Not issuing a CVSA decal for a passing inspection	25.0%
h) Other (please specify)	8.3%
25) Which area(s) should be targeted most heavily for improvement in your Jurisdiction (please rank in priority order where 1 is the highest priority and 6 is the lowest priority)?[e]	
a) Electronic screening tools/approaches	19.0%
b) Vehicle inspection tools/approaches	9.5%
c) Enforcement of violations	33.3%
d) Tools must be more user friendly for officers	19.0%
e) Tools for management to identify, track and manage enforcement activities	4.8%
f) Upgrade communications infrastructure	28.6%
g) Other (please specify)	0.0%

[d] Only responses marked with a 1 have been counted.

[e] Only responses marked with a 1 have been counted.

Results from the "Alternative Truck and Bus Inspection Strategies" Questionnaire (continued)

Question	Percent
26) What specific tools/approaches would support these improvements? Examples include:	
a) 'Virtual,' electronic or photographic enforcement	43.5%
b) New strategies for deploying enforcement resources	47.8%
c) 'Preferred' carrier programs (positive) for carriers meeting certain predefined safety criteria	30.4%
d) 'Targeted' carrier programs (negative) for carriers not meeting predefined safety criteria	43.5%
e) New approaches unique to drivers, vehicles and/or cargo	26.1%
f) Being able to gather critical safety information directly from vehicles, similar to what is being done with diagnostic tools	52.2%
g) Other (please specify)	4.3%
27) Please provide any general comments you may have regarding strategies or tools that would improve the effectiveness of vehicle selection or inspection practices.	
28) What technical or institutional barriers may impact advances in the areas of inspection tools/approaches and enforcement? How can these be overcome?	

ADVANCED INSPECTION TECHNOLOGIES QUESTIONNAIRE

1. In your opinion, considering both vehicle and driver-related inspection items, which systems or parameters might lend themselves to being accurately monitored by on board sensors? (please write down all that apply)

2. If on-board technology could be implemented to monitor vehicle "health" (and/or electronically maintain driver history), and then wirelessly transmit the data to the inspection site, please rank order the following in terms of usefulness for selecting (screening) vehicles for further (manual) inspection (1 being most important):

__Tire Condition	__Brake Condition	__Vehicle Weight
__Driver HOS	__Driver Qualifications	__Carrier Performance
__Lighting System	__Suspension	__Exhaust System
__Steering	__Vehicle Inspection History	

3. If on board technology as described above were implemented for screening trucks, how would you prefer the information presented? (select one)
   a) A simple fault/no-fault for each system; (based on predetermined "rules" or algorithms that define "fault" using system-specific performance or operational conditions). For example, a listing of those systems or items for which a "failure" was detected would be transmitted to the inspection site.
   b) A "snapshot" of recently recorded performance or operational values being measured for each system (for example, data stored within the last 30 minutes of operation). The exact format and methodology for recording the "snapshot" data would again be developed as an industry standard much like standardized emissions data.
   c) Actual real-time feeds of parameters being measured by the on-board diagnostic equipment; e.g., "live" feed of tire pressures, brake condition sensing, etc.).
   d) Other__________________________

4. If a fault/no fault light is used, when should the 'fault' light be illuminated? (select one)
   a) Any time a system is out of spec, but not necessarily in violation
   b) When there is a violation
   c) When there is an OOS violation condition
   d) When there is a safety critical violation

5. When/how should this information be available to the inspections site? (select one)
   a) Well before the inspection station (perhaps two miles) so that a decision to inspect/not inspect can be made and a return signal sent within sufficient time to allow the truck to enter or bypass the station
   b) Upon entering the exit ramp for inspection, but before scales/scalehouse (about the same point where WIM equipment is often positioned)
   c) In front of scalehouse to allow visual inspection
   d) Anytime/anywhere while vehicle is on the highway, upon request from any computer terminal (including mobile)

6. What diagnostic or status information should be available to the driver? (select one)
   a) All diagnostic information should be available to the driver upon manual query of an interface screen or terminal
   b) Fault/No fault lights for each system (but not performance or operational values)
   c) Graduated warning signals for various systems with an indication of when a "violation-level" situation has been reached

7. If only a safety critical subset of information could be transmitted to the inspection site (due to limitations of the wireless communications media and the speed of the vehicle), please select the top three items that should be included in this "safety critical" message (select all that apply)

__Brake Condition	__Tire Condition	__Suspension
__Driver HOS	__CDL Information	__Vehicle Inspection History
__Fuel System	__Exhaust System	__Lights
__Frame	__Other (please specify) ______________________________	

8. If the on board sensors report all vehicle systems are functioning properly, what other conditions/information would be needed in order for the truck to be permitted to bypass the inspection station, even if it were randomly sample for inspection? (select one)
   a) None—Anytime all sensors report no fault, the truck may bypass station
   b) Would still need/want U.S. DOT registration number to check carrier history
   c) Would still need/want CDL information to check driver history
   d) For trucks randomly sampled for inspection, no matter what information about the carrier, driver or truck was transmitted; the truck would still need to pass in front of inspectors at slow speed to allow for quick visual inspection
   e) Other______________________________

9. What is your main concern with implementing an "automated" wireless type of safety diagnostic system? (select one)
   a) Electronic falsification of data
   b) Accuracy of measured data
   c) Operator resistance to implementation
   d) Added operational and maintenance requirements
   e) Other (please specify) ______________________________

10. Which portions of a level 1 inspection could be eliminated if on board diagnostics were implemented? (select all that apply)

__Driver HOS	__Driver Qualifications	__Tire condition
__Brake Condition	__Lights	__Suspension
__Frame	__Cargo Securement	__Exhaust System
__Fuel System	__None, visual inspection is always required	

11. If a driver knows the truck they are driving is underweight, but also knows one or more items would fail inspection based on the automated on-board diagnostic system, do you feel drivers would disable the system in order to "take their chances" with random selection?
    a) Yes, most drivers
    b) Yes, but very few drivers

c) No, most drivers would be more concerned about disciplinary actions by their employer (or concerned about threat of severe fines by the State) if such a system were purposely tampered with.
d) Other (please comment) ______________________________

12. On the opposite side, if a 'no fault' signal allows the truck to bypass the stations, how prevalent will 'black boxes' that emit this signal become? (select one)
a) It will be a significant problem
b) Minor problem, stiff penalties would discourage the use of such devices
c) Minor problem, data encryption is advanced enough to prevent it
d) Cannot predict

13. Considering possible falsified signals or privacy concerns, what system would be most appropriate to use for communications between vehicle and inspector? (select one)
a) Encrypted, off the shelf WiFi
b) Private cellular communications
c) Private satellite communications
d) Other proprietary system not available to the public

14. Regarding driver HOS violations, what would be sufficient to transmit to the inspection station? (select one)
a) A simple "in-violation" versus "no-violation" signal
b) Transmit coded information that shows if an operator is approaching a violation threshold
c) Show actual HOS for each rule (10/15, 70 hr, etc.)
d) Must show complete logbook regardless of status of violation

15. Considering tire condition monitoring, what information should be transmitted to inspectors to determine the condition of the tire? (select one)
a) Pressure only for all tires
b) Pressure and temperature for all tires
c) Fault/no fault flag only (green/red/amber light)
d) Pressure or temperature, only for the tires flagged as faulty

16. Regarding tire pressures, what is the threshold for which you would like to see the tire pressure flagged as a problem? (select one)
a) 30 psi
b) 60 psi
c) 70 psi
d) 80 psi
e) 90 psi

17. What should the threshold be if two or more tires are underinflated? (select one)
a) 30 psi
b) 60 psi
c) 70 psi
d) 80 psi
e) 90 psi
f) Other (please comment) ______________________________

18. Considering brake condition monitoring, rank the following items in importance to determine the overall condition of the brakes (1 being most important)

__Air Leaks __Brake Stroke __Thickness of lining

__ABS functionality

19. Regarding the condition of the brakes, please select what single piece of information should be transmitted wirelessly to the inspector

__ABS status __Brake stroke in/out of spec __Brake lining thickness

__Air leak rate __Overall fault/no fault

20. What threshold would you place on the brake stroke indicator to warn of a problem with the system? (select one for each type of actuator)

21. If given one of the three options described below, which would you deem more helpful in improving the overall screening, inspection process, and safety of commercial vehicles:

    Option 1: Implement a screening procedure whereby vehicle, carrier, and driver identifier information could be downloaded wirelessly for each vehicle (well in advance of the weigh/inspection station) such that the information could be used to query databases containing driver history and credentialing data, past vehicle inspection history, and carrier safety rating data.

    Option 2: Introduce vehicle sensors that wirelessly transmit vehicle data, such as brake wear, tire pressure, total weight, etc., to the inspection station or the mobile crew. This data could be used to eliminate portions of the vehicle inspection, reduce the amount of time spent inspecting each truck, and assist in identifying which trucks to inspect.

    Option 3: Maintain the same procedures currently used, but double the number of trucks inspected through use of additional manpower and facilities.

    Please Select One: ___Option 1 ___Option 2 __Option 3

ADVANCED INSPECTION TECHNOLOGIES QUESTIONNAIRE RESULTS

Results from the "Advanced Technologies" Questionnaire

Question	Percent
1) In your opinion, considering both vehicle and driver-related inspection items, which systems or parameters might lend themselves to being accurately monitored by on board sensors? (please write down all that apply)	
2) If on-board technology could be implemented to monitor vehicle 'health' (and/or electronically maintain driver history), and then wirelessly transmit the data to the inspection site, please rank order the following in terms of usefulness for selecting (screening) vehicles for further (manual) inspections (1 being the most important)[a]	
Tire Condition	15.0%
Brake Condition	85.0%
Vehicle Weight	15.0%
Driver HOS	60.0%
Driver Qualifications	15.0%
Carrier Performance	5.0%
Lighting system	5.0%
Suspension	0.0%
Exhaust System	0.0%
Steering	0.0%
Vehicle Inspection History	0.0%
3) If on board technology as described above were implemented for screening trucks, how would you prefer the information presented? (select one)	
a) A simple fault/no-fault for each system; (based on predetermined 'rules' or algorithms that define 'fault' using system-specific performance or operational conditions). For example, a listing of those systems or items for which a 'failure' was detected would be transmitted to the inspection site.	45.0%
b) A 'snapshot' of recently recorded performance or operational values being measured for each system (for example, data stored within the last 30 minutes of operation). The exact format and methodology for recording the 'snapshot' data would again be developed as an industry standard much like standardized emissions data.	10.0%

[a] Only responses marked with a 1 or 2 have been counted.

Results from the "Advanced Technologies" Questionnaire (continued)

Question	Percent
c) Actual real-time feeds of parameters being measured by the on-board diagnostic equipment; e.g., 'live' feed of tire pressures, brake condition sensing, etc.	45.0%
d) Other	0.0%
4) If a fault/no fault light is used, when should the 'fault' light be illuminated? (select one)	
a) Any time a system is out of spec, but not necessarily in violation	29.4%
b) When there is a violation	41.2%
c) When there is an OOS violation condition	5.9%
d) When there is a safety critical violation	23.5%
5) When/how should this information be available to the inspections site? (select one)	
a) Well before the inspection station (perhaps two miles) so that a decision to inspect/not inspect can be made and a return signal sent within sufficient time to allow the truck to enter or bypass the station	25.0%
b) Upon entering the exit ramp for inspection, but before scales/scalehouse (about the same point where WIM equipment is often positioned)	10.0%
c) In front of scalehouse to allow visual inspection	5.0%
d) Anytime/anywhere while vehicle is on the highway, upon request from any computer terminal (including mobile).	60.0%
6) What diagnostic or status information should be available to the driver? (select one)	
a) All diagnostic information should be available to the driver upon manual query of an interface screen or terminal.	55.0%
b) Fault/No fault lights for each system (but not performance or operational values)	20.0%
c) Graduated warning signals for various systems with an indication of when a 'violation-level' situation has been reached	25.0%
7) If only a safety critical subset of information could be transmitted to the inspection site (due to limitations of the wireless communications media and the speed of the vehicle), please select the top three items that should be included in this "safety critical" message (select all that apply)	
Brake Condition	95.0%
Tire Condition	40.0%
Suspension	0.0%
Driver HOS	100.0%
CDL Information	35.0%
Vehicle Inspection History	30.0%
Fuel System	0.0%
Exhaust System	5.0%
Lights	5.0%
Frame	0.0%
Other (please specify)	0.0%
8) If the on board sensors report all vehicle systems are functioning properly, what other conditions/information would be needed in order for the truck to be permitted to bypass the inspection station, even if it were randomly sample for inspection? (select one)	
a) None—Anytime all sensors report no fault, the truck may bypass station	5.0%
b) Would still need/want U.S. DOT registration number to check carrier history	20.0%
c) Would still need/want CDL information to check driver history	30.0%
d) For trucks randomly sampled for inspection, no matter what information about the carrier, driver or truck was transmitted; the truck would still need to pass in front of inspectors at slow speed to allow for quick visual inspection	35.0%
e) Other	10.0%

Results from the "Advanced Technologies" Questionnaire (continued)

Question	Percent
9) What is your main concern with implementing an 'automated' wireless type of safety diagnostic system? (select one)	
a) Electronic falsification of data	28.6%
b) Accuracy of measured data	33.3%
c) Operator resistance to implementation	4.8%
d) Added operational and maintenance requirements	28.6%
e) Other (please specify)	4.8%
10) Which portions of a level 1 inspection could be eliminated if on board diagnostics were implemented? (select all that apply)	
Driver HOS	19.0%
Driver Qualifications	9.5%
Tire condition	9.5%
Brake Condition	14.3%
Lights	14.3%
Suspension	4.8%
Frame	4.8%
Cargo Securement	0.0%
Exhaust System	19.0%
Fuel System	19.0%
None, visual inspection is always required	61.9%
11) If a driver knows the truck they are driving is underweight, but also knows one or more items would fail inspection based on the automated on-board diagnostic system, do you feel drivers would disable the system in order to 'take their chances' with random selection?	
a) Yes, most drivers	23.8%
b) Yes, but very few drivers	66.7%
c) No, most drivers would be more concerned about disciplinary actions by their employer (or concerned about threat of severe fines by the State) if such a system were purposely tampered with.	4.8%
d) Other (please comment)	4.8%
12) On the opposite side, if a 'no fault' signal allows the truck to bypass the stations, how prevalent will 'black boxes' that emit this signal become? (select one)	
a) It will be a significant problem	22.7%
b) Minor problem, stiff penalties would discourage the use of such devices	22.7%
c) Minor problem, data encryption is advanced enough to prevent it	0.0%
d) Cannot predict	54.5%
13) Considering possible falsified signals or privacy concerns, what system would be most appropriate to use for communications between vehicle and inspector? (select one)	
a) Encrypted, off the shelf WiFi	23.5%
b) Private cellular communications	5.9%
c) Private satellite communications	5.9%
d) Other proprietary system not available to the public	64.7%
14) Regarding driver HOS violations, what would be sufficient to transmit to the inspection station? (select one)	
a) a simple 'in-violation' versus 'no-violation' signal.	50.0%
b) transmit coded information that shows if an operator is approaching a violation threshold	10.0%
c) Show actual HOS for each rule (10/15, 70 hr, etc.)	15.0%
d) Must show complete logbook regardless of status of violation	25.0%

Results from the "Advanced Technologies" Questionnaire (continued)

Question	Percent
15) Considering tire condition monitoring, what information should be transmitted to inspectors to determine the condition of the tire? (select one)	
a) Pressure only for all tires	10.0%
b) Pressure and temperature for all tires	30.0%
c) Fault/no fault flag only (green/red/amber light)	40.0%
d) Pressure or temperature, only for the tires flagged as faulty	20.0%
16) Regarding tire pressures, what is the threshold for which you would like to see the tire pressure flagged as a problem? (select one)	
a) 30 psi	33.3%
b) 60 psi	6.7%
c) 70 psi	46.7%
d) 80 psi	6.7%
e) 90 psi	6.7%
17) What should the threshold be if two or more tires are under inflated? (select one)	
a) 30 psi	20.0%
b) 60 psi	13.3%
c) 70 psi	40.0%
d) 80 psi	13.3%
e) 90 psi	6.7%
f) Other (please comment)	6.7%
18) Considering brake condition monitoring, rank the following items in importance to determine the overall condition of the brakes (1 being most important)[b]	
Air Leaks	47.6%
Brake Stroke	42.9%
Thickness of lining	4.8%
ABS functionality	4.8%
19) Regarding the condition of the brakes, please select what single piece of information should be transmitted wirelessly to the inspector:	
ABS Status	5.0%
Brake stroke in or out of spec	30.0%
Brake lining thickness	0.0%
Air leak rate	15.0%
Overall fault/no fault	50.0%
20) What threshold would you place on the brake stroke indicator to warn of a problem with the system? (For 'short' normal stroke actuators)	
a) 2 inches or greater	80.0%
b) $2\frac{1}{8}$ inches or greater	5.0%
c) $2\frac{1}{4}$ inches or greater	15.0%
d) $2\frac{3}{8}$ inches or greater	0.0%
21) If given one of the three options described below, which would you deem more helpful in improving the overall screening, inspection process, and safety of commercial vehicles:	
Option 1: Implement a screening procedure whereby vehicle, carrier, and driver identifier information could be downloaded wirelessly for each vehicle (well in advance of the weigh/inspection station) such that the information could be used to query databases containing driver history and credentialing data, past vehicle inspection history, and carrier safety rating data.	45.0%

[b] Only responses marked with a 1 have been counted.

Results from the "Advanced Technologies" Questionnaire (continued)

Question	Percent
Option 2: Introduce vehicle sensors that wirelessly transmit vehicle data, such as brake wear, tire pressure, total weight, etc., to the inspection station or the mobile crew. This data could be used to eliminate portions of the vehicle inspection, reduce the amount of time spent inspecting each truck, and assist in identifying which truck to inspect.	40.0%
Option 3: Maintain the same procedures currently used, but double the number of trucks inspected through use of additional manpower and facilities.	15.0%

APPENDIX D

INTERVIEW GUIDES

STATE QUESTIONNAIRE NO. 1

Interviewee(s):______________________
Representing:_____________________
Interviewed by:___________________
Date of Interview:_________________

Objective: Part I—Roadside Inspection

This session is designed to:

- Document the state's current roadside safety processes and systems;
- Review if/how credential and safety data currently are shared with roadside safety personnel in your state;
- Review if data from other jurisdictions are used by roadside safety personnel in your state;
- Establish performance measures/priorities to use when evaluating roadside enforcement model recommendations; and
- Identify current challenges, future plans, and opportunities for roadside enforcement processes and systems.

Background

- Is the CVISN program a priority to your state? What has been your level of involvement in the CVISN program?

Current Practice Inspection Process/Systems

- Please briefly describe your state's current roadside enforcement strategy (Which agency is responsible, criteria that you use to select trucks for inspection, how many inspections are done at fixed inspection stations and how many are done at mobile sites, number of fixed inspection stations and number of mobile sites that can be used, what other types of roadside operations does your state perform such as security scans, weight checks).
- Do roadside enforcement personnel currently use an algorithm (i.e., ISS or ISS-2) or safety data to prioritize/select commercial vehicles for roadside inspections?
  - If yes, which data are used and how is the information sent to the roadside?
  - If no, how are vehicles currently selected for inspection?
  - Which agency(ies) determine the criteria/data to be used in selecting vehicles for inspection?
  - How frequently is this criteria revisited?
- Do roadside enforcement personnel currently access credential information (i.e., IRP, IFTA, OS/OW, CDL) for enforcement purposes at the roadside?
  - If yes, which data are used, from which system(s) are data retrieved (i.e., legacy systems, CVIEW) and how is the information sent to the roadside?
  - If no, would this data be useful to roadside enforcement personnel?
- Has ASPEN inspection software been deployed to all of your state's roadside enforcement personnel?
  - If yes, which version of ASPEN is deployed?
  - If no, is the state planning to deploy ASPEN?
- Do roadside enforcement personnel have access to the Internet from the roadside?
  - Do roadside personnel have access to a wireless network? Are there "dead spots" in wireless coverage around the state?

- How are inspections uploaded to FMCSA (i.e., via SAFER data mailbox, via SAFETYNET)?
- How soon after an inspection is conducted is the report uploaded to FMCSA?
- How frequently does your state download inspection data from FMCSA?
- Are there other tools used by your state's enforcement personnel to facilitate the inspection process?

Information Needs at Roadside

Please note any data elements or records below that you feel would be desired by your state's roadside enforcement personnel to better perform their current and future's expanded duties.

___ Static data elements (VIN, CDL, U.S. DOT, etc.). Please specify which ones.
___ Hours of service (HOS) record.
___ Fault code record.
___ Wheel spin record.
___ Over spin record.
___ Tire pressure record.
___ Axle weight record.
___ Electronic manifest record.
___ Driver performance record (last two hours).

Challenges and Future Strategies

- Does your state consider hazmat trucking shipments as a potential security threat? If so, please describe any plans that the state is considering to address this threat.
- Are there other special truck shipment types that are considered to have a unique threat?
- What are the biggest safety/security concerns in your state?
- What are the biggest challenges confronting roadside enforcement personnel in your state?
- Are there any planned enhancements or changes to your state's roadside enforcement operations?
- Are there opportunities/new operations (i.e., virtual inspections) that your state should pursue in the roadside enforcement arena?
- Are there any known inhibitors to change (i.e., funding, need to change legislation/administrative code)?
- What are your general thoughts about CVISN? What are the perceived benefits/costs of the CVISN program?

Objective: Part II—E-Screening

This session is designed to:

- Document the state's current electronic screening system;
- Review the process by which carriers can register their transponders with the state;
- Review the data currently used to screen vehicles electronically; and
- Identify current challenges, future plans, and opportunities for electronic screening processes and systems.

Background

- What has been your level of involvement in the CVISN program?

Current Practices

Please briefly describe your state's current e-screening strategy (use of PrePass/Norpass/other system, criteria that you use to give trucks the green light, is WIM integrated, anything that is considered special, is your state's electronic screening program in production or is it a prototype?)

What was the motivation for deploying this strategy/system (i.e., improved customer service, improved operational efficiency)?

- In what ways has the system met your expectations?
- In what ways has the system failed to meet your expectations?

Screening

- What screening software (i.e., Model MACS, home-grown) is used in your state's electronic screening program?
  – Who is responsible for maintaining/updating the screening software?
  – Who is responsible for maintaining/updating the electronic screening hardware/infrastructure?
- What are your state's electronic screening bypass criteria?
  – Which agency(ies) determines the bypass criteria?
  – How are the criteria changed?
  – What is the basis for change?
- Where is a vehicle's screening decision calculated (i.e., at a central location, at the roadside)?
  – How frequently is the decision updated?
- What data (e.g., credential, safety, height, and weight) are used to calculate a vehicle's screening decision?
  – Where does the necessary data come from and how often is it updated?
  – Is data from other jurisdictions used in the screening decision?
  – If yes, where does this data come from and how often is it updated?
  – If no, how are screening decisions for vehicles of out-of-state carriers calculated?
- Has your state determined a random pull-in rate for motor carriers participating in the electronic screening program?
  – If yes, what is the pull-in rate?
  – Is this pull-in rate carrier-specific?
  – What, if any data has been collected specifically about carriers weighed and inspected based on random pull-ins?
  – Has the rate ever been changed? If so, what data and calculations were used to support the decision to change the rate?
- How many inspection sites exist in your state?
  – How many of the sites are fixed?
  – Who operates and/or staffs these sites?
  – What are the sites' standard hours of operation?
  – Do the sites have sufficient capacity to inspect the vehicles that pass or do they become "overwhelmed" due to the volume of traffic?
- How many sites are equipped with electronic screening infrastructure in your state?
  – Which site(s) are equipped?
  – Are the site(s) operational?
  – Which agency(ies) administer the electronic screening program?

Challenges and Future Strategies

- What are the biggest challenges confronting electronic screening in your state?
- Are there any planned enhancements or changes to your state's electronic screening program?
- Are there opportunities/new operations (e.g., virtual weigh stations, interoperability with other transponder-based programs) that the state should pursue in the electronic screening arena?
- Does your state participate in PRISM? How does this affect the Electronic Screening process?
- What are the known inhibitors to change (e.g., funding, technical infrastructure of existing systems, need to change legislation/administrative code)?
- In terms of e-screening, what are your general thoughts about CVISN? What are the perceived benefits/costs of the CVISN program?
- What quantitative or anecdotal information can you provide in terms of the costs and benefits of electronic screening based on your work to date?

INDUSTRY INSPECTION QUESTIONNAIRE NO. 1

Contact Name: ______________________ Representing: ____________________

- Is the overall inspection process working or not working? Why?
- Do you feel that certain vehicles are being targeted? If so—which ones?
- If certain vehicles are being targeted, from an industry perspective is the targeting of certain vehicles good or bad? Why?
- If certain vehicles are being targeted is the targeting improving safety? Why?
- Are there specific states that do a better job than others? Why?
- Are there specific states that do a worse job than others? Why?
- Do you think that data-related selection technologies (e.g., ISS and SafeStat) are effective in identifying potentially unsafe drivers/vehicles/carriers? Why or why not?
- Do you think other technologies such as weigh-in-motion, on-board sensors (brake, tire, light, engine, HOS, etc.) or license plate readers are effective? Why or why not?
- If you could revamp the system what would you do? Drivers/vehicles/carriers?

Interviewee(s):______________________

Representing:_____________________

Interviewed by:___________________

Date of Interview:_________________

Format: _________________

About CVISN

The term CVISN (Commercial Vehicle Information Systems and Networks) refers to the collection of information systems and communications networks that support commercial vehicle operations (CVO). The CVISN program is a way for existing and newly designed systems to exchange information through the use of standards and available communications infrastructure. The CVISN program provides a framework or "architecture" that will enable government agencies, the motor carrier industry, and other parties engaged in CVO safety assurance and regulation to exchange information and conduct business transactions electronically.

The goal of the CVISN program is to improve the safety and efficiency of commercial vehicle operations. The current, primary objective of the CVISN Program is to develop and deploy information systems that will support new capabilities in three areas:

1. **Safety Information Exchange**—Provide improved electronic exchange of MCMIS and other safety information among roadside and deskside, state and Federal systems;
2. **Credentials Administration**—Allow motor carriers to apply for, pay for, and receive credentials electronically; and
3. **Electronic Screening**—Automatically screen vehicles as they approach weigh stations and allow those that are safe and legal to bypass without slowing down or stopping.

Objective

The purpose of this interview is to:

- Identify particular aspects of the program that encouraged motor carriers to participate in the CVISN program;
- Understand how core CVISN deployment has affected motor carriers' business operations;
- Establish strategies for better marketing CVISN to expand motor carrier participation; and
- Improve the CVISN deployment process in the future.

Background

- How long have you been with your organization?
- How long have you been involved with CVISN?
- What was your organization's role, if any, with the CVISN deployment and program?
- What was your personal role, if any, with the CVISN deployment and program?

Safety Information Exchange

Pre-Deployment

- What benefits did motor carriers expect from safety information exchange?
- How frequently did motor carriers review their Federal safety scores (e.g., SafeStat, ISS, ISS-2, MCSIP Level) prior to CVISN deployment?
- Were they satisfied with the timeliness and accuracy of the old process?
- What were the biggest issues/problems related to the old process?
- What did you feel was the biggest selling point for the industry prior to deployment?
- Deployment?
- How were motor carriers involved in the CVISN deployment of safety information exchange (e.g., policy, financing, design, testing, training)?
- What were the main technical or institutional challenges that arose for motor carriers as a result of safety information exchange? How were these solved?

Post-Deployment

- Did motor carriers realize all of the anticipated benefits? Why or why not?
- What aspects of safety information exchange worked well and not well for motor carriers?
- What enhancements to safety information exchange would you like to see included in the program?

Electronic Credentialing

Pre-Deployment

- How would you rate the user-friendliness of the credentialing processes prior to CVISN (e.g., excellent, good, fair, poor)?
  – What were the best aspects of the credentialing process prior to CVISN?
  – What were the biggest issues related to the credentialing process prior to CVISN?
- What benefits, if any, did motor carriers expect from electronic credentialing:
  a. 24/7 access?
  b. Access from office (no need to visit government office)?
  c. Single point of contact for doing business with the state?
  d. Improved efficiency?
  e. Improved accuracy?
  f. Improved timeliness/turnaround?
  g. Ability to pay for credentials electronically?
  h. Other.
- What did you feel was the biggest selling point for the industry prior to deployment?
- What costs did motor carriers expect to incur (if any) for participating in electronic credentialing services?

Deployment

- How were motor carriers involved in the CVISN deployment for electronic credentialing (e.g., policy, financing, design, testing, training)?
- What were the main technical or institutional challenges that arose for motor carriers as a result of electronic credentialing? How were these solved?

Post-Deployment

- Did motor carriers realize all of the anticipated benefits? Why or why not?
- Did the participation cost more, less, or the same as expected? Why or why not?
- What aspects of electronic credentialing worked well or not well for motor carriers?
- What factors (e.g., ability to pay for the credential on-line, ability to print credential at office, improved turnaround time, better service) are affecting a motor carrier's decision to use electronic credentialing?

- What enhancements to electronic credentialing would you like to see included in the program (e.g., any other credentials you would like to see automated, electronic payments accepted, single access portal for all of a state's credentials)?

Electronic Screening

Pre-Deployment

- What benefits, if any, did you expect from electronic screening:
  - i. Improved efficiency (e.g., saved fuel, driver utilization)/increased number of vehicles passing station and reduced waiting time at stations?
  - j. Reduced delays in delivering freight and more reliability in meeting customer commitments?
  - k. Level playing field by reducing numbers of illegal or unsafe carriers?
  - l. Other.
- What did you feel was the biggest selling point for the industry prior to deployment?
- Did motor carriers anticipate any costs being associated with participation in electronic screening?
- Did motor carriers have any reservations about participating in electronic screening?

Deployment

- How were motor carriers involved in the CVISN deployment for electronic screening (e.g., policy, financing, design, testing, training)?
- What were the main technical or institutional challenges that arose for motor carriers as a result of electronic screening? How were these solved?

Post-Deployment

- Did electronic screening have the expected impact (solicit quantitative responses where available):
  - m. Improved efficiency (e.g., saved fuel, driver utilization)/increased number of vehicles passing station and reduced waiting time at stations?
  - n. Reduced delays in delivering freight and more reliability in meeting customer commitments?
  - o. Level playing field by reducing numbers of illegal or unsafe carriers?
  - p. Other.
- What aspects of electronic screening worked well and not well for motor carriers?
- What factors (e.g., cost of transponder) affect a motor carrier's decision to use electronic screening?
- What enhancements to electronic screening would you like to see included in the program?

Challenges and Future Strategies

- What was your experience like working with your state government to deploy CVISN? Do you have any suggestions for improving state/motor carrier relationships in the future?
- What do you see as the biggest challenges for expanding CVISN participation among motor carriers?
- What are effective strategies for increasing awareness of CVISN among motor carriers? For example, are there particular conferences, magazines, or web sites that are commonly used by the motor carrier industry? How do you reach your carriers? Where do you personally look for information?

Expanded CVISN

As you might know already, FMCSA is working on defining capabilities for the Expanded CVISN program. Please rate your perception of the importance of the following capabilities to the motor carrier industry (very important, somewhat important, neutral, not important):

- Driver Information Sharing Driver Information Sharing Driver Information Sharing
  - – Establish driver information snapshots for use in all processes (e.g., hiring, inspection, enforcement, credentialing)
  - – Improve enforcement's and carrier's access to driver data to target safety risk

- Enhanced Safety Information Sharing
  - Improve safety data quality
  - Improve carrier access to safety data
- Smart Roadside
  - Provide roadside personnel with better access to data systems
  - Establish virtual/remote roadside sites
- Expanded E-Credentialing
  - Improve access to electronic credentialing (data standards, access levels)
  - Improve electronic credentialing, for example through use of a single portal and adding new credentials (e.g., OS/OW, Hazmat)

Abbreviations used without definitions in TRB publications:

AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
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
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
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
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
NASA	National Aeronautics and Space Administration
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
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation