



mcsafe

Motor Carrier Safety Analysis, Facts & Evaluation

In this Issue

1 How Effective are Compliance Reviews?

A summary of an Analysis Division study on the safety impact of FMCSA on-site compliance reviews

3 How Effective are Roadside Inspections and Traffic Enforcement?

A summary of an Analysis Division study on the direct and indirect safety impact of MCSAP-funded roadside inspections and traffic enforcement

4 Motor Carrier Industry Profile Study: Analyzing Safety Performance by Industry Segment

A summary of a recently issued FMCSA report that analyzed the safety performance of major motor carrier industry segments

6 Acronyms

Definitions of various acronyms, abbreviations and initialisms used in this issue of MCSAFE

How Effective are Compliance Reviews?

The on-site compliance review (CR) is perhaps the single greatest resource-consuming activity of the Federal Motor Carrier Safety Administration (FMCSA). Thousands of CRs are conducted each year. In the most recent fiscal year, 2001, Federal and State enforcement personnel conducted almost 14,000 CRs on individual motor carriers. FMCSA expects that through education, heightened awareness of safety regulations, and the enforcement effects of the CR, motor carriers will improve the safety of their commercial vehicle operations and, ultimately, reduce their crash rates.



FMCSA, in cooperation with the Volpe National Transportation Systems Center, has developed an analytic model to measure the effectiveness of the CR in terms of crashes avoided, injuries avoided, and lives saved. This tool will provide

FMCSA management with information to address the requirements of the Government Performance and Results Act of 1993 (GPRA), which obligates Federal agencies to measure the effectiveness of their programs as part of the budget process. It will also provide FMCSA and State safety program managers with a quantitative basis for optimizing the allocation of safety resources in the field. This analytic tool is known as the CR Impact Assessment Model.

The CR Impact Assessment Model shows the direct impact of compliance reviews on carrier safety, but not the "deterrent" effects (i.e., the response of carriers to the "threat" of having a CR). [continued pg 2](#)

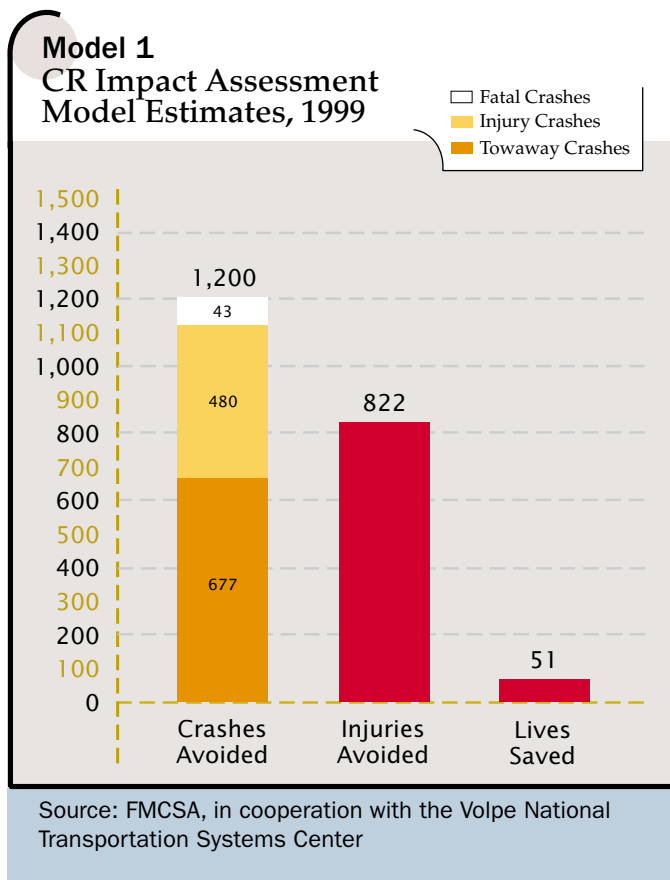
50 by 2010

Our Goal: Reduce large truck related fatalities 50 percent by the year 2010

continued from pg 1 / The model is based on the individual and cumulative “before and after” changes in the safety performance of carriers that received CRs. The model compares a motor carrier’s crash rate in a time period after a CR to its crash rate prior to that review. To make this comparison, the model uses crash and mileage data collected during CRs and CR follow-up inquiries. FMCSA recently implemented the CR Impact Assessment Model for 1999 and 2000.

CR Effectiveness in 1999

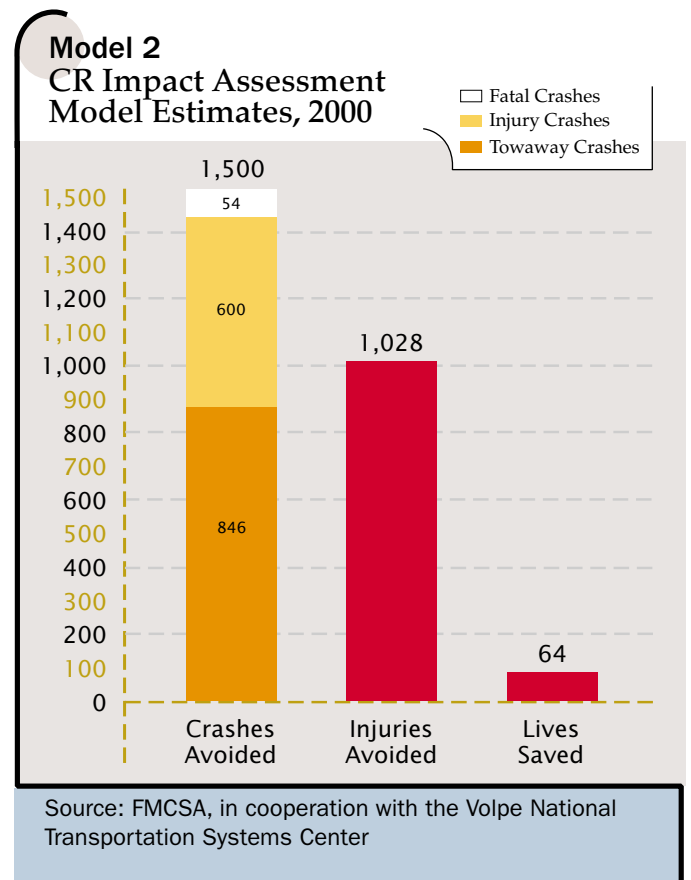
A total of 6,055 carriers received CRs in 1998. These carriers had a total of 13,844 million vehicle miles traveled (VMT) and an average crash rate of 0.823 crashes per million VMT. The model produced the following estimates:



CR Effectiveness in 2000

The CR Impact Assessment Model was also implemented for 2000, to produce an estimate of the

number of crashes (and associated injuries and fatalities) avoided in 2000 as a result of the CRs conducted in 1999. A total of 8,877 carriers received CRs in 1999. These carriers had a total of 17,409 million vehicle miles traveled and an average crash rate of 0.804 crashes per million VMT. The model produced the following estimates:



The model will be run again in 2002 to determine the effectiveness of CRs in 2001.

Potential Applications of the Model

Certain carriers may respond better to CRs (i.e., lower their crash rates more) than other carriers do. With Analysis Division assistance, FMCSA managers can use the model to determine which carriers do or do not improve after receiving CRs and the extent of the improvement of those that do improve.

For instance, the results of the implementation of the model can be broken out by carrier safety sta-

tus, i.e., the carrier's SafeStat category before receiving the initial CR. In this case, the results can be studied to see whether carriers in the higher risk categories, A and B, that are targeted for CRs reduce their crash rates more than carriers in the lower risk categories, C-G, or vice versa. Carriers in the higher risk categories currently receive priority for CRs. They are often deficient in the SafeStat Safety Evaluation Areas (SEAs) that reflect safety performance (e.g., crashes), while carriers in the lower risk categories often have more safety compliance deficiencies (which may lead to safety performance problems if not addressed).

For carriers that received more than one CR, the results of the model implementation can also be broken out by the number of CRs the carrier received. The results can be analyzed to determine where the greatest crash rate reduction occurs for carriers with multiple CRs: after the first CR, the second CR, etc. The analysis can determine whether there are diminishing returns from performing additional CRs on the same carriers. The results of this analysis will reveal the types of carriers that will most likely respond positively to CRs. Alternative treatment approaches may be necessary for carriers that are at risk but will most likely not respond positively to CRs. By focusing on carriers that are likely to respond positively, the effectiveness of the CR program may be improved.

Please contact Mr. Dale Sienicki, FMCSA Analysis Division, at 202-366-1861 or dale.sienicki@fhwa.dot.gov if you have questions or comments or would like to receive a copy of the final report. To view the report online, please visit the Analysis and Information Online web site at: www.ai.volpe.dot.gov.

How Effective are Roadside Inspections and Traffic Enforcement?

Roadside inspection and traffic enforcement are two of FMCSA's key safety programs. The roadside inspection program consists of roadside inspections performed by qualified safety inspectors following the guidelines of the North American Standard, which was developed by FMCSA and the Commercial Vehicle Safety Alliance (CVSA). Most roadside inspections by the States are conducted

under a grant program (MCSAP) administered by FMCSA. There are five levels of inspections that include a vehicle component, a driver component, or both. The traffic enforcement program is based on the enforcement of 21 moving violations noted in conjunction with a roadside inspection. Violations are included in the driver violation portion of the roadside inspection checklist.



FMCSA, in cooperation with the Volpe National Transportation Systems Center, has developed an analytic model to measure the effectiveness of roadside inspections and traffic enforcement in terms of crashes avoided, injuries avoided, and lives saved. This analytic tool is known as the Intervention Model.

The Intervention Model is based on the premise that the two programs—roadside inspection and traffic enforcement—directly and indirectly contribute to the reduction of crashes. The model includes two submodels that are used for measuring these different effects:

- Direct effects are based on the assumption that vehicle and/or driver defects discovered and then corrected as the result of interventions reduce the probability that these vehicles/drivers will be involved in subsequent crashes. The model calculates direct-effect-prevented crashes according to the number and type of violations detected and corrected during an intervention.
- Indirect effects are the byproducts of the carriers' increased awareness of FMCSA programs and the potential consequences that the programs could impose if steps are not taken to ensure and/or maintain higher levels of safety. In order to measure indirect effects, which are essentially changes in behavior involving driver preparation and practices and vehicle maintenance, the model calculates responses to exposure to the programs and the resulting reduction in potentially crash-causing violations.

FMCSA recently implemented the model to calculate program benefits for 1998, with the results below. The model will be run again in late 2002.

Potential Applications of the Model

By using motor carrier categories, or classes, such as those developed in the Analysis Division's Motor Carrier Industry Profile study, the Analysis Division can assist FMCSA managers in using the model to study program effectiveness among carrier classes. Differences in fleet size, driver age, length of haul, etc., may contribute to differences in direct-effect and indirect-effect program impacts. A better understanding of carrier classes and how they react to interventions will aid in the application and development of the roadside inspection and traffic enforcement programs.

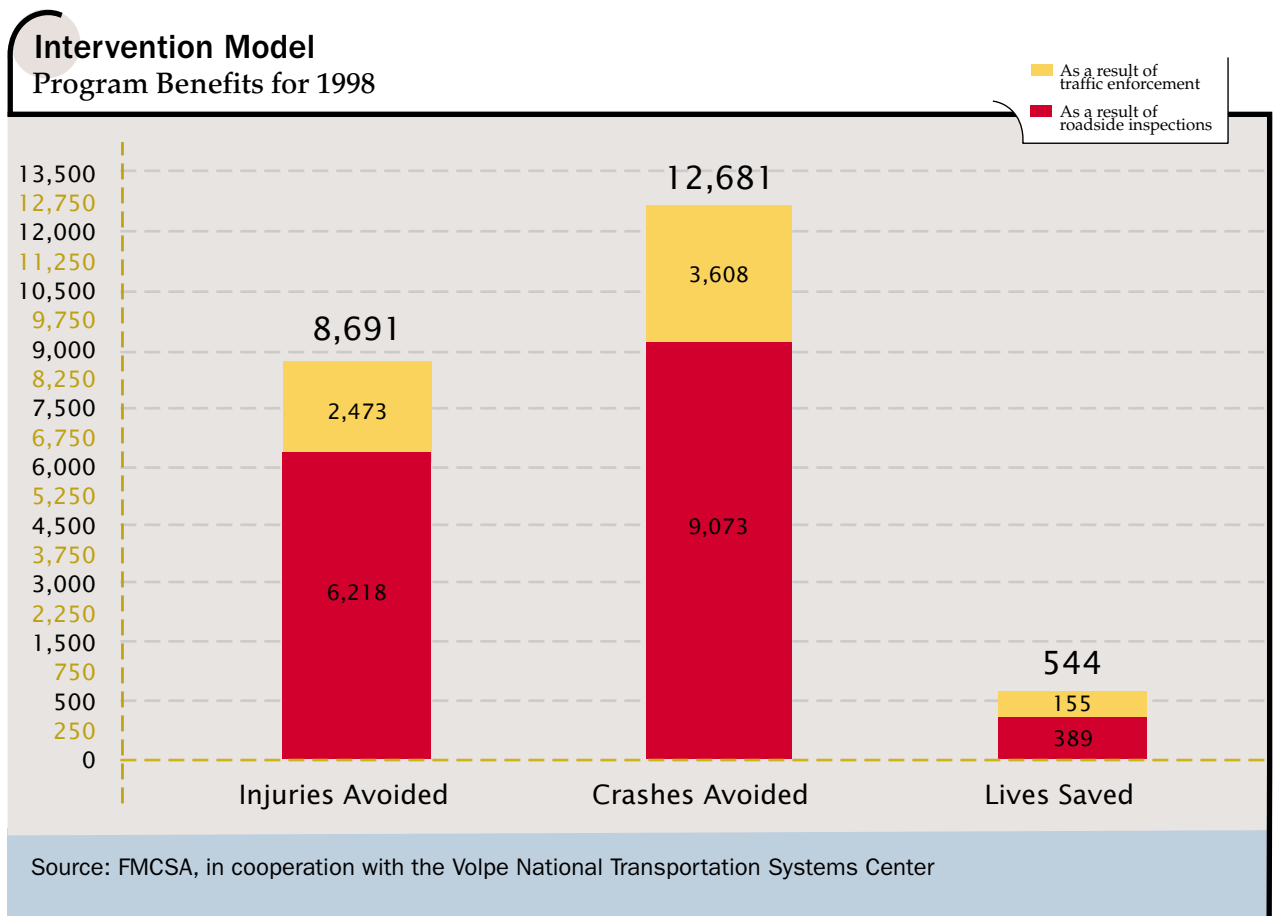
As a corollary to the investigation of carrier types, alternative forms of treatment to reduce crashes should be sought. If patterns were discovered in a particular class of carriers, then the proposed alternative treatments and implementation of effective

means of addressing those groups would become critical in the effort to increase the number of lives saved and injuries avoided as a result of FMCSA intervention programs.

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Motor Carrier Industry Profile Study: Analyzing Safety Performance by Industry Segment

The primary mission of the Federal Motor Carrier Safety Administration (FMCSA) is to prevent commercial motor vehicle-related fatalities and injuries. FMCSA contributes to ensuring safety in motor carrier operations through public education and regulatory enforcement. The motor carrier industry is



diverse and competitive, consisting of many unique types of operations and hauling many different types of commodities. In an effort to better understand the diverse nature of the industry and explore safety and operational differences among its major segments, the FMCSA, with the University of Maryland, College Park, has undertaken the Motor Carrier Industry Profile Study. The goal of the study is to analyze safety performance by major industry segment, identify worst- and best-performing segments, and use the results in FMCSA policy and program development.

Study Approach

Safety data for the period March 1998 through September 2000 were obtained from the Motor Carrier Management Information System (MCMIS) and the Motor Carrier Safety Status Measurement System (SafeStat) to examine the safety performance of 11 for-hire and 10 private commodity segments. Commodity segments evaluated in this analysis were: *Building Materials, Bulk Freight, Refrigerated (non-produce), Household Goods, Intermodal, Large Machinery, Passenger, Produce, Tank, General Freight-TL, and General Freight-LTL (for-hire carriers only)*.

The performance of each segment was evaluated on nine safety measures: *Driver Safety Evaluation Area (SEA) Score, Driver Out-of-Service (OOS) Rate, Vehicle SEA Score, Vehicle OOS Rate, Accident SEA Score, Fatal Crash Rate, Total Crash Rate, Safety Management Review Measure (SMRM), and Enforcement Severity Measure (ESM)*.

Each segment's mean score on each safety measure was compared with that of its peers. A segment was identified as best or worst on each measure (at a confidence level of 95 percent) using ranking and selection procedures (a subset of statistical inference procedures known as Multiple Comparisons Procedures). A segment was considered overall "best" or "worst" based on the number of times it appeared as "best" or "worst" on each of the nine safety measures.

Results

- For-Hire Segments, "Best" and "Worst" Overall: The Passenger and General Freight-LTL segments were identified as the best-performing for-hire seg-

ments overall: each appeared as a "best performer" on six of the nine measures (although LTL carriers also appeared as a "worst performer" on two measures). The Intermodal and Produce segments were identified as the worst performing for-hire segments overall: each appeared as a "worst performer" on four of nine measures.

The primary mission of the Federal Motor Carrier Safety Administration (FMCSA) is to prevent commercial motor vehicle-related fatalities and injuries.

- Private Segments, "Best" and "Worst" Overall: For the private sector, there is no clear overall "best" or "worst" segment. Many private segments appeared as best performers on certain measures and



as worst performers on others. On measures where we identified three or more best- or worst-performing segments, it was usually due to the small sample sizes of carriers being compared or to the mean scores being similar. Poorly performing segments included Large Machinery and General Freight-TL, which appeared as "worst" performers on five and four of nine measures, respectively, and did not appear as "best" on any. However, we cannot characterize them as overall worst.

- For-Hire vs. Private Segments Overall: As a group, private carriers were somewhat safer, displaying significantly lower mean scores than for-hire carriers on three of the nine safety performance measures—Driver SEA, Accident SEA and Total Crash Rate. For-Hire carriers displayed a significantly lower mean score on the Safety Management Review Measure.

For a copy of the complete research paper and more information on the Motor Carrier Industry Profile, please visit the Analysis and Information Online web site at: www.ai.volpe.dot.gov or contact Tom Keane at 202-366-4025. ✓



Acronyms

- CR:** Compliance Review
- CVSA:** Commercial Vehicle Safety Alliance
- ESM:** Enforcement Safety Measure
- FMCSA:** Federal Motor Carrier Safety Administration
- GPRA:** Government Performance and Results Act of 1993
- LTL:** Less than truckload
- MCMIS:** Motor Carrier Management Information System
- MCSAP:** Motor Carrier Safety Assistance Program
- OOS:** Out-of-Service
- SafeStat:** Motor Carrier Safety Status Measurement System
- SEA:** Safety Evaluation Area (SafeStat)
- SMRM:** Safety Management Review Measure
- TL:** Truckload
- VMT:** Vehicle miles traveled

For More Information

Information on large truck and motor coach crashes and the nature and effectiveness of the Federal Motor Carrier Safety Administration's safety programs is available from:

**Federal Motor Carrier Safety Administration
Analysis Division (MC-RIA)
400 Seventh Street, SW
Washington, D.C. 20590**

The Analysis Division has designated two "Data Analysis Coordinators" to assist field staff with data analysis inquiries. Employees operating in the states served by the following Centers should contact staff members listed below.

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MCSAFE is a recurring publication of FMCSA's Analysis Division. It is intended to provide FMCSA staff and other stakeholders in the motor carrier and highway safety environment with descriptive statistics and analyses about traffic crashes involving commercial motor vehicles and the programs and countermeasures FMCSA has implemented to promote motor carrier and highway safety.

Publication # FMCSA-RI-02-007