TechBrief

FEDERAL MOTOR CARRIER SAFETY ADMINISTRATION

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Individual Differences and the "High Risk" Commercial Driver

The goal of the Federal Motor Carrier Safety Administration (FMCSA) is to reduce the large truck fatality rate by 41 percent from 1996 to 2008. This reduction translates into a rate of 1.65 fatalities in truck crashes per 100 million miles of truck travel.

FMCSA's Research and Technology programs encompass a range of issues and disciplines, all related to motor carrier and bus safety and security. FMCSA defines a "research program" as any systematic study directed toward fuller scientific discovery, knowledge, or understanding that will improve safety, and reduce the number and severity of commercial motor vehicle crashes. Similarly, a "technology program" defines those programs that adopt, develop, test, and/or deploy innovative driver and/or vehicle best practices, and technologies that will improve safety and reduce the number and severity of commercial motor vehicle crashes.

Currently, FMCSA's Office of Research and Technology is conducting programs in order to *produce safer drivers, improve safety of commercial motor vehicles, produce safer carriers, advance safety through information-based initiatives,* and *improve security through safety initiatives.* The study described in this Tech Brief was designed and developed to support the FMCSA Research and Technology strategic objective to produce safer drivers. The primary goals of this initiative are to ensure that commercial drivers are physically qualified, trained to perform safely, and mentally alert.

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Background

There is a common belief in the trucking industry that, while most truck and bus drivers are both conscientious and safe, a relatively small percentage of commercial motor vehicle (CMV) drivers are associated with a significant and inordinate percentage of the overall number of motor carrier crashes. These drivers are considered to be "high risk" drivers, and the study summarized in this Tech Brief focuses on these commercial drivers. This project explores factors associated with "high risk drivers" and the means by which carriers can reduce crash risk through various safety management practices and other safety interventions.

Study Design

Expert industry opinion was accessed through survey questionnaires on the topic. Surveys were distributed to a random sample of safety managers listed in the American Trucking Associations' fleet directory. A second survey sample consisted of a group of "other experts"—those who are professionally involved in CMV safety but are not fleet safety managers. This group included former drivers and fleet managers, government regulatory and enforcement personnel, industry trade association representatives, and researchers. Of course, these are overlapping categories, and most "other experts" indicated several different motor carrier safety-related professional experience areas.

The results from these surveys were then compared to reviewed research literature on the topic, with emphasis on the personal factors associated with risk and carrier management approaches to reducing the problem. A number of these factors potentially correlate with risk and may be the basis for safety interventions to reduce risk.

Survey Method and Results

Two parallel survey forms were used—one for current CMV fleet safety managers and the other for other experts in motor carrier safety. The "safety manager" and "other expert" survey forms contained 50 and 48 questions, respectively. The surveys for "other experts" did not include questions regarding CMV fleet information. These surveys were divided into seven parts:

- **Part 1: How Important is the Problem?** Most respondents (59 percent Safety Managers, 54 percent Other Experts) felt that the worst 10 percent of drivers were associated with 50 percent or more of fleet crash risk.
- **Part 2: Driver Factors Associated with Risk.** Sixteen personal factors were rated on a scale from "0" (no association) to "4" (strong association) with regard to their strength of association with crash risk. The factors, mean ratings (to the nearest tenth), and rankings are presented in order of safety manager ranking in Table 1 (next page). When there were ties in the mean ratings, rankings were determined by looking at additional decimal places, which are not shown in the table. Respondents in both groups rated personality traits such as aggressiveness, impulsivity, and inattentiveness as having the highest associations with risk.

Table 1. Survey Results: Driver Factors Associated with Risk

DRIVER RISK FACTOR	SAFETY MANAGERS		OTHER EXPERTS	
	Mean (0 - 4)	Rank (of 16)	Mean (0 - 4)	Rank (of 16)
Aggressive/angry	3.4	1	3.4	3
Impatient/impulsive	3.4	2	3.5	1
Inattentive	3.4	3	3.4	2
Inexperienced (new CMV driver)	3.2	4	3.2	4
Unhappy with job/company	2.6	5	2.4	7
Young driver (less than 25)	2.5	6	3.1	5
Sleep apnea/other sleep disorder	2.4	7	2.9	6
Unhappy marriage/family problems	2.2	8	2.2	8
Debt or other financial problems	2.0	9	2.1	9
Heart or other medical condition	1.9	10	2.1	10
Dishonest	1.8	11	1.8	14
Older driver (60 or older)	1.7	12	1.9	12
New to company	1.6	13	2.0	11
Obese/overweight	1.4	14	1.7	15
Introverted/unsociable	1.3	15	1.1	16
Did not attend truck driving school	1.2	16	1.8	13

- **Part 3: Driver Hiring Practices and Tools.** The most frequently used, and highest rated, hiring practices were checking the applicant Motor Vehicle Record (MVR), contacting past employers, testing for alcohol and drugs (required by Federal regulation for interstate carriers), and on-road driving tests.
- **Part 4: Driver Evaluation.** "Continuous tracking of driver crashes, incidents, and violations" was almost universally used by safety manager respondents and had the highest-rated effectiveness for both respondent groups in terms of the four driver evaluation practices presented.
- **Part 5: Driver Management.** While reprimands (verbal and written) and manager counseling were among the most-used methods for driver management, "monetary rewards" received the highest effectiveness rating.
- **Part 6: Comments.** Three lines of blank space were provided on each form.
- **Part 7: Respondent Information.**

Concepts of Crash Risk

Many interacting factors affect commercial driver crash involvement. The focus of this study was on personal "constitutional" risk factors, or relatively enduring characteristics such as health, physical skills, and some personality traits. At any given moment, however, a number of other factors and influences are operative. A conceptualization of some major interacting factors is shown in Figure 1 (next page).

Researchers have discovered that certain personal traits are related to the occurrence of a vehicle crash—some drivers have a "differential crash risk." To the extent that this differential crash risk is enduring, it probably reflects constitutional or other long-term personal traits. This differential crash risk may also vary across time, reflecting chance variation or changeable traits such as age, maturation, or learning by experience.

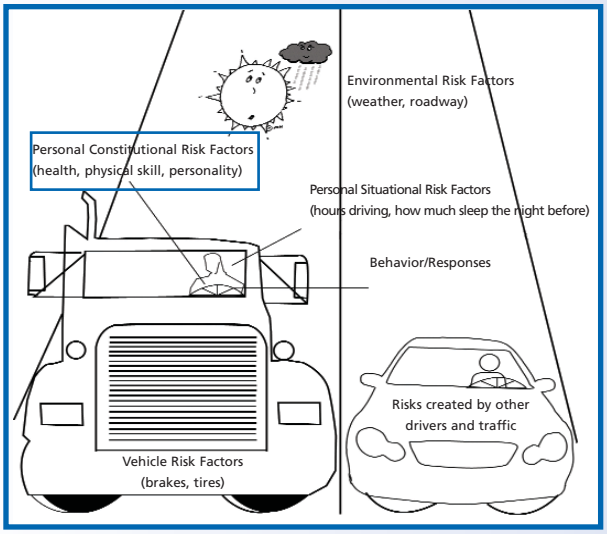

Figure 1. Major interacting factors affecting commercial driver crash involvement.

Factors Related to Driver Risk

Many factors related to driver risk were assessed in this literature review. The five most cited include:

- **Age:** For young CMV drivers, age is a very strong personal factor that affects crash involvement. In one statistical study, young truck drivers (ages 18-21) had moving violation rates that were almost twice those of the middle-aged drivers (30-49). Speeding above the speed limit and unsafe speeds for conditions were the two top violations cited. In fact, young commercial drivers were reported to be about 50 percent more likely than middle-aged drivers to be charged with a violation in a crash (Blower 1996). In two-vehicle crashes with light vehicles, the young truck driver was twice as likely as the other driver to be charged with a hazardous action or traffic violation, which is opposite the trend for large truck-light vehicle crashes in general (FMCSA 2003). On the other hand, there appears to be no major safety problem relating to older truck drivers.
- **Commercial Driving Experience:** Experience driving a large truck or bus is clearly a factor in driver safety. Not surprisingly, most motor carriers, particularly large carriers, require prior commercial driving experience for applicants to be considered for hiring (Stock 2001).
- **Sleep Disorder:** Many studies agree that the relative risk of being involved in a crash rises if the driver has a sleep disorder. The numbers given were anywhere from 3 to 14 times the normal risk.
- **Impulsivity:** Impulsivity, characterized by behavioral instability and an inability to control impulses, including threatening behavior and violence, has been suggested to be related to an increase in crash risk. A 1967 study found that both a high crash/other accident group, and a high violation group scored higher on a measure of impulsivity than those with a low number of crashes/other accidents and violations (Schuman, Peltz, Ehrilch, and Seltzer, 1967).
- **Social Maladjustment and Aggressive/Angry Personalities:** Various studies of the personalities of high-crash drivers found these drivers to have negative social traits. For example, when studying South African bus drivers with repeated crashes, Shaw and Sichel (1961, 1971) described these individuals as being selfish, self-centered, overconfident, resentful and bitter, intolerant, and having antisocial attitudes and criminal tendencies.

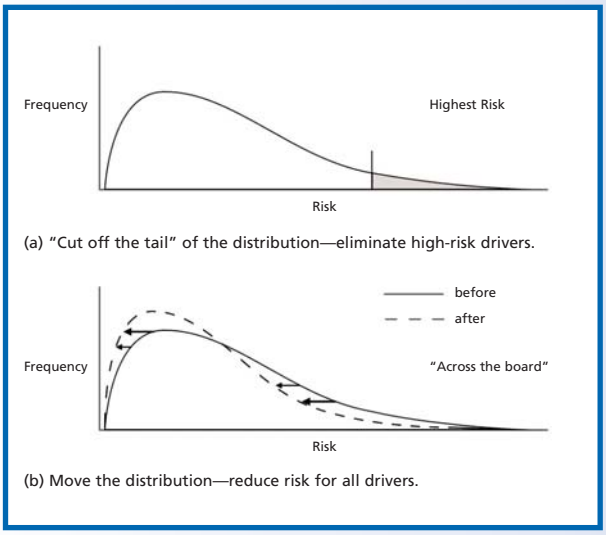

Figure 2. Two conceptual mechanisms of improvements to a group of drivers.

Operational Safety Management Methods

Based on the research review, the study team believes that there are at least two distinct ways to improve the safety performance of a group of CMV drivers. Figure 2 illustrates these. In the first example (Figure 2a), the highest-risk drivers are eliminated from the distribution, as they are never hired, thus "cutting off the tail" of the driver risk distribution. This intervention would have the effect of improving the performance of the average driver of the group by eliminating the greatest source of risk. In the second example (Figure 2b), the safety

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performance levels of all, or most, drivers in a group are improved through effectiveintervention. The overall average safety level of the fleet improves through "across the board" advancement.

Based on the literature, and discussions with motor carriers, there are a number of methods to reduce driver crash risks. These include:

- Systematic hiring,
- Driver selection tests,
- Driver performance evaluation,
- Driver training and counseling,
- Driver rewards and punishment,
- Behavior-based safety,
- Driver self-management, and
- Driver termination.

Conclusions

The survey results and statistical findings presented in this report support the view that commercial drivers differ greatly in their levels of crash risk, and that a relatively small percentage of drivers (10-15 percent) account for a disproportionate percentage of total fleet risk (30-50 percent). However, these results lead to the realization of further research needs. The findings presented in this report generally imply, but do not verify, that relative driver risk, both general and specific, endures across long periods of time. In other words, "risk" is, to some extent, a long-term personal trait, in addition to being obviously related to specific situations and conditions. The various personality traits and performance variables discussed in this report must now be confirmed. One way that this can be done is through a systematic and quantitative determination of the role that each of the many factors discussed play in commercial driver risk. Another research need has to do with carrier management strategies in working with the drivers who are more "accident prone." This can be done through research in relation to all driver management functions, including selection, evaluation, and management intervention. With further research, motor carrier companies can learn how to work with or avoid the "high risk" commercial driver, and the risk for all drivers on the road can be reduced.

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