**Session No. 718**

# The High-Risk Driver – What to Look For and How to Know

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## Summary

This paper focuses on the "high-risk" driver. The author was a co-author of a report, "Individual Differences and the "High-risk" Commercial Driver" prepared for the Transportation Research Board; Commercial Truck and Bus Synthesis Program.

This presentation highlights the efforts and results of this Study. For a complete copy of the report go to http://onlinepubs.trb.org/onlinepubs/ctbssp/ctbssp_syn_4.pdf .

Most truck and bus drivers are both conscientious and safe, but the findings of the report support the notion, and widespread industry belief, that a relatively small percentage of commercial drivers are associated with a significant and inordinate percentage of the overall motor carrier crash risk.

This paper will attempt to document this phenomenon, explore related factors, and identify ways that the high-risk driver can be targeted by various safety management practices and other safety interventions. Expert industry opinion was accessed through survey questionnaires on the topic. The research literature on the topic was reviewed, with emphasis on the personal factors associated with risk and management approaches to reducing the problem. The literature review focused primarily on transportation operators in the truck and bus industry, but also includes other modes such as air, rail, and maritime.

Fleet safety managers are the principal audience for this paper. In addition, it should be useful to government, industry, and academic personnel involved in formulating and conducting studies to gain new knowledge (i.e., research) and to create new tools (development) relating to this safety topic.

One basis for the report was survey data collected from fleet safety managers, and other experts in motor carrier safety. Safety manager surveys were distributed primarily through a random sample mailing to carriers listed in the American Trucking Associations fleet directory. In addition, survey forms were sent to respondents from a previous study (also on carrier safety management) and, in order to obtain motorcoach segment respondents, some were distributed to members of the American Bus Association Safety Council. The overall safety manager survey return rate was about 15%, so the sample cannot be described as representing the CMV industry in general. Instead, it represents 178 *safety-conscious* managers from a variety of CMV operations.

A second survey sample consisted of 67 “other experts”. These are individuals professionally involved in fleet safety but who are not fleet safety managers. This includes 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 fleet safety-related professional experience areas.

The safety manager and “other expert” survey forms were parallel in their questions and content, but there was one key difference. Regarding management practices, safety managers were asked if they currently used the method and then, if “yes,” they were asked to rate its effectiveness. This yielded data on the percent of fleet managers actually using various methods, and opinions of effectiveness of respondents actually using the methods. For the “other experts,” parallel items elicited evaluation ratings only since there were no questions regarding use.

Perhaps the most fundamental question about high-risk commercial drivers is whether the problem is genuine and significant, and not just an artifact of chance or factors uncontrollable by drivers and their fleets. Survey findings strongly support the notion that the problem is real and significant, and that individual differences in safety among drivers are enduring. Empirical data cited from a number of studies corroborate this view, but do not sufficiently describe or explain the problem. In one typical cited study, for example, large individual differences were seen in the rate of driver involvement in traffic “near-miss” incidents, and 12% of the drivers in the study were associated with 38% of the incidents. However, the study did not track drivers for a long period of time to determine the degree of consistency of differential risk or the personal traits that could produce enduring individual differences in risk.

Many interacting factors affect commercial fleet driver crash involvement. The focus of this paper is on enduring personal risk factors. Nevertheless, at any given time, driver crash risk is affected by personal situational risk factors (e.g., hours of sleep the previous night), vehicle risk factors (e.g., brake adjustment), environmental factors (e.g., weather and roadway features), and, perhaps most importantly, risks created by other drivers in traffic. “Accident proneness” was originally conceptualized nearly 100 years ago. Early concepts of it considered it an innate, unitary trait, a view that is no longer widely held. However, it certainly appears that individual differences in personality and performance predispose some people to increased crash risk. Driver errors can be violations of rules, mistakes of judgment, inattention to errors, or inexperience errors. Common driver errors resulting in crashes include recognition errors (failure to perceive a crash threat) and decision errors (risky driving behaviors such as tailgating, or poor decision making in dynamic traffic situations (such as trying to cross a stream of traffic).

There are many personal dimensions that may be correlated with crash risk. In the survey, respondents were asked to rate the strength of association of 16 such factors with crash risk. Personality traits such as aggressiveness, impulsivity, and inattentiveness were rated by both respondent groups as having the highest associations with risk.

A number of factors potentially correlate with risk and may be the basis for safety interventions to reduce risk. Factors considered include:

- Driver age and gender
- Driving history

    - Commercial driving experience
    - Longevity with company
    - Crashes, violations, and incidents
    - Defensive driving
- Non-driving criminal history
- Medical conditions and health
    - Sleep apnea
    - Narcolepsy
    - Diabetes
    - Other medical conditions
- Alcohol and drug abuse
- Driver fatigue
- Personality
    - Impulsivity and risk-taking
    - Social maladjustment and aggressive/angry personalities
    - Introversion-extroversion
    - Locus of control
    - Extreme ("dichotomous") thinking
- Sensory-motor performance
- Other risk factors
    - Stress
    - Recent involvement in other crashes
    - Safety belt use
- Risks identified in other transportation modes
    - Marine operations
    - Rail
    - Aviation.

Fleet safety management approaches to preventing high-risk driver-related crashes revolve around the basic management functions of selection and hiring, performance evaluation, and driver safety management practices. The clearest advice to safety managers is, "Don't hire a problem." Methods for improving driver selection are reviewed in this paper, and job aids for safety managers are provided.

Once drivers are hired, there are various ways to monitor their driving behaviors and modify their behavior in easy that reduce risk. Performance evaluation and feedback (enhanced by on-board safety monitoring of driver behavior), training and counseling, performance incentives, behavior-based safety, and driver self-management are among the methods described. Of course, termination may be the ultimate solution when drivers are unmanageable from the safety perspective.

## Background: Illustrative Example

In an instrumented vehicle study of local/short haul (LSH) truck driving sponsored by the Federal Motor Carrier Safety Administration, Hanowski *et al* (2000) observed 42 truck drivers driving a total of 28,000 vehicle miles. The study identified 249 critical incidents (CIs), which were defined as significant unsafe driver actions or "near-crashes." Of these 249 CIs, 77 were related primarily to the actions and errors of truck drivers. Common critical incidents included running

late yellow or red lights and crossing traffic with insufficient gaps (i.e., approaching vehicles too close for safe crossing). The 42 truck drivers initiated 77 CIs in 1,376 hours of driving, yielding an average rate of 0.06 truck driver-initiated CIs per hour. Figure 1 shows the frequency distribution of CI/hour rates among the 42 drivers.

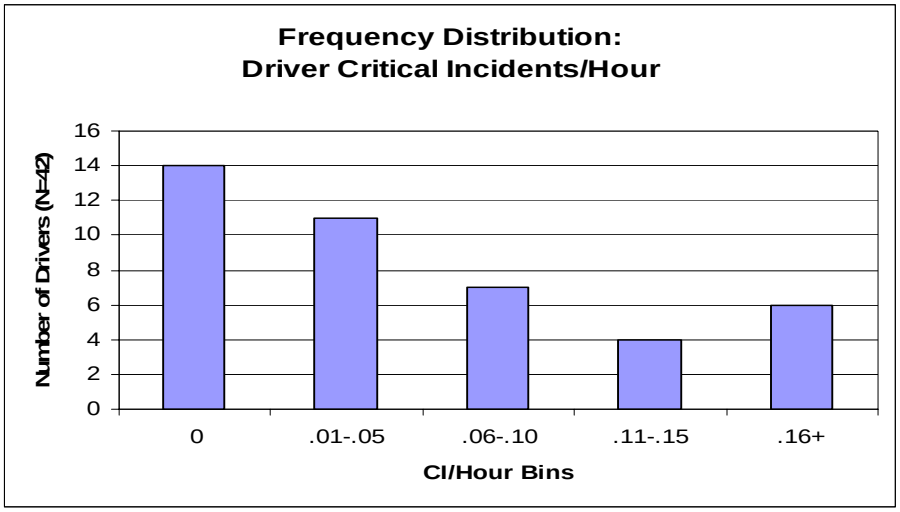


**Figure 1. Frequency Distribution of LSH Truck Driver Critical Incident Rate.**

Of the 42 truck drivers, six drivers had CI/hour rates greater than 0.15. These six drivers drove 12% of the total driving hours of the study but were responsible for 38% of all the truck driver-initiated CIs (29 of 77). In contrast, the 25 "best" of the 42 drivers (the first two bins in Figure 1) drove 63% of the hours driving but were responsible for 16% of the CIs. Figure 2 illustrates these exposure-risk relationships for the "worst" and "best" LSH drivers in terms of CI initiation.

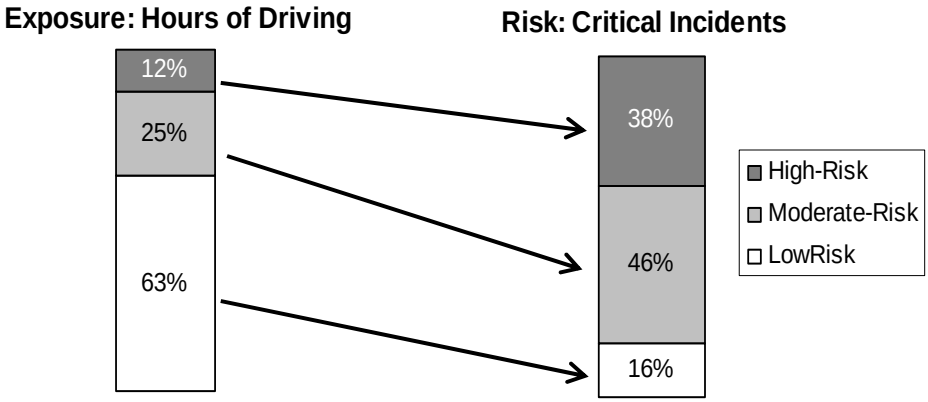


**Figure 2. Bar charts showing relation between exposure and CI risk for two extreme groups of drivers in the Hanowski et al (2000) LSH truck driver study.**

The study also continuously assessed driver alertness level, using a 5-point Observer Rating of Drowsiness (ORD) scale, which had previously been validated against physiological alertness measures. Levels 4 and 5 corresponded to "very" and "extremely" drowsy. The equipment malfunctioned for one driver, so there were 41 drivers in this sample. The 41 drivers had a total of 285 time episodes of level 4 or 5 on the ORD scale over 1,348 hours of driving, for an average rate of 0.21 high-drowsiness episodes per hour. Figure 3 shows the frequency distribution of high-drowsiness epochs for the 41 drivers.

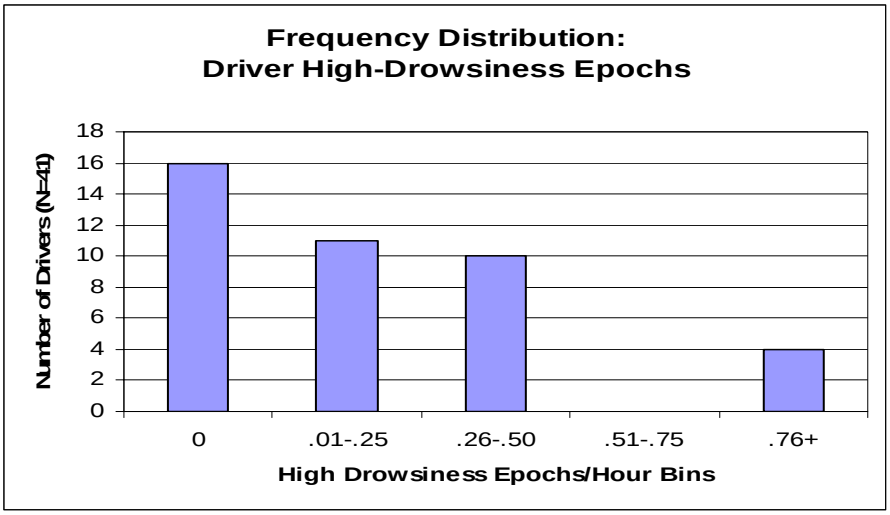


**Figure 3. Frequency Distribution of LSH Truck Driver High-Drowsiness Epochs.**

Four drivers had rates of more than 0.75 high-drowsiness episodes per hour. These four drivers drove 7% of the total driving hours but were responsible for 39% of all observed high-drowsiness episodes (112 of 285). There was also a moderate risk group (10 drivers) who had

29% of the exposure and 47% of the drowsy episodes. In contrast, the 27 most alert drivers (the first two bars in Figure 3) drove 64% of the hours driving but were responsible for only 14% of high-drowsiness episodes. Figure 4 illustrates the exposure-risk relationships for the high, moderate, and low-risk subgroups of LSH drivers.

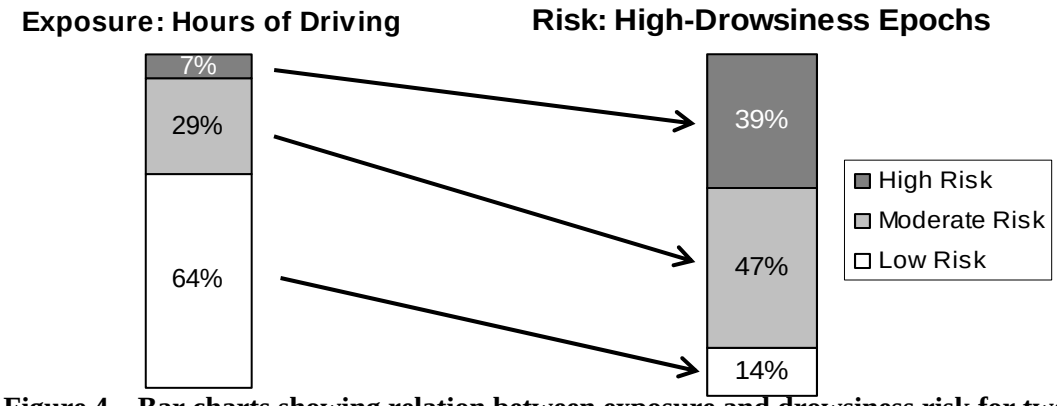


**Figure 4. Bar charts showing relation between exposure and drowsiness risk for two extreme groups of drivers in the Hanowski et al (2000) LSH truck driver study.**

The risk/exposure *odds ratios* between the "worst" and "best" groups of drivers identified here were **12.5** for CIs (i.e., 38%:12%/16%:63%) and **25.5** for high-drowsiness episodes (i.e., 39%:7%/14%:64%). In other words, on average, each high-risk driver in Figure 2 was 12.5 times more likely to be involved in critical incidents than each low risk driver. In Figure 4, the high-risk drivers were 25.5 times more likely to have drowsy episodes that were the low risk drivers.

There was only a small positive relationship between CI rate and ORD4/5 rate among the 41 drivers for which both types of data were available. The positive correlation suggests that drowsiness was a factor in CI involvement, but its low value suggests that it was not a predominant factor. Only one of the six high-CI drivers was among the four high-drowsiness drivers.

## Scope

The LSH study statistics were presented above to introduce and demonstrate the phenomenon of *high-risk* commercial drivers. Although commercial drivers generally drive responsibly and exhibit lower rates of most types of incident and crash involvement than drivers in general (FMCSA, 2003; Craft, 2004; Wang, Knipling, & Blincoe, 1999), it appears that there are significant safety-related individual differences among groups of drivers, and that a few commercial drivers have significantly elevated risk compared to their peers.

This paper will explore individual differences among commercial drivers and this "high-risk" commercial driver. The project will identify dimensions and factors relating to differences in commercial driver crash risk and assess ways that the high-risk driver can be targeted by various safety programs and practices, both at the fleet and industry-wide levels. Specifically, the study will:

- Summarize available information on individual differences in commercial driver safety performance and alertness.
- Examine various metrics and tests that might be used to hire better drivers and avoid hiring high-risk drivers.
- Identify safety management techniques that are currently used by commercial vehicle carriers to target problem drivers and their specific risky behaviors.

Although the study focuses primarily on heavy truck drivers, it will also address long-haul motorcoach drivers and, to a limited extent, the phenomenon of high-risk transportation operators in general. Most safety interventions discussed in the report are carrier management-related, and carrier safety managers are the major information source and intended audience for the study. However, a few of the safety approaches discussed are related to national regulatory and enforcement issues

The reasons and causes behind differential driver risk are by no means clear, and will be explored in this report. In the LSH study, for example, each driver was observed for only one week of driving. It's possible that the differences observed were related to long-term constitutional factors (e.g., enduring individual differences in aggression, risk-taking, health), short-term personal factors (e.g., temporary illness, lack of sleep due to a new baby at home), or even situational factors (e.g., weather, traffic variations, new delivery routes). The study collected no longitudinal data on drivers, and few truck safety studies seem to have done so.

### Approach

Information on high-risk commercial drivers and potential management solutions was obtained through several major approaches. The primary vehicle for obtaining information was project surveys. Two parallel survey forms were employed: one for current CMV fleet safety managers and one for other experts in motor carrier safety. . The safety manager and "other expert" survey forms were parallel in their questions and content, but there was a key difference in the way the management effectiveness-related questions were asked. Safety managers were asked if they currently used the method and then, if "yes," asked to rate its effectiveness. Thus, these questions yield data on the prevalence of industry use of the methods as well as subjective evaluations of them. The "other expert" survey provided data only on expert opinion since the questions regarding use of the methods were not applicable. Findings from these surveys will be the centerpiece of this report, although the authors concede that opinion surveys are not a substitute for empirical data

To supplement the expert survey, a focus group was conducted with staff members of the FMCSA, the major federal agency overseeing truck and bus safety. Supporting the survey and focus group findings is information obtained from literature reviews relating to the various personal correlates of driver risk and to safety management methods. The literature reviews employed Transportation Research Information System (TRIS) and other reference systems to identify relevant publications in the transportation literature. Also reviewed were FMCSA research publications and research journals on traffic safety, psychometrics, and industrial safety management.

## Survey Method & Results

## Method

A primary vehicle for obtaining information in this study was project surveys. Two parallel survey forms were employed: a) one for current CMV fleet safety managers and b) one for other experts in motor carrier safety. This section describes the survey methodology in more detail, and the next section of this chapter provides principal results.

A general consideration regarding most of the survey responses is that they represent subjective responses to subjective questions. A few questions were objective (e.g., questions asking safety managers whether or not they use a particular safety management practice), but most called for subjective judgments by respondents. Both groups were highly qualified to render such judgments, however, so the surveys could be said to capture expert opinion.

## Survey Design and Content

The safety manager and "other expert" survey forms contained 48 and 50 questions, respectively. These were divided into seven parts:

- Part 1: How Important is the Problem? This short section (3 questions) included both fill-in and multiple choice questions on the basic phenomena of individual differences in driver safety.

- Part 2: Driver Factors Associated with Risk. Questions 4-19 on both forms listed personal driver traits and, using a five-value Likert scale (0-4), asked respondents to rate the association (correlation) of the factor with driver risk.

- Part 3: Driver Hiring Practices and Tools. For the "other experts," this section (Questions 20-27) listed eight hiring practices and asked respondents to rate the effectiveness of each using the same five-point (0 to 4) Likert Scale. For the safety managers, the section was entitled, "Which Driver Hiring Practices and Tools Do You Regularly Use?" and included two parts for each question. First, the respondent circled "yes" or "no." Then, the instructions stated, "If 'Yes,' please rate effectiveness." Consistent with these instructions, safety manager data for the Likert scale were entered only if respondents circled "yes" to the first part of each question. On question #26 ("Selection Tests"), safety managers responding "yes" were also asked to write in the selection test(s) they use.

- Part 4: Driver Evaluation. This section consisted of just four questions (Questions 28-31) and had the same instructions as Part 3. For safety managers, it was entitled, "How Do You Evaluate Drivers in Your Fleet?"

- Part 5: Driver Management. This section contained 12 questions (32-43) and had the same instructions as Parts 3 and 4. Even though the individual questions were parallel between the two respondent groups for Parts 3, 4, and 5, the instructions for answering most of the questions (Questions 20-43) were different. "Other Experts" were answering for commercial fleets and drivers in general, whereas safety managers were answering in relation to their own practices (yes or no) and then rating effectiveness in relation to their own fleets.

  Part 5 also contained two three-choice questions relating to positive, reward-based safety

management practices versus "disciplinary" approaches. These two questions were identical on the two forms.

- Part 6: Comments. Three lines of blank space were provided on each form. Respondents were asked to comment on high-risk drivers and/or any questions of the survey. This information on the completed forms was reviewed separately and reported selectively in this report.

- Part 7: Respondent Information. For "other experts," the last section contained two questions relating to years of experience and types of positions held. For safety managers, the section contained four questions: two on their personal years of experience and two on the size and operation type of their fleet.

## Survey Distribution and Analysis

The two forms of the survey (Carrier Safety Manager and "Other Expert") were distributed primarily by U.S. Mail. Potential carrier safety manager respondents were identified primarily from the North American Truck Fleet Directory published by Transport Topics Press in conjunction with the American Trucking Associations, Inc. A nationwide random sample of approximately 700 carriers was selected from the database accompanying the directory. In addition, 100% samples were selected from the directory for the geographic areas around Blacksburg, VA (location of Virginia Tech and VTTI), Northern VA (location of the VTTI Principal Investigator), and Iowa City, IA (location of the University of Iowa). Letters to the large national sample and these geographic samples were addressed to "Fleet Safety Director" at the selected carriers. Other survey recipients were respondents from CTBSSP Synthesis #1 for whom contact information was available. Most of these individuals were active in industry trade association safety counsels, since that was the primarily distribution vehicle for those surveys. Finally, to ensure an adequate subsample of motorcoach fleet safety managers, survey forms were distributed directly to attendees at a Safety Counsel meeting of the American Bus Association. All survey forms were accompanied by a cover letter and a stamped envelope addressed to project personnel at VTTI in Northern Virginia (primarily), VTTI in Blacksburg, or at the University of Iowa. Altogether, approximately 1,000 safety manager survey forms were distributed. Carrier Safety Manager respondents were promised an *Adobe* (pdf) copy of the Synthesis #1 report (distributed by e-mail), and both Adobe (pdf) and hard copies of the present study upon its completion. Respondents in the three geographic areas were also invited to a project briefing, to be held at each location after the study's completion.

Even though most of the carrier safety manager survey distribution sample was randomly generated from a national directory, the safety manager respondent sample is perhaps best considered as a convenience sample. Study resources did not permit the design of a systematic subject sampling and survey distribution process or the tracking of survey return rates for various respondent groups. Moreover, those who complete and return a survey of this nature are likely to be those most interested in the topic and committed to support efforts relating to it. The authors consider the current sample of survey respondents to primarily consist of "safety conscious" motor carrier safety managers. Also, because there was a special effort to obtain passenger carrier fleet respondents, their percentages in the respondent sample (13% long haul/motorcoach; 4% local/transit) were high compared to the overall commercial motor transport industry.

The "Expert" survey form was distributed primarily to professional associates of the principal investigator. Many had been respondents to a previous synthesis study. Many were individuals

active in TRB truck & bus safety activities; in particular, the Committee on Truck & Bus Safety Research (ANB70). In addition to the mail distribution of approximately 125 surveys, about 30 were distributed directly during the 2004 TRB annual meetings, and a few were completed by FMCSA employees during a project focus group held on the topic. Obviously, this group is highly involved in motor carrier safety and has extensive knowledge and experience relating to the topic, although most did not and had not worked for a motor carrier. More information on their backgrounds is provided below.

All survey responses were confidential and there is no attribution of responses by individual, company name, or other organizational affiliation in this report. Statistics are cited in the report for the two major (and separate) respondent groups: fleet safety managers and other experts.

## Principal Survey Results

Part 1: How Important is the Problem?

The first few questions of the survey were intended to assess respondents' views on the importance of the high-risk driver phenomenon. These were the most conceptual of the questions of the survey. Respondents were asked to attribute percentages of crash risk to "behavior/skill" and to "uncontrollable factors (i.e., luck)." Implicit in this question is the idea that the concept of high-risk drivers assumes that there are significant behavior/skill differences among drivers. Both respondent groups averaged around 70% in their attribution of crash risk to behavior/skill, although the safety manager attribution was a few percentage points lower and more variable.

Respondents were asked a hypothetical question designed to elicit a respondent assessment of the degree to which high-risk drivers are a problem for fleets. The "null" answer would be "a", since it implies that there is little or no high-risk driver problem. The majority of both respondent groups believed that the worst 10% of drivers were associated with 50% or more of fleet crash risk.

| RESPONSE CHOICE: | SAFETY MANAGERS | OTHER EXPERTS |
|---|---|---|
| **Worst 10% → 10% of problems** | **6%** | **0%** |
| **Worst 10% → 20% of problems** | **6%** | **6%** |
| **Worst 10% → 30% of problems** | **14%** | **19%** |
| **Worst 10% → 40% of problems** | **15%** | **21%** |
| **Worst 10% → 50+% of problems** | **59%** | **54%** |

**Table 1. Survey Results: Disproportion of Risk.**

Respondents were also asked to assess how consistent and enduring individual differences in crash risk are. About two-thirds of both respondent groups believed that there is a "strong tendency" for individual differences in crash risk to be consistent and enduring year-to-year.

| RESPONSE CHOICE: | SAFETY MANAGERS | OTHER EXPERTS |
|---|---|---|
| Risk can change dramatically | 10% | 0% |
| [Moderate consistency] | 25% | 35% |
| Risk stays about the same | 65% | 65% |

**Table 2. Survey Results: Question #3 – Consistency of Individual Differences.**

Part 2: Driver Factors Associated with Risk

Respondents were asked to rate 16 personal factors with regard to their strength of the association with and crash risk. The Likert scale went from "0" (no association) to "4" (strong association). Respondents in both groups rated personality traits such as aggressiveness, impulsivity, and inattentiveness as having the highest associations with risk. The lowest rated associations were for "did not attend formal truck driving school," introversion, and obesity. The factors, mean ratings (the nearest tenth), and rankings are presented in order of safety manager ranking in Table 3. When there are ties in the mean ratings, rankings were determined by looking at additional decimal places. However, for simplicity, these are not shown in the tables. Across the 16 items, there was strong agreement between the safety managers and the "other experts" in their mean ratings.

| DRIVER RISK FACTOR: | SAFETY MANAGERS | | OTHER EXPERTS | |
|---|---|---|---|---|
| | Mean | Rank (of 16) | Mean | 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 w/ job/company | 2.6 | 5 | 2.4 | 7 |
| Young driver (e.g., less than 25) | 2.5 | 6 | 3.1 | 5 |
| Sleep apnea/other sleep disorder | 2.4 | 7 | 2.9 | 6 |
| Unhappy marriage/family prob. | 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 (e.g., 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 |

**Table 3. Survey Results: Driver Factors Associated with Risk.**

Part 3: Driver Hiring Practices and Tools

Part 3 presented eight hiring practices and tools and asked safety managers to first indicate whether they used the practice, and then, if "yes," to rate its effectiveness (again using a 5-choice 0-4 Likert scale). For "other experts", there was no "yes-no" question regarding use; instead, they just rated the effectiveness of the practice. Thus, the safety manager ratings here are based on actual use of the practice/tool, whereas the "other expert" ratings were not. Among the most frequently used, and highest rated, 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.

| HIRING PRACTICE/TOOL: | SAFETY MANAGERS | | | OTHER EXPERTS | |
|---|---|---|---|---|---|
| | % Who Use | Mean | Rank (of 8) | Mean | Rank (of 8) |
| Check MVR | 100% | 3.4 | 1 | 3.2 | 1 |
| On-road driving test | 88% | 3.3 | 2 | 3.1 | 2 |
| Test for drug/alcohol | 99% | 3.3 | 3 | 2.8 | 4 |
| Use third-party service | 46% | 3.1 | 4 | 2.3 | 8 |
| Contact past employer | 99% | 3.0 | 5 | 3.0 | 3 |
| Check criminal record | 61% | 3.0 | 6 | 2.7 | 5 |
| Selection tests | 26% | 2.9 | 7 | 2.4 | 6 |
| Check credit history & Rating | 21% | 2.4 | 8 | 2.3 | 7 |

**Table 4. Survey Results: Driver Hiring Practices and Tools.**

Part 4: Driver Evaluation

Part 4 presented four driver evaluation practices. The instructions were the same as in Part 3 for the two respondent groups. "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.

| EVALUATION PRACTICE: | SAFETY MANAGERS | | | OTHER EXPERTS | |
|---|---|---|---|---|---|
| | % Who Use | Mean | Rank (of 4) | Mean | Rank (of 4) |
| Continuous tracking: crashes, etc. | 99% | 3.3 | 1 | 3.6 | 1 |
| On-board electronic monitoring | 31% | 3.0 | 2 | 3.2 | 2 |
| Periodic observation of driving | 82% | 3.0 | 3 | 3.0 | 3 |
| "How's My Driving" placards | 24% | 2.7 | 4 | 1.9 | 4 |

**Table 5. Survey Results: Driver Evaluation Practices.**

Part 5: Driver Management

Part 5 presented 12 driver management practices. The instructions were the same as in Part 3 for the two respondent groups. Among safety managers, reprimands (verbal and written) and

manager counseling were among the most-used methods. Among the safety managers who used the methods, "monetary penalties," "suspension from service," and "monetary rewards" received the highest effectiveness ratings. There was surprisingly little variation in the mean ratings given to the 12 safety management methods by safety manager users of these methods.

The "other expert" respondents rated the effectiveness of the 12 methods somewhat differently from the safety managers. Monetary rewards were rated highest in effectiveness among the 12 methods, which was consistent with the safety manager relative ratings. Ratings of other methods tended to differ more between the two groups, however. Among the other experts there was also relatively little variation in effectiveness rating across the 12 methods.

| | SAFETY MANAGERS | | | OTHER EXPERTS | |
|---|---|---|---|---|---|
| MANAGEMENT PRACTICE: | % Who Use | Mean | Rank (of 12) | Mean | Rank (of 12) |
| Monetary penalties | 48% | 3.1 | 1 | 2.6 | 8 |
| Suspension from service | 84% | 3.0 | 2 | 2.7 | 7 |
| Monetary rewards | 38% | 3.0 | 3 | 2.9 | 1 |
| Written reprimand | 94% | 2.8 | 4 | 2.4 | 10 |
| Counseling by manager | 87% | 2.8 | 5 | 2.5 | 9 |
| Teach drivers to self-manage | 31% | 2.8 | 6 | 2.3 | 11 |
| Remedial training | 69% | 2.7 | 7 | 2.8 | 2 |
| Non-monetary rewards | 60% | 2.7 | 8 | 2.8 | 4 |
| Senior driver ride-alongs | 28% | 2.7 | 9 | 2.8 | 3 |
| Manager ride-alongs | 45% | 2.7 | 10 | 2.8 | 6 |
| Verbal reprimand | 97% | 2.7 | 11 | 2.0 | 12 |
| Counseling by senior driver | 19% | 2.6 | 12 | 2.8 | 4 |

**Table 6. Survey Results: Driver Management Practices.**

Respondents were asked to weigh the relative effectiveness of rewards and "discipline" for drivers in general and for problem drivers. Both groups tended to favor rewards for drivers in general but "discipline" for problem drivers. Among both respondent groups, there were fairly large percentages that chose "equal impact."

| RESPONSE CHOICE: | SAFETY MANAGERS | | OTHER EXPERTS | |
|---|---|---|---|---|
| | Drivers in General | Problem Drivers | Drivers in General | Problem Drivers |
| Rewards | 28% | 12% | 52% | 12% |
| Discipline | 17% | 52% | 9% | 46% |
| Equal Impact | 55% | 36% | 39% | 42% |

**Table 7. Survey Results: Which has stronger influence: rewards or discipline?**

Part 6: Comments

A space was provided for written comments. About half of the Safety Managers and Other Experts made such comments. The comments focused on a variety of issues and expressed many different views. A number are cited in various sections of this report.

Part 7: Respondent Information

Both survey forms asked respondents to provide some general demographic information about themselves and, for safety managers, their fleets. Key points are summarized below.

*Safety Managers*

The 178 safety manager respondents had been safety managers for an average of 12.8 years (range: 1 to 43) and had an average of 22.1 total years experience in CMV operations (range: 1 to 50). Fleet size varied widely, ranging from 3 to 4,500 power units. The median fleet size was 50 and the arithmetic mean was 184.

Respondents were asked to characterize their fleet's primary operation by selecting one of seven major truck and bus operation types or writing in an alternative. Results are shown in Table 8 below. The percentages sum to somewhat more than 100% (113%) because some respondents circled two or more operations types.

| OPERATION TYPE | % SAFETY MANAGERS |
|---|---|
| **For hire: long haul/truckload.** | **39%** |
| **For hire: long haul/less-than-truckload (LTL)** | **7%** |
| **For hire: local/short haul (most trips < 100 miles)** | **12%** |
| **Private industry: long haul** | **9%** |
| **Private industry: local/short haul (< 100 miles)** | **19%** |
| **Passenger carrier: long haul/motorcoach** | **13%** |
| **Passenger carrier: local/transit** | **4%** |
| **"Other" (mostly variations of above types)** | **10%** |

Note: Sums to more than 100% because some fleets had more than one operation type.

**Table 8. Survey Results: Safety Managers' Fleet Operation Types.**

*Other Experts*

The years of motor carrier safety experience of the 67 "other expert" respondents ranged widely from 3 years to 43 years. The mean was 17.7 and the standard deviation was 10.5. These respondents were also asked to indicate their professional experience areas relating to motor carrier safety. The breakdown is shown in Table 9. The percentages shown sum to well over 100% because most respondents gave multiple responses. The results show that the experience base of the other experts was both extensive and varied, with heavy representation of individuals with backgrounds in government, accident investigation/data analysis, research, and industry trade associations.

| EXPERIENCE AREAS: | % OTHER EXPERTS |
|---|---|
| Government enforcement | 27% |
| Other government (e.g., rulemaking) | 49% |
| Industry trade association | 30% |
| CMV driver | 12% |
| Carrier safety manager | 12% |
| Other carrier management position | 9% |
| Safety consultant or vendor to fleets | 22% |
| Accident investigation/data analysis | 39% |
| Motor carrier safety research | 63% |
| Journalist | 3% |
| Driver trainer | 10% |
| Insurance for motor carriers | 9% |
| Other (e.g., training developer, manufacturer) | 7% |

Note: Sums to well over 100% because many respondents had multiple experience areas.

**Table 9. Survey Results: "Other Expert" Experience Areas.**