CHAPTER **5**

DISCUSSION OF SELECTED SAFETY OPPORTUNITY AREAS

This chapter describes four study topics selected by the authors as areas of great safety opportunity for truck and bus transportation. For all four topics, the research literature and other information about the industry indicate that significant safety gains are possible by focusing on the issue or employing the safety management methodology. The four issues are (1) driver health, wellness, and lifestyle; (2) high-risk drivers; (3) behavioral safety management; and (4) safety management professionalism.

The first two of these issues are problem areas receiving high importance ratings in the survey and for which there is also strong research evidence and industry consensus highlighting their importance. The second two are general approaches to improved safety management, both of which involve various specific techniques. In the survey, these two solution areas generally did *not* receive relatively high ratings of safety management effectiveness by respondents. Yet, there is scientific literature and other rationales for believing that these approaches could have a significant positive impact on the CMV industry if employed.

These four topics provide many R&D needs and opportunities, that is, areas where new knowledge or new tools could have significant impact. These R&D needs are enumerated at the end of each topic discussion.

5.1 DRIVER HEALTH, WELLNESS, AND LIFESTYLE

5.1.1 The Driver Health Problem

Few studies have assessed the true national burden of poor health. Identification of the prevalence rates of various physical and medical conditions for different occupations is a first step in designing prevention techniques. Unfortunately, even when there is increased attention to and knowledge of health risk factors, obesity, physical inactivity, poor diet, and other "behavioral health" problems have all been on the rise since 1990 (Nelson et al. 2002). The economic importance of these trends is highlighted by the fact that 125 million people in the United States work for a living (Leigh and Miller 1998).

Truck and bus drivers appear to be at risk for a variety of physical as well as mental disorders. Congressional reports have indicated that "job stress, work posture, dietary habits, vibration, noise, carbon monoxide exposure, and postural fatigue" among CMV drivers are factors associated with an increased risk of detrimental health effects (U.S. DOT 1988). A nationwide analysis of occupational illnesses by the Bureau of Labor Statistics found that commercial drivers were more likely than most other occupations to have various disorders, ranging from myocardial infarctions to neurotic reactions to stress (Leigh and Miller 1998). The project team's survey findings suggest that both safety managers and other experts are aware health and wellness issues are a significant problem in CMV operation. Of the 20 safety problems presented to respondents, "driver health and wellness—lifestyle and general health" was rated No. 3 in importance by fleet safety managers and No. 6 by other experts. However, these two groups rated fleet-based medical and health and wellness programs relatively low in effectiveness. This implies a need for more systematic approaches in identifying health and wellness risk factors and assessing primary prevention techniques for CMV drivers.

Each year, an estimated 300,000 U.S. adults die from obesity-related causes. Obesity has been associated with an increased risk of diabetes, hypertension, myocardial infarction, and strokes. In 2000, the prevalence of obesity in the United States was 20%. In a survey conducted by Korelitz et al. (1993), the prevalence of obesity in commercial drivers was 33%. Further, 73% (compared to 66% in the U.S. population) of commercial drivers were considered overweight.

Contributing to the increased risk of obesity in commercial drivers are their poor eating habits and inactivity levels. Their working conditions include irregular work and rest cycles, long working hours, and irregular mealtimes, all of which contribute to potential poor nutrition and activity habits. More than 50% (compared to 27% in the U.S. population) of commercial drivers indicated they never participated in any physical activity, while less than 10% reported exercising regularly (Korelitz et al. 1993). Eighty percent of commercial drivers reported eating only one to two meals per day, with the preferred meal being a steak or hamburger (Holmes, Power, and Walker 1996).

Hypertension is one result of obesity, poor eating habits, and lack of physical activity. Commercial drivers were comparable to the national norm for high blood pressure, but they are often unaware of it. Sixty-six percent of commercial drivers with high blood pressure had not been informed by a doctor, compared with 46% of the general U.S. population.

The exact performance effects and safety toll resulting from poor driver health are not known, but it stands to reason that the overall driving performance levels of commercial drivers are significantly reduced by various health problems. For example, obesity is a major risk factor for cardiovascular illness, diabetes, and sleep apnea—all conditions associated with elevated crash risk. The high importance rating given to the health and wellness problem in the surveys is further evidence that a consensus is developing about the need to address this industry problem effectively.

5.1.2 Motor Carrier Wellness Programs

As discussed briefly in Chapter 4, the FMCSA, American Transportation Research Institute (ATRI, formerly the ATA Foundation), the NPTC, and Sue Roberts Health Concepts have partnered to assess commercial driver wellness needs and to design, develop, and evaluate a driver wellness program (Roberts and York 2000). This program represents a small, but tangible and seminal effort to introduce wellness as a health and safety initiative in CMV transport.

In their survey and design study, Roberts and York (2000) found few CMV fleets with comprehensive health and wellness programs for their drivers. Such comprehensive programs may include health screenings, identification of the prevalent health problems of the company's drivers and associated lifestyle issues (e.g., diet, exercise), design and delivery of wellness education and counseling, fitness programs and subsidies for fitness club memberships, and continuing promotional activities such as lunch seminars and fitness-related stories in company newsletters.

Health assessment protocols might include the following activities, supervised and conducted by qualified health professionals: (a) testing health knowledge, (b) testing self-knowledge (e.g., do drivers know their blood pressure levels?), (c) written lifestyle assessment, (d) blood testing (e.g., cholesterol, glucose), (e) blood pressure and pulse measurement, (f) weight and body mass index determination, (g) aerobic fitness testing, flexibility testing, and (h) strength testing.

Roberts and York (2000) contacted 23 trucking companies and found 6 who had health and wellness programs they were willing to describe in the phone interviews. All six were from large fleets, ranging from 500 to more than 10,000 drivers. By-and-large, these programs were rudimentary and did not appear to be effective. For example, participation rates among drivers were generally very low.

In the current survey, medical screening and counseling and general health and wellness counseling were employed by less than one-half of the responding safety managers, even though the survey sample was largely reflective of the most safety-conscious managers of larger fleets—the fleets most likely to have such programs.

In recent years, the ATAF, working with the NPTC and with funding from FMCSA, has developed a "Gettin' in Gear" multimedia driver wellness program. This program, described in an FMCSA "tech brief" (FMCSA 2000), includes audio tapes and workbooks for drivers focusing on four aspects of health and wellness:

- Refueling: healthy eating habits;
- Relating: relationships with family and friends;
- Rejuvenating: exercise; and
- Relaxing: managing stress.

In a pilot administration of the program, a group of drivers were presented the program along with follow-up individual coaching. Although the results of the pilot test were somewhat mixed, the drivers did show improvements in health lifestyle and, in particular, exercise and fitness. Marketing of "Gettin' in Gear" will target several audiences: (a) drivers, (b) fleet owners, (c) safety managers, or (d) other decision makers who might recognize the importance and potential effectiveness of these programs.

"Gettin' in Gear" developers have recommended a promotional plan to widely publicize the program and train-the-trainer sessions that are offered by ATRI to introduce the program to carriers and prepare safety managers to provide the training to drivers. Successful dissemination of "Gettin' in Gear" will hopefully encourage fleets to provide more comprehensive health and wellness services to their drivers and encourage drivers to begin a "wellness journey" (FMCSA 2000; Roberts and York 2000).

Roberts and York (2000) enumerate the many organizational elements necessary for successful programs including the following:

- Strong and clear commitment from senior management;
- Financial and personnel support;
- Strong program leadership;
- Staffing with effective and qualified professionals;
- Thorough and accurate needs assessment;
- Understanding the stages and processes of behavior change;
- Effective marketing and communication;
- Accessibility for drivers;
- Attractive physical environment (e.g., fitness facility);
- Individualized to meet needs of different drivers; and
- Sound evaluation and continuous program improvements.

The FMCSA has announced an education and outreach program focusing specifically on the problem of obstructive sleep apnea among CMV drivers. A recent FMCSA-sponsored study (Pack et al. 2002) described in Chapter 3 found that nearly 30% of CDL holders suffer from some degree of sleep apnea, and that severe sleep apnea is associated with significant deficits in driving-relevant task performance. Solicitation DTMC75—02-R-00133, announced by the agency in September 2002, will fund the design, development, evaluation, and implementation of a multi-tiered Internet-based

education/outreach program for use by drivers, motor carriers, and shippers/consignees that addresses the problem of sleep apnea and best practices for dealing with it in operational CMV settings.

5.1.3 R&D Needs

Compelling R&D needs relating to the commercial driver health and wellness problem and deployment of fleet-based wellness programs and practices include the following:

- Quantitative determination of the role that various physical and medical conditions play in driver productivity and safety, including assessment of economic impacts so that cost-effectiveness of inventions targeting various conditions can be assessed.
- Evaluation of the "Gettin' in Gear" wellness program (and similar programs such as the planned sleep apnea education/outreach program) in various fleet settings to demonstrate the value of the program and determine the conditions under which it is most successful. This should include close follow-up with individual driver participants to see the degree to which the program changes attitudes and behaviors.
- Development of more comprehensive wellness programs comparable to those employed in other U.S. industries. Extensive information and resources relating to these programs exists; they simply need to be adapted for the CMV operational setting and the unique requirements of trucking operations. Such programs, if well-designed, packaged, and marketed, would likely be adopted by enough fleets to constitute a reliable test bed for evaluation and springboard for cultural changes needed to make health and wellness the norm, rather than the exception, among CMV drivers.

5.2 HIGH-RISK DRIVERS

5.2.1 Problem Importance

One of the very highest rated problem areas in the survey was Item 15, as follows: "High-risk drivers [all causes combined]; i.e., the extent to which managers should focus on the worst 10-20% of drivers." For safety managers, this problem area was rated second in importance of the 20 problem areas, and for other experts it was rated the highest overall.

This is not a specific problem or shortcoming of drivers, like fatigue or poor defensive driving, but rather a subpopulation of drivers representing a particular concern for safety managers and others involved in motor carrier safety. Many studies of driver safety and performance have noted the skewed distribution of crashes and other safety behavior indices among groups of drivers. Reliably, a relatively small percentage of drivers accounts for a much larger percentage

of crashes. To an extent, this is to be expected based on simple probabilities; even if crashes were completely random events, some individuals would be unlucky and be involved in multiple crashes, while many others would be lucky and have no crashes. The Poisson probability function describes the distribution resulting from *random* discrete events, where one occurrence has no effect on subsequent ones, so that some specific outcomes can occur more than once while many others do not occur at all.

Random occurrence may contribute to a disproportionate distribution of crashes and other incidents among drivers, but available research and industry opinion support the view that the effect is primarily due to variations in driver safety behavior. As described briefly in Chapter 3, an FMCSA-sponsored instrumented vehicle study found that, of 42 local/short-haul drivers and 77 truck-driver-caused incidents, two drivers (4.8%) accounted for 26% of the incidents; and eight drivers (19%) accounted for 60% of the incidents (Hanowski et al. 2000). Fourteen (33%) of the drivers were involved in no incidents. In a study of long-haul drivers that employed similar instrumentation and monitoring (Dingus et al. 2001), 56 drivers were involved in 24 collisions or near-collisions. Of these, a single driver was responsible for seven of the events, while four drivers (7.1%) had a combined involvement in 13 events (54%). In the FHWA Driver Fatigue and Alertness Study, Wylie et al. (1996) found that, of 80 drivers in the study, 11 (14%) accounted for 54% of the drowsy episodes. In an experimental study of the effect of sleep deprivation on alertness, Dinges et al. (1998) found wide variations in the level of performance decrement among 14 subjects. A subset of these subjects accounted for a disproportionate number of performance lapses. Four of the subjects were retesting using the same sleep deprivation protocol several months later and exhibited almost identical relative patterns of performance deterioration, suggesting large, enduring individual differences in the ability to sustain alertness during sleep deprivation.

Industry safety experts are aware of this variation in driver safety and the paramount need to incorporate this awareness into fleet safety management. For example, the following 4 relevant recommendations were among the top 10 safety recommendations resulting from the 2002 International Truck and Bus Safety Research and Policy Symposium at Knoxville (Zacharia and Richards 2002):

- Standardized entry-level driver training and remedial training for problem drivers.
- Information systems to provide driver risk data to fleets (e.g., employment history, physical qualifications, training, crash and traffic violation history, and prior drug/alcohol records).
- Behavioral research and analysis to identify high-risk drivers exceeding reasonable driving parameters such as hard braking, moving violations, HOS violations, and complaints from the public.

- Improved "people management" information and skills relating to selection and retention of safe drivers.

5.2.2 Past Behaviors Predictive of Driver Crash Rates

Individual characteristics known to affect future crash and incident involvement include: (a) prior history of crashes and traffic convictions, (b) being young, (c) being male, (d) being inexperienced, (e) increased exposure, that is, miles traveled, (f) poor social adjustment, (g) being poorly educated, (h) some personality traits, and (i) previous criminal record (Peck 1993).

Prior traffic violations are one way to predict future crashes and incidents. Rajalin (1994) randomly selected 615 non-commercial drivers involved in fatal crashes and 143 drivers stopped by police for risky driving from prior driving records. He found that drivers involved in fatal crashes and risky driving had significantly more traffic offences prior to these incidents than other drivers. These high-risk drivers were more likely to receive speeding tickets and be involved in running-off-the-road crashes than other drivers. Chen, Cooper, and Pinili (1995) examined nearly two million drivers' records and discovered a consistent increase in crashes and convictions for those drivers who had prior traffic convictions and at-fault crashes. The authors suggested that identifying high-risk drivers by their at-fault crashes as opposed to prior traffic convictions would result in identifying 23% more high-risk drivers.

Young males are more likely to be involved in crashes and incidents than other groups (Peck 1993; Rajalin 1994; Abdel-Aty and As-Saidi 1999). Driving experience can also affect future crash involvement. Cooper, Pinili, and Chen (1994) examined driving exposure and crash involvement (culpable and nonculpable) in 149,000 inexperienced non-commercial drivers between the ages of 16 and 55. Inexperienced drivers, when compared to experienced drivers of the same age, were involved in more culpable vehicle crashes: however, there was no difference between groups when assessing nonculpable crashes.

5.2.3 Psychometric Approaches to Predicting Commercial Driver Crash Risk

While driving history and some demographic characteristics may help predict crash risk, the deeper question is whether there are personal cognitive or behavioral traits that can be used to identify and better understand high-risk drivers. For example, West, Elander, and French (1993) surveyed 711 non-commercial drivers and found that individuals with the Type-A behavior pattern (sense of time urgency, competitiveness, alertness, and ambitiousness) and low thoroughness in decision-making style (tendency not to plan ahead or approach decision making in a logical manner) were

more likely to be involved in a vehicle crash. These individuals have also been shown to hold a risk/sensation-seeking attitude, characterized by their involvement in high-risk activities, such as drinking and driving. Aggressive, sensation seeking, and low emotional stability drivers were judged to have lower levels of driving skill when driving on a simulated driving course (Deery and Fildes 1999). Dewar and Olson (2002) provide a lengthy discussion of individual differences relevant to driving safety, including its relationship to personality traits such as neuroticism, extraversion, aggressiveness, "fatigue proneness," and on the positive side, conscientiousness.

The FMCSA R&T program, through the U.S. DOT Small Business Innovation Research (SBIR) program, has a project underway to develop a low-cost driver assessment tool for use during applicant screening (FMCSA 2001c). The PC-based driving simulation will attempt to measure safety-related cognitive skills, vigilance, performance capabilities, and behavioral tendencies. The device will present drivers with simulated traffic situations requiring safe vehicle control, recognition of crash threats, defensive driving behaviors, decision making, and execution of appropriate evasive maneuvers. The device is envisioned primarily as a selection tool, although it could also be used to assess and counsel current drivers (FMCSA 2001c).

The *Truck Driver Risk Assessment Guide* (ATAF 1999b) describes several psychological tests (mostly personality and occupational interest profiles) that are commercially available to fleets.

A 4-min paper-and-pencil or computer-administered sensory-motor test that requires subjects to connect numbered and alphabetized boxes presented in random patterns or increasing complexity has been developed as a driver crash risk assessment instrument. The developer of the test claims that it "identifies the 20% of drivers who have about 60% of the collisions." The developer cites a study of the Metropolitan Atlanta Rapid Transit Authority (MARTA) transit drivers in which 39 of 51 drivers were correctly classified as low or high risk based on test results. More specifically, the test identified 17 of 23 high-risk drivers (based on preventable collisions for a period of 2 years before the test) and 22 of 28 low-risk drivers. The developer claims that a 25% reduction in fleet collisions is a "realistic expectation" if the test is used as a selection tool.

While the above findings are tantalizing, they do not constitute a large, reliable, and public domain database of commercial driver personality and behavioral factors, metrics for assessing them, or quantitative relations to crash risk. Sharper and more extensively verified tools are needed to identify and quantify specific driver physical, performance, or personality characteristics associated with crash involvement. Boyle, Meltzer, Hitz, and Knipling (2002) suggest using a case-control design to estimate the relative crash risks associated with individual driver characteristics. In a collaborative planning study involving the Volpe National Transportation

Center and the FMCSA, a methodology and project plan were developed to compare crash-involved to non-crash-involved commercial drivers to determine the relative risk associated with selected driver characteristics (e.g., age, years of experience, training, violations, crash history, sensory-motor performance), physical/medical qualifications (e.g., vision, hearing, diabetes, epilepsy, sleep apnea), vehicles (e.g., configuration, load), schedule factors (e.g., work schedule, time-of-day), and environmental factors (e.g., weather, roadway). The study would derive odds-ratios and other statistical metrics of the quantitative risk associated with every factor measured including, potentially, dozens of driver physical, medical, performance, and personality dimensions, as well as various vehicle and environmental factors.

5.2.4 Intervention

The existence of high-risk drivers presents both a problem and an opportunity to safety managers; the opportunity is to find ways to eliminate the high risk and resulting outcomes associated with a few drivers, either by avoiding the hiring of these drivers, terminating their employment if hired, or successfully changing their driving behavior patterns. Survey respondents from the I-95 Corridor Coalition Field Operation (Stock 2001) indicated a variety of hiring criteria aimed at identifying high-risk drivers including the following:

- Between 77% and 93% of respondents turn down applicants if their driving records are below company mandated standards.
- Nearly every manager responded contacted prior employers to validate the driver's employment history.
- Many respondents required new applicants to complete psychological profile tests to assess for risk-taking, psychological well-being, and personality characteristics.

The current survey included a number of specific safety management approaches applicable to high-risk drivers. The following were among the most frequent and highest-rated of the 28 safety solutions by safety-conscious safety managers:

- Hiring based on criteria relating to driver crash, violation, or incident history (90% use; 2nd highest effectiveness rating).
- Requiring that new hires meet or exceed a minimum number of years of experience (86% use, 4th highest rating).
- Continuous tracking of driver's crashes/incidents/violations (92% use, 3rd highest rating)
- Remedial training programs for problem drivers (69% use, 10th highest rating).

Risk ultimately translates into behaviors, either unsafe driving behaviors that create increased risk or the lack of defensive driving behaviors to avoid risk. Behavioral safety management approaches, to be described in-depth in Section 5.3, are intended to directly target and reduce such behaviors.

5.2.5 R&D Needs

Future work on the high-risk commercial driver is planned within the TRB CTBSSP. A CTBSSP research project, *Individual Differences and the "High-Risk" Commercial Truck and Bus Driver: Implications for Carrier Human Resource Management*, will be initiated in mid-2003. Per the scope, this research project will (1) summarize available information on the individual differences in commercial driver safety performance and alertness, and examine the reliability and validity of various metrics and tests that might be employed to hire better drivers; (2) identify safety management techniques used by commercial vehicle carriers to target problem drivers and their specific risky behaviors; (3) conduct a scan of other industries that employ safety-sensitive individuals (e.g., airlines, nuclear power facilities, railroads, maritime facilities, and the military) and summarize key techniques used to identify and address high-risk individuals/employees; and (4) identify and discuss institutional and regulatory issues that affect the ability of an employer to address potential or current high-risk employees. The study will examine the degree to which individual differences in commercial driver safety reflect long-term, enduring personality traits (pointing to the need for better classification and screening), versus learned behaviors that may be readily changed by appropriate BBS management (e.g., training, performance feedback, rewards and punishments). The study will also identify needs for (a) research to delineate CMV driver individual differences and (b) tools to aid fleet safety managers in better managing their human resources from the safety perspective.

Some major empirical research needs relating to high-risk drivers are already apparent, however. They include the following:

- Systematic and extensive studies to identify all major human dimensions potentially associated with driver crash risk, selection of the best available instruments to measure them, and empirical determination of their effect on crash risk, perhaps employing both prospective and retrospective records of crash involvement. Instrumented vehicles might also be employed to provide direct, naturalistic observations of driver safety-related behaviors, thus providing a more reliable criterion measure of safety. As discussed previously, the case-control crash risk study design, already prepared for implementation by the FMCSA (Boyle, Meltzer, Hitz, and Knipling 2002), would address this research need in relation to many diverse driver dimensions and other contributing factors. In this context, it is notable that the FMCSA/NHTSA Large Truck Crash Causation Study will determine the prevalence of various factors

and events associated with crashes, but will not directly quantify the increased risk associated with preexisting factors, because the study does not have a control group (Craft 2002). Thus, implementing a case-control study, as planned by FMCSA, would fill an important gap in the understanding of CMV crash genesis.

- Once drivers are hired, how can fleet safety managers assess their relative crash risks, and take proactive steps to reduce their high risks? Once drivers are hired, the problem shifts from improving selection to improving performance assessment and management intervention. Comprehensive fleet-based studies could identify the operational performance assessment metrics most associated with driver crash involvement and the management techniques that have the greatest impact on these metrics and crash outcomes.

- After these studies have identified the underlying factors of risk and productive means to affect them, the knowledge and tools need to be packaged and disseminated to the industry. The FMCSA "Safety is Good Business" program, for example, may be an excellent vehicle to disseminate new knowledge and tools as they are acquired. Industry trade association safety councils are another vehicle to convey new knowledge and methods to those fleet safety managers most likely to implement them.

- One specific application of this new knowledge would be the development and validation of vastly improved, multifactor selection protocols for CMV drivers. Such protocols could include personal history assessments, physical/medical examinations, personality tests, and performance tests.

5.3 BEHAVIORAL SAFETY MANAGEMENT

The Indiana Tri-Level Study (Treat et al. 1979) and other studies of crash causation (Najm et al. 1995; Craft 2002) have indicated that the vast majority of traffic crashes are principally related to human causes, either misbehaviors, inadvertent errors, or impaired states. The current survey findings support this view. Both safety managers and other experts rated at-risk driving behaviors (e.g., speeding, tailgating, improper following distance, etc.) as a "Top 5" safety management problem affecting CMV fleet safety.

Identifying the factors related to these at-risk behaviors is of paramount interest. Behavioral safety management interventions are designed to increase specific safe driving behaviors and decrease specific at-risk driving behaviors. BBS is the primary approach to behavioral safety management. Other variations, or extensions, relevant to CMV safety include BBS self-management, driver incentive programs, safety placards, and OBSM. These are discussed subsequently as significant opportunity areas for improved safety management.

5.3.1 Behavior-Based Safety

For the past 20 years, BBS has been used successfully in the prevention of occupational injuries in numerous industrial settings. These interventions have not only reduced at-risk behaviors and increased safe behaviors, but have lead to significant reductions in injury rates and compensation claims (Guastello 1993; Hantula, Rajala, Kellerman, and Bragger 2001). BBS can be administered by individuals with minimal professional training, can reach people in the setting where the problem occurs (e.g., community, school, workplace), and are cost-effective. People can be taught the behavior-change techniques most likely to work under specific circumstances (Baer, Wolf, and Risley 1987; Daniels 1989; Geller 2001; Sulzer-Azaroff and de Santamaria 1980; Krause 1999).

BBS involves interventions directed toward safety-related target behaviors, first by identifying and defining target behaviors, and second by observing and recording behavior in its natural setting. When a baseline measure of the frequency of behavior is obtained, an intervention is implemented to change the behavior in beneficial directions. Interventions involve modifying or changing antecedents (events prior to behavior that direct behavior) and consequences (events after behavior that motivate behavior) of specified target behavior(s). Behaviors followed by positive consequences are more likely to be repeated in the future; those followed by negative consequences are less likely to be repeated. To determine intervention effectiveness, the frequencies of target behaviors are recorded during these interventions and compared to baseline measures of behavior (see Daniels 1989; Geller 2001).

One of the primary tools used to influence behavior in BBS is peer observation and feedback. Coworkers systematically observe fellow coworkers and record the occurrence of safe and at-risk safety behaviors on a checklist. Results can be based on individual or group performance (see Zohar, Cohen, and Azar 1980). Yet, this approach may be difficult to implement with professional drivers, who are typically solitary workers. Having another individual conduct behavioral observations can be costly and time-consuming, and the driver may react to being observed. Thus, the observer might not see an accurate depiction of the driver's habits. Thus, a self-management approach within a BBS framework may be most appropriate for solitary workers or workers with little oversight, such as CMV drivers. This is described in more detail in Section 5.3.2.

One possible substitute for direct observation of CMV drivers is telephone conversations between dispatchers (or safety managers) and drivers on the road regarding specific safety practices. In this approach, the dispatcher asks the driver a standard series of questions over the telephone about whether prescribed safety practices are being performed. This helps to remind drivers of fleet safety expectations and their accountability for their actions.

Because it is "employee-driven," BBS is one of the best ways to actively, and substantively, involve workers in improving safety. A number of survey respondents mentioned the value of involving drivers in fleet safety initiatives, and one of the top seven safety action items adopted at the June 2001 fleet safety conference sponsored by the 21st Century Driver and Truck Alliance was to "develop programs for management to encourage driver participation in developing safety programs" (Grace and Suski 2001).

Often, in BBS applications, increases in targeted safety-related driving behaviors lead to increases in non-targeted safety-related driving behaviors. This is termed generalization (Ludwig and Geller 1991; Ludwig and Geller 1997). This process of generalization allows safety professionals to target a few specific driving behaviors with benefits across many more non-targeted behaviors, and is thus a less cumbersome application.

Given the impressive industrial safety track record of BBS, it's notable that this survey of safety managers rated BBS approaches relatively low in effectiveness (22nd of 28 solutions) as a solution for CMV fleet safety. The other expert respondents related it higher, but not among the very top approaches, that is, 12th of 28 solutions. Both of these groups selected at-risk driving behaviors as among the most important problem areas influencing CMV fleet safety. Why the discrepancy? Several hypotheses can be surmised from the literature review. First, the traditional BBS peer-observation and feedback techniques are largely impractical in CMV transport. As mentioned, a self-management approach within a BBS framework may be more appropriate. Second, behavioral approaches may be implemented incorrectly or unsystematically in some fleets. BBS is most effective if implemented as a systems approach. The project team believes that, given the proven effectiveness of BBS in other industrial settings, its systematic application in CMV fleets would yield impressive results and become established as a primary fleet safety management approach.

5.3.2 BBS Self-Management

Self-management is a behavior-based improvement process whereby individuals change their own behavior in a goal-directed fashion (Mahoney 1971 and 1972) by (a) manipulating behavioral antecedents; (b) observing and recording specific target behaviors; and (c) self-administering rewards for personal achievements (Geller and Clarke 1999; Kazdin 1993; Watson and Tharp 1997). Research indicates that five self-management procedures can facilitate behavioral improvement including (a) activator management (Heins, Lloyd, and Hallahan 1986), (b) social support (Stuart 1967), (c) goal setting (Locke and Latham 1990), (d) self-monitoring and self-recording (Lan, Bradley, and Parr 1993), and (e) self-rewards (Sohn and Lanal 1982).

Unfortunately, the potential benefits of using self-management techniques to improve safety-related behaviors have not been widely studied or evaluated. Three published studies include reports of the use of self-management techniques to increase the safety practices of bus divers (Olson and Austin 2001), CMV drivers (Krause 1997), and short-haul truck drivers (Hickman and Geller 2002). Olson and Austin (2001) used a combination of self-monitoring and feedback with commercial bus drivers to influence a 12.3% increase in a variety of driving behaviors (including, complete stop, bus in motion, and loading and unloading passengers), with individual increases in performance ranging from 2% to 41%. Krause (1997) used a combination of self-monitoring and feedback with commercial motor vehicle drivers and reported a 66% reduction in injuries and crashes. Hickman and Geller (2002) used a combination or goal setting, self-monitoring, and objective feedback to influence a reduction in one group of drivers' mean percentage of time speeding by 30.4%, and their mean frequency of extreme braking incidents by 63.9%. For another group of drivers, the mean reductions were 27% for speeding, and 49% for extreme braking.

Implementing self-management programs. Self-management can be implemented as a six-step process:

1. Establish a behavioral baseline using self-monitoring, identifying antecedents and consequences associated with the occurrence and non-occurrence of the target behaviors (Cormier and Cormier 1991).
2. Identify target behaviors (Cervone and Wood 1995).
3. Select a self-management strategy to promote desired behavior change and chart progress.
4. Select a goal that is specific, motivational, attainable, relevant, and trackable (Geller 2001 and 2002).
5. Self-observe and self-record target behavior(s) to measure progress toward the goal (Kirschenbaum, Ordman, Tomarken, and Holtzbauer 1982).
6. Administer self-rewards that are accessible, individualized, valued, varied, and follow the targeted behavior as immediately as possible (Cormier and Cormier 1991).

Self-management involves three critical elements, as depicted by the Self-Management for Safety (SMS) Model in Figure 4. The SMS model suggests the combination of self-monitoring, objective feedback, and goal-setting provides the most cost-effective self-management process. With all three of these components, individuals can commit to a goal and then continuously and appropriately reduce the gap between the ideal behavior and reality. By comparing their self-monitored results with objective feedback, individuals improve the accuracy of their self-monitoring. When objective feedback matches self-monitoring and reflects progress toward goal attainment, the individual feels more competent and the entire process is reinforced. An optimal self-management process seems to require each of these components.
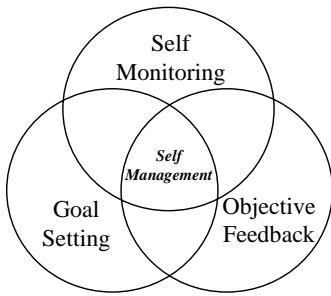
Figure 4. The Self-Management for Safety (SMS) Model.

The vast majority of BBS programs do not lend themselves to solitary workers. Because most employees who operate a vehicle as part of their job duties work alone, there may be substantial benefits from the development of practical self-management techniques for professional drivers. If SMS activities can be integrated with other job activities, safety practitioners will have an effective tool for improving safety-related behaviors that occur when there is little or no opportunity for interpersonal observation and feedback.

5.3.3 Driver Incentive Programs

Incentive programs may be one of the most influential safety management techniques in increasing safety-related driving performance, because economic factors are one of the most important determinants of worker behavior. Since CMV drivers are usually paid by the unit distance (mile or km), not per hour, at-risk behaviors (i.e., speeding, following distance, hours on the road, lack of rest) may, unfortunately, be fostered by economic factors (Wilde, Saccomanno, and Shortreed 1996). An incentive safety program strengthens the motivation for people to behave safely.

Barton and Tardiff (1998) outline the steps needed to develop, administer, and implement an effective incentive program. Some of the critical steps include (a) forming a team to develop and drive the program, (b) proper communication of the rules and benefits to all employees, (c) deciding on the types of rewards, and (d) tracking the program to evaluate effectiveness.

In the survey, 73% of safety manager respondents indicated that they employ driver incentives, but both safety managers and other experts rated incentive systems relatively low in effectiveness (21st and 14th, respectively). As with BBS, many of the pitfalls associated with using an incentive system come from inadequate planning or poor employee buy-in (Barton and Tardiff 1998).

As noted, most incentive programs base their rewards on safety outcomes (i.e., crash-free driving) as opposed to safety behaviors (e.g., speed and headway maintenance). This is a key difference between incentive programs and BBS. A common view among BBS practitioners is that relatively small, yet valuable, incentives are optimal to induce individuals to alter their behaviors and attitudes. The belief is that,

when incentives are kept small, individuals will attribute their behavior change to internal causes rather than external causes. In other words, they will internalize the behavior change. In essence, they say to themselves, "I'm driving the speed limit because I want to be safe—not just to earn a reward" (Geller 2001).

There is also a division among safety professionals as to "what" should be rewarded. While some safety professionals suggest using outcome-based measures (i.e., crash-free miles) in determining rewards (Barton and Tardiff 1998; Barton and Tardiff 2002; Wilde, Saccomanno, and Shortreed 1996), BBS proponents suggest that process-based measures (i.e., specific safety-related driving behaviors) should be used (Geller 2001). They note that, given the relative rarity of crashes and the large role that chance plays in their occurrence, crash involvement may not be the most accurate measure of driver risk.

A difficulty in CMV transport, however, is observing and measuring these safety-related behaviors (Barton and Tardiff 1998; Wilde, Saccomanno, and Shortreed 1996). Two approaches to obtaining such observations are safety placards and on-board monitoring, which are described in the following sections.

5.3.4 Safety Placards

Safety placards are affixed to the rear of trucks or buses and display the driver's personal identification number and an 800 number that links to the company's monitoring department or a third party monitoring service. Once a call is received, an incident report is created, if necessary, for both complaints and compliments. This incident report is then sent to the fleet safety manager or supervisor for review. The driver is consulted to ascertain his or her side of the story, and the incident report is returned with these comments. A summary statement is formulated compiling all the reported information and corrective action, if deemed necessary, is taken (Driver's Alert 2002; Safety Alert 2002; SafetyNet, Inc. 2002).

The use of safety placards can help fleet safety managers identify risky drivers before a crash, thus allowing for preventative action (retraining and proper instruction of company safety standards) instead of contingent action (reprimand, warning, or termination). Safety placards are effective to the extent they provide objective feedback to the driver about specific safety-related driving behaviors and how to correct them (if a negative action report has been delivered).

Third party monitoring companies offer an affordable and convenient way to monitor commercial drivers. These companies offer many services that in-house monitoring departments may be untrained or unwilling to handle. They also provide the consumer with unbiased personnel.

Most calls received by third party monitoring services are complaints about specific incidents or observed driving behaviors. These services report that the "80–20" rule applies

to the complaint reports within a fleet. That is, most drivers in a fleet rarely receive complaint reports, whereas a relatively small percentage receives the majority (J. Vincent, personal communication 2002; SafetyNet, Inc. 2002; The Fund 1999).

Behavioral safety management emphasizes the value of feedback, but there are several drawbacks in using this type of feedback for commercial drivers. The first, and most obvious, is that drivers will only receive feedback if another motorist makes a call. Second, the accountability and increased attention towards safety the driver initially feels will likely dissipate over time, a term called habituation (Geller 2001). Last, if most of the calls received by third party monitoring services or the company's in-house monitoring department are complaints, the driver is left with the impression he or she will receive only negative feedback (i.e., only discussing at-risk driving behaviors rather than safe driving behaviors).

Yet, several studies, mostly by insurance providers, have researched the efficacy of using safety placards, such as "How's My Driving" stickers, in improving safety in CMVs. These studies have shown significant reductions in vehicle crashes, insurance premiums, and DOT reportable crashes when fleets used safety placards with an effective feedback loop, that is, feedback combined with training and instruction (Johnson 1998; The Fund 1999; STN 1999; Driver's Alert 2002). For example, the Hanover Insurance Co. conducted a study with 11 different trucking fleets (n = 445 trucks) using "How's My Driving" safety placards and reported a 22% reduction in crash rate and a 52% reduction in crash costs after 1 year (Johnson 1998).

Given these reported results, it is notable that safety managers and other experts rated safety placards very low in effectiveness (25th and 28th, respectively) as a CMV safety solution. Only 22% of safety managers reported using safety placards with their CMV fleets. Unfortunately, the survey did not discern if safety managers used their own in-house monitoring department or a third party monitoring service. The project team also knows little about the way in which the feedback reports, if any, were used. Feedback, which is also an essential feature of any BBS approach, is critical when using safety placards (see Figure 5). The lack of a reliable and positive feedback loop hinders the effectiveness of safety placards and may be one reason safety managers and other experts rated them relatively low in effectiveness as a CMV safety solution.

5.3.5 On-Board Recording

On-board recording includes two approaches: OBSM of safety-related driving behaviors (e.g., speed, acceleration, braking force), with feedback to drivers and managers and event-data recorders that also monitor driver safety behavior and performance, but which are primarily accessed after a crash or incident to determine and document driver behavior

Figure 5.   Feedback loop from an action report. Adapted from SafetyNet, Inc. (2002). www.fleetsafe.com

and vehicle performance just before and during the crash. Some of the vehicle sensors employed in these two applications may be identical, but the safety applications of the information are different.

On-Board Safety Monitoring

In-vehicle technology can be employed to provide continuous, behavioral measures of driving safety, consistent with BBS approaches of behavioral observation, but also potentially serving as a basis for material incentives to drivers to meet safety criteria. Most notably, OBSM technology may be used to focus CMV safety motivational programs on "source" CMV driving behaviors to affect the likelihood of crash involvement (Knipling and Olsgard 2000). A fundamental supposition of industrial safety (see Heinrich, Peterson, and Roos 1980) is that modification of operator behavior parameters to within acceptable bounds will greatly decrease the likelihood of accidents. In other words, the reduction of at-risk behaviors will reduce more serious occurrences (i.e., accidents and injuries).

Many safety-related driving behaviors can be monitored, including driving speed, acceleration (longitudinal and lateral), brake force, location (via GPS monitoring) and driving times (i.e., for HOS compliance monitoring). As noted in Chapter 4, emerging technologies are providing the capability to continuously measure such parameters as forward headway, lane tracking, and even driver alertness. These are all safety process measures that could be employed in a BBS program as the basis for feedback, goal-setting, and rewards for behavioral change. At the June 2001 Pittsburgh fleet safety conference sponsored by the 21st Century Driver and Truck Alliance (Grace and Suski 2001), one of the top seven

safety action items adopted by the conference was, "Establish real-time feedback systems for drivers and define good behaviors and reward mechanisms."

However, only 36% of safety managers in the survey reported using OBSM, and the effectiveness ratings assigned by both safety managers and other experts were relatively low (18th and 16th, respectively). As discussed in Chapter 4, a major obstacle to more widespread use of OBSM is driver acceptance of these devices. Possible measures to attain greater driver acceptance are (1) addressing driver privacy concerns by giving drivers greater control over the handling and disposition of the OBSM data and (2) emphasizing positive feedback and rewards (including financial rewards) for safe driving behaviors rather than punishments for unsafe behaviors and actions captured by the recording (Knipling and Olsgard 2000).

Ironically, perhaps, safety managers and other experts rated the practice of crash, incident, and violation tracking as highly effective (3rd and 1st, respectively), but they did not highly value the monitoring of the source safety behaviors creating these outcomes. Typically, crashes, incidents, and violations are reported by enforcement agencies or by drivers themselves. This information can be misleading and inaccurate because a crash, violation, or incident is only reported if the driver is caught in the act or reports the incident. OBSM is potentially superior in many respects including the following:

- It can provide objective data on crashes, incidents, and violations, as well as the specific driving behaviors that occurred.

Behavioral Safety Management in a Nutshell

Behavior-Based Safety (BBS) is strongly grounded in behavioral science and proven highly effective in industry applications. The challenge is to apply BBS in the distributed operations of trucking.

BBS Self-Management may be the most effective approach for operations with solitary workers, such as trucking; its key elements include self-monitoring, objective feedback, and goal-setting.

Driver Incentive Programs employ the reward principle and may be effective when well-designed and systematic. However, most programs focus on safety outcomes, whereas behavioral science generally favors focusing on behavior.

Safety Placards provide behavioral feedback to drivers, but are not reliable measures of performance and are perhaps too negative.

On-Board Safety Monitoring is the ultimate in behavioral observation, but the challenges are to win driver acceptance and establish a positive reward system to reinforce desired performance.

- Drivers can receive reports on their successes, rather than receive reports complied solely on negative events.
- Detailed individual driving statistics can be used to reward drivers for safe driving behaviors (i.e., incentive program).
- OBSM can replace time-consuming ride-alongs.
- It allows drivers the opportunity to receive weekly, and even daily, feedback on their driving performance.
- It can be used to address safety behavior and performance issues before a crash, incident, or violation occurs.

Clearly, OBSM technology and behavioral applications are underused in truck and bus transport in relation to their safety potential.

Event-Data Recorders

Event-data recorders employ many of the same sensors as OBSM, but the key application is different: crash or incident reconstruction. Only 24% of safety manager respondents reported using these devices in their fleets, and they received relatively low ratings for effectiveness by both safety managers and other experts (24th and 26th, respectively). As with OBSM, it is ironic that conventional crash and incident investigation is practiced so widely (83% of safety managers) and rated so highly in effectiveness (5th and 10th, by safety managers and other experts, respectively). For the parameters that they measure, event-data recorders can provide accurate and detailed information to support the crash investigation and provide both managers and drivers with superior feedback regarding possible driving errors leading to the crash.

Like OBSM, event-data recorders have the potential to become a standard and effective tool for improved fleet safety if the driver acceptance issue as well as various other practical and institutional concerns relating to their use can be overcome.

5.3.6 Research and Development Needs

Behavioral safety management has been hugely successful in other industries, but not systematically applied in commercial truck and bus transport. An obvious safety opportunity is to apply and evaluate these methods, determine the most effective practices, and then facilitate its dissemination to the industry. Below are some specific suggested activities:

- Conduct a broad-based, long-term study assessing the efficacy and applicability of using BBS techniques in CMV operations. Based on study findings, develop a standardized manual and a training program for managers addressing the necessary and sufficient techniques to be used in CMV operations.

- Conduct independent, well-designed studies of the benefits and cost-benefits of safety placards, including consideration of how feedback is provided to drivers and how managers conduct corrective follow-up activities.

- Experimentally compare process-based and outcome-based incentive programs to assess which technique is most effective in CMV operations. Develop comprehensive, easy-to-use guides for the fleet management application of techniques found to be the most effective.

- Design safety management applications of OBSM technology to be compatible with behavioral safety management principles. Develop or adapt existing monitoring technologies to support the behavioral safety management system, for example, develop better and easier ways to benchmark good safety performance in terms of the data parameters available from OBSM devices. Test and evaluate this safety technique.

5.4 SAFETY MANAGEMENT PROFESSIONALISM

This section addresses several approaches to elevate the professionalism of motor carrier safety management, including certification of fleet management practices, training and qualifications certification of safety managers, and industry promulgated best practices.

5.4.1 Certification of Fleet Management Practices

Background and Scope

Within the United States, motor carriers that travel across state lines are subject to a regime of mandatory safety regulations relating to vehicles and drivers and are subject to oversight and review by federal and cooperating state officials. These requirements and the associated information systems that record and measure safety performance often influence safety management by fleet operators.

Beyond compliance with governmental requirements, a number of voluntary, management-driven safety management and certification systems and approaches have evolved within the commercial vehicle operations community. These voluntary systems are the focus of this section. The question for future attention is whether such systems can be effective in ensuring safe practices and performance independent of or in conjunction with mandatory, regulatory-driven practices.

Carrier safety management certification processes and programs include the following:

- The International Organization for Standardization ISO 9000 quality certification is likely the most structured of these processes. Although the process does not focus specifically on truck fleet management, overall management practices do have an impact on fleet operations

(Eitah Naveh, Technion and Alfred Marcus, University of Minnesota, personal communication, 2002). A recent evaluation of this program is described in the next subsection.

- The "Responsible Care" program, promoted by the Chemical Manufacturers Association (2002) and affiliated industry associations, is a formal process through which truck and other operations voluntarily participate in audits of activities and practices formally prescribed and published by a unit of the association. The activities are designed to ensure safe handling of hazardous and other toxic materials throughout the life cycle of the products.

- The Canadian Standards Association (CSA) International has developed a carrier safety management certification program. The Carrier Safety Management System (CSA International 2002; Drew 2002) is a voluntary program designed to evaluate and qualify a carrier's safety management system to an established set of requirements based on CSA International's B619-00 Carrier Safety Management Systems standard. The standard applies basic management system principles, but from a safety management perspective. To complement this standard, CSA has also designed a qualification program, so that safety management efforts can be audited by an independent third party, CSA International.

- The Military Traffic Management Command, as a supplement to the FMCSA safety rating process, has created a multilevel rating process, more expansive than the FMCSA system. The auditor is Consolidated Safety Services (CSS). Although this process has regulatory underpinnings, it provides an additional benchmark for measuring safety performance in a certification context.

- The TruckSafe Accreditation Program has been developed by the Australian Trucking Association (AusTA) as a voluntary business and risk management system aimed at improving the safety and professionalism of trucking operators. The program includes four standards areas: workplace and driver health, vehicle maintenance, driver training, and management. After entry and compliance audits, the participating fleet is eligible for accreditation by the TruckSafe Industry Accreditation Council, which is an independent body. The AusTA provides support materials for the program.

- Insurance Evaluations. Although these systems are proprietary, many insurance companies and underwriters that support the trucking industry have developed internal evaluation systems that support the risk rating and rate setting processes the companies use in evaluating and insuring carriers.

Effectiveness of Processes and Programs

Information on the effectiveness of safety certification programs is beginning to emerge. A recent analysis of firms

that had implemented ISO 9000 processes, entitled "ISO 9000's Effect on Accident Reduction in the U.S. Motor Carrier Industry" found that "the safety performance of the ISO 9000 certified carriers was significantly better than the non-certified carriers" (Eitah Naveh, Technion and Alfred Marcus, University of Minnesota, personal communication, 2002). The study compared safety results and other performance results of ISO 9000 certified and non-certified motor carriers before and after certification. It appears that these results flow primarily from the overall ISO 9000 process applicable to all of the carrier firms' management and operational practices, because no targeted ISO practices approach has yet been developed for truck fleet safety management. The authors note that the main limitation of the data supporting the analysis is that it does not report causation and thus includes the confounding effects of other drivers and vehicles. They also suggest that further investigation is needed to determine the extent to which ISO 9000 contributes to safety improvements, and whether it could lead to the establishment of quality assurance standards for motor carriers. The authors suggest that ISO 9000 could lead to changes in regulations, which could be complemented by reliance on voluntary compliance with ISO 9000 implementation. They also note that, "voluntary ISO 9000 certification does have the potential to alleviate the regulatory burden and improve overall motor carrier safety. However, certification is relatively new in this industry, and companies that have been certified may be unique . . ."

On the effectiveness of TruckSafe, The AusTA (2002), on its website, asserts that "the records of the largest insurer of transport equipment indicate that TruckSafe operators have 40% fewer accidents than non-accredited operators . . ." The AusTA also holds that participation in TruckSafe results in reduced worker compensation costs and reduced maintenance costs.

The CSA Carrier Safety Management Systems Program is relatively new (Drew 2002). CSA supports its potential effectiveness with evidence of positive safety results in other industries where CSA certification is applicable and has recently completed two case studies (CSA International 2002) of carriers that implemented a Carrier Safety Management System as prescribed by standard CAN/CSA B619-00. The case studies indicate that each carrier experienced improvement in quantitative measures obtained from the Commercial Vehicle Operator Registration data after implementation of the Carrier Safety Management System. The measures relate to driver performance, vehicle condition and convictions, and are derived from safety inspections conducted by the Ministry of Transportation. Information on relative improvements in crash rates were not included in the case study summaries.

In the project survey, about one-third of the safety managers claimed to use quality certification of carrier safety management practices. It is likely that the certification experienced by respondents varied from relatively informal inter-

nal or insurance-related evaluations to more formal programs. Effectiveness was not rated high compared to other safety management methods; for safety managers, the mean rating assigned was 18th of 28 methods, and for other experts the mean rating was 17th of 28. These relatively low ratings likely reflect the effectiveness of specific programs safety managers have used and, in the case of other experts, a lack of familiarity with these approaches. The project team believes that safety management certification programs hold significant promise in an overall strategy to improve safety performance of commercial motor carriers. However, the discipline of certification and best practices definition of motor carrier safety systems are in a developmental stage. Even though common elements and approaches are emerging, there is currently no major systematic or visible effort to organize information on the results and relative effectiveness of alternative strategies and tactics, or to apply these programs more widely in the industry.

5.4.2 Certification of Safety Managers

Another approach to enhanced safety management professionalism in CMV transport is professional certification for safety managers. The North American Transportation Management Institute (NATMI, www.NATMI.org) has been affiliated with the ATA. It offers a number of certification opportunities and programs for safety managers, including Certified Director of Safety, Certified Safety Supervisor, Certified Director of Maintenance/Equipment, Certified Supervisor of Maintenance/Equipment, and Certified Driver Trainer. On its website, NATMI asserts that its certification programs measure CMV safety manager "education, experience, and expertise against objective standards that are respected throughout the industry." NATMI offers safety manager training on such topics as fleet safety management in general, maintenance management, crash investigation, regulatory compliance, and driver training. Steps to certification include completion of required seminars, submission of a formal application, three letters of recommendation, and passing an examination. Admission to each certification program requires certain minimum qualifications; for example, the Safety Director program requires 5 years in the safety field or 4 years plus a 4-year college degree. Candidates must "serve as full-time administrators demonstrating their capability of handling a position which involves establishing programs and policies, setting standards, developing materials, and providing leadership to achieve the goals set."

Commercial transport trade associations may also offer manager certification programs. For example, the NPTC's Certified Transportation Professional Program includes a component of safety management in its overall certification of fleet managers as Certified Transportation Professionals.

The survey results for professional "certification of individual fleet safety managers (i.e., professional certificate)"

were similar to those for certification of fleet practices. About one-third of the safety managers claimed to use these programs, but the effectiveness ratings were relatively low for both respondent groups. These relatively low ratings may reflect specific experiences of safety managers and perhaps lack of familiarity by the other experts. The concept of professional certification for safety managers, based on valid and substantive criteria, is a relatively new one. The project team believes that the continued development and promotion of these programs will ultimately result in meaningful improvements in safety manager stature and effectiveness.

5.4.3 Industry-Promulgated Best Practices

Another approach to safety management professionalism is the establishment and promulgation of industrywide best practices, in particular to address known problems and to establish higher standards and greater consistency of professional practice. For some industries, the voluntary establishment of best practices is seen as a way to instill a greater sense of issue "ownership" among practitioners, and perhaps also a way to avoid regulatory or enforcement solutions that might prove more onerous. An example of such an industry-promulgated best practice is the Code of Ethics adopted jointly by the Truckload Carriers Association (TCA) and the National Industrial Transportation League (NITL). The code is entitled, "[A] Voluntary Guide to Good Business Relations for Shippers, Receivers, Carriers, and Drivers."

Background

Many people involved in commercial motor vehicle transport believe that tight delivery schedules often force drivers to violate HOS or to drive while fatigued. The same factors may lead to violation of highway speed limits, as drivers rush to deliver their cargo on time. This concern was among the top 10 safety issues identified at the 1995 FHWA Truck & Bus Safety Summit and has been the subject of an NTSB recommendation to the FMCSA to initiate rulemaking to prevent such influences on drivers.

Shippers are often cited as the primary party responsible for such influences on drivers, but a 1997 report by the FHWA Office of Motor Carriers (now the FMCSA) (Duke et al. 1997) found, based on a series of focus groups, that "no single player" in the shipping cycle could be held primarily accountable for unreasonable trip scheduling and any resulting unsafe practices. Receivers, shippers, carrier brokers and sales staff, carrier dispatchers, and drivers themselves all contribute to the problem and, potentially, could be involved in reducing it. Economic incentives to drivers for fast delivery may be as strong as demands by various parties for specific delivery times.

A number of factors seem to influence the pressure drivers feel to drive fatigued or violate regulations and traffic laws in making their deliveries. Specific loads may be "rush" based on the needs stated by any of the involved parties. Independent drivers and those with small companies may feel they have fewer resources and less flexibility to turn down or renegotiate jobs requiring tight schedules. Specific types of cargo, such as produce, may frequently require a quick delivery, thus resulting in real or perceived pressure on drivers to compromise safety. However, as noted by the 1997 FHWA OMC study, it appears difficult to assign and document specific responsibility for the problem to parties other than the driver and carrier.

Industry-Based Best Practice

The TCA and the NITL, a trade association representing shippers and receivers, have jointly developed a Code of Ethics for its members and others to address this problem. The code, available on-line at www.nitl.org/guide.htm, is not intended to prescribe industry standards or to create legal rights and responsibilities. Rather, TCA and NITL state that it is in their members' "mutual interest" to subscribe to the guidelines.

The code consists of 54 specific guidelines. Below are the major categories of the code and the number of specific guideline items under each:

- Shippers/Receivers
  - Treat drivers with courtesy and respect (4 specific items).
  - Ensure that safety practices are followed (10).
  - Foster honesty, fairness, and openness in their dealings with carriers (5).
  - Expedite the movement of equipment (10).
- Carrier Drivers
  - Treat shipping and receiving personnel with courtesy and respect (6).
  - Maintain safe practices (5).
- Carrier Personnel
  - Negotiate honestly with shippers (7).
  - Provide safe and efficient transportation services 7).

The 54 items represent a variety of specific issues too numerous to address here. Some items address business practices such as the negotiation of loads and fulfillment of agreements. A number of items delineate guidelines for workplace practices, including specific loading and unloading practices, parking and queuing protocol, and facilities and amenities available to drivers. An item directly addressing the shipper issue discussed above is as follows: "Shipper/receivers will . . . cooperate with carrier in establishing reasonable transit time requirements so carriers can comply with driver hours of service regulations and speed limits."

The project team discussed the Code of Ethics with both TCA and NTIL representatives. Their consensus was that the code is in active use and has mitigated these problems. An example of the use of the code is in shipper requests for proposals and subsequent shipping agreements. "Compliance" with the code varies, of course, with larger organizations tending to follow such guidelines more closely, as well as having more closely-prescribed operations in general. The code has, by no means, solved the problems of long waiting times, difficult working conditions, or schedule pressure felt by drivers, but it is a substantive and collaborative effort by the industry to address the problem.

The TCA also unilaterally developed a set of best practices, focusing on loading and unloading waiting times, based on a contracted study (Mercer Management Consulting 2000) of such practices from the carrier perspective. The study report, entitled *"Just in Time to Wait": An Examination of Best Practices for Streamlining Loading/Unloading Functions*, identifies best practices among shippers, receivers, and carriers for reducing loading dock waiting times, and otherwise expediting freight flow. The report also suggests a number of solutions; and recommends ways to disseminate these solutions within the TCA membership. The study was based on interviews with carriers, drivers, shippers, and receivers, and an examination of more than 100 carrier-shipper contracts to identify contract clauses addressing waiting times and related freight flow issues that might arise in the course of these operations. Among the interesting findings was an "80–20" phenomenon parallel to that described earlier for drivers, that is, a small percentage of the shippers and receivers seem to cause a disproportionate amount of delay and other operational concerns for carriers. A central theme of the solutions offered is that carriers should manage the problem more actively, anticipating and preventing potential problems before they occur. One sensible suggestion was to instill an understanding in everyone involved, including shippers and receivers, that in the long run, unnecessary delays drive up costs for all parties. Thus, carrier-shipper relations should ideally be seen as a partnership for efficient operations.

5.4.4 Research and Development Needs

All three of the practices previously described—carrier certification, manager certification, and industry-based best practices—represent seminal approaches. They all hold promise but this promise is years from realization. The following are some R&D activities to further these concepts:

- Develop measures of effectiveness for certification and best practices programs. The purpose of this effort would be to create a common evaluation framework for assessing programs, and would include the following:
  – Establishment of an ongoing common disciplinary approach to measurement and evaluation of the relative effectiveness of efforts.
  – Rigorous assessment of evidence for crash-reduction effectiveness of each strategy.
  – Identification of research needed to categorically demonstrate the value of safety certification or adoption of recommended practices.
- Detailed analysis of safety certification and best practices programs. The focus of this analysis would be development of a structure and topology to track and evaluate these programs. It would include the following:
  – Examination of existing CMV safety certification (carrier and manager) and recommended practices programs, with emphasis on identification of common elements and protocols.
  – Development of a public domain guide to support fleets seeking information on available programs.
- Evaluation of how certification and best practices programs can supplement or even supplant a range of regulatory and compliance strategies. Should certification and best practices programs prove effective in reducing crashes and injuries, these efforts should be compared to current regulatory programs and the relative effectiveness of each evaluated.
- Convening of a coordination group for guidance and overall assessment of evolving safety certification and best practices programs. This effort would ensure stakeholder input in evaluating and advancing programs and a greater continuity of effort.
- Establishment of a professional organization for carrier safety managers that is independent of specific trade associations or industry segments and is dedicated to advancing the stature and professionalism of fleet safety managers and the safety operations of their employers and employees.