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Improving Safety-Related Rule Compliance in the Public Transportation Industry

INTERIM REPORT

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INTRODUCTION

BACKGROUND

Transit is a vital component of the nation's transportation network. In 2008, transit systems in the United States provided more than 10.5 billion trips during 343 million vehicle-hours of service and transit vehicles traveled more than 5.2 billion miles (APTA, 2010). Considering service measured by passenger-miles traveled, almost half of these trips were by bus, including bus rapid transit, and more than one third involved heavy and light rail service. Regardless of mode, however, all transit patrons expect safe, efficient and courteous service.

Given the recent growth in transit and the public's expectation of safe operations, operator compliance with safety-related rules is paramount to attainment of a solid safety record. The transit workforce totaled nearly 400,000 employees in 2008 with nearly 250,000 involved in vehicle operations. To ensure safe operations, transit agencies train their workforce with formal rules and requirements, but compliance with these rules remains problematic.

To address noncompliance by transit operators, the American Public Transportation Association (APTA) adopted a voluntary standard for compliance testing in light and heavy rail transit systems. While this standard is an important step toward achieving safe operating practices in the industry, more remains to be done. Recent incidents due to violations have called into question the safety of public transit. Most notable was the September 2008 commuter rail crash in Chatsworth CA that killed 25 and injured 135 others. The National Transportation Safety Board (NTSB) concluded that "the probable cause … was the failure of the Metrolink engineer to observe and appropriately respond to the red signal…because he was engaged in prohibited use of a wireless device…that distracted him from his duties." (NTSB, 2010). Texting has also been implicated in a subsequent collision on the Massachusetts Bay Transportation Authority (MBTA) Green Line in May 2009. Most recently, NTSB's report on the June 2009 collision of two Washington Metropolitan Area Transit Authority (WMATA) trains recommended that the Federal Transit Administration (FTA) facilitate the development of a nonpunitive safety reporting program at all transit agencies. The purpose of such a system would be to collect reports from all employees regarding near-misses and unsafe conditions. Recognizing the potentially serious consequences of safety rule noncompliance, TCRP has undertaken this project with the objective of developing a resource for improving safety-related rule compliance in the public transportation industry.

SCOPE OF STUDY

The focus of the project is primarily on those safety or operating rules that are designed to prevent high consequence events, especially those where the public is affected. Some agencies may refer to these as operating rules. Transit agencies have safety rules that address workplace safety and prevention of worker injury. These rules are an important aspect of overall transit agency safety but this project did not focus on these rules as they are within the scope of TCRP project A-35, Improving Safety Culture

in Public Transportation, that will begin later this year. Because the potential risk of harm to the public is greatest when the vehicle operator fails to comply with an operating or safety rule, the majority of the measures for improving compliance will likely affect this group, although other operations personnel, track workers and equipment maintainers are also affected.

The set of best practices for improving safety-related rule compliance draws on existing practices in the transit industry as well as those of the aviation, railroad, motorcoach, trucking and petrochemical industries. Best practices described in the literature, but not in use by either transit or the other industries, are also candidates for inclusion in the final resource document.

The scope of the study also includes review of safety reporting systems in transportation and other industries. Based on the experiences with these other systems, a preliminary design for a safety reporting system for transit was prepared.

RESEARCH APPROACH

The research began with a comprehensive literature and research review of safety-related rule compliance to identify proven approaches in transit and other safety-critical industries. A review of accident reports prepared by NTSB and two state agencies identified the errors or rule violations that caused or contributed to transit accidents. Structured interviews with safety officials in the transit industry as well as the railroad, aviation, trucking, motorcoach and petrochemical industries was the method used to gather information on rule compliance best practices in each industry. The interviews covered approaches for preventing and managing noncompliance, both errors and violations, that occurs.

Using criteria relevant to the transit industry, the research team selected best practices for improving safety-related rule compliance in the transit industry. The applicability of each of the best practices to transit agencies of different sizes and different transit modes was assessed.

Separately, existing safety reporting systems for aviation, railroading, and firefighting were investigated. The focus of this investigation was on understanding how the system was developed, stakeholder concerns during system design, key features and provisions of each, and experiences to date. The design for a prototype safety reporting system used the experiences of these other systems.

All of the above elements—literature review, accident report review, selected best practices, design for a transit safety reporting system—formed the basis for the resource document. Preparation of the resource document, as well as final design of the prototype reporting system, is currently underway.

ORGANIZATION OF THE REPORT

Chapter 2 highlights the results of the literature and research review. Review of transit accident reports from NTSB and two state agencies are the focus of Chapter 3. Chapter 4 describes the rules compliance practices of other industries, Chapter 5 provides similar information by transit mode and Chapter 6 identifies best practices applicable to transit. A description of existing safety reporting systems is in Chapter 7 and Chapter 8

describes a prototype safety reporting system for transit. Several appendices support the major chapters of the report. Appendix A contains a table of the types of errors and violations associated with the accident reports of Chapter 2. A table that illustrates the applicability of the best practices to each element of a rules compliance program is in Appendix B and a similar table illustrating their applicability across different size agencies and modes is in Appendix C. Appendix D contains a prototype memorandum of understanding from a safety reporting system.

CHAPTER 2
LITERATURE AND RESEARCH REVIEW

A significant body of research exists regarding the factors that influence safety rules compliance including the reasons underlying errors and violations and ways to mitigate noncompliance. This section summarizes the factors and mitigation strategies that are applicable to transit operations. The section describes the factors from a bottom-up perspective, concluding with a discussion of the role of safety culture and safety management in the rules compliance process. Although an extensive array of reports and articles was reviewed, this chapter summarizes only the most relevant and recent works.

FRAMEWORK FOR UNDERSTANDING NONCOMPLIANCE

Just as there is no single cause of an accident, reasons for noncompliance are multifaceted. Noncompliance can be willful, resulting in a violation, or it can be unintentional, resulting in an error. Numerous human error and violation taxonomies exist that differentiate among the underlying causes of noncompliant behavior. A popular error classification system, known as the skill-, rule-, knowledge-based (SRK) approach, was based on information processing models and is described in a number of publications (Rasmussen, 1979, 1980, 1986; Reason, 1990). Figure 1 presents a compilation of the SRK model and other types of error classifications in the context of human information processing.

Knowledge-based errors occur when someone does not have the correct mental model to assess a situation, resulting in formation of an incorrect plan of action. Inexperienced operators often fall prey to these types of errors. Rule-based errors, in contrast, occur when an operator has a clear understanding of the situation, but the incorrect plan to deal with the situation is undertaken, resulting in a poor outcome. These types of errors arise when an operator is not adequately trained via classroom and field exposure to handle unexpected situations; the operator does not possess the necessary strategies needed to address low frequency events.

Skill-based errors, also known as slips, occur when performance is highly automatic (as indicated by the dashed line in Figure 1) and a cue in the operational environment triggers the behavior at an inappropriate time (Norman, 1981). While slips are errors of commission, lapses are errors of omission, resulting from memory failure. DiFiore and Cardosi (2006) found pilot reports of air traffic control (ATC) personnel who forgot that aircraft were holding in position on the runway (a lapse) and cleared another aircraft to land on the same runway. Operator distraction, workload, and fatigue are among the risk factors for these types of incidents and will be discussed later.

Reason (1997) makes the important point that "a purely cognitive analysis of error mechanisms fails to capture some of the more important human contributions to [accidents]" (p.204). An examination of violations, deliberate acts of noncompliance, fills this gap. The University of Texas has developed a methodology to examine flight operations, the Line Operational Safety Audit (Helmreich, 2000). The data from these studies indicate that more than half of the in-flight errors observed were intentional noncompliance, or violations.

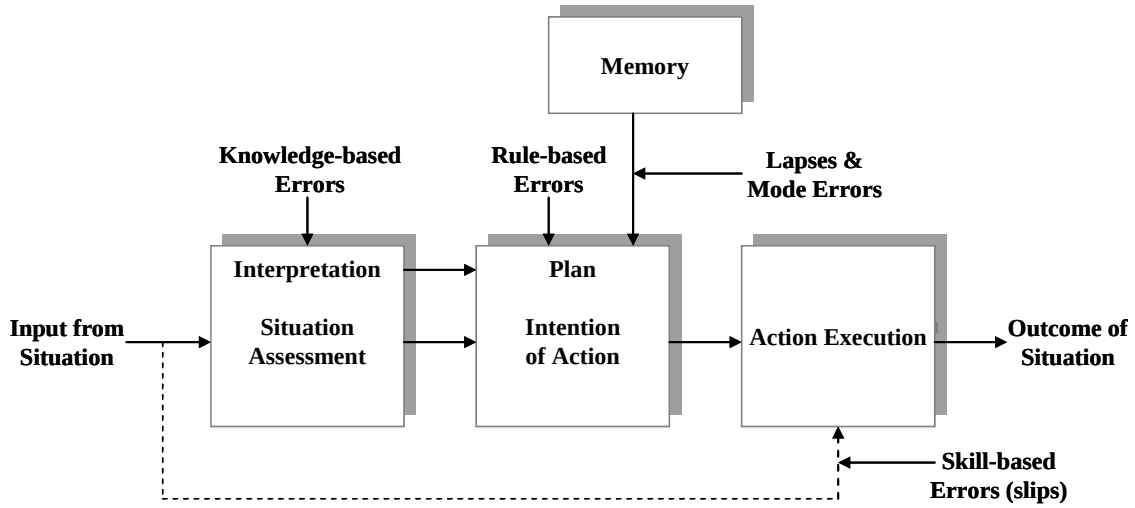

Figure 1. Information processing model of human error

Lawton (1988) distinguishes among three types of violations: situational, exceptional, and routine. The classification is based on data obtained from a survey of UK rail shunters' experience with rule noncompliance. (In the UK, shunters refer to people who work on the ground switching cars in a railroad yard.) For the most part, Lawton argues that violations tend to be perceived as well-intentioned desires to get the job done. Situational violations result from motivations to keep the job going under adverse conditions. There is often an inconsistent approach to dealing with these types of violations. That is, when the job is completed without incident, the employee is rewarded. However, if an accident occurs, the result is usually disciplinary action. This inconsistent response does little to curb these types of violations.

Situational violations are frequently observed in the transportation industry owing to the time pressure operators feel trying to adhere to schedules. Exceptional violations occur when unusual circumstances call for an unusual response and the employee knowingly does not comply with the organization's rules and chooses an alternative action. Routine violations occur when a shortcut presents itself and is taken regularly. This often happens when an employee no longer thinks a rule applies.

Incident taxonomies provide a framework within which to identify reasons for noncompliance with safety rules and guide appropriate countermeasures. The Human Factors Analysis and Classification System (HFACS) is a well-known error and violation taxonomy used in aviation and served as the basis for the pilot reporting system in the railroad industry that is reviewed in Chapter 7 (Wiegmann & Shappell, 2001). With an understanding of the underlying reason, a transit agency supervisor or safety officer can determine the appropriate strategy to correct or manage noncompliance. For example, did noncompliance occur because the operator did not understand the situation and unintentionally failed to comply (knowledge-based error)? Training is a possible remedy when this is the cause of noncompliance. Or was there a willful decision by the operator to disobey the rules because the organization placed more emphasis on getting the job done on time than on their safety policies (situational violation)? In this circumstance, the organization's safety culture may be the cause. Perhaps an operator consistently

chooses not to comply because he or she did not understand why the rule is required (routine violation). Closer enforcement and explanation of the rules may prevent this behavior.

PERCEPTUAL ERRORS

Perception is a psychological construct that describes the neural processes that transform sensory information that enters the brain from sensory organs (e.g., eyes, ears). Most research on perception involves vision and audition (or hearing). Perception occurs as the result of both bottom-up and top-down processes. Bottom-up processing refers to the brain's ability to combine simple, bottom-level features which allows humans to recognize more complex, whole patterns. Many times, however, information in our environment is degraded or obscured. Top-down processing refers to the brain's ability to use a person's knowledge about how the world is organized to identify patterns. The latter highlights the role of expectation in perceptual processing (Proctor & Van Zandt, 1994).

Top-down processing provides humans with an efficient way to process in-coming information. If all information were processed piece-meal as it would be in a totally bottom-up system, human information processing would occur too slowly to allow humans to be able to respond to safety-critical situations, a highly adaptive feature. However, there is a disadvantage regarding the role of expectation with respect to safety-critical situations. A person's expectations, which are based on previous experience, can lead to error (Green, 2003).

A relevant example of error arising from expectation occurs in the runway environment. Pilots are often familiar with the standard taxi routes at the airports with which they are familiar. Sometimes, however due to unexpected operational changes, air traffic controllers must instruct pilots to traverse a different taxi route. There are reports that describe the scenario where pilots will hear and confirm the non-standard taxi route, but during execution, they will revert to the more familiar taxi route (DiFiore & Cardosi, 2006). Often times, they report that they heard what they expected. Expectation is an important contributing factor to rules noncompliance involving safety-critical communication.

Top-down processing can also be a source of human error with respect to visual perception. Obscured or degraded signage cannot be processed completely with bottom-up processing (Wickens & Hollands, 2000). Therefore, the brain attempts to fill in the missing information via top-down processing. Error can occur when the brain fills in the incorrect information leading to misinterpretation. These types of errors occur in the medical industry where medication labels are often not dissimilar enough with respect to either type of medication or dosage, sometimes resulting in fatalities (Frey et al., 2002).

DISTRACTION

Vehicle control is a complex activity involving multiple tasks and multichannel information input. Because humans are inherently limited in processing complex tasks simultaneously, activities or conditions that compete for the driver's attention pose a risk to the driver's control over the vehicle (Sheridan, 2004). Wickens' multiple resource theory states that tasks that draw upon the same mode or stage of processing will suffer

significantly more than tasks that rely on different cognitive resources (Wickens, 1984). Previous research has also found that "cognitive load combined with the loss of exogenous cues, which can occur when the driver briefly glances away from the roadway, may be particularly detrimental."(Lee, Lee & Ng, 2007). This diversion can occur willingly, for example, using a cell phone or tuning radio controls, or as a consequence of some environmental stimuli, like passing a billboard or a flashing warning sign (Regan, Lee & Young, 2008). With the increase of technology proliferation into vehicles, driver interaction and hence driver distraction is becoming more common, leading to an increase of risk exposure. However, even though the effects of driver distraction are well documented, research into fully understanding the sources of distraction, the underlying causal mechanisms, and mitigation techniques are all still undeveloped and lacking (Regan, Lee & Young, 2008).

FATIGUE

Research has documented the performance effects of fatigue. The performance effects of inadequate sleep can affect an individual's ability to work safely and efficiently. Belenky et al. (2003) have shown that performance declines initially with mild to moderate sleep restriction of 7 and 5 hours, and after a few days it stabilizes at a less than fully rested level. The relevant performance effects include the following (Institute of Medicine, 2006):

- Response time slows.
- Attention to intensive performance is unstable, with increased errors of commission and omission.
- Involuntary microsleeps occur.
- Performance declines in short-term recall of working memory.

The susceptibility to any of the above becomes an urgent concern when the job carries safety risks for the employee, co-workers or the public. The job performance of transit operators getting less than 7 hours of sleep on workdays is likely compromised. Research of Van Dongen, Mullington, and Dinges (2003) has shown that sleep loss-related performance declines often go unrecognized by the affected individuals making them at increased risk of error.

TCRP Report 81, *Toolbox for Transit Operator Fatigue*, contains approaches for managing operator fatigue (Gertler, Popkin, Nelson, & O'Neil, 2002).

WORKLOAD

The study of workload has a long history in psychology as well as human factors transportation research. For the purpose of the present review, only mental workload is considered. Gopher and Donchin (1986) define workload as "the difference between the capacities of the information-processing system that are required for task performance to satisfy expectations and the capacity available at any given time." There is an optimal level of mental workload. Under circumstances where workload is either too high or too low there are performance decrements. Low-workload conditions do not provide enough arousal to sustain vigilance and high-workload conditions cause operators to over-focus resulting in cognitive tunneling, both of which potentially lead to human error (Proctor & Van Zandt, 1994).

Cox-Fuensalida (2007) noted that previous research described a general decrement in performance following a decrease in task demand. In an experimental study of workload variability, they confirmed that a condition involving a shift from high workload to low workload impaired performance. Additionally, they observed that abrupt increases or decreases in workload led to a loss of accuracy and slower response time. The high to low condition may be an artifact of fatigue. Regardless, measuring the dynamics of workload is important given the potential for performance decrement.

WORKSTATION DESIGN

Workstation design is a potential source of safety rules noncompliance. Given that improper securement of wheelchairs is the leading cause of injuries to passengers, Herring and Wolf (2002) conducted an observational study of wheel-chair tie down operations in transit buses. They found that the general consensus among bus operators was that systems were very difficult to use, a factor that decreases the probability of compliance.

Regarding the operator's workstation, it is imperative that the area be designed with consideration of human factors design principles. Buccliaglia, et al.(1995) suggest beginning the process with a task analysis to identify primary and secondary operator tasks. This provides a basis to ensure that all safety-critical controls and displays are in the primary visual area and are easily accessed (Wickens, Lee, Liu & Becker, 2004).

RISK TAKING

Trimpop (1994) defines risk taking as "any consciously, or non-consciously, controlled behavior with a perceived uncertainty about its outcome, and/or about its possible benefits or costs for the physical, economic or psychosocial well-being of oneself or others." In essence, risk taking is acting without fully considering the consequences of one's actions. To a certain extent, we all engage in some form of risk-taking behavior because it is not practical to always fully weigh each and every consequence prior to action. For the sake of efficient, and timely, behavior humans engage in heuristic evaluations for decision-making (Matlin, 1994). That is, they combine past experience with the present circumstances to take cognitive shortcuts to determine the best possible choice of action. However, because these heuristics are shortcuts, they may exacerbate the uncertainty of the situation at hand. Of interest to transit agencies is the need to identify individuals who may engage heavily in risk-taking behavior to the point it is either pathological or at least increases the probability of a safety incident during day-to-day operations.

There is a long history in aviation psychology of trying to identify personality features of pilots who are risk takers (Hunter, 2002). Personality is a psychological construct that describes the inherent behavioral attributes of an individual. Personality assumes a set of stable traits that persist across situations. Due to the high risk associated with flight, the aviation community was interested in identifying psychometric measures associated with pilots who engaged in risk-taking behavior. However, Besco (1994) conducted a literature review that examined the validity of using personality inventories to predict pilot behavior and found it to be an unreliable method.

The approach of looking at personality as the root of error and/or violations comes from Heinrich's early work that suggested that about 80% of industrial accidents results from the human in-the-loop (Heinrich, Peterson & Roos, 1980). Unfortunately, many researchers began to examine what was wrong with the human that caused the error, i.e., personality and/or character flaws. The rationale for this approach is flawed because of the classification of these original studies; they failed to examine the root cause of the industrial incidents. Therefore, the operator was erroneously assigned blame instead of the many contextual factors associated with the situation. Consequently, the latter is a well-known social psychological phenomenon known as the fundamental attribution error, whereby negative events are attributed to the personal characteristics of the individual involved in the event without considering the situational factors (Jones & Harris, 1967).

Looking for character flaws using psychometric tools is not useful for predicting risk taking because it perpetuates the act of blaming the operator; however, it is worthwhile to understand the situations that may lead to increased risk-taking behavior. In this light, researchers have begun to examine the factors that moderate risk perception including its effect on rules compliance. Diaz and Resnick (2000) used the Johnson Personality Inventory – Revised (JPI-R) and found that the risk-taking scale measures of this test were positively correlated with personal protective equipment (PPE) compliance. The researchers discuss that there are multiple factors that influence risk perception including time on the job without incident. The longer someone is employed, the more likely they are to have encountered a hazardous situation and perhaps recovered from it. Recovery from these events can lead to overconfidence in one's ability thereby negatively influencing risk perception as is evident in pilot risk taking during adverse weather (Pauley & O'Hare, 2008). Research in driver behavior demonstrates that operator overconfidence is associated with an impaired ability to evaluate a driver's own performance (Kidd & Monk, 2009). Therefore, if a driver's overconfidence results in an error or violation, that driver is not likely to detect his, or her, mistakes and recover from them.

Gonzales and Sawicka (2003) refer to risk homeostasis theory that was developed in the context of automobile safety. The theory involves a model that presents the actual risk of a situation and contrasts it with the perceived risk. The discrepancy between the two is modulated by the individual's ability to accurately perceive the risk (perceptual skills) and to make a good decision about what sort of adjustment is necessary (decision-making skills). Both types of skills are heavily influenced by experience, or top-down processing.

The aforementioned theory is related to Kahneman and Tversky's (1979) prospect theory which suggests that people either grossly overestimate the likelihood of improbable events or fail to consider them a possibility at all. The latter is a bias that may lead operators to underestimate the possibility of disastrous events. These biases are evident immediately after safety incidents. Workers often become hypervigilant after an accident followed by a steady decrease in safety vigilance as time goes on. As such, a decline in safety vigilance can become an organizational hazard where the organization, like individuals, becomes complacent over time underestimating the possibility of an unexpected safety occurrence.

While risk perception helps to explain why some people are more likely to take chances than others, past behavior can also be used as a predictor of future behavior. Using a logistic regression analysis of approximately 309,000 pilot records, McFadden (2002) showed that driving while intoxicated (DWI) convictions were associated with alcohol-related aviation accidents. Pilots convicted of driving while intoxicated were 3.5 times more likely than pilots without these types of convictions to have alcohol-related general aviation accidents. This trend has also been observed with accidents resulting from risky pilot maneuvers in commercial aviation.

Most of the research conducted on attitudes involving risk used explicit measures of attitude. Explicit measures rely on self-report and are not always a reliable indicator of a person's attitude, because people may respond based on the questionnaire administrator's expectations. Recent research has focused on the use of implicit measures of attitude. Adapted from the field of social cognition, the implicit attitude test (IAT) measures unconscious attitudes, which are impervious to experimental demand characteristics. Using the IAT, aviation researchers have demonstrated that the use of this tool, at least experimentally, can identify pilots who are likely to make risky flight decisions (Molesworth & Chang, 2009). However, this research is still in its infancy and is not ready for practical application.

Summary points

- Traditional psychometric inventories are not useful for identifying individuals as having risk-taking personalities; therefore, they do not serve as useful screening tools for the hiring process.
- High scores on the risk taking scales of the JPI-R were associated with failure to comply with PPE requirements. The applicability of this study to transit is limited.
- Identifying the situational factors that influence risk taking in transit operations is useful. Examples of factors to consider include length of time an organization has without incident, length of time an individual is on the job without incident, and the number of operator incidents he, or she, successfully recovers from.
- DWI convictions are predictors of pilot risk-taking behavior; however, there is no empirical evidence to suggest this as a predictor in transit operations.
- The IAT is a promising methodology that may be adapted as a practical tool to identify individuals who may engage in risk-taking behavior. This may lead to improved employee screening and targeted training.

TRAINING

Training employees is an effective way to promote safety rules compliance. Tannenbaum, Beard, McNall & Salas (2009) report that learning in organizations needs to address four core areas. These are:

- Intent to learn
- Experience and action
- Feedback
- Reflection

To optimize training effectiveness, employees need to be prepared for the learning experience. An organization can accomplish this by informing employees about upcoming training opportunities and requirements. The information about training should include why the organization is sponsoring it, the goals and objectives, and any potential benefits.

Research shows that even under optimal training circumstances, individual differences related to an employee's intention to learn plays a role in training effectiveness. Some individuals have low self-efficacy. This refers to a person's belief that he, or she, has the capacity to successfully perform specific behaviors or tasks. Day, Boatman and Kowollik (2007) describe how Bandura's (1978) social learning theory can be used to promote behavior modeling to mitigate the effects of low self-efficacy. Behavior modeling fosters confidence and promotes skill development in those with low self-efficacy.

These researchers examined the effects of a collaborative training protocol known as active interlocked modeling (AIM) on employee self-efficacy. The protocol requires trainees to practice half of a training task and then observe a partner performing the remaining half of the task. Results from this study indicate that training with an experienced partner using AIM provides an effective way to increase self-efficacy.

The type of experience one has during training influences its effectiveness. The three types of experiential training included in the review are on-the-job (OJT), computer-based, and simulation. None of these training techniques should be used in isolation of one another. Rather a balanced combination of them provides optimal training effectiveness.

The use of OJT is most appropriate when work procedures need to be passed down to employees and implemented immediately. This can occur during initial job orientation as well as when there are new procedures that need to be trained well after an individual is hired. The advantages of OJT include that the organization does not have to hire trainers or conduct training offsite, which can be costly. However, OJT does take supervisors away from their regular duties and potentially increases supervisor workload. Mullaney and Trask (1992) also point out that supervisors and subject matter experts are not always exceptional trainers. Their proficiency may cause them to skip certain steps in the process that learners, particularly those with low self-efficacy, need to understand.

Additionally, OJT must meet the needs of the trainee so that it builds upon his, or her, existing skill set. OJT is also a good opportunity to use the commentary drive technique (McKenna, Horswill & Alexander, 2006). During training, instructors in the vehicle (or cab) observe and then give feedback after the session concludes. Observing other employees' commentary drive sessions is also an effective training tool and is easily implemented using video recording of OJT sessions.

Derouin, Parrish, and Salas (2005) provide several guidelines for optimizing the effectiveness of OJT including the following:

- Ensure upper management support for OJT.
- Standardize OJT programs.
- Include training staff in the design and development of OJT programs.

- Train the trainer.
- Prepare trainees for OJT.
- Provide descriptive, but not evaluative, feedback during training.
- Encourage practice in a non-evaluative environment, allowing trainees to make errors where possible.
- Evaluate OJT effectiveness.

Computer-based training (CBT) can also be incorporated into a successful training program. It can be conducted during work hours, linked to the internet for remote access, and incorporated into classroom-led instruction. Fisher, et al. (2002) found that PC-based risk awareness training reduces the likelihood of risk-taking behavior, though this research only examined young, inexperienced drivers.

Horrey, Lesch, Kramer and Melton (2009) systematically examined the effectiveness of computer-based training of distraction mitigation. Research demonstrates that operators may not be aware of the distracting effects of in-vehicle tasks on performance (Horrey, Lesch, & Garabet, 2008; Lesch & Hancock, 2004). As such, zero-tolerance policies regarding the operation of electronic equipment during safety-critical tasks may not be as effective as when these policies are combined with a training program that educates individuals on the dangers of operating a vehicle while talking or texting on a cell phone. The following is a list of the information contained within the distraction mitigation training modules, which successfully deterred individuals operating electronic devices while driving:

- Distraction facts and information
- Video demonstrations of distraction involving others
- Interactive demonstrations of distraction
- Training how to deal with distraction
- Video demonstrations using commentary drives

Simulation is another useful training tool, however, high-fidelity training simulators are costly and not widely available. Some studies examined the use of low-cost, low-fidelity simulators and found positive training effects (Chase & Donohoe, 2008). Simulation provides the opportunity to conduct safety error management training (EMT). This type of training specifically encourages operators to make mistakes so that they learn how to recover from them. Generating one's own solution to a problem is much more effective than reading or hearing about potential solutions from someone else. This is based on the generation effect in cognitive psychology (Crutcher & Healey, 1989). EMT is particularly suited for training novel tasks when compared with error-avoidant methods.

Summary points

- Effective training, at a minimum, will include preparing the learner prior to training, providing the optimal training experience based on the science of training, nonevaluative feedback, and encouraging the trainee to reflect on the learning process.
- Promote self-efficacy during training by pairing a more experienced partner with one who is less sure of him- or herself.

- Follow the recommendations regarding OJT.
- CBT and simulator training provide opportunities to train employees about human information processing limitations and go beyond traditional classroom training to promote effective error recovery strategies.

SAFETY CULTURE, MANAGEMENT AND RULES COMPLIANCE

While the academic literature does not share a single standard definition regarding safety culture, researchers as well as practitioners in the area agree that safety culture is a subset of organizational culture. As such, a reasonably accepted notion is that safety culture represents that part of an organization's culture that relates to safety. Therefore, safety culture encompasses organizational structure as it pertains to safety as well as the way people think, feel, and behave with respect to safety practices (Cooper, 2002).

Related to the notion of safety culture is safety climate. While these two terms have sometimes been used interchangeably, they are in fact different constructs. According to Flin, Mearns, O'Connor and Bryden (2000), "safety climate can be regarded as the surface features of the safety culture discerned from the workforce's attitudes and perceptions at a given point in time." Given this definition, assessing safety climate provides a "snapshot" of an organization's safety culture. As such, safety climate assessment tools provide a way for transit agencies to measure their organizational commitment to safety.

A review of the relevant safety culture/climate literature suggests that rules compliance can be optimal when an organization addresses the following dimensions of safety culture (Antonsen, 2009; Cooper, 2002; Flin, Mearns, O'Connor and Bryden, 2000):

Management/supervision. When assessing safety culture, one of the most important factors to consider is the level of commitment of management and supervisors to encouraging safe operations. This must be a genuine effort so that labor is able to perceive organizational commitment and internalize this attitude into his, or her, own set of personal values. Also, leadership style of both upper management and first line supervisors is an important impetus for worker safety. The types of questions that formal assessment tools must answer include the following:

- When it comes to safe operations, do management and supervisors "walk the walk" or just "talk the talk?"
- Is there a consistent message regarding safety from top-level management as well as at the level of first line supervisors?
- Do workers perceive that management is specifically committed to safety and in general concerned with their overall well-being?

Safety system. Safety culture assessments usually involve characterizing the makeup and functionality of an organization's safety system. Elements of a safety system include a safety management system (SMS), the presence and hierarchical position of safety officials, safety committees, policies, and equipment.

Fernández-Muniz, Montes-Peón, and Vásquez-Ordás (2007) define an SMS as "a set of policies and practices aimed at positively impacting on the employees' attitudes

and behaviors with regard to risk. The aim of an SMS is to intervene on the circumstances that result in risks and accidents. This involves identifying and analyzing both latent and visible hazards. Bottani, Monica, and Vignali (2008) surveyed 400 manufacturing firms, some with and some without formal SMSs. The results demonstrated that the attitudes regarding several safety-related variables were better for safety officials from the companies that had formal SMSs. Further research is needed that uses process measures in addition to attitudinal ones. While there have been guidelines set forth for conducting a hazard analysis for transit projects (Adduci, Hathaway, & Meadow, 2000), there are presently no guidelines for conducting operational hazard analyses or establishing a formal safety management system (SMS) for the transit industry (R. Adduci, personal communication, August 2010).

Many safety systems include a program for rewarding safe work practices as a means to encourage safe behavior. Behavior-based safety (BBS) programs focus on the interaction between people and their working environment. There are functional variations of these programs with the most common entailing members monitoring the behavior of a workgroup and managers monitoring their own safety-related leadership behavior. The most common employee protocol involves peer observation with on-the-spot feedback. However, there are reports of self-observation approaches where single operators perform their own checklists. The data is compiled over a number of self-observations and the results are used to inform training needs and other remedial action (Cooper, 2007). Self-observations are most appropriate for transit operators. However, there is no empirical data to support the efficacy of the self-observation approach. Cooper (2007) presents the IDEAL components of a BBS program. They include the following:

- **I**dentify unsafe behaviors.
- **D**evelop appropriate observation lists.
- **E**ducate everyone and train observers.
- **A**ssess ongoing safety behaviors.
- **L**imitless feedback.

A safety reporting system, such as those in aviation and the railroad industry, is a proactive element of any safety system. Formalizing the safety system within an organization by means of the aforementioned elements provides protective barriers against unexpected occurrences related to safety breaches. These systems are reviewed in Chapter 7.

Work pressure. Safety critical service industries such as public transit must effectively balance the need for on-time performance with the need to perform safely. Assessing the tension between these two often competing goals provides a way to determine if the effects of top-level management commitment have "trickled down" to the supervisory and employee level. Sometimes supervisors and top level management establish safety goals without consulting the workforce to determine if the goals are practical and attainable. When safety and performance compete at the level of the operator, supervisors may choose to "look the other way" regarding safety violations in order to maintain on-time performance or keep equipment in service. This in turn sends

the message to employees that safety is not truly valued and sacrificing safe operations in order to stay on schedule is acceptable.

Procedures/rules. While not traditionally part of most formal safety culture/climate assessments, the perceptions of and attitudes toward safety rules and procedures provide an indicator of whether or not individuals within an organization accept and value them. Rules and procedural adherence can be improved when management partners with labor to create safety rules and procedures. In essence, this process empowers individuals by giving them input to the safety system. Labor feels management respects their opinions as expert operators and they feel ownership of the rules and policies. Therefore, labor is more likely to comply. The rules and procedures in a truly resilient organization empower the employees to deal with unanticipated events.

From a behavioral economics perspective, Battman and Klumb (1993) suggested that procedural and rules violations originate primarily from the following:

- Unclear or conflicting rules or constraints.
- Delayed, ambiguous or missing feedback.
- Absence of clear priority rules in cases of conflicts between high-level and low-level safety commitments.

Dekker (2003) comments that operators fail to adapt procedures when adapting is necessary, or alternatively they attempt procedural adaptations that ultimately prove futile. To improve rules compliance, organizations should avoid increasing pressure to comply. Rather, they should invest in their understanding of the gap between procedures and practice, and help develop operators' skill at adapting.

Employees. There are many factors related to the workforce that provide an indicator of safety culture/climate including employee competence, safety training, safety attitudes and risk-taking behavior, and job satisfaction and security. Organizations committed to safety adhere to rigorous screening procedures when hiring to ensure that their employees have the required knowledge, skills and abilities to perform their jobs. They provide exemplary training to ensure the workforce understands how to operate under both typical and atypical operating circumstances. They train the workforce how to recover from unexpected occurrences as well. Finally, employees are more likely to be committed to their organization's safety goals if they are satisfied with and feel secure in their jobs. Genuine management commitment to the employee fosters employee commitment to the organization.

Summary Points

- There must be a top-level management commitment to safety that permeates the organization from the top level all the way down to the employees.
- Safety reporting systems, hazard analyses, and safety management systems are all effective ways to improve an organization's safety culture thereby improving rules compliance.
- Safety must be a higher priority than on-time performance.

- The safety rule-making process must involve the employees who are required to follow the rules.
- Safety rules must be clear, concise and easily understood by employees.
- Genuine management commitment to the employee fosters employee commitment to the organization.

CHAPTER 3
ACCIDENT REVIEW

The initial purpose of the review of transit accident reports was to identify the types of rule violations or errors that were either the primary cause of the accident or a contributory factor. After reviewing the majority of the accident reports, the research team realized that in many of the cases, there were contextual factors that allowed the accident to occur. Contextual factors are characteristics of the environment and may include workspace issues, weather conditions, vague rules, lack of adequate supervisory oversight, or lack of adequate proficiency testing. In terms of Reason's Swiss cheese model of human error (Figure 2), contextual factors are the latent failures or preconditions that allow the unsafe act to occur. In many cases, the agency incurring the accident made changes to modify contextual factors as a way to prevent future rules violations. For this reason, the researchers felt it was important to identify these factors. These factors will be a part of the error taxonomy for the safety reporting system described in Chapter 8. In addition, the accident histories where the agency took corrective action will provide case examples for the final resource document.

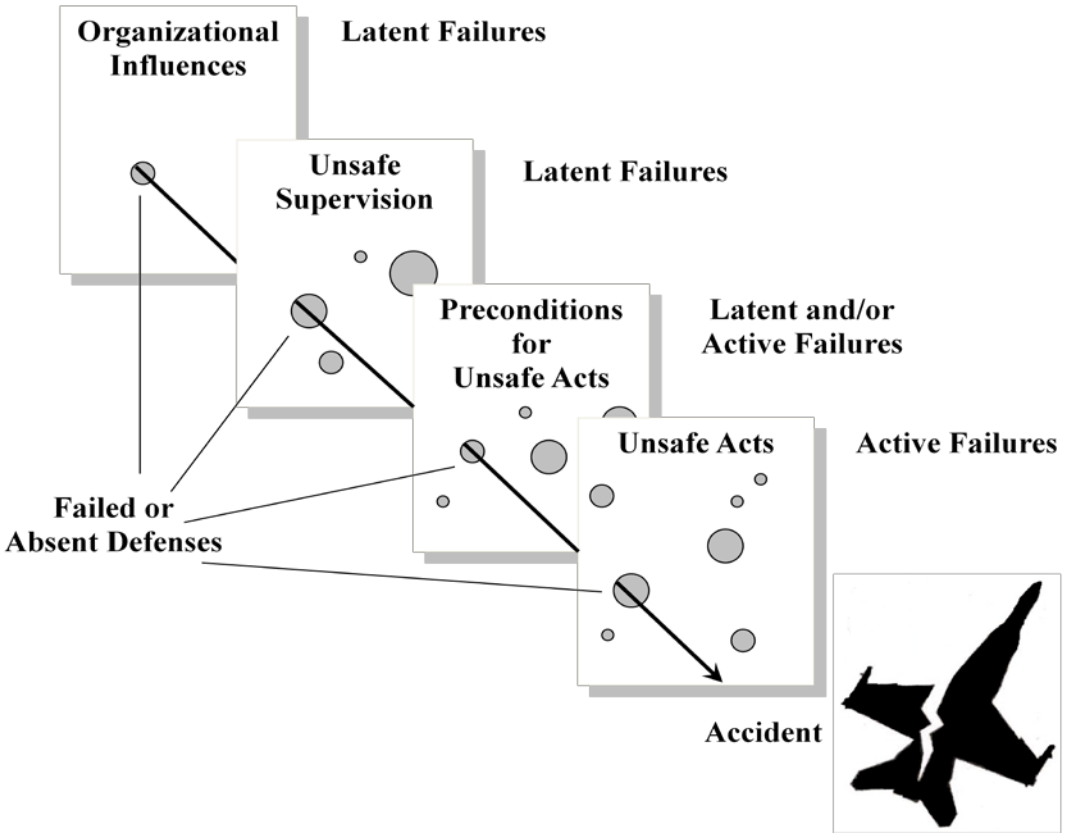

Figure 2. Reason's Swiss cheese model

SOURCES

The research team identified three sources of accident reports that provided meaningful information in terms of understanding rules noncompliance and accidents. These sources are the following:

- National Transportation Safety Board (NTSB)
- New York Public Transportation Safety Board (PTSB)
- California Public Utilities Commission (PUC).

NTSB conducts thorough investigations of selected transit accidents. The accidents that they select for investigation tend to involve significant numbers of casualties and significant property damage. The NY PTSB was created in 1984 with statutory responsibility for safety oversight of all public transportation systems operating in New York State. This oversight responsibility includes accident investigation and analysis. PTSB has a Rail Division and a Bus Division and divides its accident investigations into the two groups. The CA PUC has safety oversight responsibility similar to NY PTSB but only began conducting and making public in-depth rail transit accident investigations and reports in 2007. The PUC releases reports on few accidents because the process for approval of report release is lengthy and costly. In other states, such as Massachusetts, the transit agencies themselves are responsible for investigating accidents and the state oversight agency, for example the MA Department of Public Utilities, verifies that the investigation did in fact occur. These state agencies do not prepare accident reports.

APPROACH

The research team identified all reports that were readily available from the three source agencies. In terms of NTSB, the scope of the review was limited to reports issued between 1996 and 2009. These reports were easily accessible via the internet. Earlier reports are more difficult to obtain. Because the available NTSB reports that the team reviewed described similar violations, reviewing the earlier reports would likely not provide examples of additional types of violations or errors. Also, the issues and conditions present in these earlier accidents may no longer be relevant due to changes in operating procedures or new equipment. The PTSB accident reports are limited in scope in comparison with the NTSB reports, but they do adequately describe the circumstances of the accident and they do identify the primary and contributory causes. Table 1 summarizes the number of reports available from each agency and the number that were relevant for this project.

Table 1. Sources of transit accident reports

Agency (time period)	Mode	Total Reports	Relevant Reports
NTSB (1996-2009)	rail	35	23
NTSB (1996-2009)	ferry	2	1
NY PTSB (1997-2008)	rail	291	50
NY PTSB (2006-2008)	bus	198	115
CA PUC (2008-2009)	rail	2	2

Many of the rail reports from NTSB and PTSB were not relevant to the present study because they involved highway crossing accidents where the motorist, pedestrian or trespasser was at fault. A large number of the PTSB accidents involved fires or station evacuations unrelated to any safety rule issue.

The research team reviewed each accident report to identify the nature of the rule violation or error and the relevant contextual factors. If the report mentioned subsequent action by the transit agency to correct contextual factors responsible for or contributing to the accident or discipline or training for the employees involved, these were noted.

RESULTS

The errors or rule violations that caused or contributed to the 191 accident cases were categorized by mode and employee group. The complete list of errors and violations appears in Appendix A. Highlights are the following:

Rail (heavy rail, light rail, commuter rail)

- *Train operators and locomotive engineers* – The majority of the violations involved controlling or operating the train. Examples include failure to obey a signal indication, including passing a red signal, failure of a LRV operator to judge the clearance from a motor vehicle at grade and failure to ensure authority to proceed before moving train.
- *Dispatcher/Operations* – Most violations involved procedures for responding to emergencies, which is not a common occurrence.
- *Maintenance of way (MOW)* – Rule noncompliance involved failure to obey on-track safety rules and failure to maintain track to standards.
- *Signal* – Similar to MOW, rule noncompliance involved failure to follow on-track safety rules and failure to follow proper electrical procedures.
- *Mechanical (car)* – Failure to properly maintain or repair equipment resulted in accidents.

Bus

- *Driver* – The majority of violations involved controlling or driving the bus. Specific violations included aggressive driving, failure to exercise defensive driving in an intersection, failure to observe a pedestrian, and failure to obey a traffic device.
- *Dispatching* – The only violation involved failure to provide proper direction to the driver of a bus with an apparent mechanical problem.
- *Mechanical* – Similar to rail, failure to properly maintain or repair vehicles led to accidents.

Ferry

- Failure of captain to exercise command responsibility over vessel.
- Failure of co-pilot to properly pilot boat.

Review of the accident reports also identified contextual factors that were present and either contributed to the accident or were pre-existing conditions that allow the accident to occur. These included the following categories:

Rail

- Equipment or infrastructure design
- Work schedule
- Weather
- Failure to comply with requalification policy
- Lack of aggressive rule compliance testing and enforcement
- Inadequate maintenance procedures
- Inadequate training
- Inadequate procedures for responding to emergencies
- Inadequate operating procedure or rule
- Lack of adequate safety procedures or oversight
- Workload
- Work area distraction

Bus

- Weather
- Vehicle design
- Vehicle condition
- Inadequate maintenance procedures
- Inadequate training
- Work area distraction

CHAPTER 4
RULES COMPLIANCE PRACTICES IN OTHER INDUSTRIES

Other industries, similar to transit, must address rules compliance in an effort to prevent low-probability/high consequence events. The research team selected aviation, railroad, motorcoach, trucking, petrochemical and construction as industries that face low-probability high-consequence events and might offer best practices that are applicable in the transit industry. Two criteria led to the selection of these industries: the individual operator/employee is at significant risk for personal harm as a result of noncompliance and the operator/employee puts the public at significant risk for harm as a result of rule noncompliance.

Structured interviews with representatives from each industry provided the means to gather information on current industry practices. The interview questions covered the various activities these industries use to teach employees the rules, make sure employees understand the rules, assure rules are followed and respond to noncompliance. In addition, the interview explored proactive measures to encourage rules compliance and voluntary reporting programs designed to allow operators to self-report rule violations and near-misses.

Table 2 summarizes the number of organizations contacted by industry as well as the number of interviews that were conducted. The research team assured anonymity to the organizations that were interviewed, consequently this information is not included in this report.

Table 2. Number of organizations interviewed by industry

	Number of Interviews	
Industry	**Contacted**	**Completed**
Aviation	20	12
Railroad	17	15
Motorcoach	8	6
Trucking	9	6
Petrochemical	8	2
Construction	1	1

The interviews produced a great deal of information on each industry. The railroad, motorcoach and trucking industries offer many best practices relevant to transit. To facilitate the organization and presentation of the best practices for these industries, there is a summary table for each industry that presents the best practices for the following aspects of the rules compliance process:

- Initial rules communication
- Communicating new rules
- Validating rules comprehension
- Monitoring adherence

- Responding to noncompliance
- Encouraging compliance
- Evaluating program effectiveness
- Safety reporting mechanisms

Federal Aviation Administration (FAA) regulations govern the training and certification of pilots. In addition, FAA examiners conduct check rides with commercial pilots to audit their compliance with FAA safety regulations. Since these procedures do not differ from airline to airline, this information was available from published sources. Instead, the interviews with aviation industry representatives focused on voluntary safety reporting systems for pilots.

AVIATION

Table 3 summarizes the rules compliance and reporting practices of the aviation industry.

FAA regulations govern flight operations as well as the certification and training of pilots (Title 14 C.F.R., although still commonly referred to as the Federal Air Regulations or FAR). A student pilot who begins training is introduced immediately to the flying regulations that apply to the student's level of flying. At each level of certification, both a written examination as well as a practical, or flying, test is required. As a pilot moves through the various levels of certification, he is introduced to the appropriate flying regulations, and must understand these regulations in order to complete the written, oral, and flying evaluations. In order to be hired by an airline or a corporate flight department, a pilot must be certified at the commercial level, with an instrument rating, and have a certain level of flying experience. During this period of preparation, the individual will have been exposed to the flight regulations through both the academic and practical flying environment. Therefore, when the pilot is then hired by a flying corporation, he is already expected to be familiar with the FAR. During his initial training, he is then presented with the flight regulations that apply to the particular type of flying that he has been hired to do. Follow-on simulator and in-flight training re-emphasize the general flight regulations, as well as the specific regulations. Thus, when the pilot begins operational flying, he/she has been exposed to, and is expected to know, all the flight regulations that apply to the new flight environment. In summary, then, as a baseline, the new employer has trained the new pilot to understand any specific regulation that applies to the particular type of flying, and has also re-emphasized general flight regulations.

Once a pilot is employed, the FAA requirements for continuous recurrent training apply. The basic requirement calls for a certain amount of annual ground school, a certain number of simulator periods that include flight checks, and the requirement that Pilots-in-Command (Captains) receive a periodic operational line check. In addition, a flight crew may receive an unannounced random line check from an FAA flight inspector at any time. In recent times, many airlines have moved to the Advanced Qualification Program, another voluntary program through the FAA that emphasizes training outcomes and scenario-based training. In general terms, this type of training moves away from the pass/fail checkride mode, and highlights training and proficiency goals. This type of

training also uses a simulator exercise called Line Oriented Flight Training (LOFT), that accomplishes the training in an operational scenario, rather than simply dealing with specific flight maneuvers. This type of training is a major change to the older concept of periodic checkrides and results in more effective training and pilot proficiency.

Table 3. Rules compliance in the aviation industry

Program Characteristic	Industry Practices
Initial rules communication	• Classroom presentations • Computer-assisted training
Communicating new rules	• Through computer based read file indicating information has been read • Memorandums with copies that must be signed/initialed and returned
Validating rules comprehension	• Written or computer-based testing • Recurrent classroom training • Recurrent simulator training • Operational Line Checks
Monitoring adherence	• Voluntary Safety Reporting Systems • Operational Flight Monitoring Systems • Air Traffic Control Deviations • FAA violations
Responding to noncompliance	• Dependent on level of deviation/violation and current labor agreement • Informal conference with supervisor • Formal investigation within company • Formal investigation with FAA
Encouraging compliance	• Voluntary safety programs • Crew Resource Management • Top-down safety culture • Emphasizing the causes of safety issues rather than an emphasis on disciplinary action
Evaluating program effectiveness	• Decrease in incidents/accidents • Analysis of Voluntary Safety Reporting • Benchmarking with other airlines • Input from the FAA • Line Operational Safety Audits
Safety reporting mechanisms	• Safety Hot Lines • Aviation Safety Reporting System • Aviation Safety Action Program • Other company reporting systems

In the distant past, the major concern of a pilot new to operational flying was incidents and potential violations, resulting in discipline from the FAA or the pilot's employer. This resulted in a mentality in which any potential safety issue that was not detected by the system was kept secret. Pilots feared potential discipline, especially

certificate suspension or revocation. In addition, it was common for a company to terminate a pilot for such incidents or violations. Needless to say, this did not encourage an environment where a pilot was willing to voluntarily disclose any safety issue. As a result of this perception, the Aviation Safety Reporting System (ASRS) was created in the 1970s. ASRS encouraged pilots to report safety data so that safety trends could be analyzed and system corrections could be made. A detailed description of this system is in Chapter 7.

Data gathered in ASRS revealed that the most common incident or violation involved an altitude deviation. As a result, a program was developed whereby airlines and corporate aviation departments could develop a voluntary system for reporting these events, and in return the pilot would again receive limited immunity. This program, the Aviation Safety Action Program (ASAP) is explained in more detail in Chapter 7. This successful voluntary safety program, which is classified as confidential and nonpunitive, is today a leading contributor to overall flight safety, and has been fully accepted by the FAA, the companies, and the labor unions.

Aviation groups, unions, industry groups, and the FAA offered the following comments regarding ASAP:

- The system emphasizes the root cause of incidents and violations, rather than a punitive discipline program.
- Approximately 90% more incidents and violations are being uncovered due to the nonpunitive aspect of the program.
- All the stakeholders have a high level of confidence in the system.
- Safety concerns are now being examined by all parties and system corrections are being made so that these concerns do not develop into accidents/incidents.

The FAA's Flight Operations Quality Assurance Program (FOQA) is another example of a successful voluntary program. This program allows airlines to download information regarding the movement of an aircraft from one point to another via flight data recorders. The program is confidential and negotiated through a Memorandum of Understanding among the FAA, labor, and airlines. The information obtained is not used punitively. Rather, it provides information about aircraft handling that otherwise would go unnoticed.

RAILROAD

Table 4 summarizes the rules compliance practices of the railroad industry.

The Federal Railroad Administration (FRA) regulations prescribe a program of operational or efficiency testing (40 C.F.R. 217) to determine compliance with operating rules. As of January 1, 2009, this program must place emphasis on those operating rules that cause or are likely to cause the most accidents or incidents. In addition, FRA requires that locomotive engineers be certified every 3 years. Each engineer must have a check ride every year. Each railroad sets the frequency of rules exams but Federal Regulations require that the railroad's program/policy be filed with FRA. Because of these requirements, the approach of all railroads to validating rules compliance is similar. Labor agreements and the Railway Labor Act prescribe procedures for progressive

discipline for rules violations so the response is similar from railroad to railroad. In spite of these common requirements, there are significant differences in each railroad's approach to the overall rules compliance process.

Locomotive engineers and conductors are trained by the railroad that hires them. The length of this training may vary but all railroads use some combination of instructor-led classroom training and hands-on training, and sometimes CBT. Feedback from labor indicates that the most effective rules training is instructor-led, involves practical application or illustration of the rule, and includes an explanation of the purpose of the rule. Railroads use written tests or computer-based tests to validate the employee's rules knowledge. When there is a change in a rule or a new rule, the method for conveying this information will depend upon the complexity and impact of the rule. For major changes, a class or video and job briefing will occur. Other changes will be covered in a general order or system bulletin and then be incorporated into the rule book.

Table 4. Rules compliance practices in the railroad industry

Program Characteristic	Industry Practices
Initial rules communication	• Instructor-led classroom training with scenarios • Computer-based training • Hands-on training
Communicating new rules	• Track Bulletin, System Bulletin, Timetable • Class or video and job briefing for major change
Validating rules comprehension	• A minimum of biennial rules class and testing • Scenario-based simulator for train handling • Operational/efficiency testing • Monthly meeting of management/labor committee discusses problematic rules • Review test results to identify areas that need more attention
Monitoring adherence	• Operational/efficiency testing – may be scenario-based • Review accident/injury data with focus on human factors accidents • Download locomotive event recorder data to monitor operating and train handling rules • Audit teams to validate testing • FRA violations • Review radio transmissions • 1-day safety assessment of co-workers
Responding to noncompliance	• Discuss test failure with employee immediately so cause can be identified

Program Characteristic	Industry Practices
	• Progressive discipline per labor agreement • Alternative process with minor, serious and major violation instead of formal investigation • Supervisor interview to determine appropriate actions, e.g., training, coaching
Encouraging compliance	• Safety briefings • Train supervisors how to coach and counsel employees • Mutual accountability – both supervisor and employee hold each other to standard of accountability • Crew resource management • Signal awareness forms (conductor records each signal passed) • Safety audit program not part of discipline process • Safety Assurance and Compliance Program at System and Division levels • Debriefing of every accident and incident with no discipline attached • 7Cs Program – confirming, correcting, caring, collaborating, coaching, conciliating, clarifying
Evaluating program effectiveness	• Relationship between results of operational testing and accidents/incidents and FRA violations • Change in number of accidents and injuries • Change in operational/efficiency test failures • Benchmarking with other railroads
Safety reporting mechanisms	• Close Calls Reporting System pilot • Safety hotline • Open communication between supervisors and their people

All railroads use operational/efficiency testing to monitor rules compliance. In addition, some download locomotive event recorder data to monitor an engineer's performance relative to operating and train handling rules. One railroad reported that this method allows them to identify red light run-throughs that they would not otherwise know about. Labor expressed the concern that this technology can be over-used and in some cases have a negative impact. Most railroads also review radio transmissions. Per FRA requirements, all railroads use accident and injury data to focus their testing

programs. One railroad reported focusing on human factors accidents for possible rules problems.

There is some variation in the responses to noncompliance. Some railroads do not discuss the operational test results with the employee unless there is unacceptable performance. Many railroads have a policy that supervisors are to give feedback but the positive feedback usually comes later while failures are handled at the time of the test. One railroad reported that they give feedback immediately, regardless of the outcome. Labor prefers this approach. The supervisor may discuss unsatisfactory test results with the employee and recommend an appropriate action such as training or coaching. Two railroads offer the employee, in certain situations, an alternative to the discipline process. Under this arrangement a labor/management committee reviews the circumstances of the rule noncompliance and recommends the remedial action. No disciplinary action occurs but the employee gives up the option of a hearing.

Railroads reported a variety of proactive strategies for encouraging rules compliance. These include training supervisors how to coach and counsel employees, adopting a policy of mutual accountability between the employee and supervisor, conducting safety audits that are not part of the discipline process, and conducting a debriefing of every accident with no discipline attached.

The railroad industry has been characterized as having a culture of blame but there appear to be attempts to change this. The ongoing Confidential Close Calls Reporting System (C^3RS) pilot will determine whether a nonpunitive near-miss reporting system will identify hazardous situations before an incident or rule violation occurs. (See Chapter 7.) Aside from C^3RS, one Class I railroad is implementing a nonpunitive reporting mechanism that will be managed by the labor organizations that represent its employees. There are also efforts to promote open communication between supervisors and their people.

Advice from railroad industry and labor representatives to transit agencies included the following:

- Train the first line supervisor to deal with individuals that violate an operating rule in a non-confrontational way.
- Discuss noncompliance issues with other transit agencies and similar industries.
- Implement programs such as job briefings and increased rules classes that force more communication between first line supervision and labor.
- Know your people and listen to them. Make sure supervisors are spending time in the field getting to know their people and talking to them.
- Make sure employees know the rule, the intent of the rule and how the rule is applied.
- In order to take safety and rules compliance to the next level you have to understand why the violation occurred. A misunderstanding or lack of knowledge should be treated differently than conscious disregard of a rule.
- Involve employees in the development of operating rules and procedures.

- The Federal Government needs to be more active in developing regulations for the transit industry to help them improve their safety performance.

MOTORCOACH

Table 5 summarizes the rules compliance practices of the motorcoach industry.

Table 5. Rules compliance practices of the motorcoach industry

Program Characteristic	Industry Practices
Initial rules communication	• Initial training that may include self-directed study via CBT, classroom and over-the-road training
Communicating new rules	• Notices mailed to drivers' homes • Memorandum posted in drivers' area • Safety meetings • Update training
Validating rules comprehension	• Written exam • Check out by veteran driver or trainer • Discussion at safety meetings
Monitoring adherence	• Onboard cameras for video recording • GPS tracking data • Mystery riders • Public feedback via internet or 800-number • On-road observation by field safety staff • Ride-along by operations staff
Responding to noncompliance	• Coaching • Retraining • Progressive discipline
Encouraging compliance	• Awards or financial incentive for no preventable accidents or other safety violation such as cell phone use while on duty
Evaluating program effectiveness	• Track at fault collisions, customer complaints • Accident Review Board • Review Drive Cam events
Safety reporting mechanisms	• 800-number for reporting; treated as confidential • Safety committees • Driver suggestion box • Management open door policy

Other than medical standards and commercial driver's license (CDL) requirements, Federal Motor Carrier Safety Administration (FMCSA) has no oversight of driver rules compliance.

Most over-the-road motorcoach companies provide both classroom and over-the-road training. One company did report that they only hire experienced drivers with a CDL. This company does a review of all candidates including an extensive background check and a psychological profile test to be sure that the individual meets the company's requirements for drivers. Orientation at this company covers company rules and policies and also includes a crisis management program. Most companies have written exams but one smaller operator reported that they relied on the recommendation of an experienced driver who trains the new hire.

Motorcoach operators use a variety of methods to monitor compliance with safe driving rules. These methods are the following:

- A majority of the companies that the research team contacted reported that they use a video-based system for monitoring driver behavior. The system is triggered by an unsafe driving behavior such as hard breaking or speed. When the event occurs, the system saves a video recording of the event along with engine data.
- Some companies hire mystery riders who purchase a ticket and ride the bus to observe the driver with regard to speed, customer service, lack of distracting activities while driving, following distance and other safety behaviors.
- Some companies have GPS tracking systems on their vehicles. These systems provide position and speed data.
- Some companies rely on observation by safety managers from a trailing vehicle.

In addition to the above activities, motorcoach operators also review customer complaints that come through an 800 number or email.

When management becomes aware, through one of the above methods, of an unsafe driving behavior, the driver's supervisor will meet with the driver to discuss the observation. The driver may be coached or sent for retraining. The information from the video monitoring system is used as a training tool, not as a means to discipline drivers. In every place where this system is in operation, labor initially resisted the system. After a number of instances where the video data showed that the driver was not at fault in an accident, i.e., it was a non-preventable accident, the drivers began to support its use. Discipline is an option when the driver does not respond to coaching and training.

All motorcoach companies evaluate their compliance programs based on the number of avoidable accidents. Those with video monitoring also look at the number of events that are reported. Motorcoach operators that use video monitoring all reported a decline in accidents after the system was installed.

Nearly all of the motorcoach companies have an incentive program to reward safe driving. Many of the people interviewed stressed that the drivers value these programs because the programs recognize the drivers as professionals. Both labor and management made this point. In some companies, compensation is based on safe driving.

Motorcoach industry and labor representatives offered the following advice to the transit industry:

- The most important way to encourage safe driving is to have open communication between the employees and management. Have an open-door policy and do one-on-one counseling.
- Safety must be a goal for everyone. Management sets the tone for safety, starting at the top.
- Conduct periodic safety meetings that include a review of actual situations that have occurred.
- Do a thorough background check and conduct a bona fide road test before hiring a driver. If you hire the right people, there are less performance issues.

TRUCKING

Table 6 summarizes the rules compliance practices of the trucking industry.

Table 6. Rules compliance practices of the trucking industry

Program Characteristic	Industry Practices
Initial rules communication	• Instructor led training • Practice in nonrevenue service • Read and sign policy
Communicating new rules	• Read and sign policy • Safety briefing
Validating rules comprehension	• Periodic safety quizzes • Periodic driver re-certification • Quarterly internet-based safety training
Monitoring adherence	• Ride-along • Public reporting via 800 phone number • Private monitoring services for covert observation • Hard braking data from engine recorder
Responding to noncompliance	• Remedial training • Peer coaching • Progressive discipline • Conduct root cause analysis
Encouraging compliance	• Periodic safety meetings • Monthly newsletter • Posters • Incentive award system for positive safety behavior • Employee recognition program (nonmonetary) • No tolerance policy for use of electronic devices • Defensive driving program
Evaluating program effectiveness	• Evaluate rule book and modify for clarity • Hard braking frequency
Safety reporting mechanisms	• Confidential report to safety department

Like the motorcoach industry, FMCSA has no direct oversight of driver rules compliance. Therefore, the agency thought the interview efforts of this project would best be suited for specific fleets and industry organizations. The following summarize these efforts.

The trucking industry is a proud proponent of safe operating practices. These companies realize they can either pay up front for proactive safety measures, or they can pay later (most likely at greater loss to the company) for accidents resulting in injury and claims. Therefore, they consider safety to be an investment.

The industry hires inexperienced as well as experienced drivers and uses various employee screening methods. The most predictive of these methods are the drug and alcohol offender screening process and the review of moving violations. The types of initial training for each differ based on experience. Subsequent information regarding rules may be relayed during periodic safety briefings. Some have traditional types of training, e.g., biennial spring/winter training. In the winter, specific types of safety rules can be revisited such as driving in icy weather, whereas spring training will highlight different driving challenges, e.g., fatigue resulting from the driver pushing him- or herself because of the extra daylight hours. There is a trend toward moving from these traditional types of training to more frequent (sometimes five times a year) CBT along with an annual rules recertification and in-truck assessment.

One company recently revised their rulebook examining each operating rule for relevance. They assigned employees, including drivers, to working groups for each section of the operating manual. The process took 3 months and uncovered areas where retraining was necessary. The end product was a streamlined version of the rulebook that was driver-friendly and provided much-needed clarity of the written rules.

The trucking profession consists of primarily two types of drivers. Some have dedicated routine assignments while others are long-haul operators. Both of these types of drivers present unique challenges to the companies that employ them. It is particularly difficult to manage long-haul drivers and create a sense of cohesiveness among the workforce. Large companies feel the need to create an atmosphere of individual responsibility given the sometimes geographically distributed workforces. In addition to fostering self-monitoring, these companies will require periodic ride-alongs, monitor motorist reports, as well as review automated truck-handling reports. They also keep track of accident data to inform risk assessment. These monitoring strategies act as proactive ways to prevent accidents, but they also provide a means for the company to identify noncompliant individuals, intervene through coaching or procedural changes, and then track subsequent behavior.

The industry is proactive in many regards. One company reported that they look beyond the cause of accidents attributed directly to driver error. They recognize the fact that 65% of accidents are due to reasons other than faulty driving. As a result, the company looks at these incidents to identify ways to improve driver ability to prevent additional similar occurrences. To facilitate this proactive approach the company relies heavily on a private methodology geared toward teaching drivers to be aware of their surroundings.

These companies rely on incentive programs to engage their employees. They report traditional bonus programs, but also use non-monetary rewards like safety recognition, e.g., the CEO of the company might send a personalized letter to a valued employee. One company reported that they feel these programs are undervalued. They spend so much time identifying when things potentially go wrong, that they sometimes forget the importance of acknowledging the people who provide safe and efficient transport services.

A labor representative commented that it is important to train and recognize operators as professionals. While much of the responsibility of professionalism falls on the shoulders of the drivers, the companies that employ these individuals are responsible for providing the opportunity for professional certification, honoring good driving behavior and compensating their drivers competitively. These company actions will go a long way toward encouraging safe driving behavior and help them to be less likely to feel the need to take shortcuts or make unsafe actions in the interest of generating more income, e.g., violating hours of service, speeding, etc.

When asked what advice they had to offer the transit industry, one company remarked that you "must start with a foundation of safety culture." Management commitment from the top-level down is the only way this can be accomplished. Labor also remarked on the importance of fostering a safe culture.

PETROCHEMICAL

The research team conducted interviews with two petrochemical companies. The initial plan was to conduct additional interviews; however, petrochemical companies did not see a benefit to their participation in this research and most were not willing to grant the interview. Table 7 summarizes the practices of the two companies that participated.

Table 7. Rules Compliance practices of the petrochemical industry

Program Characteristic	Industry Practices
Initial rules communication	• Computer-based training • OJT
Communicating new rules	• Email changes • Monthly safety meetings
Validating rules comprehension	• Safety audit
Monitoring adherence	• Safety audit • Supervisor observation
Responding to noncompliance	• Remedial training • Coaching
Encouraging compliance	• Monthly safety meetings • Coaching • Safety audit
Evaluating program effectiveness	• Leading/lagging indicators
Safety reporting mechanisms	• Self-report incidents and near-misses

All employees, including office workers, receive safety training as part of their initial orientation. Those employees who handle chemical products are trained in the standards relevant to their particular job. Some training is computer-based/online, but most is on-the-job with an experienced employee. In addition, one companied reported holding monthly safety meetings. This company emails new or changed rule details to employees if the monthly meeting is scheduled more than a few days after a rule change is effective.

One company conducts safety audits of all hazardous material remediation projects as well as its plant operations. Audit results are summarized in a Safe Act Index. Any employee found to be non-compliant during the audit will be educated appropriately. The other company relies on its shift supervisors in the plant to monitor adherence to safety rules. This is the primary way that management becomes aware of rule noncompliance. Employees at both companies are also strongly encouraged to self-report incidents as well as near-misses, also referred to as unanticipated occurrences (UO).

Remedial training may be recommended when there is a safety violation. Dismissal would occur only in the most egregious cases or if there are repeated willful actions. One company reported that management expects supervisors and managers to intervene and coach on the spot for any actions that do not follow policy, regardless of whether or not it results in an event.

Both companies use leading/lagging indicators to monitor the effectiveness of their safety compliance programs. Examples of leading indicators are monthly safety meeting attendance, completion of UO reports on time, and the requirement for one safety contact per employee quarter. Safety contacts can be providing training at monthly safety meetings, audit completion, completing a Project Safety Analysis or calculating a Safe Act Index. Lagging indicators are environmental deviations, incidents and injuries.

The companies report that they use safety training, safety meetings, peer coaching, and auditing to encourage compliance. Representatives at one company reported that, "Safety is not an option; it is a culture." Management expects employees to comply. When asked for advice to transit industry management, interviewees offered the following:

- You will achieve the level of safety excellence that you *demonstrate* that you want to achieve.
- You must plan/do/check. The biggest challenge is the checking. There must be a way to check if rules are being followed.
- A clear focus from senior management that safety is important and is a fundamental policy of the company will set the tone for how people work.

CONSTRUCTION

The research team contacted a major construction company based in Massachusetts to learn about their safety rules. Because this industry involves the use of construction equipment and large trucks, there was a possibility that some useful practices with application to transit operations would exist. (Their vehicles cover 3-5 million miles a year in total.)

Most of the initial training to new hires involves personal safety but the training also covers driving safety. The company has the employee sign a safety "agreement" after reviewing the safety handbook. New hires are assigned a mentor, usually a senior foreman, who works with them to help them identify and avoid hazards.

There is no formal rules compliance testing or evaluation. Foremen are responsible for monitoring employees. If an incident occurs, a superintendent or project manager may then increase monitoring of the foreman and the foreman's people. The company keeps a record of all safety infractions. Depending upon the nature of the safety infraction, there is a progressive discipline policy.

The company evaluates the effectiveness of its safety program by monitoring the number of injuries requiring first aid, number of recordable injuries, and lost-time injuries per hours worked.

The company treats near-misses as an incident and asks employees to report them on the incident report form. These reports, which go to the safety director, can be done confidentially, but not anonymously.

The safety director reported that the company tries to maintain a culture of safety but that this requires personal involvement from management. When asked what advice he would offer to transit management, his comments were more about safety culture than rules compliance. He offered the following:

- Share information with everyone, be it good or bad. Report the what and why, not the who.
- Management involvement and support is very important. If the management is involved, then the employees will follow.
- Be constantly alert; just because there has not been an incident does not mean it cannot happen.

Since the practices of the construction industry did not appear to offer any practices or strategies that were not present in the other industries, there were no additional interviews with construction companies.

CHAPTER 5
RULES COMPLIANCE PRACTICES IN TRANSIT

The transit industry currently employs a variety of practices to assure rules compliance. Structured interviews with representatives of transit agencies across all modes and sizes, labor and industry as well as representatives from regulatory agencies, provided the means to gather information on current industry practices. The questions used for these interviews covered initial rules communication, notification of rules changes, verifying employee rules knowledge, monitoring for rules compliance, responding to rules compliance, and measures to encourage rules compliance. The interviews also covered evaluating rules compliance program effectiveness and asked the organizational representative, "What advice would you give another transit agency with regard to fostering rules compliance?"

The following sections highlight the research team's findings with regard to each mode. Table 8 summarizes the number of organizations contacted as well as the number of interviews that were conducted. As Table 8 indicates, not all of the agencies contacted were available for interviews. The ferry operator is summarized along with the cable car operator under *Other*. As was the case with the nontransit industries, the research team assured anonymity to these organizations, consequently this information is not provided in this report.

Table 8. Number of agencies contacted by mode

Mode	Number of Interviews	
	Contacted	Completed
Commuter rail	8	5
Light rail	7	6
Heavy rail	8	6
Bus	12	11
Paratransit	3	3
Ferry	2	1
Other (cable car)	1	1
Labor	6	4
FTA	1	1
Industry Organization	2	2

COMMUTER RAIL

Table 9 provides a summary of the practices reported by the five commuter rail agencies that were contacted.

The FRA regulations that apply to railroads also apply to the commuter railroads. This means that the commuter railroads must have a program of operational testing and their locomotive engineers must have biennial rules examinations and annual ride checks with the supervisor of locomotive engineers.

Table 9. Rules compliance practices in commuter rail operations

Program Characteristic	Industry Practices
Initial rules communication	• Instructor led training • Onboard OJT
Communicating new rules	• Short class or safety briefing for major rules • "Meet and greet" notification from supervisor for major rules • Issue as bulletin order then general order • Update rule book • Cover in next annual rules class
Validating rules comprehension	• Written exam • Annual rules class and exam
Monitoring adherence	• Supervisor observations per FRA operational testing • Check ride in cab • Download data from onboard recorder • Data from signal system • Onboard spotters (cell phone use)
Responding to noncompliance	• Minor noncompliance, supervisor coaches and counsels employee, may require retraining • De-certification if FRA specified violation per regulation • Dismissal for cell phone use
Encouraging compliance	• Encourage employees to bring issues to local safety committees • Post notices to emphasize consequences of serious violations • Posters to heighten awareness • Safety bulletins to address special situations in proactive manner
Evaluating program effectiveness	• Monthly review of all accidents, incidents, near-misses • Results of operational/efficiency testing • FRA Audit reports
Safety reporting mechanisms	• Confidential Close Calls Reporting System • Daily crew de-briefing • Confidential report to safety department

All commuter railroads have training programs for their engineers and conductors. Some hire all new recruits as conductors or assistant conductors and then after some period of time allow them to apply to become a locomotive engineer. Initial training for both engineers and conductors includes rules instruction and a written examination. While FRA requires a rules class for engineers every 2 years, some commuter railroads require this annually for both engineers and conductors. One labor

representative commented that the most effective training includes an explanation of the reason or need for the rule, a demonstration of practical application, and hands-on practice applying the rule.

One commuter rail operator reported that prior to some rules classes, they administer a pre-test to gauge the group's understanding prior to the class. These results are compared with the scores of the group at the end of the class. This is done for informational purposes only and provides a means to judge the effectiveness of the training.

All commuter railroads have a program for operational/efficiency testing that is driven by accident and injury experience. In addition, commuter rail operators identify rule noncompliance using data that is downloaded from the locomotive and indications from the signal system. The check ride that is part of locomotive engineer certification also may identify noncompliance. One commuter railroad reported that they use onboard spotters to monitor handling of cash by conductors in ticket sales. These people have also been instructed to report unauthorized use of cell phones by the train crew. As with other transit operations, commuter rail operators receive complaints from patrons which may lead to the identification of a rule violation. The most common violations are signal violations and entering a work zone without proper permission. On systems with at-grade rail-highway crossings, improper protection violations occur.

FRA regulations prescribe engineer de-certification for certain rule violations. For minor noncompliance, the employee's supervisor will coach and counsel the employee and retraining may be required. Most commuter railroads have a "no tolerance" policy with regard to cell phones and anyone found using one will be terminated. Some permit the employee to have it in a grip that is on the train, but the device must be off. Since the locomotive engineer is alone in the cab, detecting cell phone use or texting is difficult. One of the NTSB recommendations following the Chatsworth accident was that video cameras be placed in the locomotive cab to detect this behavior.

Commuter railroads have employed a number of proactive strategies to encourage rule compliance. Examples are the following:

- For key rule changes, such as a new cell phone policy, one commuter railroad uses a "meet and greet" approach where a supervisor explains the new rule one-on-one.
- Training bulletins that address special situations (e.g., taking shortcuts) in a proactive fashion are given to supervisors for distribution to their people.
- Safety bulletins or alerts to give actual examples of the consequences of rule violations on the property or at another commuter railroad. These may be used in safety briefings.
- Conduct of a hazard analysis to identify risks related to rule violations and unsafe situations.
- Daily job de-briefing at the end of the day's last run including review of how unanticipated situations were handled.

One commuter railroad is participating in the Close Calls pilot implementation. The other commuter railroads reported waiting to see the results before committing to that type of nonpunitive safety reporting system.

All commuter railroads review the results of operational tests as well as all accidents, incidents and near-misses. If there is a pattern in either accidents or rule noncompliance, observations in the operational testing program may be refocused. This review may occur monthly and/or quarterly. One large commuter railroad took this review to a different level. They established a task force to look at hazards as a proactive measure to prevent rule violations and accidents.

Commuter rail operators offered the following suggestions on ways to foster rules compliance:

- There is no substitute for supervision. Supervisors must observe their employees.
- Address a problem when it occurs.
- Be proactive rather than reactive.
- Encourage employees to speak up and ask for help if they don't know how to do something.
- Front line supervisors must work with the hourly people. They must create an atmosphere of trust. The operators need to know that they are going to be supported for working safely. Supervisors must be accountable for the overall performance of their employees, not just on-time performance.
- Rules compliance requires a holistic approach that is based on a safety culture that comes from the top of the organization.

LIGHT RAIL AND HEAVY RAIL

Table 10 provides a summary of the practices reported by the six light rail and six heavy rail agencies that were contacted.

The approach that most transit agencies use for monitoring rules compliance is very similar to that used by the railroad industry. Unlike the railroad industry, oversight comes from state agencies, not a federal agency. The one exception is any light rail service that operates over track shared with a freight railroad and is part of the national railroad network, which is subject to FRA requirements. This applies to two light rail operators that the research team interviewed.

Training for rail system operators is always a combination of instructor-led classroom and field training. The representative for one light rail operator mentioned that since situational awareness is a key skill, their agency screens for this skill during the recruitment process. There is a written exam to validate the candidate's knowledge of the rules. Rules re-certification, including signals, beyond the initial test varies by location. For example, California requires annual rules exams for all rail operators. Other systems require biennial recertification.

Table 10. Rules compliance practices in light and heavy rail operations

Program Characteristic	Industry Practices
Initial rules communication	• Instructor led training • Practice in nonrevenue operation • Onboard OJT
Communicating new rules	• Safety bulletins, employee acknowledges by signature • Classroom training • Posters
Validating rules comprehension	• Written exam • Practice operation • Rule of the day/month • Quarterly safety workshops
Monitoring adherence	• Operational/efficiency testing • Download data • Observation by roving supervisor (off vehicle) • Ride-along • Public input
Responding to noncompliance	• Progressive discipline depending upon severity of violation • Employee counseling • Retraining
Encouraging compliance	• Quarterly workshops with LR operators • Rules of the Week • Defensive driving course (LR) • Safety Award Program • Hazard analysis • Management/labor safety audits
Evaluating program effectiveness	• Results of efficiency tests • Accidents
Safety reporting mechanisms	• Safety Committee with hourly and supervisory personnel • Open door policy • Confidential report to Safety Dept. • Use of nonthreatening safety language • Near-miss reporting system

In addition to periodic testing, rail agencies use a number of strategies to validate rules knowledge. These include having a rule of the day that is discussed at safety meetings or a rule of the month that the supervisor reinforces with each operator. One heavy rail operator queries operators during their shift and asks them to repeat back the rule of the day. One light rail operator conducts quarterly workshops with operators. These are half-day informal events that are intended to communicate information

regarding recent industry accidents or incidents, or rulemaking that has occurred. There is no testing at these workshops.

The common element in all rail compliance programs is operational/efficiency testing. The rail agency has a written plan with goals for the number and types of tests that must be done each month. These tests are planned, but supplemental unannounced tests may occur. Some agencies report that they make these tests transparent to their operators while others feel they should be done without operator knowledge. Only one agency reported giving positive feedback to the operator after successfully passing a test. Failures are always communicated immediately. Other techniques for monitoring compliance include download of vehicle data, roving supervisors who observe operations, and supervisor ride-along with the operator. Public input received via toll-free number, internet or email may also indentify rules violations. When asked about the most frequent types of violations, transit agency representatives mentioned failing to sound the horn in a work zone and accepting an improper route at a switch as light rail violations. Heavy rail operators mentioned failure to stop or hold at a specific location and closing the door on a passenger.

When a violation is detected, the response will depend upon the severity of the violation. The supervisor may counsel or coach the operator, or retraining with follow-up observations may be recommended. Most rail systems have prohibitions regarding the use of cell phones and texting while on duty. Some have a "no tolerance" policy requiring immediate dismissal. Others apply progressive discipline. Progressive disciplinary action occurs for serious rule infractions. Union agreements prescribe the discipline process. One labor representative commented that if an operator has a bad attitude and does not want to come to work, forcing the operator to take off 3 days without pay is not punishment to him. He added that this individual needs retraining, not punishment.

More than one labor representative pointed to the need for root cause analysis to identify any underlying problems that are responsible for or contribute to rule violations. The researchers learned of two noteworthy examples where root cause identified the underlying cause. They are the following:

- NJTransit's River Line experienced a number of red signal violations that exceeded the industry average over a 3-year period. A thorough investigation of these incidents revealed that the majority of LRV operators who had violated the stop signal reported that they presumed that the signal would be permissive by the time they reached it. Understanding that it was presumption not distraction or some other reason led River Line management to the appropriate way to reduce these violations.
- Two track worker fatalities on the New York City Transit (NYCT) subway system led to the formation of a labor/management task force to identify the underlying reasons for these fatalities. In addition to measures to improve track worker safety, the task force investigated the safety culture and current perceptions of safety. Among the recommendations of this task force effort are joint labor/management safety audits that are nonpunitive, injury and illness data analysis, root cause analysis of accidents and near-misses, and an ongoing

evaluation of the safety consciousness and culture. The final report from the Joint Track Safety Task Force is impressive. Other materials that the research team obtained indicate that changes were made in operating rules for train operators, track workers and flaggers.

Rail agencies employ a variety of measures to encourage rule compliance. As described above, NYCT conducts safety audits to reinforce compliance with safety rules and identify hazards before there are problems. Appendix C contains a description of this NYCT program. Other strategies include quarterly workshops with operators (mentioned above), focusing on a Rule of the Week in safety meetings or via bulletins, selecting a rule for operator coaching sessions, and safety incentive programs. Some agencies conduct a hazard analysis to identify problem areas that are a risk for a rule violation or accident. One labor representative commented that operators become complacent after 5-7 years of experience and that for this reason they need reminders as to how to operate in accordance with the rules. This same individual also commented that, in his experience, peer coaching can and does reduce this complacency.

All agencies evaluate the effectiveness of their compliance programs in terms of the results of their efficiency tests and number of accidents. Agencies review these data on a periodic basis, usually monthly, and adjust their test plans accordingly.

There is a variety of mechanisms for employees to report safety issues but only NYCT has a system that is specifically designed to encourage reporting of near-miss incidents. (Chapter 7 contains a description of this program.) Transit agency and union safety committees accept issues from operators and most safety departments provide a confidential 800 number for reporting safety issues and near-misses. Labor feels that if there are honest good faith efforts by management to listen and act on problems, then employees will report these situations. Lacking trust, the reporting will not happen.

Rail operators offered numerous suggestions on ways to foster rules compliance. These suggestions included:

- Get the employees actively involved in safety. This occurs when management removes the incentive for "gotcha" actions to penalize the employees and fosters dialog on the underlying reason for each rule and how it protects the operator.
- Build a training curriculum that teaches using both classroom methods and practical application of rules and procedures.
- Line supervisors must be able to coach operators. Not every operational deviation requires harsh discipline.
- Remain consistent in training and communication activities with operators.
- Let people know they are appreciated.

BUS

Table 11 provides a summary of the practices reported by the 11 bus agencies that were contacted.

Table 11. Rules compliance practices in bus operations

Program Characteristic	Industry Practices
Initial rules communication	• Instructor led training • Onboard OJT
Communicating new rules	• Written and video presentation during orientation, refresher training, and following incident • Monthly driver safety meetings • Monthly employee newsletter • National Safety Council publications • Rule of the week program • Read/Sign policy for new rules • Bulletin board • Broadcast email, data messages on screens in buses and radio alerts • Weekend safety retreat
Validating rules comprehension	• Periodic supervisor ride-along • Employee interview and field observation following incident • Review of safety incidents • Random ride check with instructor • Monthly performance evaluations • Periodic safety rules quizzes • Exams following orientation and retraining sessions • Safety discussions at periodic driver meetings
Monitoring adherence	• Periodic supervisor ride-along • Onboard camera for video recording (e.g., DriveCam, Vigil Solutions) and GPS monitoring • Ghost riders • Passenger reports • Operational testing
Responding to noncompliance	• Supervisor disciplinary discretion based on interviews and review objective incident information (e.g., camera) • Demerit/point system • Coaching and counseling; retraining when necessary • Progressive discipline • Union input if property is represented • Accident Review Committee recommendation for discipline

Program Characteristic	Industry Practices
Encouraging compliance	• Video training (e.g., "Steering Wheel" developed in the trucking industry) • Rules revision in response to risky procedures • Increase length of initial and refresher training • No tolerance policy for specific types of risky behavior (e.g., cell phone use) • Regular evaluations linked to incentive program • Expansion of video monitoring • Operator self-assessment programs • Accident reduction team • Safety campaigns • Adopt improved safety policies • Annual awards program
Evaluating program effectiveness	• Field and written exams • Quantitative risk assessment • Accident frequency statistics • Accident trends • Safety point system for employee evaluation • Passenger reports • Annual safety audit
Safety reporting mechanisms	• May be reported on accident/incident form submitted to supervisor or safety department

Safety rules compliance programs for bus operators are similar to those in the trucking and motorcoach industries. However, many of these properties are small, which has both advantages and disadvantages. The main advantage of small properties is that they have open-door policies and managers personally know their employees. This aspect fosters the communication necessary to ensure people understand safety rules. The major disadvantage of smaller properties is smaller revenue. As a result, the smaller properties are challenged with respect to acquiring expensive monitoring and training programs.

With respect to communicating safety rules, properties rely on the following traditional types of methods:

- Video presentations
- Rulebook
- Safety meetings
- Various safety publications

- Bulletin boards

Some properties reported innovative ways to relate safety rules to their employees. These include weekend safety retreats where employees take part in intensive safety training sessions. Additionally, one property has an accident review committee (ARC) that operates much like event-review committees in aviation safety reporting systems. That is, the ARC reviews accident reports and disseminates information regarding safety breaches and potential safety enhancements. To determine that employees understand the rules, properties conduct ride-alongs, perform employee evaluations and test for rules knowledge. Assessing knowledge retention occurs by using informal methods such as safety discussions as well as formal methods that include exams after orientation and retraining sessions.

Bus properties also use ride-alongs to make sure their employees are adhering to safety rules. However, these ride-alongs may occur covertly, a.k.a, ghost rides. Bus companies also rely on passenger reports of unsafe behavior. However, employees sometimes feel pressured to avoid customer complaints and as a result will break rules. One property reported that one of their most frequent safety violations was stopping to pick up passengers between stops. Obviously, drivers feel pressured to appease the riding public at the expense of safety. Many properties rely on video-monitoring equipment. Several commercial systems are available and in use at a number of bus properties. These systems record continuously but only maintain data for a pre-set time before and after an incident and can be reviewed later as a record of the event. Initially, labor was opposed to this type of system. However, subsequent accidents have shown that the camera system can be used to determine that the driver was not at fault. Bus properties also report using this tool nonpunitively, purely as a training tool.

Bus properties report various actions when they discover noncompliance. They use traditional progressive discipline, demerit or point systems, as well as more progressive interventions. The latter includes coaching and counseling as well as recommended interventions from a non-biased group like an ARC. Not surprisingly, the most commonly reported bus driver violations were cell phone use, following too closely, and speeding. Many properties have found that an enforced zero-tolerance policy for cell phone use is an effective deterrent.

One labor representative pointed out that management pressure to meet a schedule may cause an operator to compromise safety. Labor encourages their members to make safety their top priority. Their priorities are “Safety, service, schedule.”

When asked what advice these properties had for other transit properties, the most notable responses included:

- Agency should continually be proactive with instilling safety culture rather than reactive. Be adaptable.
- Clear communication of rules compliance to employees.
- Constant feedback from management to employees.
- Driver performance review programs.
- Establish safety incident point system for employee evaluations.

- Driver incentive programs.
- Utilize state of the art technology for observation of safety related rules compliance.
- Provide training, explain expectations and have a clear disciplinary process.
- Simulator video driver training programs.
- Vigilance every day to ensure employee adherence to rules compliance.

PARATRANSIT

The approach to safety rule compliance in paratransit is very similar to the programs identified in the bus interviews. These properties inform their employees of the rules initially at orientation, during periodic retraining, and in response to incidents and/or accidents. Some use instructor-led training to explain safety rules. Most disseminate safety information and changes to existing rules via the company bulletin board and/or employee newsletter. They assess employees' knowledge of rules through ride-alongs, employee performance reviews, and by word-of-mouth gathered by the supervisor. Like bus, these properties are also beginning to rely on video-camera technology to monitor adherence. These properties have their own safety noncompliance issues such as vehicle backing accidents, improper wheel-chair tie down, and under- or over-estimating vehicle size because operators often switch between operating mini-vans and cut-away buses. This can result in serious injury and damage to vehicles because the operator forgets which vehicle he or she is operating and fails to adhere to clearance height. All of these properties point out that open communication between employees and management is key to safe operations.

Many paratransit operators provide service in small communities and as such provide a vital link for the patrons that they serve. Because these services operate in small communities where everyone in town knows everyone else, patrons readily share feedback on the service and the manager of the service knows how the drivers perform. A key motivator to the drivers is that they likely know the riders (and know that they will tell others about their experiences), so they tend to provide safe service in accordance with the agency's safety rules.

OTHER

The team spoke with one ferry property. Their safety rules compliance program is similar to other transit modes. They do not have a formal safety reporting system, but they do rely on comment cards that can be submitted anonymously. They make a point to implement worthy suggestions. They did mention that educating via shipboard drills is an effective practice that may benefit other modes. This is akin to simulator or scenario training in other industries.

The research team spoke with one cable car operator. Their methods are the same as those that apply to their light rail operation.

CHAPTER 6
BEST PRACTICES FOR RULES COMPLIANCE

The interviews with representatives from other industries as well as the interviews with transit industry representatives produced a significant amount of information with regard to rules compliance programs and practices. Since many practices used by other industries were also present in transit, the research team felt that combining the two sets of best practices and then identifying those most suitable for transit was preferable to treating the two sets of practices independently. This chapter first explains the process that was used to identify the best practices and then discusses each group of practices.

PROCESS FOR SELECTION OF BEST PRACTICES

Chapters 4 and 5 presented the results of the structured interviews in terms of the following elements of a rules compliance program:

- Initial rules communication
- Communicating new rules
- Validating rules comprehension
- Monitoring adherence to rules
- Responding to noncompliance
- Encouraging compliance
- Evaluating program effectiveness
- Safety reporting mechanisms

During the interviews with representatives from the trucking and motorcoach industries, several interviewees provided information about their hiring practices when answering the questions regarding training. These individuals talked about the importance of hiring individuals who do not engage in risky behavior and the measures that their companies use to do this. While screening and selection of transit operators and other personnel is not part of a rules compliance program, *per se*, and was not a topic for the interviews with transit, it appears to be an important factor in achieving rules compliance. For this reason, screening and selecting employees was added to the above list of elements of a rules compliance program.

Many practices have application in more than one of these elements of a rules compliance program. For example, safety meetings can be a means to communicate new rules, validate rules comprehension and encourage rules compliance. Appendix B contains a table that maps the best practices to the element(s) of a rules compliance process (see Table 26). To facilitate evaluating the candidate best practices and to avoid duplicates, the best practices from both transit and the other industries were divided into the following groups:

- Screening and selecting employees
- Training and testing
- Communication
- Monitoring rules compliance
- Responding to noncompliance

- Safety management

The research team applied the following criteria to each candidate practice:

- Brought about measurable change
- Effect is easily monitored and measured
- Employee acceptance
- Realistic to implement in transit environment
- Cost-effective

To be included, a practice had to meet at least one of these criteria. The subsections below contain one table for each of the six groups of best practices. Each table includes the benefits and limitations or barriers relative to each best practice. These two columns in the tables address the criteria. All of the practices described by transit industry representatives appear in the tables because they have proven to be "realistic to implement in transit environment."

There were two practices from other industries that did not meet the criteria: crew resource management (CRM) and behavior-based safety. CRM is used in aviation and there has been some attempt to adapt it to the railroad industry. Because most transit operators do not work as part of a crew, this practice did not appear to be one that is realistic to implement for transit operators, the focus of this project. CRM might, however, be an effective strategy for track crews. This technique requires intensive training which might stress a transit agency's training resources. The other practice that is not included here is BBS. This technique involves peer observation and coaching. The literature suggests that BBS can be adapted to solo operators but its effectiveness is not reported. In addition, BBS was not mentioned in any of the interviews. As with CRM, implementing BBS requires specialized training, usually from outside consultants.

The initial set of criteria presented in the project's Work Plan included "Can be implemented in existing safety culture" and "Adaptable to transit agencies of varying sizes." Since the issue of safety culture will be addressed in TCRP Project A-35, this criterion was not used. The feasibility of some practices depends upon the size of the agency. Rather than eliminate a practice because it was not applicable to all modes and sizes of agency, each practice was assessed separately with regard to this issue.

The literature review identified a few best practices that were not mentioned in any of the interviews. These are included where appropriate. Similarly, any practice that is supported by the literature has "literature review" as one of its sources.

SCREENING AND SELECTION

The interviews with representatives from the trucking and motorcoach industries indicated that they screen candidates for operator positions based on specific types of motor vehicle violations because they are predictors of risk-taking behavior. Specifically, they look for motor vehicle moving violations and alcohol-related offenses. The literature supports both of these as indicators of risk-taking behavior. The aviation literature indicates that alcohol-related offenses are predictive of risk-taking maneuvers in the cockpit. These occurrences do not necessarily involve alcohol. Table 12 presents

both of these screening strategies relative to transit. Many transit agencies already employ these criteria.

Table 12. Best practices for screening and selecting employees

Practice	Benefits	Limitations/barriers	Source
Review motor vehicle moving violations	• Predictor of risk taking behavior	• No empirical transit research to support	motorcoach, trucking, transit, literature review
Review motor vehicle alcohol-related violations	• Predictor of risk taking behavior	• No empirical transit research to support	motorcoach, trucking, transit, literature review

TRAINING AND TESTING

Table 13 presents the best practices for rules training and testing rules knowledge. Effective rules training has four characteristics: (1) presentation of relevant information or concepts, (2) demonstration of the application of the rule, (3) opportunity for trainee to practice or apply the rule, and (4) feedback to the trainee during and after practice. Transit agencies use a variety of methods for teaching rules. As these characteristics suggest, if a video presentation or computer-based training is used, it should be combined with practical application and hands-on experience under the guidance of an instructor who is also available to answer questions. Simulator training is expensive and only the larger properties can afford this capability in their training centers. The major advantage to simulator training is that it provides an opportunity for the operator to experience a dangerous scenario without risk. Low-fidelity low-cost simulators may be an option. Both the presentation of a rule and any examination to test rules knowledge should include case scenarios.

Table 13. Best practices for training and testing

Practice	Benefits	Limitations/barriers	Source
Instructor-led training	• Opportunity for group discussion and questions • Correct skill inadequacy • Reinforce rules knowledge and application	• Cost • Requires qualified trainer	Bus, heavy rail, light rail, commuter rail, railroad, motorcoach, trucking
Video presentation	• Low cost	• No opportunity to ask questions	Railroad, bus
Simulator training	• Allows operator to experience dangerous scenarios without risk	• Cost	Railroad, bus

Practice	Benefits	Limitations/barriers	Source
Computer-based training	• Self-paced • Not location-dependent • Adaptable to internet	• Cost • Trainer not available to answer questions	Railroad, motorcoach, trucking, petrochemical
OJT	• Opportunity for personal coaching	• Requires qualified trainer	Bus, heavy rail, light rail, commuter rail, paratransit, motorcoach, petrochemical, railroad
Practice in nonrevenue operation	• Opportunity to apply knowledge • Useful for remedial training	• Requires coach or skilled trainer	Trucking, bus, light rail
Defensive driving course	• Prepares bus operators for unanticipated situations	• Cost	Trucking, bus
Refresher training	• Re-enforces rules knowledge and application	• Cost	Motorcoach, bus, heavy rail
Written exam	• Measures knowledge • Use test results to identify areas needing attention	• May not test practical application	Commuter rail, railroad, trucking, motorcoach, bus, light rail, heavy rail
Field test	• Tests practical application of rules	• Cost. • Requires skilled trainers.	Light rail
Periodic safety rules quiz	• Reinforces knowledge	• May not test practical application • May appear punitive	Trucking, bus
Periodic recertification	• Re-enforces rules knowledge and application	• Cost	Trucking, railroad, light rail

COMMUNICATION

All of the communication practices apply to either communicating new rules and/or encouraging rule compliance (see Table 14). For example, a rail transit agency will use bulletins and timetable updates to encourage compliance and also to communicate a new or changed rule. Safety briefings will convey the new rule as well as encourage compliance and hopefully, explain the reason for the rule. Daily crew briefing and periodic safety meetings also provide a forum for validating employee comprehension of rules. Reports from passengers and, for paratransit services, feedback from client agencies provide information for use in evaluating program effectiveness but the existence of these communication channels may also motivate employees to comply with rules.

Table 14. Best practices for communication

Practice	Benefits	Limitations/barriers	Source
Track bulletin, system bulletin, timetable, update rule book	• Codification of rules • Widely distributed	• Can become overly complex due to changes	Railroad, commuter rail, heavy rail, light rail
Job/safety briefing	• Reinforces rules knowledge and application • Opportunity for questions	• None	Railroad, transit track department, trucking, commuter rail
Daily crew debriefing	• Reinforces safe behavior	• Requires trust • Must be nonpunitive	Commuter rail
Rule of the day	• Reinforces rote knowledge of rule • Provides opportunity to focus on problematic rule	• Indicates awareness but not necessarily practical application	Bus, heavy rail
"Meet and Greet"	• Opportunity for questions	• Supervisor/manager availability	Commuter rail, bus
Open Door Policy	• Informal communication channel with supervisors and managers	• Requires trust	Bus, railroad, motorcoach, paratransit
Sit and chat session with GM	• Informal communication channel with management	• Requires trust	bus
Periodic safety meeting	• Opportunity for questions and discussion	• Opportunity to assemble group • Scale of meeting affects cost	Railroad, motorcoach, trucking, petrochemical, bus, light rail, paratransit
Read/sign policy	• Confirms awareness • Promotes employee accountability	• Indicates awareness but not necessarily practical application	Trucking, bus, light rail, cable car, heavy rail, paratransit
Safety notice via mail or email	• Assures information delivery when employees are geographically dispersed	• No opportunity for questions	Motorcoach, bus, petrochemical
Periodic newsletter	• Regular communication	• None	Trucking, bus, light rail

Practice	Benefits	Limitations/barriers	Source
Bulletin board	• Communicate information quickly	• Must be in conspicuous place • Lengthy materials go unread	Motorcoach, bus, paratransit
Electronic message board	• Communicate information quickly	• Must be in conspicuous place • Not suitable for lengthy communication	bus
Posters to heighten awareness of rules	• Effective method of communication	• None	Trucking, bus, heavy rail, light rail, commuter rail
Safety bulletins to address special situations	• Effective method of communication	• None	Commuter rail
Passenger/public reports	• Allows detection of behaviors not otherwise observable	• Not always objective	Motorcoach, all transit, trucking, motorcoach, heavy rail, paratransit
Solicit feedback from agencies served	• Allows detection of behaviors not otherwise observable	• None	Paratransit

MONITORING RULES COMPLIANCE

There are ten best practices for monitoring rules compliance (see Table 15). In addition to being a monitoring tool, transit agencies and motorcoach operators reported that onboard video data has proven to encourage compliance; operators do not want to take risks because there will be a record of any unsafe behavior or rule violation. Review of radio transmissions is done routinely by railroads and the FAA. Since it is a labor-intensive process, a transit agency might want to do this only if there is a series of rule violations or accidents that may be related to a communication issue. The last practice in the table, "Audit teams to validate operational testing," is a process to evaluate the accuracy of the operational testing process. On a large property, supervisors from another division would conduct an operational test to validate the observations of the regularly assigned supervisors.

Table 15. Best practices for monitoring rules compliance

Practice	Benefits	Limitations/barriers	Source
Operational testing	• Uniform testing • Helpful to operator if feedback is immediate	• Provides only a snapshot of performance • Requires trained observers • Punitive	Railroad, commuter rail, light rail, heavy rail, bus
Ride-along observation	• Opportunity to coach	• Requires qualified evaluator • May not be true measure of compliance because operator is on best behavior	Motorcoach, railroad, trucking, petrochemical, bus, light rail, cable car, commuter rail, paratransit
Mystery rider	• Allows detection of behaviors not otherwise observable	• Labor may resent because is a nontransparent way to check on the operator	commuter rail, motorcoach, bus
Observation exterior to vehicle	• Observe in routine service	•	Bus, heavy rail, light rail, motorcoach, trucking
Onboard recorder	• Continuous objective data	• May be misused punitively without knowing context or determining root cause	Railroad, trucking, bus, light rail
Data from signal system	• Continuous objective data	• May be misused punitively without knowing context or determining root cause	Heavy rail, commuter rail
Onboard video data	• Continuous objective data • Can be training tool to provide feedback on operator performance • Provides documentation of accidents • Reduced accident claims	• Labor may resent because is a nontransparent way to check on the operator	Bus, motorcoach, paratransit

Practice	Benefits	Limitations/barriers	Source
Speed monitoring with handheld radar gun	• Objective data	• Requires trained observer	Bus, light rail, commuter rail
Review radio transmissions	• Continuous objective data • Can be used as training tool	• Labor may resent because is a nontransparent way to check on the operator • Labor intensive process	Railroad, aviation
Audit teams to validate operational testing	• Assures accurate testing	• Cost	Railroad

RESPONDING TO NONCOMPLIANCE

Table 16 contains the eight practices for responding to noncompliance. In some organizations the supervisor reviews the circumstances of the noncompliance and determines the appropriate response. Coaching and counseling or remedial training are frequently the response to minor or first-time safety violations. Progressive discipline, with dismissal the final step, is present in all of the transit agencies contacted. Two railroads have a system of alternative handling that gives the employee the choice of using the hearing/arbitration process or participating in a system whereby if the employee exceeds the threshold for number and type of violations, then the employee is subject to discipline. A demerit point system is similar to alternative handling. Many transit agencies, as well as trucking companies, have adopted a no tolerance policy with regard to cell phone use and other risky behaviors, e.g., alcohol and drug use. Transit agency representatives reported that this policy has proven successful for stopping the unsafe behavior.

Table 16. Best practices for responding to noncompliance

Practice	Benefits	Limitations/barriers	Source
Supervisor investigates and decides appropriate response	• May lead to rapid response to noncompliance	• Requires skilled supervisor	Railroad, bus, light rail, heavy rail, paratransit
Coaching and counseling	• Personal • Provides immediate feedback to employee	• Requires qualified evaluator or supervisor	Motorcoach, trucking, petrochemical, bus, heavy rail, commuter rail
Remedial training	• Re-enforces rules knowledge and application • Opportunity to correct deficiencies	• Cost • Requires skilled trainer	Trucking, petrochemical, motorcoach, bus, paratransit, heavy rail
Progressive discipline	• Well-defined system	• Punitive	Railroad, transit, motorcoach, trucking
Alternative handling	• Choice-based discipline	• Requires labor/management agreement	Railroad
Dismissal	• Discourages repeat noncompliance and most egregious violations	• Labor agreements may define policy	All
No tolerance policy for risky behavior, e.g., cell phone use	• Discourages most egregious violations	• Punitive	Trucking, bus, rail
Demerit point system	• May discourage risk-taking behavior that results in rule violations	• Requires definition of penalty conditions and recordkeeping system	Bus

SAFETY MANAGEMENT

Table 17 contains 17 best practices for safety management. Many organizations rely on the results from various operational data collection efforts to determine baseline safety levels and monitor them over time. These include reviewing the results from operational testing, safety process audits and incident/accident analyses. The results from these efforts may be used as a benchmark to compare safety performance across transit properties. Additionally, transit may benefit from the petrochemical industry's method of monitoring both leading and lagging indicators. Traditionally, transit focuses on lagging indicators, such as number of accidents per frequency of operations. Leading indicators,

such as number of weekly safety briefings, provide a way to measure safety commitment before there is an effect on the lagging indicators.

Many organizations encourage their employees to report safety concerns and/or near-misses. Transit agencies generally reported informal types of reporting systems such as encouraging employees to report to local safety committees or the safety department, a safety hotline, or suggestion box. Many of these venues were confidential in nature, which encouraged reporting without fear of retribution. Other industries reported the use of formal safety reporting systems, which are the focus of Chapter 7. The information reviewed from reporting systems, either formal or informal, provides a way to identify operational hazards. Formal hazard analysis was reported in transit for light and heavy rail. The latter can be the basis for a formal safety management system like those implemented in the aviation industry.

Many agencies and other industries reported the use of incentive programs to encourage safe operating practices. These include safety awards programs recognizing safe operators with both monetary and non-monetary awards. Paratransit and trucking also reported using a safety point system for employee evaluations. Other best practices for safety management involved using nonthreatening safety language (e.g., unexpected occurrences in lieu of incident) and establishing a rules review committee that examined the efficacy of rules and the organization of rulebooks.

Table 17. Best practices for safety management

Practice	Benefits	Limitations/barriers	Source
Review results of operational testing	• Quantitative data	• Requires planning to structure tests	Railroad, light rail, heavy rail, commuter rail, bus
Benchmark agency test results with peers	• Quantitative data • Provides comparison with peer agencies	• Must recognize individual differences	Railroad, transit
Monitor leading/lagging indicators	• Provides insight into situations that might cause problem	• Requires a recordkeeping system	Petrochemical
Accident frequency statistics and trends	• Provides quantitative indicator of safety	• Requires a recordkeeping system	Railroad, bus, light rail, heavy rail
Safety audit by property, APTA, or regulator	• Nonpunitive and objective review	• Cost	Heavy rail track dept., railroad, petrochemical, bus, commuter rail
Encourage employees to bring issues to local safety committees	• Provides employee avenue for communicating concerns with peers	• Requires trust	Motorcoach, bus, light rail

Practice	Benefits	Limitations/barriers	Source
Safety hotline	• Provides employee avenue for communicating concerns	• Employees reluctant to use to report problems with co-workers	Railroad, motorcoach, commuter rail, light rail, heavy rail
Confidential reporting to safety department/director	• Confidential communication channel	• Requires trust	Commuter rail, trucking, bus, light rail, heavy rail
Suggestion box	• Communicate anonymously	• None	Motorcoach
Hazard analysis to identify risks	• Identifies risky situations that might otherwise go unidentified	• Requires individual familiar with methodology	Light rail, heavy rail
Review of near-miss incidents	• Identifies risky situations that would otherwise go unidentified	• Requires trust • Should be nonpunitive system	Heavy rail, petrochemical
Incident and accident review	• Opportunity to identify root cause and implement corrective action	• Full benefit not achieved without going beyond blaming the operator • May appear punitive • Requires formal committee	Railroad, motorcoach, trucking, bus, heavy rail, paratransit
Incident / accident de-brief without discipline	• Open discussion of cause	• Requires trust	Railroad
Safety awards program	• Recognizes operators as professionals	• Cost, if monetary rewards involved	Motorcoach, trucking, bus, light rail, paratransit
Safety point system for employee evaluation	• Provides quantitative measure of safety performance for each employee	• Requires a recordkeeping system	Paratransit, trucking
Use of nonthreatening safety language	• Formal communication of unsafe condition	• Requires management and supervisor acceptance • Works in the context of a no-blame culture	Petrochemical, commuter rail

Practice	Benefits	Limitations/barriers	Source
Management/labor rules review committee	• Perspectives from both labor and management as to why rule does not work	• Must reach consensus • May be lengthy process	Railroad, trucking, bus

APPLICABILITY OF BEST PRACTICES BY MODE ANDE SIZE OF AGENCY

Appendix C contains a table illustrating the applicability of each of the best practices by size of agency and mode. As Table 27 in this appendix indicates, the majority of the best practices apply to all sizes of agency and all modes. A few practices, such as the use of track bulletins to convey new rules or changes to rules, apply only to rail operations. A number of the best practices did not apply to paratransit due to the nature of that type of operation.

CHAPTER 7
SAFETY REPORTING SYSTEMS

Review of safety reporting systems from other transportation modes and other industries provides models for the development of a similar system for the transit industry. This chapter describes the following ongoing programs:

- Aviation Safety Reporting System (ASRS)
- Aviation Safety Action Program (ASAP)
- Air Traffic Safety Action Program (ATSAP)
- Confidential Close Calls Reporting System (C^3RS)
- Confidential Incident and Analysis Reporting System (CIRAS)
- Firefighter Near-Miss Reporting System
- NYCT Near-Miss Reporting System

Publicly available documents and interviews with developers and administrators for these systems provided information on the various systems. In addition, researchers reviewed accident/incident reporting forms that provide a means for transit employees to report a near-miss.

AVIATION REPORTING SYSTEMS

Three different safety reporting systems exist in the aviation industry, ASRS, ASAP and ATSAP. Each provides a reporting mechanism for a different group of stakeholders or employees. Table 18 summarizes the characteristics of each system. The subsections below describe each one.

Aviation Safety Reporting System

The need for a safety reporting system in aviation operations was recognized by the military and industry during WWII. However, it was the crash of TWA flight 514 on December 1, 1974 that prompted the creation of ASRS. TWA 514 was en route to Washington National Airport but was redirected to Dulles International due to turbulence and rapidly deteriorating weather conditions. As with all accidents, many factors led to the crash, including confusion regarding instrument approach procedures and poor cockpit communication. As a result, the captain piloted the aircraft below the minimum vectoring altitude and collided with the west slope of Mount Weather VA. Seven crew members and 85 passengers died in the crash. There were no survivors. A similar incident had occurred almost six weeks prior involving a United Airlines flight. The accident and near-miss highlighted the need for an aviation safety reporting system so that problems with the National Airspace System (NAS) could be identified to prevent future accidents.

ASRS was begun in 1976, funded by the FAA, and administered by the National Aeronautics and Space Administration (NASA). At the time, this was an innovative program, because it introduced a confidential, voluntary reporting system for pilots, air traffic controllers, and any other personnel working in safety-critical operations within the NAS. Additionally, it featured what was then referred to as limited immunity from the FAA's disciplinary system of potential fines and certificate action, with certain caveats. The objective of the program was to gather data on violations or flight incidents

Table 18. Aviation reporting systems

Feature	Reporting System: Aviation Safety Reporting System (ASRS)	Reporting System: Aviation Safety Action Program (ASAP)	Reporting System: Air Traffic Safety Action Program (ATSAP)
Managing organization	National Aeronautics and Space Administration (NASA) and the Federal Aviation Administration (FAA)	FAA, Office of Voluntary Safety Reporting, AFS-230	FAA Safety Services AJS-1 and CSSI, Inc., a private third-party company
Year initiated	1976	1997	2008
Coverage	All individuals working within the National Airspace (NAS) involved with safety-critical operations	Airline employees with a Memorandum of Understanding (MOU) with the FAA	Air traffic control specialists, both non-bargaining unit employees and bargaining unit employees contingent upon a MOU with FAA
Annual cost	Approximately $3M, of which $2.4 M comes from FAA and the remaining from NASA	Salary cost for 2 FAA employees; 5 contract personnel support all FAA voluntary reporting programs	Information not available
Staffing	Staffing services provided by Batelle Memorial Institute and includes highly experienced pilots, air traffic controllers, mechanics, and human factors analysts.	8 FAA personnel, 5 Contract personnel. Individual Airline Employees	FAA oversight personnel, CSSI personnel and the regional ERCs
Annual number of reports	Received approximately 49,000 in 2009	45,000 reports generated in 2008	Information not available
Report submission	Online and written paper submission via US Post	Online, mostly through WBAT. Option to send copy of report to NASA's ASRS	Online
Time limit on submission	10 days	Variable by airline	Within 3 days of the incident

Feature	Reporting System		
	Aviation Safety Reporting System (ASRS)	**Aviation Safety Action Program (ASAP)**	**Air Traffic Safety Action Program (ATSAP)**
Implementation issues	None discussed	Confidentiality, liability, trust, protection from discipline/certificate action.	NATCA reported no major issues and commented that the program was "put together well." Air traffic control culture was militaristic and punitive.
Program oversight	NASA Program Manager	FAA Program Manager	FAA Program Manager

that may have never surfaced. As this data was reported, general trends and potential safety deficiencies could be uncovered. ASRS has evolved into a highly successful program generating nearly 49,000 safety reports during calendar year 2009.

Staffing for the system is made up of highly skilled pilots, air traffic controllers, mechanics and psychologists knowledgeable in the field of human factors. These employees serve as analysts that review each report as it enters the system. An analyst conducts an initial review, screening the reports for actionable items. If a hazardous situation is identified, a resultant safety alert is issued. The analyst then identifies multiple reports of the same incident and cross-references the related reports. Then the analyst codes the event using the ASRS coding taxonomy. The taxonomy has a minimal number of error and causal categories. When asked why the ASRS team does not use a more comprehensive taxonomy, the director replied that information may become obscured by an overabundance of categories. The incident narrative, although de-identified, serves to provide additional information when the initial taxonomic categories do not provide sufficient information.

After coding an incident, an analyst will clarify (if necessary) any information with the reporter during a callback. After this, the report is de-identified, submitted to a quality check, and entered into the system. All original documentation is destroyed. De-identification is an important part of the process that is more than just removing the names of individuals and locations referenced in the reports. This process requires a trained professional to be able to identify potential contextual cues in the report that may identify the reporter. As such, de-identification requires intense scrutiny by individuals who can spot potentially identifying information that an untrained individual might otherwise not recognize.

The information gleaned from ASRS can be accessed via many different sources. The data are available for public download online as well as through specific search requests submitted to ASRS staff. Many safety researchers use the information from

ASRS to conduct archival analyses of safety issues in the NAS. In addition, ASRS staff conducts quick response analyses for government agencies such as the FAA, NTSB, NASA and Congress. *CALLBACK*, a monthly newsletter, provides valuable safety information to pilots and air traffic controllers.

Aviation Safety Action Program

The next iteration in the development of voluntary reporting systems came with the Altitude Awareness Program. Prior to this, a group of senior executives from all facets of aviation and the FAA formed the beginnings of what is now the Commercial Aviation Safety Team (CAST), a group that examines all aspects of flight safety from a comprehensive viewpoint. At the time, the most common flight issue was altitude deviations. In order to gather more data to determine the causes of these deviations, from a pilot and air traffic control perspective, a program was developed that would gather altitude deviation data from voluntary reporting. Again, limited immunity was given in order to increase the reporting level and data collection. The program became highly successful, generating a large amount of data. In addition, the program also began to take the factual data and from that examine why the deviations were occurring.

This program was very successful in reducing altitude violations, because with the data from the confidential voluntary reports, not only what happened but also the ability to see why these deviations happened became possible. In addition, data that ordinarily would never have surfaced with the current inspection systems was collected in great detail. Again, the basic elements that made the data gathering successful were the voluntary and confidential aspects of the reporting system and the limited immunity from the standard FAA enforcement procedures. Based on the success of the Altitude Awareness Program, the CAST group began to discuss some kind of a similar voluntary reporting system that would cover all aviation events. The CAST group envisioned a total reporting system that would include any safety incident or concern. The complexity of this, however, would dictate a more formal system to go into the future. These initial discussions are what eventually led to ASAP.

Establishing a formal system required a pilot implementation. In the mid-90s, the FAA, American Airlines, and the Allied Pilots Association were enthusiastic with the initial intent of the program, especially in light of the successful Altitude Awareness Program. Nonetheless, each party had its own individual concerns with the new system (see Table 19). The pilots' union was concerned with the confidentiality of the reports, as well as protection from discipline both by the FAA and airline management. Management voiced concerns regarding liability for any of the reported incidents, as well as any possible tarnish to their public image. The FAA had issues in dealing with actual violations of the FAR, as well as the perception that any immunity from prosecution would be perceived as excessive leniency, since this immunity was often referred to as a get out of jail free card.

Table 19. ASAP stakeholders issues

Stakeholder	Issues
Labor	• Confidentiality of the information • Protection from discipline by the FAA (fines/certificate action) • Protection from discipline by the airline management
Airline management	• Liability for any reported incidents • Public Image
Federal Aviation Administration	• Handling an incident that involves a FAR violation • Sole source versus non-sole source • Appearance of leniency

The major issue that affected all of the stakeholders involved trust between each of the three parties. This program was a distinct departure from the punitive system involving any breach of the airline or FAA regulations. As a result, this involved a substantial change in these relationships, and was difficult for many of the participants to overcome. In addition, labor found it difficult to believe that the FAA and airline management would really operate differently in this new environment, considering it was such a radical change. Trust among all the parties thus became the overriding issue as the program moved into the test phase.

The test phase employed the services of the University of Texas, who had been involved with the design of the program. A pilot implementation with American Airlines led to changes and improvements were made. All parties considered the test phase successful. However, there were still issues to be resolved. Some of the senior FAA personnel and some of its line inspectors were not fully accepting of the program. Senior FAA personnel were not happy with the concept of foregoing enforcement action and particularly the term immunity. Some FAA inspectors, as well as airline pilot management, felt that the program usurped some of their authority. All of these issues had to be worked out over time, and some elements of them still exist, although today these issues are pretty well isolated. In terms of administration, a Memorandum of Understanding (MOU) was developed between the FAA and the airline, detailing how the program would be operated. This document was to become the guiding directive on the operation of the program, and is a requirement today for any operational ASAP system.

The first ASAP system went into effect in 1997, and over the years the program has continued to experience some changes. The current operation of the system is based on the template MOU that has been worked out over time. In the beginning of the program, the FAA agreed to a tailored MOU to encourage more airlines to participate in the program. As the program expanded and matured, the use of the tailored MOU became unwieldy, especially as the program became more standardized. Today, the FAA insists on the use of the template MOU. Previously, some of these changes were the

result of labor's effort to put more immunity into the program. Now the FAA prefers that airlines accept the template MOU and make any changes between the airline and its employees, assuming those changes do not alter the fundamental objectives of the program.

As mentioned, the senior level of the FAA was unhappy with the term immunity, feeling this nomenclature gave the implication of some kind of leniency. The new concept of voluntary reporting, however, was a radical departure from the standard inspection and violation process that was inherent in the original system. To satisfy the FAA, a formal procedure was established within the ASAP system that would categorize how each incident or violation would be handled. Further, the phrase regulatory incentive replaced the older term immunity, and this newer phrase is now found in the current MOU. Also, there is delineation between reports that are considered sole source versus non-sole source. If an incident or violation is sole source, it means that it only surfaced because it was reported voluntarily. If the incident or violation comes to the attention of the FAA or the airline management from another avenue, it is then considered non-sole source and is handled somewhat differently.

Each airline's ASAP has an Event Review Committee (ERC), composed of representatives from the FAA, airline management, and airline labor. These committees review all ASAP reports. When a person submits a report, (s)he also has the option to submit a companion report to ASRS. After the ERC receives a voluntary report, the first step is to determine whether or not the report qualifies for the program. While more than 95% of the reports are accepted by the committee, there are five exclusions. These are: (1) criminal activity, (2) substance abuse, (3) controlled substances, (4) alcohol, and (5) intentional falsification. If the ERC determines that the report does not qualify, the incident or violation in question can then be handled by the FAA and airline management in a disciplinary manner. However, most reports are accepted into the program, and they are then examined in terms of an actual violation or an incident/safety concern. The ERC decides action based on consensus, not unanimity. That is, all three parties must agree that the final decision and/or action is something each of them can live with.

Historically, violations have made up only about 20% of the reports, so most of the reports do not involve the regulatory incentive part of the program. For those reports that involve an actual violation of the FAR, there is no penalty or discipline given for a sole source report. For a non-sole source report, as long as the report was filed prior to the second source information, the FAA will impose an administrative penalty, such as a letter of admonishment, rather than the standard fine or certificate action.

The result of processing the report generates two actions. The first establishes any corrective action or training that may be required. Smaller issues can be completed in approximately 30 days. If the report is determined to be a systemic issue, the period for corrective action could be much longer. The second action involves categorizing the violation/input in accordance with the established taxonomy, and submitting the data to a computerized data base for later retrieval. Today, most airlines use the Web-based Application Tool (WBAT) for their ASAP system.

Keeping track of self-reported safety incidents allows airlines to compare report frequency and type of report before and after remedial actions, thereby giving them a

means to track the effectiveness of their remediation efforts. This latter approach solves a long-standing problem with reporting systems like ASRS. While ASRS is a valuable data source, it has traditionally been a challenge to take the information from these reports and feed it back into the system with the goal of improving operations. By having each airline responsible for their reporting system, the information source (i.e., safety reports) was closer to operations and could easily be fed back up the operation chain to improve safety.

By any measure ASAP is a success story. The FAA estimates that 90 to 95% of the reports are sole source. This is data that would never have surfaced without a voluntary reporting system. With the categorization and analysis of this data, potential incidents as well as systemic problems can be detected before they become an issue. In general, all of the stakeholders, FAA, airline managements, and labor groups fully support this voluntary reporting system. Moreover, the sharing of this data through the Aviation Safety Information Analysis and Sharing System (ASIAS), the FAA's large-scale data compilation effort, is another step forward in the effort to solve problem areas before they become accidents. In summary, this program is a transition to a prognostic and diagnostic safety program, and is a valuable addition to the existing FAA line inspection program that will continue to exist.

Today, virtually all pilot groups in the US have an ASAP program. Additionally, many of the other labor groups, such as airline dispatchers, airline maintenance personnel, and flight attendants have ASAP systems as well. The program works especially well with any labor group that is licensed or subject to the FAR.

Air Traffic Safety Action Program

In August 2007, the FAA released a call to action to reduce runway incursions. One of the action items that came about involved a renewed interest in developing a reporting system specifically for air traffic controllers. While controllers were able to file confidential reports to NASA's ASRS, they were not afforded the same protective provision incentives (i.e., immunity) that pilots benefited from. Because of this, there were significantly fewer reports from controllers in ASRS that could be used to help identify the root causes of operational errors resulting in runway incursions. Given the success of the ASAP program for airlines and the impetus to reduce runway incursions, the FAA began development efforts for ATSAP.

ATSAP began as a demonstration program in March 2008 and underwent review in August 2009 at which time it was judged to be a successful program and instituted as fully operational. As with ASAP, the FAA and labor negotiated an MOU. There were obstacles to implementing ATSAP including the militaristic culture of air traffic management. A culture of blame existed in tower operations with the mindset that managers must identify those committing errors and punish them without necessarily trying to understand why a controller committed the error in the first place. For this reason, the program was phased in at centers over time due to acceptance issues. Parts of the country are still being phased into the program.

The staged implementation included a required 2-hour training program that labor and management had to attend in order to be able to participate in the program. Training was onsite and in-person with both labor and middle management. The initial training

targeted both groups. Then a representative from the National Air Traffic Controllers Association (NATCA) provided separate training for labor as did an FAA representative for air traffic management. The training involved explaining the importance of safety culture and the concept of a just culture.

The program is modeled after ASAP. However, the immunity portion of the program has wider latitude than that of the ASAP program. Only in the case of egregious violations (e.g., illegal acts, acts of sabotage) do protective provision incentives not apply. This is in stark contrast to the way things were prior to the implementation of the program. ATSAP has gone a long way to changing the reporting culture of air traffic in a relatively short period of time.

As with ASAP, a controller will electronically submit a report in which he/she was directly involved within 3 days of the incident. ATSAP interfaces with NASA's ASRS the same way ASAP does, i.e., controllers are given the option of providing a companion ASRS report. The major benefit to this interface is the increase in the number of controller ASRS reports filed to the national database. Prior to ATSAP, the percentage of ASRS reports from controllers was about 1%. Post ATSAP, the percentage is now close to 12%. Reporters also have the option to file a report regarding general safety concerns (i.e., issues that do not specifically result in an incident but are worth reporting). An analyst reviews the report and then follows up with the reporter to complete any missing information or clarify any vagaries.

An ERC is composed of three representatives from the FAA Air Traffic Organization (ATO), the FAA Air Traffic Safety Oversight Service (AOV), and NATCA and they meet weekly to review reports and come to a consensus regarding the best response to the incident based on the root cause. Complete de-identification of the reports is particularly important for this step in the process to ensure that members of the ERC remain objective regarding the review of and response to incident reports. Potential solutions are implemented and tracked to determine their effectiveness. There are multiple ERCs that represent different regions of the country.

While every reporter will receive follow-up from the ERC regarding his/her own at-risk behavior, this effort does not disseminate important information to the larger ATC community that might benefit from learning about the information contained in these reports. The ATSAP team releases a weekly briefing sheet and a monthly briefing report describing recent trends in the reporting data. However, data dissemination continues to be an inherent problem in the system. The program guarantees complete confidentiality; therefore, it becomes a challenge to get the word out about particular system problems or even successful solutions to problems. Data dissemination is an on-going work-in-progress for ATSAP.

Trust in a transformational system such as ATSAP is difficult to obtain particularly in an autocratic environment such as ATC. Given this limiting factor, the change in reporting culture has been very positive. Air traffic managers have anecdotally reported that they are amazed at the amount of information contained in the reports and how useful the reports are. Like the airlines after the implementation of ASAP, air traffic management commented that they cannot imagine a time when this data was not

available. NATCA and the FAA plan follow-up visits to facilities to gauge the long-term acceptance of the program.

Advice for Transit Industry Regarding Reporting Systems

Interviews were conducted with various sized airlines, their labor unions, industry organizations, and the FAA. During these interviews, each party was asked what they would recommend to a transit agency that would want to initiate a voluntary safety program. The following is a summary of the comments that were offered:

- The key and overriding issue in the establishment of any voluntary safety reporting system is the establishment of trust among all of the participants. Without mutual trust, a satisfactory reporting system will simply not work.
- All safety systems need to be supported by the highest levels of management, and re-emphasized at each organizational level. Any system will collapse if the average employee feels that there is no real commitment to the program from the executive levels, and they will perceive that the program is simply a façade or window dressing.
- Before any system is put into effect, a complete understanding and support for the new system must come from each element that will be involved. All employees that will come under the new system need to fully understand the program. In addition, employees who are not participants in the new program must feel that the new system is not a threat to them. Proper training is the key to a successful system.
- Make sure any voluntary reporting system is used only for the purpose that it was intended. Attempts to use the system for other reasons will cause a lack of trust among the employees.
- Make sure that all the employees who serve on the program oversight committee are thoroughly trained and support the philosophy of voluntary safety programs.
- There must be a basic understanding of system hazards from frontline employees. This can be accomplished through a safety reporting system. The industry must have a genuine desire to improve safety and this mindset must be adopted by the organization's safety manager. There has to be an emphasis placed on adopting incentives to be proactive about safety. While subjective data, such as that obtained from safety reporting systems, is invaluable, you must look to a variety of subjective as well as objective data (e.g., on board recorders) to tell the whole story.

CONFIDENTIAL CLOSE CALLS REPORTING SYSTEM

Table 20 summarizes the features of C^3RS, a pilot reporting system for railroad employees. This pilot system is currently under evaluation with four railroads.

Table 20. Confidential Close Calls Reporting System

Feature	Description
Managing organization	Federal Railroad Administration, Office of R&D
Year initiated	2005
Coverage	Employees at selected pilot sites
Annual cost	$1M for implementation and evaluation (Volpe) plus$100K per month for processing reports
Staffing	Information not available
Annual number of reports	1 ½ calls per day with three pilot sites
Report submission	Paper copy submitted by mail
Time limit on submission	File within 3 days of event to receive protection from discipline
Implementation issues	Confidentiality, liability, trust, protection from discipline
Program oversight	Steering Committee

Background

In 2000, FRA's Office of Research and Development realized that improvements in safety in the railroad industry would only happen if the safety culture in the industry could improve. R&D sought a way to get both labor and management to talk about the safety culture issue. Exploring the feasibility of a close calls or near-miss reporting system was a way to foster the discussion. FRA, working closely with the Volpe Center, invited key representatives from both railroad labor and management to participate on a Planning Committee to explore the feasibility of such a system for the railroad industry.

The Planning Committee held its first meeting in April 2002. Initially the committee members were skeptical about the concept of a close calls reporting system. They sought a definition for "close call." Volpe Center staff prepared a white paper to meet this need. Ultimately there was total buy-in and the committee took ownership and planned a workshop to bring the issue before the entire industry.

An FRA-sponsored workshop on Improving Railroad Safety Through Understanding Close Calls took place on April 23-24, 2004 in Baltimore. The purpose of the workshop was to educate the railroad industry on the benefits of understanding close call events and the challenges to implementation and success of a close call reporting system. A close call was defined as "an opportunity to improve safety practices in a

situation or incident that has a potential for more serious consequences." The workshop focused on experiences in the US airline industry and the Confidential Incident and Analysis Reporting System (CIRAS) for UK railroads. The outcome of the workshop was that there was unanimous support from both railroad management and labor to proceed with planning a pilot confidential reporting system as a demonstration for US railroads.

Designing the System

After the workshop, the Planning Committee focused on designing C^3RS. Each stakeholder had issues to be considered (see Table 21). For labor, confidentiality was the top issue. They were also concerned about whether or not an employee who reported a close call incident could later be penalized if data in the locomotive recorder indicated failure to obey an operating rule. Railroad management had liability concerns while the FRA saw a potential conflict with agency regulations. As the group built trust amongst themselves they were able to work through all of these issues.

Table 21. C^3RS stakeholder issues

Stakeholder	Issues
Labor	• Confidentiality of the information • Protection from punishment if employee voluntarily reported incident and locomotive data recorder indicates a rule violation • Must all crew members report an incident or does one report cover all present?
Railroad Management	• FELA liability for consequences of any reported incidents • Public image
FRA	• Handling an incident that involves a violation of FRA regulations

In designing C^3RS, staff from the Volpe Center benchmarked other confidential reporting systems then worked with the Planning Committee to create a workable system for the railroad industry. Volpe considered the CIRAS system in use with UK railroad operators and the ASRS operated by NASA for the aviation industry. CIRAS is funded by the rail operators while a government agency, FAA, pays for ASRS.

Confidentiality was such a key issue that FRA and the committee determined that a third party had to collect and protect the data. FRA initially chose to use the Bureau of Transportation Statistics (BTS) for this important role. BTS protects data under the provisions of Confidential Information Protection and Statistical Efficiency Act (CIPSEA).

FRA proposed a 5-year pilot implementation of the system at four railroads to validate the concept and to evaluate its effectiveness and function. The Planning Committee worked to develop a model MOU that would be signed by all participating stakeholders at a location that wanted to participate in C^3RS pilot. By March 2005 the

model MOU was signed by all stakeholder groups. The model MOU describes the provision of the C^3RS Demonstration Project and explains the rights, roles, and responsibility of the participants under the project. Ultimately each site would have to make changes to meet the specific needs of the stakeholders at the specific location.

System Operation

The first step in initiating C^3RS at a railroad is negotiation of an implementing MOU (IMOU). This can take considerable time as the stakeholders work through their concerns and establish trust that the system will work. After railroad management, the relevant labor union and FRA negotiate and sign an IMOU, a Peer Review Team (PRT) must be established. The PRT is a local joint labor/management/FRA problem-solving group that will review all of the de-identified reports and ultimately recommend corrective action to railroad management. For the pilot implementation, Volpe Center staff have been responsible for training the PRT on team building and root cause problem solving designed for C^3RS.

The Volpe Center is also responsible for evaluation of the pilot demonstration project. Their evaluation has several aspects. One is to determine the costs and benefits associated with the project. Another is to document the implementation experiences at each site. Finally, Volpe is monitoring the ongoing experiences at each site so as to detect problems and issues before they lead to failure of the project.

Employees who see or experience unsafe conditions may submit a written report to BTS. In order to be immune to disciplinary action, the report must be postmarked within 48 hours of the event. If the employee is unable to do this, the employee may notify BTS by phone within 48 hours of the event and have the written report postmarked within 3 calendar days of the call. BTS removes all identifying information, follows up with all employees who submit a report within 2 weeks, and forwards reports back to the PRT of the railroad involved once a month. The PRT meets, usually monthly, to review the reports, establish the root causes, and recommend corrective actions to management.

As C^3RS moved from the design stage into an operational pilot, the Planning Committee became a Steering Committee that meets periodically via face-to-face meetings and phone conferences to review progress.

Experience to Date

The Union Pacific Railroad's North Platte Service Unit (UP) was the first to become a pilot site. In February 2006, UP initiated a series of activities to build confidence in C^3RS among its employees. UP, with guidance from Volpe Center staff, undertook a series of teambuilding activities for its PRT where the group discussed confidentiality of the data, methods for root cause analysis and other issues. Posters in the crew reporting points announced the system and for a 72-hour period, labor and management representatives went to the crew reporting points to talk about C^3RS. Press releases from the Association of the American Railroads (AAR), the Brotherhood of Locomotive Engineers and Trainmen (BLET), and United Transportation Union (UTU) announced the formal rollout of the system in February 2007. There was an immediate response from covered UP employees. Employees began submitting reports of incidents as soon as the system was available.

The Canadian Pacific Railroad's Chicago Area Service Unit (CP) was the next to become a pilot participant. They came onboard about a year after UP and in November 2009, New Jersey Transit (NJT) initiated its participation. Amtrak will join in the latter part of 2010.

Based on experience to date, FRA reports the following potential impacts of C^3RS:

- Corrective action is being taken on close call events that can have a pronounced impact on safety.
- The PRT identified processes that merited corrective action, some of which were not identified as key problems prior to implementation of the reporting system.
- The process of analyzing close call reports identified classes of close calls whose existence were known in a general way and highlighted their importance as systemic issues.
- C^3RS created a new process for communicating about safety-critical information across the railroad.
- Safety culture may be shifting into a more collaborative mode (FRA 2008).

A union representative reported that the program has been very successful to date resulting in a reduction in accidents and injuries, a reduction in discipline and an improvement in employee/employer relationships.

The confidentiality provisions of CIPSEA proved to be more restrictive than was necessary. Until a third railroad was involved in the pilot, CIPSEA prevented sharing of any data from the system. While reports were submitted, neither FRA nor the other stakeholders could learn the types of issues that were reported and subsequently addressed by the participating railroads. FRA has decided to move responsibility for handling the incident reports from BTS to NASA. (NASA currently manages ASRS and served as a model for the Firefighter Near-Miss Reporting System.) NASA's procedures for assuring confidentiality are not as restrictive as those of BTS but they are able to provide the level of protection that the railroad stakeholders require. NASA assures confidentiality by destroying the original report after the identifying information is removed.

Once the migration to NASA is complete, Amtrak will become an active participant in the pilot program. FRA plans to support each pilot site for 5 years. The source of funding for C^3RS after the four pilot sites complete their respective test periods, remains to be determined. It is likely that C^3RS will migrate to FRA's Risk Reduction Program at that time.

Advice to Transit Industry

Representatives from FRA and the Volpe Center who have been involved with the design and implementation of the C^3RS pilot offered the following advice to the transit industry with regard to establishing a similar system for transit:

- Put together a committee of the leaders from the stakeholder groups to design the system. These people should be opinion leaders in government, labor and railroad management. Use this group to assess the feasibility of the proposed system with stakeholders.

- Trust among the stakeholders is critical to being able to implement the system.
- Once the system is active, employees need to hear the "lessons learned" from the system.

FIREFIGHTER NEAR-MISS REPORTING SYSTEM

Table 22 provides a summary of the features of the Firefighter Near-Miss Reporting System.

Table 22. Firefighter Near-Miss Reporting System

Feature	Description
Managing organization	International Association of Fire Chiefs (IAFC)
Year initiated	2005
Coverage	Primarly structural firefighters but some reports from specialty fields such as wildland firefighting, EMS, hazmat, etc.
Annual cost	$1M (grant from DHS) Fireman's Fund Insurance Company provided matching funds for 2004-2005
Staffing	1 project manager, 1 administrative support, 8 part-time report reviewers
Annual number of reports	~600 1058 in 2009, probably due to outreach at fire academies
Report submission	Online but have option to fax or mail
Time limit on submission	none
Implementation issues	confidentiality
Program oversight	Advisory Board

Background

In 2000, the former Executive Director of the International Association of Fire Chiefs (IAFC) saw the need for a near-miss reporting system for firefighters involved in structural firefighting. The purpose of the system would be to improve firefighter safety through sharing of experiences. At that time, firefighters involved in wildland fire safety already had SAFENET, a safety reporting system for wildland fire operations. (SAFENET provides a means for reporting any safety concern of wildland firefighters, not just near-misses.) The aftermath of 9/11 delayed progress on the near-miss initiative

until 2004 when the Department of Homeland Security (DHS) awarded IAFC a grant under its Assistance to Firefighters Grant Program to develop the near-miss reporting system.

IAFC assembled an informal committee, including representation from the firefighters union, to design and test the new system. It became clear early in the process that the system could not be punitive and that assuring confidentiality was the key to a viable system. IAFC used the SAFENET system and the ASRS as examples of how the reporting system might be designed. Focus groups with firefighters across the country provided a means to gather feedback on proposed system features and the form that would be used for reporting near-miss incidents. The system design drew heavily on NASA's experience with ASRS.

A 6-month pilot test at 38 fire departments demonstrated that the system would work. Prior to initial launch of the reporting system website in August 2005, IAFC promoted it through trade publications, a direct mail campaign to 30,000 fire departments, press releases and a news conference at a trade show. The direct mail campaign included a program kit sent to each fire department following an initial postcard.

System Operation

Any firefighter may submit a report of a near-miss incident. There is no time limit for submitting a report following an incident. Most reports are submitted online but the system offers the option to submit the report via fax or mail. The reporting form asks for a description of the event as well as lessons learned as a result of the incident.

Every report is reviewed by two independent reviewers to de-identify the information. There are eight reviewers who are active duty firefighters from various locations across the country. The goal is to review each report within 72 hours of submission. Since the reviewer may contact the person who submitted the report, the review process sometimes takes longer. Feedback from firefighters indicates that the personal connection with the reviewer assures the person submitting the report that his/her information is important. Additional datapoints are collected on the administrative side of the database during the reviewing process. After the reviewers have assured that the report contains no identifying information and a reviewer has followed up with the firefighter who submitted the report, it is entered in the database on the National Firefighter Near-Miss Reporting System's web page, www.firefighternearmiss.com.

Experience to Date

Since initiation of the National Firefighter Near-Miss Reporting system in 2005, there have been over 3900 reports submitted. In 2009, two reviewers trained instructors at selected state fire academies. As a result, the number of reports for 2009 was over 1000.

The case histories are in a searchable database that facilitates searching by topic or situation. State fire academies have used cases from the database to enhance training programs. At the local level, cases have been used for drills. Each week the reviewers select one case as the Report of the Week to feature on the web page and to email to a list

of 13,000 individuals. The Report of the Week includes, in addition to the circumstances of the incident, a set of discussion questions so that the case may be used for discussion or training.

The IAFC has not yet used the information in the reports to identify trends or underlying problems. There is, however, an ongoing project to identify risks or hazards in the firefighter environment.

CONFIDENTIAL INCIDENT AND ANALYSIS REPORTING SYSTEM

Table 23 describes the features of CIRAS, a system for the UK rail industry.

Table 23. Confidential Incident and Analysis Reporting System

Feature	Description
Managing organization	Rail Safety and Standards Board
Year initiated	1999
Coverage	All UK railroad workers, including contractors
Annual cost	Not available
Staffing	Not available
Annual number of reports	550
Report submission	Submit report on form via mail, telephone or text message to CIRAS
Time limit on submission	none
Implementation issues	confidentiality
Program oversight	Executive Committee

Background

After a serious rail accident in November 1999, the UK Rail Industry made a decision to develop a national reporting system for safety-related concerns. The rail regulator mandated that all rail operators make the system available to their employees and that they pay an enrollment fee to participate. An Implementation Group representing all industry stakeholder groups developed the system. As with other reporting systems of this nature, confidentiality of the data was a critical issue.

System Operation

All UK railway employees as well as infrastructure contractors and subcontractors may report a safety concern to CIRAS. The reporting and follow-up process has four steps:

1. Employee contacts CIRAS by phone or text message, or mails a written statement to CIRAS.

2. A trained CIRAS staff person contacts the employee to discuss the concern. The CIRAS staff person writes a report that will not contain any identifying information.
3. CIRAS sends the report to the relevant company.
4. Company responds to CIRAS and CIRAS sends the response to the employee who reported the concern.

CIRAS publishes a bi-monthly newsletter as well as quarterly reports that summarize the reports and responses that were processed that quarter. The newsletter includes selected reports along with the response from the railway operator or contractor. In addition, CIRAS regularly analyses the reports that they receive to identify possible trends and themes that may be occurring. When such themes are identified, the CIRAS team will thoroughly research the issues and report these back to the industry. For example, in 2006, CIRAS examined precursor conditions that led to signals passed at danger (failure to stop for a red signal).

Experience to Date

From April 2009 through March 2010, CIRAS received over 550 reports. Of these, 43 % led to an investigation or actual change in practices. CIRAS reports that the majority of the companies that they contact welcome the opportunity to examine the issues that are brought to their attention. These companies recognize that CIRAS can be a vital tool that supports their existing safety management systems. CIRAS provides the means to identify problems before there is an accident or incident and as such supports a proactive safety culture where both managers and their staff feel comfortable reporting what appears to be an unsafe condition. Based on the reports produced to date, it appears that CIRAS is achieving its intended purpose.

NYCT NEAR-MISS REPORTING SYSTEM

NYCT has an agency system for reporting near-misses. Support of the agency's executive management, in terms of both budget and safety as a core value, has been key to making this reporting system successful. Unlike the other industry- wide systems described above, it is not voluntary, confidential or nonpunitive. NYCT defines near-misses as

> *An incident that involves train and/or right of way operations, which did not involve personal injury or damage to equipment or property, but could have resulted in death or serious injury.*

Prior to 2003, there was a process for handling near-miss incident reports at the divisional level, but NYCT's Office of System Safety (OSS) was not involved and it was somewhat of a fledgling system. It was the responsibility of the operating departments to investigate near-misses. As part of negotiations with TWU in 2003, labor requested that a formal structured near-miss investigation process be instituted. In 2004 the current system was put into place. In 2007, after two fatalities within weeks of each other in the track department, OSS got involved and began issuing their own reports for incidents where employee contact was an issue, e.g., employee could have come in contact with a train or other on-track equipment.

As defined in a 2004 NYCT Memorandum, any employee involved in or witnessing a near-miss incident must immediately report it to the employee's supervisor. The supervisor of the involved employee(s) must verbally report the incident to the Rapid Transit Operations (RTO) Control Center, the Divisional Chief Officer, and OSS. A March 2008 RTO Bulletin requires that "any employee who witnesses or becomes aware of a near-miss incident must immediately report it to the Rail Control Center." There are posters throughout the system reminding employees of their responsibility to report near-misses. The supervisor in the operating department must initiate an investigation within 24 hours of the incident in order to determine the causative factors related to the incident. Separately, the OSS will investigate those incidents where employee contact issues were involved. Within 30 days of the incident, the supervisor must issue an incident report to the relevant Divisional Chief Officer and also submit a copy to OSS. OSS will issue a separate report on their findings for the cases that they investigate.

OTHER TRANSIT NEAR-MISS REPORTING MECHANISMS

Many transit agencies provide mechanisms for their employees to report near-misses and unsafe conditions. These mechanisms are typically part of the agency's accident/incident reporting system. One large transit agency has a form for reporting "Unsafe Condition or Hazard/Near-Miss." This form may be submitted anonymously. Another large property has an "Unusual Occurrence" form for its rail operation but the categories on the form do not include "near-miss." One large bus property has a form for reporting an occupational illness, injury or near-miss that could have caused an injury or illness. Both of these later two forms must be submitted to the employee's supervisor so they are not confidential or anonymous. A multimodal agency has a very detailed accident report form that includes "near-miss" as an option under "Type of Accident." While many transit agencies do provide a way for employees to report information about near-miss incidents, the interview process did not identify any agency, other than NYCT, that has a separate process to identify and investigate near-misses.

CHAPTER 8
PROTOTYPE SAFETY REPORTING SYSTEM FOR TRANSIT

This chapter presents the initial design of a prototype safety reporting system for the transit industry. Table 24 presents a checklist of the integral components of a safety reporting system for the transit industry. While the RFP for this proposal called for an incident reporting system, the research team's review of existing systems revealed that the majority of reports (nearly 80% in some instances) did not relate a specific incident but rather general safety concerns and issues. As such, these programs saw great success in the identification of safety risks that did not necessarily result in an incident. Therefore, the proposed system should be open to both types of reports.

Table 24. Checklist for implementing a prototype safety reporting system

Identify relevant stakeholders (e.g., transit management, labor, industry organizations) and obtain program "buy-in"
☐ • Form a steering committee composed of stakeholder representatives to oversee pilot and program implementation
☐ • Provide stakeholder training regarding building consensus and conflict resolution
Pilot program
☐ • Negotiate MOU between labor and management
☐ • Provide assurances for the program to be voluntary, nonpunitive and confidential
☐ • Recruit a non-biased third party to manage demonstration program and assign role of program liaison and support staff
☐ • Identify/develop data collection and analysis software
☐ • Assemble report review committee and provide appropriate training
☐ • Provide program training prior to roll-out of pilot program
☐ • Pilot program with at least two transit agencies
☐ • Refine report taxonomy based on initial reports
☐ • Evaluate program success
Make program available to entire transit industry
☐ • Disseminate the results of the pilot program to stakeholders
☐ • Provide implementation assistance
☐ • Provide on-going training regarding the importance of a safety reporting system
Disseminating system information
☐ • Conduct analyses and distribute to management and employees
☐ • Newsletters
☐ • Use for training

The programs reviewed in Chapter 7 varied from centralized reporting systems such as ASRS to property-based systems such as ASAP and C^3RS. The general recommendation for the transit industry is that the reporting system should reside at the level of the transit agency. The reason is that the information gleaned from locally-based systems is more easily related to transit management in contrast to centralized systems where it can take months to years for the information to become beneficial. From a cost perspective, a reporting system subsidized by the FTA, would be the most economical solution.

STAKEHOLDER "BUY-IN"

All of the programs reviewed were successful in getting "buy-in" from their respective regulators, industries, management, and labor unions. None of the systems had a formal process for encouraging stakeholder "buy-in"; however, there were activities the stakeholder representatives engaged in that facilitated cooperation. One of these activities involved assembling a planning committee or implementation group with representation from each of the stakeholder groups. The members of these committees worked toward the common goal of creating a safety reporting system. In doing so, trust developed over time.

A second successful activity included having exploratory workshops whereby stakeholder representatives invited safety leaders from other industries to discuss and present the merits of their approaches to safety reporting mechanisms. Stakeholder attendees then had the opportunity to discuss the benefits and limitations of these programs for their own industry. This provided a means for these individuals to express concerns and issues prior to the implementation phase.

PROGRAM ASSURANCES

Barriers to a reporting culture include fear of individual or organizational retribution, the incorrect assumption that human error is a measure of competence, and the legal complications associated with discovery of error reports. There are three necessary program assurances that minimize these barriers and encourage employees to report. The most successful programs are voluntary, nonpunitive and confidential.

Mandatory programs operate under the assumption that an individual is at fault and must file a report. However, most errors have many underlying causes and may involve more than one individual, which makes it unclear who should file a report. As such, reporting responsibility for mandatory programs often places the reporting burden on the supervisor. Because the supervisor did not experience the event and is only reporting it secondhand, the fidelity of the information may be lacking and not reveal significant information regarding the root cause(s) of the event.

A culture of blame will most certainly deter widespread safety reporting. A majority of the reporting systems offered reporting incentives that minimized or eliminated any disciplinary action for an incident except for the most egregious violations. The nonpunitive aspect of these systems eliminated any fear of retribution or liability.

Last, confidentiality is a hallmark feature of a successful safety reporting system. However, this assurance was reported as one of the most difficult to implement. In blame-ridden organizational cultures, management was not keen on keeping the information confidential. The notion was that those who were committing errors and violations were bad apples that needed to be identified and punished. A cultural shift had to occur which involved educating middle management that it is more important to identify the root cause(s) of errors and violations than to assign blame and punish. Root causes can be mitigated; however, punishing someone for something they could not prevent is not an effective practice.

Because this latter assurance is key to a successful system, the stakeholders involved in implementing the existing reporting systems took great care to ensure this feature. The reports from many of the systems were handled by a third-party agent who was responsible for de-identifying the reports and in some instances coding the incident causal factors.

PILOT IMPLEMENTATION

Prior to full-scale implementation, a pilot implementation program is recommended. The merits of instituting a pilot program are as follows:

- Allows system to be tested at a few choice sites, or departments, to identify program strengths and weaknesses.
- Gives implementation team the opportunity to monitor program effectiveness and make any necessary adjustments before full-scale implementation.
- Lowers the overall cost of the program because the system design is optimized prior to it becoming operational.

Most of the systems either conducted or are still in the midst of an elaborate pilot program. The research team learned that one of the most important practices for implementing a pilot rollout is that it must have high visibility. Ways to market a pilot reporting system include posters, news conference at trade shows, and trade publications. One program used direct mail with a program kit to encourage reporting. Most all of the programs held town hall-like meetings with representatives from labor and management whereby employees could raise concerns and have their questions answered. One program used focus groups conducted with employees to evaluate the reporting form and reporting system features. This latter method is highly recommended prior to rolling out a pilot program.

Training for the stakeholders involved in the reporting system should include the following:

- Consistent information across all stakeholders.
- Educate how program addresses property's safety goals and culture.
- Educate how safety reporting removes threats to safety.
- Clearly define and explain reporting incentives.
- Make sure stakeholders fully understand the program process.
- Train regarding the principles of trust and how to develop it.
- Teamwork for review committees.

- Taxonomy used to classify events and causal contributors including root cause analysis.
- Importance of responding to recommendations of review committee.
- Periodic retraining.
- Make part of new hire training.

MEMORANDUM OF UNDERSTANDING

For the existing systems that were property-based (i.e., not a centralized repository of incident reports such as ASRS), an agreement between the property management (e.g., airline or railroad), the labor union, and the regulatory agency had to be negotiated. Originating from the airline industry model of reporting systems, this agreement is referred to as an MOU. An example of an MOU for the ATSAP program is displayed in Appendix D.

The basic (core) information included in an MOU is as follows:

- Describes how the information obtained from the reports will be analyzed.
- Authorizes nonpunitive response to noncompliance including skill enhancement or system corrective action to help solve safety issues; reports accepted under the program will result in lesser action or no action, depending on whether it is a sole-source report.
- Describes what egregious events do not qualify for the program; examples include gross negligence, criminal activity, substance abuse, controlled substances, alcohol, or intentional falsification of information.
- Describes the reporting process and the role of the review team.
- Outlines the provisions for information dissemination from the system.

For both the aviation and railroad reporting systems, the template MOU was developed by committees composed of stakeholders representing all facets of their respective industries. The program managers of the reporting systems reported that negotiating the final Implementing Memorandum of Understanding (IMOU) was the lengthiest part of the process. This was due in large part to the many needs each of the stakeholders required. Team- and consensus-building training for the stakeholders will facilitate this process. In addition, the language of the MOU template needs to be amenable to the changes that may be required during the negotiation process (i.e., a single MOU for all properties is not effective).

REPORTING PROCESS

Figure 3 presents a diagram of the reporting process as well as the report review as described in the next section. The most important aspect of the report submission process is to encourage timely submission. For a voluntary program, the only way to accomplish this is to incentivize the process by setting a time limit for submittal of reports that will be covered by protective provisions (i.e., immunity). For the existing systems, the time limit ranged from 24 hours to 10 days. It is important for the reporter to relate the event before memory of it becomes contaminated or begins to degrade.

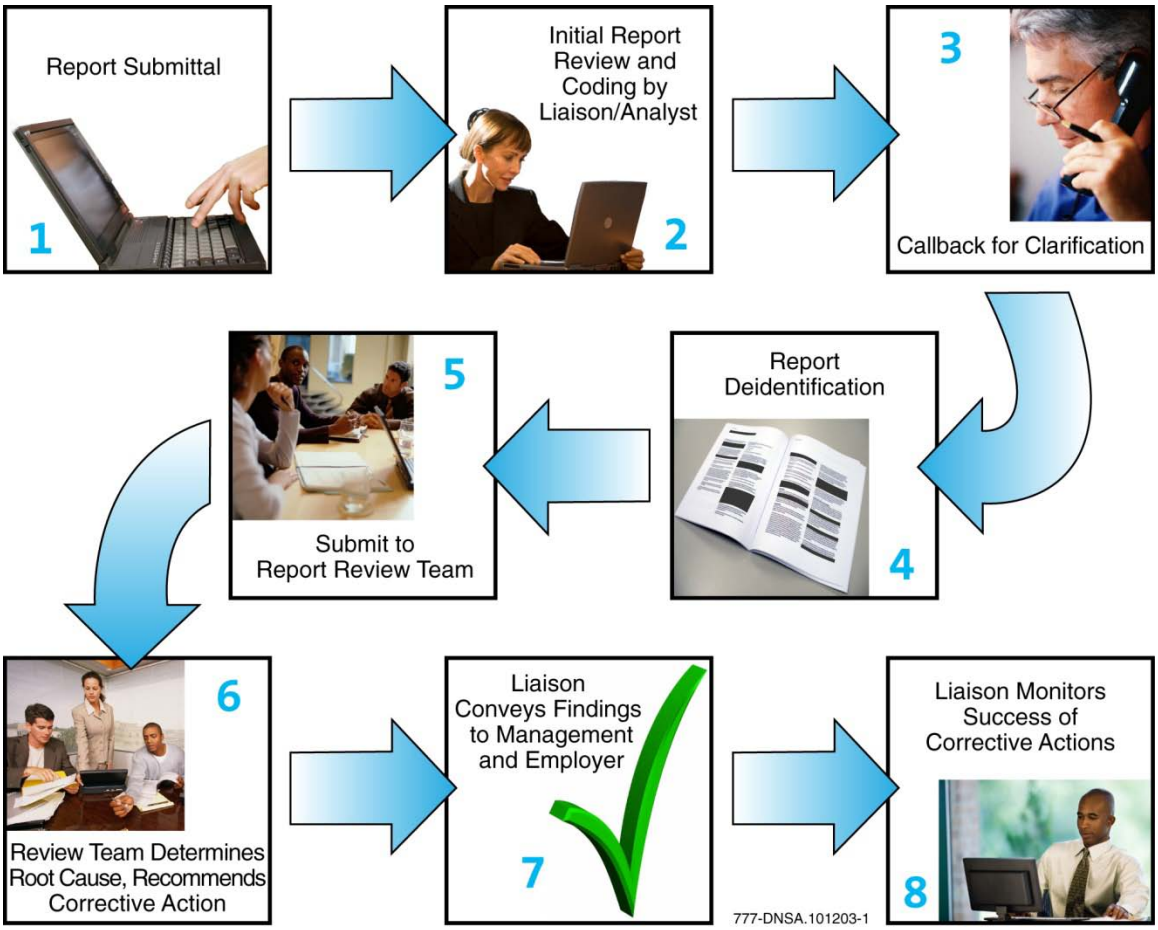

Figure 3. Safety reporting process

It is also imperative that the reporting process be as simple and efficient as possible for the reporter. To do so requires a user-friendly electronically available system, which is ideally accessible from home. The system should have the following features at a minimum:

- Data fields pre-populated with relevant information, e.g., employee name.
- Drop-down boxes for commonly used responses.
- Format that guides the submitter through a series of questions that when answered, automatically directs him/her to other related data fields.
- Be able to upload attachments used as part of the investigation process.
- Email capability (allows communication to be tracked but kept confidential).
- System generated acknowledgment receipt of report.

REPORT REVIEW TEAM

The report review team is typically a three-person group composed of individuals that represent labor, management and the regulatory agency. Since there is no Federal regulator for transit, as there is for aviation and railroads, the third member of this team might be a representative from the state safety oversight agency, FTA, or an impartial

arbitrator. The presence of a third person on the review team prevents deadlock from occurring during the report deliberation process. The purpose of this group is to review the report and supporting documentation to determine if there are any corrective actions or recommendations to be made regarding the reporter as well as the transit property. Remedial training is an example of a recommended action for an employee; whereas, adopting a new safety rule is something a transit agency might be asked to do.

To accomplish their tasks, the incident review team needs specific types of training, which include consensus-building, conflict management, team-building and root cause analysis (RCA). There are specific attributes that help qualify someone for a position on a report review committee. These include:

- Expert knowledge about the work processes the reports will involve.
- Knowledge of safety principles.
- Effective communication skills.
- Ability to compromise.

It is important to document the group's processes and procedures in a review committee manual; it should include important contact information and procedures for handling difficult situations. Additionally, the committee should set aside one meeting annually to review program guidelines, the review process, and member roles and responsibilities. New members should be required to shadow veteran members and observe other review committees prior to full group membership.

In addition to the members of the report review team, the implementing agency must assign program management responsibility to a liaison. As a nonvoting member of the report review team, the program liaison is an objective staff member that oversees the information capture process and facilitates the activities of the team. In addition, this person is the point of contact for the agency management as well as labor with regard to the reporting system. This person would most likely be on the staff of the agency's safety department.

REVIEW PROCESS

After submittal, the report will go through a multistep process before it reaches the attention of the report review team (Figure 3). The program liaison, or an appointed report analyst managed by the liaison, must perform several intermediary steps. These include coding the report with respect to the event and report taxonomies, clarifying any vagaries during a callback with the reporter and de-identification. The analyst needs to be a subject matter expert familiar with the transit operations he/she will be reviewing.

Just as the reporting process needs to occur in a timely manner, the review process needs to be expedited to ensure that the group's corrective actions and recommendations are relevant. Therefore, team meetings should be scheduled as often as possible. Review teams generally meet either weekly or monthly depending on the number of reports they must review.

Some recommendations for the review process include the following:

- Reports should only be reviewed when sufficient/required information is available for the review team to deliberate on.

- Review old reports first to close them out and then new ones. Prioritize the new ones by risk level, if possible.
- Corrective actions and recommendations should be the end-product of risk assessment and root cause analysis.
- Maintain complete records of the report review process.
- Follow up with appropriate persons to make sure recommendations have been implemented and are successful; can use trends from ASAP reports before and after implementation to judge success.

DISSEMINATING SYSTEM INFORMATION

To fully realize the benefits of a safety reporting system, there must be a process for the data to be disseminated to those who have reported, the workforce, in general, and transit management. To accomplish this, the data management system must have a user-friendly way to provide meaningful analyses. There are two levels of analyses: the report level containing the narrative, which informs corrective actions for individuals and the event level, which informs organizational improvement.

It is important to summarize the data periodically to identify trends. Important ways to summarize the data include the following:

- Event characteristics.
- Causal contributors.
- Risk assessment.
- Corrective actions and recommendations.

The following are common ways data are disseminated from safety reporting systems:

- Newsletters.
- Report of the month.
- Use reports to enhance training and as a basis for safety drills.
- Periodic reports of data trends.
- Review team periodically reports to management.

REPORT TAXONOMY

The development of the report taxonomy is still in progress. The initial taxonomy is based on the accident data collected during task 2 and is presented in Appendix A. Additionally, we plan to incorporate the most common rule violations reported by transit agencies during the best practice interviews. Presently, the taxonomy is organized by mode, employee group and operational failure. However, the complete taxonomy will include a second layer that captures the causal and contributing factors to the incident. Capturing this information will facilitate the report review team's ability to determine root cause and recommend the appropriate corrective action.

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ABBREVIATIONS

AAR	Association of American Railroads
AIM	active interlocked modeling
AOV	Air Traffic Safety Oversight Service
APTA	American Public Transportation Association
ARC	accident review committee
ASAP	Aviation Safety Action Program
ASIAS	Aviation Safety Information Analysis and Sharing System
ASRS	Aviation Safety Reporting System
ATC	air traffic control
ATSAP	Air Traffic Safety Action Program
BBS	behavior-based safety
BLET	Brotherhood of Locomotive Engineers and Trainmen
BTS	Bureau of Transportation Statistics
CAST	Civil Aviation Safety Team
CBT	computer-based training
CDL	commercial driver's license
CIPSEA	Confidential Information Protection and Statistical Efficiency Act
CIRAS	Confidential Incident and Analysis reporting System
CP	Canadian Pacific Railroad
CRM	crew resource management
DHS	Department of Homeland Security
DWI	driving while intoxicated
EMT	Error management training
ERC	Event Review Committee
FAA	Federal Aviation Administration
FAR	Federal Air Regulations
FMCSA	Federal Motor Carrier Safety Administration
FOQA	Flight Operations Quality Assurance Program
FTA	Federal Transit Administration
HFACS	Human Factors Analysis and Classification System
IAFC	International Association of Fire Chiefs
IAT	implicit attitude test
JPI-R	Johnson Personality Inventory – Revised
LOFT	Line Oriented Flight Training
MBTA	Massachusetts Bay Transportation Authority
MOU	Memorandum of Understanding
MOW	maintenance of way
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NATCA	National Air Traffic Controllers Association
NJT	New Jersey Transit
NTSB	National Transportation Safety Board
OJT	on-the-job training
OSS	Office of System Safety
PPE	personal protective equipment

PTSB	Public Transportation Safety Board
PUC	Public Utilities Commission
RCA	root cause analysis
RTO	Rail Transit Operations
SMS	safety management system
SRK	skill-, rule-, knowledge-based
UO	unanticipated occurrence
UTU	United Transportation Union
UP	Union Pacific Railroad
WBAT	Web-based application tool
WMATA	Washington Metropolitan Area Transit Authority

APPENDIX A
TYPES OF ERRORS/VIOLATIONS ASSOCIATED WITH ACCIDENTS

Table 25. Preliminary error/violation taxonomy based on transit accidents

Mode	Employee Group	Error/Violation
Rail (LRV, transit, commuter rail)	T&E/train operator	*Pre-trip* • Failure to perform pre-trip radio check. • Incomplete or inadequate pre-trip vehicle check. *Control/operate rail vehicle* • Failure (of LRV operator) to accurately judge clearance from motor vehicle. • Failure to assure forward/reverser in correct position for move. • Failure to call signal • Failure to ensure has authority to proceed before doing so. • Failure to make required stops when approaching station. • Failure to obey signal at crossing intersection (LRV). • Failure to obey signal indication. • Pass red (stop) signal • Failure to obey speed restriction • Failure to stop train or control its movement • Failure to follow winter weather rules. • Failure to inform control center of current position. • Failure to inform control center of vehicle condition. • Failure to report unusual circumstances regarding vehicle or ROW. • Failure to slow or stop train until MOW workers were safely off track • Failure to stop (LRV) after collision. • Failure to stop train after identifying obstruction on track. • Operating defective equipment. *Securing equipment* • Failure to set adequate number of hand brakes. • Failure to follow operating procedures for securing unattended equipment. *Emergencies* • Failure to follow SOP for evacuating passengers. • Improper use of rescue equipment. • Lack of communication of accurate information between rail traffic control center and crew of rescue switcher.

Mode	Employee Group	Error/Violation
		Conductor issues • Failure of conductor to act when engineer operating in unsafe manner. • Failure of conductor to follow procedures for discharging passengers. *D&A* • Violation of D&A policy.
	Dispatcher/Operations Control	*Protection of workers on track* • Failure to maintain blocking protection for MOW workers *Emergencies* • Failure to sound emergency siren. • Lack of communication of accurate information between rail traffic control center and crew of rescue switcher. • Failure of control center desk superintendent to ascertain information in timely manner. • Improper use of ventilation fan system.
	Maintenance of Way	*On-track safety* • Failure of track inspector to maintain lookout • Failure to apply shunting device for protection of track workers • Failure to follow written safe clearance procedures on ROW. • Failure to use PPE or safety warning devices. • Working around track without adequate lookout. • Failure to assure track in work area secured before allowing train to pass. *Track Maintenance* • Failure to maintain track to standards. • Improper interpretation of results of mechanized inspection and failure to issue findings in timely manner.
	Signal	*Signal Maintenance/Repair* • Failure to follow electrical systems test procedure. • Improper wiring. • Improper operation of control valve. *On-track Safety* • Unsafe action by signal maintainer. (Left signal case open and left tool bag too close to track.) • Failure to ensure no trains in area prior to over-riding gate control. • Failure of signal foreman to maintain safe working environment on job site.

Mode	Employee Group	Error/Violation
	Mechanical (Car)	*Maintenance/repair errors* • Failure to secure brake shoe assembly • Failure to detect improper car loading. • Use of wrong size bolts to hold cylinder head to crankcase.
Ferry	Operations	*Piloting ferry* • Failure (of co-captain) to properly pilot boat. • Failure (of captain) to exercise his command responsibility over vessel by ensuring safety of its operation.
Bus	Bus driver	*Pre-trip* • Failure to perform proper pre-trip inspection of bus (interior and exterior) and identify unsafe condition • Failure to properly adjust mirrors. *Controlling/driving bus* • Aggressive driving. • Driving with improper following distance. • Failure to adhere to training for traversing sight-restricted intersection in inclement weather. • Failure to check that all passengers clear of bus before moving bus. • Failure to control movement of vehicle. • Failure to exercise defensive driving for highway/expressway driving. • Failure to exercise defensive driving in intersection. • Failure to exercise defensive driving near bicyclist. • Failure to exercise defensive driving when passed by another vehicle. • Failure to focus on driving task. • Failure to identify hazard presented by auto overtaking bus. • Failure to identify loss of braking efficiency. • Failure to identify stopped vehicle as a hazard and drive safely around it. • Failure to obey pavement markings. • Failure to obey traffic device. • Failure to observe motorcyclist in street. • Failure to observe pedestrian in crosswalk. • Failure to observe pedestrian in roadway. • Failure to perform left turn with brake covered. • Failure to provide proper clearance to pass another vehicle. • Failure to safely proceed around road obstruction.

Mode	Employee Group	Error/Violation
		• Failure to stop for red signal. • Failure to yield right of way to pedestrian. • Failure to yield ROW to approaching vehicle. • Improper entry into travel lane. • Improper right turn. • Stopping bus too far from curb. • Travelling at excessive speed. *Emergencies* • Failure to manually activate fire suppression system when it did not automatically activate. • Failure to follow procedure to secure disabled vehicle. *D&A* • Violation of D&A policy.
	Mechanical	• Maintenance/repair errors • Failure to check electrical connections. • Failure to identify problem during PMI. • Failure of maintenance staff to detect defective roof panels. • Failure to follow maintenance directive. • Failure to properly replace or repair equipment. • Performed improper repair. • Failure to verify correct operation after repair.
	Dispatching	• Improper direction to driver of bus with apparent mechanical problem.

APPENDIX B
BEST PRACTICES BY COMPLIANCE PROGRAM ELEMENT

Table 26 relates each best practice to the element of an overall rules compliance program where it applies.

Table 26. Best practices and compliance program elements

Practice	Element								
	Screening and Selecting	Initial Rules Communication	Communicating New Rules	Validating Rules Comprehension	Monitoring Adherence	Responding to Noncompliance	Encouraging Compliance	Evaluating Program Effectiveness	Safety Reporting Mechanisms
Screening and Selecting									
Review motor vehicle moving violations	●				●				
Review motor vehicle alcohol-related violations	●				●				
Training and Testing									
Instructor-led training		●	●	●		●	●		
Video presentation		●	●				●		
Simulator training				●			●		
Computer-based training		●	●	●		●	●		
OJT		●		●		●			
Practice in nonrevenue operation				●		●			
Defensive driving course							●		
Refresher training			●			●	●		
Written exam				●					
Field test				●					
Periodic safety rules quiz				●			●		
Periodic recertification				●			●		

Practice	Element								
	Screening and Selecting	Initial Rules Communication	Communicating New Rules	Validating Rules Comprehension	Monitoring Adherence	Responding to Noncompliance	Encouraging Compliance	Evaluating Program Effectiveness	Safety Reporting Mechanisms
Communication									
Track bulletin, system bulletin, timetable, update rule book			●						
Job/safety briefing			●				●		
Daily crew debriefing				●			●		
Rule of the day				●			●		
"Meet and Greet"			●				●		
Open Door Policy							●		
Sit and chat session with GM							●		
Periodic safety meeting			●	●			●		
Read/sign policy			●						
Safety notice via mail or email			●						
Periodic newsletter			●				●		
Bulletin board			●						
Electronic message board			●						
Posters to heighten awareness of rules			●				●		
Safety bulletins to address special situations			●				●		
Passenger/public reports							●	●	●
Solicit feedback from agencies served							●	●	

Practice	Element								
	Screening and Selecting	Initial Rules Communication	Communicating New Rules	Validating Rules Comprehension	Monitoring Adherence	Responding to Noncompliance	Encouraging Compliance	Evaluating Program Effectiveness	Safety Reporting Mechanisms
Monitoring Rules Compliance									
Operational testing					•				
Ride-along observation					•				
Mystery rider					•				
Observation exterior to vehicle					•				
Onboard recorder					•		•		
Data from signal system					•		•		
Onboard video data					•		•		
Speed monitoring with handheld radar gun					•				
Review radio transmissions					•				
Audit teams to validate operational testing					•			•	
Responding to Noncompliance									
Supervisor investigates and decides appropriate response						•			
Coaching and counseling						•	•		
Remedial training						•	•		
Progressive discipline						•	•		
Alternative handling						•			
Dismissal						•			
No tolerance policy for risky behavior, e.g., cell phone use						•	•		

Practice	Element								
	Screening and Selecting	Initial Rules Communication	Communicating New Rules	Validating Rules Comprehension	Monitoring Adherence	Responding to Noncompliance	Encouraging Compliance	Evaluating Program Effectiveness	Safety Reporting Mechanisms
Demerit point system						•			
Safety Management									
Review results of operational testing								•	
Benchmark agency test results with peers								•	
Monitor leading/lagging indicators								•	
Accident frequency statistics and trends								•	
Safety audit by property, APTA, or regulator								•	
Encourage employees to bring issues to local safety committees									•
Safety hotline									•
Confidential reporting to safety department/director									•
Suggestion box									•
Hazard analysis to identify risks							•		
Review of near-miss incidents									•
Incident and accident review									•
Incident / accident de-brief without discipline							•		•
Safety awards program							•		

Practice	Element								
	Screening and Selecting	**Initial Rules Communication**	**Communicating New Rules**	**Validating Rules Comprehension**	**Monitoring Adherence**	**Responding to Noncompliance**	**Encouraging Compliance**	**Evaluating Program Effectiveness**	**Safety Reporting Mechanisms**
Safety point system for employee evaluation							•		
Use of nonthreatening safety language							•		
Management/labor rules review committee						•		•	

APPENDIX C
BEST PRACTICES BY SIZE OF AGENCY AND MODE

Table 27 relates each best practice to the size of transit agency and mode where it is applicable.

Table 27. Applicability of best practices by size of agency and mode

Practice	Size			Mode				
	Small	Medium	Large	Bus	Heavy Rail	Light Rail	Commuter Rail	Paratransit
Screening and Selecting								
Review motor vehicle moving violations	●	●	●	●	●	●	●	●
Review motor vehicle alcohol-related violations	●	●	●	●	●	●	●	●
Training and Testing								
Instructor-led training		●	●	●	●	●	●	●
Video presentation	●	●	●	●	●	●	●	●
Simulator training			●	●				
Computer-based training	●	●	●	●	●	●	●	●
OJT	●	●	●	●	●	●	●	●
Practice in nonrevenue operation	●	●	●	●		●		●
Defensive driving course		●	●	●				
Refresher training	●	●	●	●	●	●	●	●
Written exam	●	●	●	●	●	●	●	●
Field test	●	●	●	●	●	●	●	●
Periodic safety rules quiz	●	●	●	●	●	●	●	●
Periodic recertification		●	●		●	●	●	
Communication								
Track bulletin, system bulletin, timetable, update rule book	●	●	●		●	●	●	
Job/safety briefing	●	●	●		●	●	●	
Daily crew debriefing							●	
Rule of the day	●	●	●	●	●	●	●	●
“Meet and Greet”	●	●	●	●	●	●	●	●
Open Door Policy	●	●	●	●	●	●	●	●

Practice	Size			Mode				
	Small	**Medium**	**Large**	**Bus**	**Heavy Rail**	**Light Rail**	**Commuter Rail**	**Paratransit**
Sit and chat session with GM	●	●	●	●	●	●	●	●
Periodic safety meeting	●	●	●	●	●	●	●	●
Read/sign policy	●	●	●	●	●	●	●	●
Safety notice via mail or email	●	●	●	●	●	●	●	●
Periodic newsletter	●	●	●	●	●	●	●	●
Bulletin board	●	●	●	●	●	●	●	●
Electronic message board			●	●	●	●	●	
Posters to heighten awareness of rules	●	●	●	●	●	●	●	●
Safety bulletins to address special situations	●	●	●	●	●	●	●	●
Passenger/public reports	●	●	●	●	●	●	●	●
Solicit feedback from agencies served								●
Monitoring Rules Compliance								
Operational testing	●	●	●	●	●	●	●	
Ride-along observation	●	●	●	●	●	●	●	●
Mystery rider	●	●	●	●	●	●	●	
Observation exterior to vehicle	●	●	●	●	●	●	●	●
Onboard recorder	●	●	●	●	●	●	●	
Data from signal system	●	●	●		●	●	●	
Onboard video data	●	●	●	●				●
Speed monitoring with handheld radar gun	●	●	●	●		●		
Review radio transmissions	●	●	●				●	
Audit teams to validate operational testing			●	●	●	●	●	

Practice	Size			Mode				
	Small	Medium	Large	Bus	Heavy Rail	Light Rail	Commuter Rail	Paratransit
Responding to Noncompliance								
Supervisor investigates and decides appropriate response	●	●	●	●	●	●	●	●
Coaching and counseling	●	●	●	●	●	●	●	●
Remedial training	●	●	●	●	●	●	●	●
Progressive discipline	●	●	●	●	●	●	●	●
Alternative handling	●	●	●	●	●	●	●	●
Dismissal	●	●	●	●	●	●	●	●
No tolerance policy for risky behavior, e.g., cell phone use	●	●	●	●	●	●	●	●
Demerit point system	●	●	●	●	●	●	●	●
Safety Management								
Review results of operational testing	●	●	●	●	●	●	●	
Benchmark agency test results with peers	●	●	●	●	●	●	●	
Monitor leading/lagging indicators	●	●	●	●	●	●	●	●
Accident frequency statistics and trends	●	●	●	●	●	●	●	●
Safety audit by property, APTA, or regulator	●	●	●	●	●	●	●	
Encourage employees to bring issues to local safety committees	●	●	●	●	●	●	●	
Safety hotline	●	●	●	●	●	●	●	●
Confidential reporting to safety department/director	●	●	●	●	●	●	●	●
Suggestion box	●	●	●	●	●	●	●	●
Hazard analysis to identify risks	●	●	●	●	●	●	●	
Review of near-miss incidents	●	●	●	●	●	●	●	●

Practice	Size			Mode				
	Small	**Medium**	**Large**	**Bus**	**Heavy Rail**	**Light Rail**	**Commuter Rail**	**Paratransit**
Incident and accident review	●	●	●	●	●	●	●	●
Incident / accident de-brief without discipline	●	●	●	●	●	●	●	●
Safety awards program	●	●	●	●	●	●	●	●
Safety point system for employee evaluation	●	●	●	●	●	●	●	●
Use of nonthreatening safety language	●	●	●	●	●	●	●	●
Management/labor rules review committee	●	●	●	●	●	●	●	

APPENDIX D
ATSAP MEMORANDUM OF UNDERSTANDING

PURPOSE. The FAA and NATCA are committed to improving air traffic control (ATC) system safety. Each party has determined that safety would be enhanced if there were a systematic approach for all ATC personnel to promptly identify and correct potential safety hazards. The primary purpose of the ATO Air Traffic Safety Action Program (ATSAP) is to identify safety events and implement skill enhancement and system corrective action to reduce the opportunity for safety to be compromised. In order to facilitate safety analysis and system corrective action, all ATC stakeholders join the FAA in voluntarily implementing this ATSAP for all ATC personnel, which is intended to improve flight safety through self-reporting, cooperative follow-up, and appropriate skill enhancement or system corrective action. This Memorandum of Understanding (MOU) describes the provisions of the program.

BENEFITS. The program will foster a voluntary, cooperative, nonpunitive environment for the open reporting of safety of flight concerns. Through such reporting all parties will have access to valuable safety information that may not otherwise be obtainable. This information will be analyzed in order to develop skill enhancement or system corrective action to help solve safety issues and possibly eliminate deviations from and deficiencies in applicable air traffic control directives. For a report accepted under this ATSAP MOU, the Air Traffic Safety Oversight Service (AOV) will use lesser action or no action, depending on whether it is a sole-source report, to address an event involving possible noncompliance with applicable air traffic control directives.

APPLICABILITY. The FAA ATO ATSAP applies to all FAA recognized credentialed personnel engaged in, and supporting air traffic services and only to events that occur while acting in that capacity. Reports of events involving apparent noncompliance with applicable air traffic control directives that are not inadvertent or that involve gross negligence, criminal activity, substance abuse, controlled substances, alcohol, or intentional falsification are excluded from the program.

PROGRAM DURATION. This is a Demonstration Program the duration of which shall be 18 months from the date this MOU is signed. If the program is determined to be successful after a comprehensive review and evaluation, the parties intend for it to be a Continuing Program. This ATSAP may be terminated at any time for any reason by NATCA, the FAA, or any other party to the MOU. The termination or modification of a program will not adversely affect anyone who acted in reliance on the terms of a program in effect at the time of that action; i.e., when a program is terminated, all reports and investigations that were in progress will be handled under the provisions of the program until they are completed.

REPORTING PROCEDURES. When a credentialed individual observes a safety problem or experiences a safety-related event, he or she should note the problem or event and describe it in enough detail so that it can be evaluated by a third party.

5a. ATSAP Report Form. At an appropriate time during the duty day, the employee should complete FAA ATO ATSAP Form for each safety problem or event. The report must be submitted within 24 hours of the employee's duty day end time, (e.g. after the workday has ended) and submit it to (https://atsapsafety.com).

5b. Time Limit. Reports that the ERC determines to be sole-source will be accepted under the ATSAP; regardless of the timeframe within which they are submitted, provided they otherwise meet the acceptance criteria of paragraphs lOa(2) and (3) of this MOD. Reports which the Event Review Committee (ERC) determine to be non sole-source must meet the same acceptance criteria, and must also be filed within one of the following two possible timeframes:

5b(1). Within 24 hours after the end of the duty day for the day of occurrence, absent extraordinary circumstances. For example, if the event occurred at 1400 hours on Monday and a credentialed individual's shift for that day ends at 1900 hours, the report should be filed no later than 1900 hours on the following day (Tuesday). In order for all credentialed personnel to be covered under the ATSAP for any apparent noncompliance with air traffic control directives resulting from an event, they must all sign the same report or submit separate signed reports for the same event. If the ATSAP system is not available to the credentialed individual at the time he or she needs to file a report, the employee may contact the ATSAP manager's office and file a report via fax or telephone within 24 hours after the end of the controller's shift for the day of occurrence, absent extraordinary circumstances. Reports filed telephonically within the prescribed time limit must be followed by a formal report submission within three calendar days.

5b(2). Within 24 hours of having become aware of possible noncompliance with air traffic control directives provided the following criteria are met: If a report is submitted later than the time period after the occurrence of an event stated in paragraph 5b(l) above, the ERC will review all available information to determine whether the credentialed individual knew or should have known about the possible noncompliance with air traffic control directives within that time period. If the ERC determines that the credentialed individual did not know or could not have known about the possible noncompliance with air traffic control directives until informed of it, then the report would be included in ATSAP, provided the report is submitted within 24 hours of having become aware of possible noncompliance with air traffic control directives, and provided that the report otherwise meets the acceptance criteria of this MOD. If the employee knew or should have known about the possible noncompliance with air traffic control directives, then the report will not be included in ATSAP.

5c. Non-reporting employees covered under this ATSAP MOU. If an ATSAP report identifies another covered employee in an event involving possible noncompliance with applicable air traffic control directives and that employee has neither signed that report nor submitted a separate report, the ERC will determine on a case-by-case basis whether that employee knew or reasonably should have known about the possible noncompliance with applicable air traffic control directives. If the ERC determines that the employee did not know or could not have known about the apparent possible noncompliance with applicable air traffic control directives, and the original report otherwise qualifies for inclusion under ATSAP, the ERC will offer the non-reporting employee the opportunity to submit his/her own ATSAP report. If the non-reporting employee submits his/her own report within 24 hours of notification from the ERC, that report will be afforded the same consideration under ATSAP as that accorded the report from the original reporting employee, provided all other ATSAP acceptance criteria are met. However, if the nonreporting employee fails to submit his/her own report within 24 hours of notifications

from the ERC, the possible noncompliance with applicable air traffic control directives by that employee will be referred to an appropriate office within the FAA for additional investigation and reexamination.

6. POINTS OF CONTACT. The ERC will be comprised of one representative from, or approved by ATO Safety Services, one representative from NATCA, and one AOV Air Traffic Safety Inspector (ATSI) assigned as the ATSAP representative or designated alternates in their absence. In addition, the ATO Safety Service will designate one person who will serve as the ATSAP manager. The ATSAP manager will be responsible for program administration and will not serve as a voting member of the ERC.

7. ATSAP MANAGER. When the ATSAP manager receives the report, he or she will record the date and time of any event described in the report and the date and time the report was submitted through the ATSAP system. The ATSAP manager will maintain a database that continually tracks each event and the analysis of those events. The ATSAP manager will enter the report, along with all supporting data, on the agenda for the next ERC meeting. The ERC will determine whether a report is submitted in a timely manner or whether extraordinary circumstances precluded timely submission. To confirm that a report has been received, the ATSAP manager will send a written receipt to each employee who submits a report. The receipt will confirm whether or not the report was determined to be timely. The ATSAP manager will serve as the focal point for information about, and inquiries concerning the status of ATSAP reports, and for the coordination and tracking of ERC recommendations. The ATSAP manager will report on progress of the recommended system corrective action implementation as part of the regular ERC meetings. The ATSAP manager will publish a monthly synopsis of the reports received from credentialed personnel, with sufficient information so that the credentialed personnel can identify their reports. The outcome of each report will be published, however employee names will not be included in the synopsis. The ATSAP manager will provide any employee who submitted an ATSAP report with the status of his/her report.

8. EVENT REVIEW COMMITTEE (ERC). The ERC will review and analyze reports submitted by the credentialed personnel under the program, identify actual or potential safety problems from the information contained in the reports, and propose solutions for those problems. The ERC will provide feedback to the individual who submitted the report.

8a. The ATSAP manager will maintain a database that continually tracks each event and the analysis of those events. The ERC will conduct a 12-month review of the ATSAP database with emphasis on determining whether system corrective action has been effective in preventing or reducing the recurrence of safety-related events of a similar nature. That review will include recommendations for system corrective action for recurring events indicative of adverse safety trends.

8b. This ERC review is in addition to any other reviews conducted by the FAA. The ERC will also be responsible for preparing a final report on the demonstration program at its conclusion. If an application for a continuing program is anticipated, the ERC will prepare and submit a report 60 days in advance of the termination date of the demonstration program.

9. ERC PROCESS. The ERC will meet as necessary to review and analyze reports that will be listed on an agenda submitted by the ATSAP manager. The ERC will determine the time and place of the meeting. The ERC will meet at least twice a month, and the frequency of meetings will be determined by the number of reports that have accumulated or the need to acquire time-critical information.

9a. The ERC will make its decisions involving ATSAP issues based on consensus. Under the ATO ATSAP, consensus of the ERC means the voluntary agreement of all representatives of the ERC. It does not require that all members believe that a particular decision or recommendation is the most desirable solution, but that the result falls within each member's range of acceptable solutions for that event in the best interest of safety. In order for this concept to work effectively, each ERC representative shall be empowered to make decisions within the context of the ERC discussions on a given report. The ERC representatives will strive to reach consensus on whether a reported event is covered under the program, how that event should be addressed, and the skill enhancement or system corrective action that should be taken as a result of the report. For example, the ERC should strive to reach a consensus on the recommended skill enhancement or system corrective action to address a safety problem such as an operating deficiency or noncompliance with an air traffic control directive reported under ATSAP. The system corrective action process would include working the safety issue(s) with the appropriate facility or service area and the ATO that have the expertise and responsibility for the safety area of concern. AOV will not use the content of an ATSAP report in any subsequent credential action except as described in paragraph 10 of this document. However, recognizing that AOV holds regulatory authority to enforce the necessary air traffic control directives, it is understood that AOV retains all legal rights and responsibilities contained in FAA Order 1100.161, FAA Order 8000.90, and FAA Order 8000.86 in the event there is not a consensus of the ERC on decisions concerning a report involving an apparent noncompliance(s), or qualification issue. ATO will not use the content of the ATSAP report in any subsequent disciplinary action, except as described in paragraph lOa(3) of this MOU.

9b. The parties to this agreement anticipate various types of reports will be submitted to the ERC. Reports may include: safety-related reports that appear to involve a possible noncompliance with applicable air traffic control directives, reports that are of a general safety concern, but do not appear to involve possible noncompliance with applicable air traffic control directives, all operational errors, and any other reports. All safety-related reports shall be fully evaluated and, to the extent appropriate, investigated.

9c. The ERC will forward non-safety reports to the appropriate ATO department head for hislher information and, if possible, internal resolution. For reports related to flight safety, including reports involving possible noncompliance with applicable air traffic control directives, the ERC will analyze the report, conduct interviews of reporting credentialed personnel, and gather additional information concerning the matter described in the report, as necessary.

9d. The ERC should also make recommendations for changes to systemic issues. For example, changes to the training curriculum for credentialed personnel. Any recommended changes will be forwarded through the ATSAP manager to the appropriate ATO department head for consideration and comment, and, if appropriate,

implementation. The FAA will work with NATCA to develop appropriate changes for systemic issues. The ATSAP manager will track the implementation of the recommended skill enhancement or system corrective action and report on associated progress as part of the regular ERC meetings. Any recommended skill enhancement or system corrective action that is not implemented should be recorded along with the reason it was not implemented.

9e. ERC Recommendations. Any skill enhancement or system corrective action recommended by the ERC for a report accepted under ATSAP must be completed to the satisfaction of all members of the ERC, or the ATSAP report will be excluded from the program.

9f. Use of the ATO ATSAP Report. Neither the written report nor the content of the written ATSAP report will be used to initiate or support any ATO disciplinary action, or as evidence for any purpose in an AOV credential action, except as provided in paragraph lOa(3) of this MOU. The ATO or AOV may conduct an independent investigation of an event disclosed in a report.

10. ENFORCEMENT.

10a. Criteria for Acceptance. The following criteria must be met in order for a report to be covered under ATSAP.

10a(1). The employee must submit the report in accordance with the time limits specified under paragraph 5 of this MOU;

10a(2). Any possible noncompliance with applicable air traffic control directives disclosed in the report must be inadvertent and must not involve gross negligence; and,

10a(3). The reported event must not appear to involve criminal activity, substance abuse, controlled substances, alcohol, or intentional falsification. Reports involving those events will be referred to an appropriate FAA office for further handling. The FAA may use the content of such reports for any enforcement purposes and will refer such reports to lawenforcement agencies, if appropriate. If upon completion of subsequent investigation it is determined that the event did not involve any of the aforementioned activities, then the report will be referred back to the ERC for a determination of acceptability under ATSAP. Back reports involving the aforementioned activities will be accepted under ATSAP provided they otherwise meet the acceptance criteria contained herein.

10b. Sole-Source Reports. The ERC shall consider a report to be sole-source when all evidence of the event available to the ATO outside of the ATSAP is discovered by or otherwise predicated on the ATSAP report, or when a credentialed individual that has had an operational error or deviation files an ATSAP report. It is possible to have more than one sole-source report for the same event.

10c. Reports Involving Qualification Issues. ATO ATSAP reports covered under the program that demonstrate a lack, or raise a question of a lack, of qualification of a credentialed individual will be addressed with skill enhancement, if such action is appropriate and recommended by the ERC.

10d. Excluded from ATSAP. Reported events involving possible noncompliance with applicable air traffic control directives that are excluded from ATSAP will be referred by

the AOV ERC member to an appropriate office within the FAA for any additional investigation and re-examination and/or enforcement action, as appropriate.

10e. Skill Enhancement. Employees initially covered under an ATSAP will be excluded from the program and not entitled to the enforcement-related incentive if they fail to complete the recommended skill enhancement in a manner satisfactory to all members ofthe ERC. Failure of an employee to complete the ERC recommended skill enhancement in a manner satisfactory to all members of the ERC may result in the reopening of the case and referral of the matter for appropriate action.

10f. System Corrective Action. Failure of the ATO organization to complete the ERC recommended system corrective action in a manner satisfactory to all members of the ERC may result in the reopening of the case and referral of the matter for appropriate action.

109. Repeated Instances of Noncompliance. The ERC will consider on a case-by-case basis the skill enhancement or system corrective action that is appropriate for such reports.

10h. Closed Cases. A closed ATSAP case including a related enforcement investigative report involving a noncompliance addressed with the enforcement-related incentive, or for which no action has been taken, may be reopened and appropriate credential action taken if evidence later is discovered that establishes that the noncompliance should have been excluded from the program.

11. EMPLOYEE FEEDBACK. The ATSAP manager will publish a synopsis of the reports received from credentialed personnel. It is intended that through this agreement ATSAP synopsis reports may be included in NATCA's Air Traffic Controller publication monthly. The synopsis will include enough information so that credentialed personnel can identify their reports. Employee names, however, will not be included in the synopsis. The outcome of each report will be published. Any employee who submitted a report may also contact the ATSAP manager to inquire about the status of his/her report. In addition, each employee who submits a report accepted under ATSAP will receive individual feedback on the final disposition of the report.

12. INFORMATION AND TRAINING. The details of the ATSAP will be made available to all credentialed personnel engaged in, and supporting the ATO in appropriate NATCA and FAA publications. All credentialed personnel will receive written guidance outlining the details of the program at least two weeks before the program begins. Credentialed personnel will also receive additional instruction concerning the program during the next regularly scheduled recurrent training session, and on a continuing basis in recurrent training thereafter. All new-hire credentialed personnel will receive training on the program during initial training.

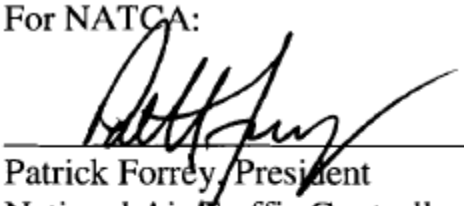
13. REVISION CONTROL. Revisions to this MOD may be proposed by any party, will be conducted by the parties and require a voluntary agreement between the parties before change can be affected.

14. RECORD KEEPING. All documents and records regarding this program will be kept by the ATO-S ATSAP manager and made available to the other parties of this agreement at their request. All records and documents relating to this program will be

appropriately kept in a manner that ensures compliance with all applicable air traffic ATSAP MOD directives and all applicable law. NATCA and FAA will maintainwhatever records they, deem necessary to meet their needs.

15. SIGNATORIES. All parties to this ATSAP are entering into this agreement voluntarily.

For NATCA:

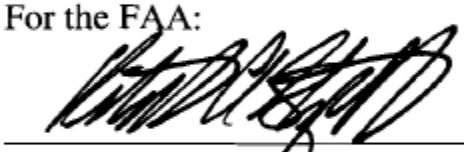


3-27-08

Patrick Forrey, President
National Air Traffic Controllers Association (NATCA)

Date

For the FAA:



3-27-08

Robert A. Sturgell
Acting Administrator, Federal Aviation Administration

Date

3-27-08

Anthony S. Ferrante
Director of Air Traffic Safety Oversight Service

Date