

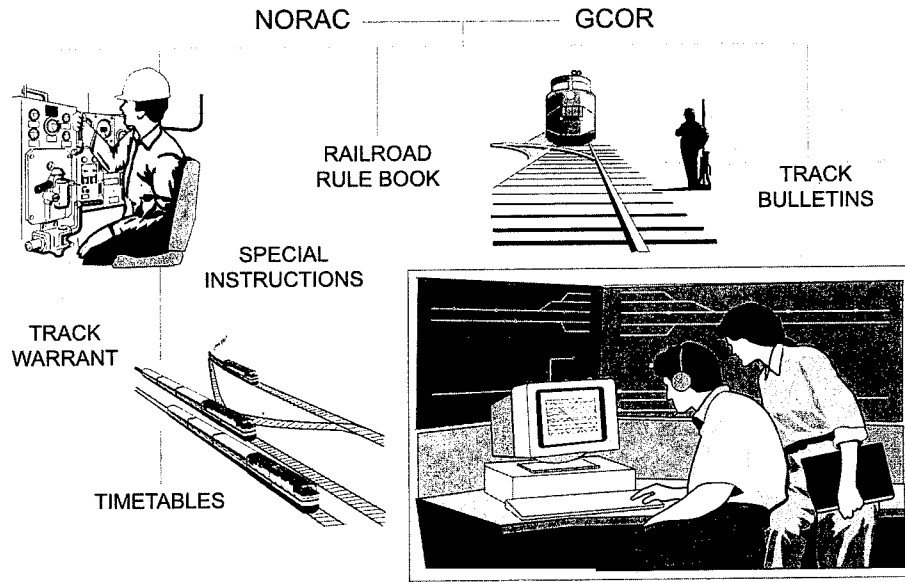


U. S. Department  
of Transportation  
**Federal Railroad  
Administration**

# Compliance with Railroad Operating Rules and Corporate Culture Influences

Office of Research  
and Development  
Washington, DC 20590

## Results of a Focus Group and Structured Interviews



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13. ABSTRACT (Maximum 200 words)

A focus group was held at the November 11, 1996 meeting of the Operating Rules Association of North American Railroads to discuss the general issue of compliance and operating rules. Twelve operating rules officers participated, representing Class I, II, and III railroads. Individual structured interviews were also conducted both prior to and following the focus group session to discuss general issues surrounding operating rules, and to provide follow-up information to major findings from the focus group session. Focus group participants generally reported that senior management tends to emphasize productivity over safety, suggesting some railroads may have created an organizational culture that unintentionally encourages operating rules violations. Follow-up interviews with a number of industry representatives supported this view. Some interviewees suggested railroad mergers often result in discordant management philosophies within the same organization, directly influencing corporate culture and how operating rules officers enforce rules compliance. Findings for each of the five focus group questions are categorized by type of response. Specific recommendations for structural change and follow-on work are also discussed.

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## **PREFACE**

This final report presents the results of a focus group session on railroad operating rules and compliance. In addition, it summarizes information gathered from structured interviews with various railroad managers, government officials, and other individuals concerned with the management of railroad safety.

The focus group session was tape recorded and then transcribed verbatim. Participants included first-line and mid-level operating rules officials from Class I, II, and III railroads. The Volpe National Transportation Systems Center in Cambridge, Massachusetts, performed this project for the Federal Railroad Administration.

The author would particularly like to thank the following individuals for their assistance in completing this project: Allan Fisher, Director of Operating Rules at Conrail, for the invitations to the Bi-annual Operating Rules Association meetings, and for his insightful suggestions on existing operating practices; J.K. Pollard at the Volpe National Transportation Systems Center, for general direction and support; Dennis Yachechak at the Federal Railroad Administration (FRA) Office of Safety, for his comprehensive reviews of this report and for his historical perspective of railroad operating rules; Bruce Magladry of the National Transportation Safety Board, for his insight on railroad accidents; and Garold Thomas at the FRA Office of Research & Development, the sponsor for this project.

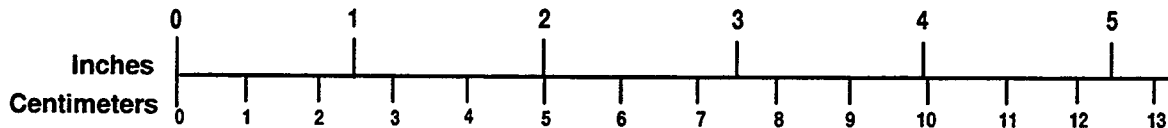
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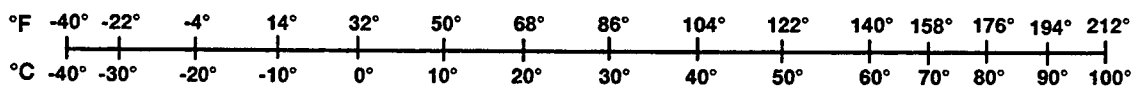
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<p><b>MASS - WEIGHT (APPROXIMATE)</b></p> <p>1 ounce (oz) = 28 grams (gm)                      1 pound (lb) = 0.45 kilogram (kg)                      1 short ton = 2,000 pounds (lb) = 0.9 tonne (t)</p>	<p><b>MASS - WEIGHT (APPROXIMATE)</b></p> <p>1 gram (gm) = 0.036 ounce (oz)                      1 kilogram (kg) = 2.2 pounds (lb)                      1 tonne (t) = 1,000 kilograms (kg) = 1.1 short tons</p>
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<p><b>TEMPERATURE (EXACT)</b></p> <p><math>[(x-32)(5/9)] \text{ } ^\circ\text{F} = y \text{ } ^\circ\text{C}</math></p>	<p><b>TEMPERATURE (EXACT)</b></p> <p><math>[(9/5)y + 32] \text{ } ^\circ\text{C} = x \text{ } ^\circ\text{F}</math></p>

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## LIST OF ACRONYMS

AAR	Association of American Railroads
FRA	Federal Railroad Administration
GCOR	General Code of Operating Rules
NORAC	Northeast Operating Rules Advisory Committee
NTSB	National Transportation Safety Board
ORA	Operating Rules Association
SCOR	Standard Code of Operating Rules



## EXECUTIVE SUMMARY

The overall purpose of this study was to explore the issue of compliance with railroad operating rules from a management perspective through structured interviews and a focus group session. The influence of corporate culture on railroad operating rules, while not part of the original study design, was a major finding in the outcomes of the study.

The term corporate culture (i.e. an organization's shared assumptions, values, artifacts, and communication processes) has received widespread attention in management circles in recent years, because of its direct influence on both safety and productivity (Reason, 1997). How and to what extent corporate culture influences organizational accidents is difficult to understand and even more difficult to control. Organizational accidents, like products, are often the result of many interrelated events, beginning with decisions and actions at the highest levels of management that trickle down to middle management and line staff (Krause, 1997). To improve safety in large complex organizations, however, both the positive and negative aspects of an embedded Safety Culture must be identified and clearly understood.

In the railroad industry, operating rules have become the premier artifacts (i.e. those directly observable aspects of corporate culture, including both things and written procedures) of the industry's safety culture. The shared assumptions, values, and communication processes of the industry determine how the artifacts of operating rules are constructed, interpreted, and complied with. Consequently, corporate culture can have a direct impact on safety. Findings in this report suggest corporate culture can influence compliance with railroad operating rules. The report is intended to demonstrate the usefulness of the Safety Culture concept in the analysis and prevention of accidents in the railroad industry from the perspective of middle managers.

Because middle managers are often both the intermediaries and the champions of corporate philosophy, a focus group was held with Operating Rules Managers at the 1996 Biannual Meeting of the Operating Rules Association of North American Railroads to explore the issue of compliance with railroad operating rules. Twelve Operating Rules Managers participated, representing Class I, II, and III railroads. Five questions were posed:

- What are some railroad operating rule compliance problems?
- How has management achieved rule compliance?
- What have been some of the major roadblocks in achieving rule compliance?
- What have been some important guidelines established among management for achieving rule compliance?
- Is there a need for developing guidelines on rule compliance, made available to all railroads?

Participants identified restricted-speed violations as the most common rule compliance problem. Typical restricted speed violations reported include running through stop signals, switches, and de-rails. To achieve effective rule compliance, comprehensive programs that included random drug and alcohol tests, quality efficiency tests, supervisory observations, new employee training, and annual rules exams are used.

When questioned about major roadblocks to rule compliance, participants suggested that senior management sometimes appears to emphasize productivity over safety, which may create an organizational culture that unintentionally encourages operating rule violations. Similarly, developing a culture that embeds positive safety behaviors through consistent and equitable discipline, positive reinforcement, and personal contact were thought to be important strategies used to achieve rule compliance. The development of guidelines to achieve better rule compliance was felt to be unnecessary. Participants agreed that informal guidelines already exist and are currently in use on most railroads.

During follow-up discussions with operating rules officers, and interviews with other railroad safety representatives, they suggested that senior management may influence unsafe work behavior by unintentionally encouraging operating rule violations. Senior managers use bonus programs and other incentives to urge middle managers to improve productivity. In turn, first-line supervisors, in their zeal to improve productivity, sometimes overlook, or even encourage operating rule violations by operating employees. When operating employees receive mixed signals from immediate supervisors -- indicating that it is permissible to violate operating rules sometimes, and that at other times it is not permissible -- they may be more likely to engage in unsafe behaviors.

Overall, results of the focus group session and follow-up interviews indicate that operating rules managers and line supervisors understand the major compliance problems with railroad operating rules. Also, they generally practice effective methods to achieve rule compliance. However, it was suggested that routine administrative responsibilities and tasks often take them away from the personal contact, train observations, and other supervisory practices necessary for effective rules compliance monitoring. Thus, although line supervisors may have the knowledge to improve operating rule compliance, they may not always have the means of doing so.

Rule compliance can be made even more difficult in any organizational setting that historically rewards and encourages the "bending" of operating rules. Until rules managers and line supervisors are supported with adequate resources to monitor and enforce rule compliance, operating employees may continue to doubt management's intentions about whether they should comply or not comply with railroad operating rules. To help middle managers and line supervisors better monitor and enforce compliance with operating rules, senior management should consider implementing some of the following recommendations: 1) improve the procedures and methods of conducting efficiency tests, 2) better utilize event recorders as a means for monitoring operating rule compliance, 3) improve intranet and internet communications among operating rules managers within and between railroads, 4) document the formal and informal processes

for identifying deficiencies in operating rules, 5) establish better near-incident data and analyze existing near-incident datasets to help identify unsafe behaviors, 6) further investigate the extent to which personal, environmental or other organizational factors systemically influence unsafe work behavior in railroad operations.



# 1. INTRODUCTION

## 1.1 BACKGROUND

In railroad operations, nearly every aspect of employee behavior is governed by operating rules. Employees who perform their jobs in an unsafe manner usually violate operating and safety rules. Human-factors related incidents are caused, or influenced by, unsafe work behavior and attitudes, as opposed to non-behavior related factors like inclement weather or undetected faulty track. Therefore, *nearly all human-factor incidents and injuries can be associated with one or more operating or safety rule violations.*

In 1996, accidents attributed to human factors accounted for almost a third of all reported train accidents, resulting in more than \$40 million in damages to the American railroad industry.<sup>1</sup> The accident rate (accidents per million train miles) is also higher for human factors than for any other causal category, except track and signal (See Table 1).

**Table 1. Frequency and Severity of All Train Accidents by Cause**

CAUSE	FREQUENCY		SEVERITY <sup>2</sup> (\$ in millions)		ACCIDENT RATE (millions of train miles)
	N	%	\$	%	
Human Factors	783	30.3	42.4	19.2	1.17
Track & Signal	954	36.9	80.1	36.2	1.42
Equipment	318	12.3	36.8	16.6	0.47
Highway/Rail	141	5.5	8.8	4.0	0.21
Other <sup>3</sup>	388	15.0	53.0	24.0	0.59
<b>TOTAL</b>	<b>2,584</b>	<b>100</b>	<b>221.1</b>	<b>100</b>	<b>3.86</b>

Note: Data adapted from Accident/Incident Bulletin No. 164, Calendar Year 1996 (p. 16), U.S. Department of Transportation, Federal Railroad Administration, August 1997. Data includes Human-Factor and Non-Human-Factor Accidents.

<sup>1</sup> Railroads must file monthly accident/incident reports with the Federal Railroad Administration's (FRA) Office of Safety for train accidents over \$6,300. Bulletin 165 is a summary of accident/incident data reported by 704 railroads for calendar year 1996.

<sup>2</sup> Severity refers to property damages only, not to loss of life or personal injury.

<sup>3</sup> The category Other excludes all highway/rail accidents.

Research indicates unsafe work behavior can be influenced by any number of factors, including temperature, workload, time of day, and specific job tasks to name a few (Ramsey et al, 1983). Unsafe work behavior has also been linked to the organizational culture and to organizational processes (Andrews, 1997; Marske, 1997). Consequently, before unsafe work behaviors in railroad operations can be reduced, some of the reasons employees do not comply with railroad operating rules must be understood. Also, there must be an understanding of some of the cultural components of rule compliance within the railroad system, particularly the development of railroad rules, and how that culture interacts with unsafe work behavior.

## **1.2 HISTORY OF RAILROAD OPERATING RULES**

By the 1850's, railroad operating rules, often printed as pamphlets or on the back of a time card, had evolved to near universal application. On April 14, 1887, representatives of 48 railroads voted for the adoption of what is now known as the Standard Code of Operating Rules (SCOR), published by the Association of American Railroads (AAR). Thus, all railroad rule books in North America today have as their foundation the SCOR in both development and application (Shaw, 1978).

The SCOR, however, was never intended to be used as a working rulebook. Rather, its primary intention was to standardize operating practices to the extent practicable while still preserving the flexibility of individual railroads to either modify or omit rules at their discretion. Even rulebooks with identical phraseology could be interpreted and applied differently on different railroads. Although used as a reference book, the SCOR was primarily a matrix document, from which the industry could establish standard verbiage and a common numbering system. Until recently, in fact, railroads rarely deviated from the original numbering system. (D. Yachechak, personal communication, March 1997).

At present, most Class I railroads in the U.S. use one of two "standard" rulebooks: the Northeast Operating Rules Advisory Committee (NORAC) rulebook and the General Code of Operating Rules (GCOR). Conrail, Amtrak, and several commuter and short line railroads in the northeastern United States use the NORAC rulebook. The GCOR is used by every Class I railroad west of the Mississippi River, most of the Class II railroads, and numerous shortline railroads. A few railroads, including CSX, Norfolk Southern, Illinois Central, and Florida East Coast, have adopted their own rulebooks.

## **1.3 MERGERS AND OPERATING RULES**

Mergers of major railroad companies in recent years resulted not only in the merging of different railroad lines and operating rulebooks, but also in the merging of railroad cultures and operating practices. Superficially, it may appear that most railroads have adopted a common code of operating rules, but major differences still exist in the application, and consequently, the compliance with these operating rules. Moreover, different management styles often clash when organizational cultures merge, as documented in the case of the Penn Central merger in 1968 (Daughen and Binzen, 1971)

and the Burlington Northern Santa Fe merger in 1995 (Machalaba, 1997). This leaves operating rules managers uncertain as to how specific rules should be applied on their newly-formed railroad. Different management philosophies may also influence different compliance standards across railroads.

As railroad operating environments become increasingly complex – from mergers, new technology, and other external forces – operating rules will continue to change in both number and frequency. The number of operating rules and procedures that employees must now commit to memory is substantial. With fewer employees to handle the same workload, individuals may no longer have the time to look up rules when performing their duties, perhaps further complicating both their ability and their desire to comply with these rules.

For years, the FRA has been recommending the standardization of operating rules and practices for cost-effectiveness in both safety and efficiency. In 1992, the American Association of Railroad Superintendents (AARS) convened a special committee, which suggested to its Board of Directors, Executive Council, and membership that “the AARS sponsor a full conference on the standardization of railroad operating rules, practices, and procedures, and that this conference be conducted on the highest level possible, with the full and complete endorsement and involvement of chief operating officers (Gamst, 1993).” A standard set of operating rules, it was argued, would minimize the confusion that exists when employees operate over joint lines and are governed by two rule books instead of one. Of particular concern are situations where different operating rules govern identical, or similar, signal aspects on different railroads.

Some railroad operating officials believe standardized railroad operating rules would have a positive impact on the railroad industry in fundamental and important ways, including:

- increasing the mobility and ease of transition for both railroad employees and managers when transferring from one railroad to another;
- reducing training costs and operating rule development;
- improving safety practices when railroads and railroad rule books merge; and
- improving the overall railroad delivery system across interchange points, regions, and yards.

In response to pressures for standardization, the railroads governed by both NORAC and GCOR recently hired consultants to rewrite and reorganize their operating rulebooks. Two major benefits are expected from these new versions of the operating rule book: 1) an improvement in the clarity and understanding of operating rules, and 2) an improvement in the ability of an employee to look up unfamiliar operating rules.

The extent to which these and other benefits have been obtained, however, is uncertain. Even if the revised rule books enhance the clarity and understanding of operating rules, other important questions still remain. Given a factual understanding, how well are

employees able to conceptually apply the rules? How often do operating employees purposely violate rules, even when they understand them and know how to apply them? What influences operating employees to knowingly violate operating rules? How often do rule violations lead to incidents or injuries that otherwise could have been prevented?

Some railroad operating officials urge that both GCOR and NORAC should be used as the SCOR was originally used. They say operating rule books should be used as a basic guide to standardizing operating practices, while still preserving the flexibility of individual railroads to either modify or omit rules at their discretion. If standard operating rules are not needed, the major question that remains is whether or not a *process* has been established for maintaining quality in operating rule development. This is especially important with the implementation of constantly changing equipment and train control technology, which will force the need for more rapid rule changes. Therefore, the question that must be asked is whether or not guidelines are needed for the development, writing, testing, application, and *representation* of operating rules. What kinds of guidelines should be developed, if at all? If necessary, what should be the process for developing those guidelines?

#### **1.4 PURPOSE & SCOPE**

The purpose of this report is to discuss the results from a focus group on compliance and railroad operating rules, held at the 1996 Biannual Meeting of the Operating Rules Association (ORA) of North American Railroads in Atlantic City, New Jersey. Although the findings do not answer many of the questions raised in this report, they do explore some of the possible influences on unsafe work behavior and help explain why employees do not always comply with railroad operating rules.

This report not only covers the focus group session, but also highlights information gathered from structured interviews conducted both prior to and following the focus group session. In general, this report aims to: 1) explore various influences on non-compliance to operating rules, and 2) explore attitudes toward developing guidelines that could assist operating rules managers to maintain rules compliance.



## 2. METHODS

### 2.1 STRUCTURED INTERVIEWS

Prior to the Focus Group session, structured interviews were conducted with representatives from the Association of American Railroads (AAR), the National Transportation Safety Board (NTSB), the Federal Railroad Administration (FRA), and other interest groups to identify important issues involving railroad operating rules. In these interviews, rule compliance consistently arose as a major concern. Follow-up interviews were also conducted with several individuals to further clarify and better understand some of the issues discussed during the focus group.

### 2.2 FOCUS GROUP QUESTIONS

Pilot questions were developed for the Focus Group, and were distributed to operating rules experts for comment prior to holding the focus group session. These pilot questions were then revised for use during the actual focus group. The resulting questions were carefully selected and phrased to stimulate thoughtful and spontaneous communication among the participants.

Although the moderator posed follow-up questions, the following five questions were used as foundation questions for the focus group:

- Q1: *What are some of the major types of railroad operating rule compliance problems that lead to serious incidents or common personal injuries?*
- Q2: *How has railroad management achieved rule compliance?*
- Q3: *What have been some of the major roadblocks in achieving rule compliance?*
- Q4: *What have been some important guidelines established among management for achieving rule compliance?*
- Q5: *Do you see a need for developing a common set of guidelines on rule compliance, made available to all railroads?*

### 2.3 FOCUS GROUP PARTICIPANTS

Attendants at the 1996 Biannual ORA meeting, held in Atlantic City, New Jersey, were invited to participate. Fifty-two people attended the meeting, representing Class I, II, and III railroads. Twelve people elected to participate in the focus group session. Participants included Managers and Directors of Operating Rules, Safety and Training, and Transportation Services. All participants were members of the ORA and had direct

responsibilities in either developing operating rules, or in supervising the conduct and safety of employees.

## **2.4 CONDUCTING THE FOCUS GROUP**

Prior to starting the Focus Group session, anonymity was assured to all participants. They provided only information relating to job title and class of railroad. The process for conducting a focus group was then explained, including a description of ideas typically generated from mediated discussion in such a small group setting (Krueger, 1988). The focus group session lasted approximately one and one-half hours and was tape-recorded and transcribed verbatim.

## **2.5 LIMITATIONS**

Methodology for conducting this study was adopted from program evaluation standards established by the Joint Committee on Standards for Educational Evaluation, including standards on utility, feasibility, propriety, and accuracy (Saunders, 1994). However, because the results presented in this report are based upon combined information from structured interviews, focus group comments, and other informal interviews, they are inherently qualitative in nature. Even though consistent response patterns and general agreement were noted among interviewees and focus group participants, no conclusive statements can be made regarding the causes of non-compliance with railroad operating rules.

On the other hand, focus group participants had considerable expertise in both the understanding and application of railroad operating rules. Their opinions are highly valued among their peers. Any insights shared during this discussion group would suggest important areas for further study.

### 3. FINDINGS

*Note: The following findings are summarized from the opinions expressed during the focus group session and follow-up conversations with participants. These findings are not necessarily in order of importance.*

**Question 1: What are some of the major types of railroad operating rule compliance problems that lead to serious incidents or common personal injuries?**

1. Restricted speed.

The original definition of restricted speed, which first appeared in the Association of American Railroads SCOR in 1924 (Yachechak, 1996), is as follows: *“Proceed prepared to stop short of train, obstruction, or anything that may require the speed of the train or engine to be reduced.”*

NORAC currently defines restricted speed as “Prepared to stop within one-half the range of vision — short of a train, obstruction, or switch improperly lined. Be on the lookout for broken rail. Speed must not exceed 20 MPH outside interlocking limits, or 15 MPH within interlocking limits. This speed applies to the entire movement.”

The General Code describes restricted speed as follows: “When a train or engine is required to move at restricted speed, movement must be made at a speed that allows stopping within half the range of vision short of: train engine, railroad car, men or equipment fouling the track, stop signal, or derail or switch not properly lined. The crew must keep a lookout for broken rail and not exceed 20 MPH.”

Restricted speed was the first topic discussed when the focus group was asked about rule compliance problems. Some of the most common violations of restricted speed reported include failure to comply with stop signals, run-through switches, and run-over derails. One person noted that he thought many people tended to apply restricted speed in terms of miles per hour rather than generally being prepared to stop.

It was also noted that restricted-speed violations rarely occurred in isolation. Rather, a series of violations usually occurred that would lead up to a restricted-speed violation. For example, a train dispatcher may have failed to provide requested blocking protection for workers within restricted-speed territory, resulting in a train colliding with equipment on the track while operating under 20 MPH. Although the engineer was operating the train under 20 MPH, as is required by the restricted-speed rule, workers or equipment on the track may not have been anticipated. Not being able to stop within one-half the range of vision was a clear violation of restricted speed. On the other hand, the dispatcher did not provide proper blocking protection to the workers on the track. In this case, two rule violations occurred and both the engineer and dispatcher were partly to blame for the incident.

1. Restricted speed (continued).

Accident data from FRA's 1996 *Accident/Incident Bulletin* support operating managers concern about restricted-speed accidents. In fact, the vast majority of human-factor train accidents (85%) occur under 10 MPH. Table 2 summarizes human-factor train accidents by speed. Note that 96% of human-factor train accidents in the yards and 93% of human-factor train accidents on industry/sidings occurred less than 10 MPH. More than half (55%) of human-factor train accidents on the main line occur under 10 MPH, 75% under 20 MPH.

**Table 2. Human-factor Train Accidents<sup>4</sup> by Speed**

SPEED	MAIN LINE		YARDS		INDUSTRY/ SIDINGS		ALL TRACKS	
	n	%	n	%	n	%	n	%
1-10 MPH	108	55.1	485	96.4	69	93.2	662	85.6
11-20 MPH	38	19.4	17	3.4	5	6.8	60	7.8
21-30 MPH	20	10.2	1	0.2	-	-	21	2.7
31-40 MPH	15	7.7	-	-	-	-	15	1.9
41-50 MPH	9	4.6	-	-	-	-	9	1.2
> 50 MPH	6	3.0	-	-	-	-	6	0.8
<b>TOTAL</b>	196	100	503	100	74	100	773	100

Note: Data adapted from Accident/Incident Bulletin No. 164, Calendar Year 1996 (p. 28), U.S. Department of Transportation, Federal Railroad Administration, August 1997.

<sup>4</sup> Train accidents refers only to on-track equipment and trains. It does not include any data with motor vehicle collisions with trains.

1. Restricted speed (continued).

Table 3 summarizes all derailments and collisions on main line track by speed, including non-human-factor accidents. Similar to Table 2, more than 50% of all derailments and collisions occurred under 20 MPH.<sup>5</sup> Nearly 40% of main line derailments, regardless of cause, occurred under 10 MPH. Over one-fourth of the collisions occurred under 10 MPH. All human-factor collisions and derailments that occurred under 20 MPH are considered violations of restricted speed.

**Table 3. Train Derailments and Collisions on Main Line Track by Speed**

SPEED	DERAILMENTS		COLLISIONS	
	n	%	n	%
1-10 MPH	280	37.6	15	28.3
11-20 MPH	126	16.9	12	22.6
21-30 MPH	137	18.5	8	15.1
31-40 MPH	84	11.3	11	20.8
41-50 MPH	79	10.6	5	9.4
> 50 MPH	38	5.1	2	3.8
<b>TOTAL</b>	<b>744</b>	<b>100</b>	<b>53</b>	<b>100</b>

**Note:** Data adapted from Accident/Incident Bulletin No. 164, Calendar Year 1996 (p. 23), U.S. Department of Transportation, Federal Railroad Administration, August 1997. Includes Human-factor and Non-Human-factor Accidents.

<sup>5</sup> Derailment is defined in the *Accident/Incident Bulletin* as “A derailment occurs when one or more than one unit of rolling stock equipment leaves the rails during train operations for a cause other than collision, explosion, or fire.” Collision is defined in the FRA Guide to Accident Reporting as “an impact between on-track equipment consists while both are on rails and where one of the consists is operating under train movement rules or is subject to the protection afforded to trains.”

2. Compliance with radio rules. Focus group participants agreed radio rule compliance was a common operating rule violation, and the problem was lack of enforcement. Radio miscommunication and misunderstandings, for example, have led to serious incidents. Instructions such as “High ball, everybody’s in the clear,” without train or unit number identification, could potentially cause a fatal accident. If a crew who overheard those instructions assumed that message was for them and began proceeding, they might operate in such a way that could lead to a collision. In the FRA’s 1996 *Accident/Incident Bulletin*, however, improper radio communications accounts for less than one percent of human-factor train accidents.

Other examples of improper radio communications can be simply described as “assumptions.” For instance, when crews do not properly identify their train or engine number, other operating crews or workmen may make assumptions about which train the message applies to without confirming the train’s identity. Of particular concern were situations in which crews left main line switches open (not lining back a switch for the main line movement) to expedite trains, transferring the responsibility to another crew. When a train leaves a yard switching track as to the main line, the crew on that train often has the responsibility to line the switch back to the main line. With cabooses no longer being used, and no one at the rear of the train, the engineer must now stop the train when it is past the main line switch, then wait for the conductor or brakeman to walk back up to the head end again (sometimes up to a mile and one-half). This can cause considerable delay. To expedite movement, the responsibility for lining the switch back to the main line is often turned over to someone from another crew still working in the yard.

Incidents happen when the yard crew with the responsibility to line the switch for the main track does not do so, for one reason or another. Another crew on a train that is approaching the switch on the main track will often *assume* that the track is lined for the main line, which it usually is, and may run through the switch when it is not lined properly. This can cause extensive damage to the switch requiring immediate repair. If the train crew does not realize they ran through the switch, or does not tell anyone for fear of being disciplined, it could easily cause a serious derailment or personal injury the next time a train goes over the switch. While the crew of the train that ran through the switch is responsible for violating the restricted-speed rule (i.e. “... prepared to stop ...”), other violations and *assumptions occurred prior to this violation*, which were important contributing factors that led up to the incident.

3. Securing equipment. Some focus group participants felt securing equipment was not taken seriously on many railroads. One individual commented that, “There’s a lot more [trains and engines] that are running away that nobody knows about because if there’s no harm, no problem ... it’s the attitude I see that’s the problem.” Failure to provide sufficient hand brakes accounted for almost 5% of the human-factor accidents, (FRA 1996 *Accident/Incident Bulletin*).<sup>6</sup>

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<sup>6</sup> A recent accident on BNSF near FT. Worth, TX, on 8-20-97, demonstrated this concern and resulted in the issuance of an FRA Safety Advisory which made several recommendations on securing unattended

4. Failure to provide proper blocking protection. Providing proper blocking protection was another concern mentioned, especially if a train dispatcher or operator does not provide the proper authority to operate a train within certain track areas when requested. Proper block protection is required by railroad operating rules, but no causal category is assigned on the FRA accident/incident reporting form.

**Question 2: How well has railroad management achieved rule compliance?**

1. Random drug and alcohol tests. Most participants agreed that random drug and alcohol tests have probably had the largest positive impact on railroad safety over the past several years.
2. Annual rules tests. Annual rules exams were considered an effective method of reinforcing important safety rules, “raising the level of awareness of the rules.” Creating *real world tests and good instruction* were suggested for annual rules exam. Good instruction provides a basis *for understanding rules*. Annual exams were perceived as a good opportunity to discuss critical safety issues that surfaced in the past year. Annual exams also become an important means of information gathering for the rules examiners, helping them keep in touch with problems out on the road.
3. Efficiency tests and supervisor observations. Many participants felt that the method for conducting efficiency tests<sup>7</sup> should be improved, and be used more as a non-punitive learning tool rather than as a punitive device. Supervisors should be visible, they said, and make regular observations with immediate feedback. When supervisors are out in the field, for example, it is easy for them to identify and immediately correct improper radio procedures without taking punitive action. Daily positive face-to-face interactions were critical, they felt, for effective management of rules compliance. As one participant explained, “People for the most part want to understand how to do their job correctly. And sometimes, especially with the new employees, just someone to take them aside and talk to them and explain to them how to do it correctly ... they will follow. The old hand, the guy who’s been at it for a number of years, takes a different type of coaching. But I don’t think we need to approach people punitively.”

Participants generally encouraged the use of *quality efficiency tests*, with a caution not to rely on quotas and numbers when conducting efficiency tests. Supervisors should do something that “challenges the employee to put on his thinking cap and respond to a situation.” There was also an expressed interest in teaching some of the first line

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rolling equipment to reduce the inherent risks.

<sup>7</sup> Although not specifically defined in the Code of Federal Regulations, efficiency test is a commonly used term among railroad operating personnel. Essentially, efficiency testing refers to how railroad management conducts operational tests and inspections to comply with those portions of the federal regulation which require railroads to monitor operational performance and general compliance with operating rules (See 49 CFR 217.9: Programs of Operational Tests and Inspections; Recordkeeping).

supervisors how to do quality efficiency testing. “Not ten tests a month, or a quarter, with each rule being a test. That’s not ten tests. That’s one test. People are going back to big numbers for the FRA ... Make a quality test. Make the test mean something. Don’t rely on quotas and numbers.”

4. New employee training. Some participants felt introductory rules classes for new employees should be followed by field training, then follow-up testing, for two reasons: 1) “Old heads” in the field provide immediate feedback about the procedural aspects of work rules and acceptable safety behaviors, reinforcing and elaborating classroom training, and 2) new employees often bring back to supervisors vital information about common safety practices and safety violations from the field. This information is often difficult to obtain, since most train operations are unsupervised.

**Question 3: What have been some of the major roadblocks in achieving rule compliance?**

1. Ambiguous communications. “Mixed signals” were described as a major barrier to rule compliance. In the opinion of the participants, it appears that a culture has been created on some railroads which fosters a tendency for supervisors to send confusing messages to operating employees – ambiguous messages that imply they should comply with operating rules under some conditions and not comply under others.

Also, different levels of employees appear to have different motivations and pressures to not comply with the rules at times. Yardmasters, train masters, and train dispatchers, for example, may be urged by their supervisors to get the train out of town, and indirectly encourage employees to cut corners on rule compliance to speed up operations. Conductors or engineers may send similar messages to their brakemen.

One participant explained it like this. “It’s a militaristic environment, really, that the railroad runs under. And the fact is that you have commands that come down from the top. And most of the time in transportation those commands are to move the trains. And to get the train from A to B in a certain amount of time. And when you’re not doing it, you know, to the requirements that come in to that ... the operating rules, or whatever, get overridden by that command.”

Another participant followed up by saying “What happens is our supervisors forget, and our general managers and our superintendents forget, that the real command that comes down first is Safety First. When they lose sight of that because of equipment priorities, you have a supervisor ... now this takes you up to a V.P. or higher, who says now you either meet goals or I’ll find somebody who will. That’s when the real mixed signal comes in. Now ... now you’ve taken people who are supposed to be managing people, who are supposed to be producing for us, and they don’t really know which way to turn.” Still another participant explained that “You still have a whole climate of people [operating employees] out there who are convinced that the only reason you’re interested in safety is the bottom line of the company.”



2. Ignorance of responsibilities. Ignorance of responsibilities seemed to be a common denominator in how these mixed signals, or mixed communications, get disseminated. It was also noted that many yardmasters, dispatchers, and operators are sitting with computers and telephones and have very little face-to-face interaction with the employees they directly supervise. Some complained that people in these jobs often do not realize they are actually supervisors and that they have an important role in communicating rule compliance.
3. Employees' desire for short cuts. Employees are often motivated to get the job done quickly. Many factors can increase employee motivation to violate, or bend, operating rules. If it is too cold or too warm, there may be a desire to operate unsafely if it will reduce their discomfort. Similarly, getting a train to a terminal in less time often has little or no impact on one's wages. Consequently, the sooner one gets the job done, the more money they effectively make per hour. However, once an employee starts overtime, the desire may be to stretch out the time it takes to perform an operation as long as possible. In either case, safety becomes secondary. When these personal motivations are coupled with supervisor requests for increased productivity, both of which could encourage a bending of the rules, participants believe unsafe behaviors are much more likely to follow.
4. Too much paperwork. A reduction in the workforce seems to have had an impact on mid-management as well as on operating crews. As one focus group participant said, "... what is really happening is that there are fewer trainmasters, fewer roadmasters. Paperwork is killing them. It's keeping them at the desk. And they're working 28 hours a day, instead of maybe 18 or 16 like we used to." When this happens, the quality of supervisor observations is reduced. Safety-related errors are also more likely to occur when operators, dispatchers, and yardmasters are overloaded with tasks previously performed by someone else. Additional clerical staff, they said, would significantly remedy this situation.
5. Lack of enforcement. One participant described lack of enforcement this way. "We know when guys are taking shortcuts. No mistake about it. We know it. Question is ... are we responding to it? And are we consistent enough in our discipline approach?"

In follow-up conversations to the focus groups, two other participants from a major railroad explained that one of the consequences of overloading supervisors with paperwork and other work previously completed by administrative staff, is a problem with enforcement. Supervisors are fully aware of the extra work required of them when following-up on observations of non-compliance. Enforcing compliance means discipline, and discipline means lots of time and paperwork. While the supervisors may fully intend to enforce rule compliance, the resources may not always be available to them to perform these functions.

Mixed signals was another reason why management may not enforce operating rules. One participant explained it this way. "I know in most cases that people [supervisors] are not responding as they should. Because of mixed signals. I know that." Senior management, he says, sends mixed signals to first line supervisors regarding safety and productivity. Consequently, supervisors may be reluctant to enforce rule compliance when rule non-compliance improves productivity, especially if the supervisor perceives little risk in doing so. This tendency may be compounded when perceived rewards are much greater for efficient operations than for safe operations.

6. Required quotas. Required quotas, some suggested, encouraged supervisors to perform non-essential efficiency tests rather than safety-oriented tests.

**Question 4: What have been some important guidelines established among management for achieving rule compliance?**

1. Consistent and equitable discipline. Participants recognized the importance for consistent and equitable discipline, an approach long advocated by behavioral psychologists. Also, they emphasised reinforcing positive safety behaviors as opposed to punishing unsafe, or non-compliant, behaviors.
2. Immediate consequences for rule violations. When serious rule violations were apparent, immediate discipline was recommended. There should be no question about the disciplinary consequences of serious rule violations. One or two examples, they said, is all it takes to make this message understood.
3. Positive reinforcement. Everyone also agreed on the importance of positive reinforcement during or after any employee observations. "When you observe somebody and they do the job well, you just don't go off and disappear. You need to tell that man that he was observed, and he did a good job today."
4. Personal contact. Establishing personal contact and getting to know your employees, it was suggested, helped make this positive interaction much easier. This also fosters a more natural communication process that helps the immediate supervisor identify problem areas with the rules that may be difficult to do with simple observations.
5. Yearly evaluations of critical incidents. A participant from a small railroad described its procedures for evaluating critical incidents in the preceding year, and then creating a testing program for the subsequent year that tests the compliance of major failures from the previous year. It was suggested that this method of test development helped them keep their rule compliance failures to a minimum.
6. Fostering positive safety attitudes. People realized that to change unsafe behavior you must also change the attitudes that lead to unsafe behaviors. Rules classes, they noted, were the place to do this. "Until you get the guy convinced on the ground that what

he's doing he's doing for himself ... he's doing it for his family ... then you're still gonna have the guy not paying attention."

7. Peer respect toward safety. One proposal for embedding safety behavior, and thus rule compliance, was to develop a culture of peer respect toward on-the-job safety. "What I'd really like to see you do is apply this to the rest of the rules. Because railroaders, safe railroaders, do things because they're right. That's the way to do it in my book ... Apply it to their inner logic, their inner reasons as to why they comply. The very basic of rules."

**Question 5: Do you see a need for developing a common set of guidelines on rule compliance, made available to all railroads?**

1. Guidelines are not needed. Most participants did not see a need for developing a common set of guidelines on rule compliance, perhaps because they perceived the notion of guidelines as a federal regulation. Following are typical comments to the question about the perceived need for developing guidelines on rule compliance:

"The best guidelines in the world won't work if you don't change the attitude of the people who have the rules to abide by these guidelines."

"I guess what we're all saying is that we don't need regulations to comply with the rules."

"Regulations create rules. More rules creates confusion."

"Accidents are not caused by existing guidelines. They are caused by non-compliance with guidelines ... it's non-compliance that's the problem."

"So ... somebody else writing those guidelines doesn't work."

"You don't need a bookshelf policy."

"We don't wanna get over-regulated."

2. General guidelines are now in use on many railroads. Although people disagreed with a need for developing a common set of guidelines for rule compliance, a number of good ideas were recommended that could be included in a handbook of guidelines. Following are typical comments about unwritten practices currently used by some rules managers, which could easily be established as general guidelines:

“It [safety] comes from the top. And it can’t get lost in the middle.”

“Until you get the guy convinced on the ground that what he’s doing, he’s doing for himself ... he’s doing it for his family ... then you’re still gonna have the guy not paying attention [to the rules].”

“Apply it to their inner logic, their inner reasons as to why they comply.”

“... they [operating employees] may not be aware of the consequences. They can’t envision anybody can get killed by what’s really going on.”

“A lot of first line supervisors have ... never been taught how to deal with ... pursuing enforcement, or pursuing compliance, I guess.”

“Teach ... first line supervisors how to do quality efficiency testing. Don’t rely on quotas or numbers.”

“The discipline has to be understood. And it has to be handled equitably.”

“... not approaching your employee from a punitive point of view, but from a coaching or instructing point of view.”

“When you observe somebody and they do the job well . . . You need to tell that man that he was observed, and he did a good job today.”

“When you have instructional training you have to have time for questions, for examples.”

“Creating real world tests. Doing things out there in the real world that challenges the employee to put on his thinking cap and respond ...”

“... create a testing program for the subsequent year that will test the compliance of those failures in the previous year.”

## 4. OTHER FINDINGS

Note: *The following are supplemental findings to the specific questions asked during the focus group session. They represent participants' opinions and are not necessarily in order of importance.*

1. Although a formal process for changing or adding rules exists on most railroads, the identification of rules that need to be changed or added is largely an informal process, and neither process is well documented. Under NORAC's constitution and by-laws, specific procedures are described for making permanent rule changes. GCOR's constitution and by-laws employ similar procedures for making permanent rule changes. Although the process for making temporary rule changes is essentially identical from railroad to railroad, little documentation exists that describes the details of this process.

Usually, operating rule changes and additions progress from track bulletins, to general orders, to timetables, and, finally, to the operating rulebook (e.g. NORAC or GCOR). However, rules that need to be changed or added must first be identified. This process identifying problem rules is also very similar across railroads, and includes a wide variety of formal and informal identification mechanisms, such as: "morning meetings," suggestions from operating personnel via either personal conversation or written communication, requirements from the FRA in the form of reports or personal communications, NTSB recommendations from incident reports, suggestions from the AAR, not to mention inquiries from various media and public interest groups.

While the number of ways in which problem operating rules can be identified is obviously large, there appears to be a lack of coordination of these vastly different efforts. Without coordinated effort, substantial time may elapse before senior rules and operating managers are notified about potentially serious problem areas. Thus, these delays in making corrective action on problem rules may contribute to operational safety hazards. Developing an expedient and efficient process for identifying and correcting problem rules may be an important tool for effectively managing a safe operating environment.

2. Event recorders may not be fully utilized as a means of supervisor observations. Event recorders are those "black boxes" on locomotives that record most performance activity, including speed, throttle position, dynamic braking, air braking, etc. Management, however, rarely uses this information unless there is a specific reason to do so, such as an incident or an observation suspecting speeding. It is possible that analytical software could be utilized to measure both safety and productivity performance of locomotive engineers. Standards and guidelines could be established for rule compliance and productivity. If used on random basis, similar to alcohol and drug tests, engineers may be much more likely to comply with operating rules.

3. Various individual, environmental, and organizational factors may be influencing when and under what circumstances employees do not comply with operating rules. In the focus group session, as well as in follow-up conversations, participants suggested a variety of reasons why employees do not comply with operating rules. These include operating goals set by management, weather, desire for overtime, desire to get off early, desire to reduce workload, anger or hostility toward the company, personal or family problems, and others. Multiple factors may be at work at any given time, influencing an employee not to comply with the rules. Employees can make conscious risk/benefit decisions whether or not to comply with operating rules, depending on the perceived weight of particular influences at the time. At other times, risk-taking behavior may be habitual, or automatic, without much thought about the specific risk factors.
4. Senior management may have created a culture on some railroads that encourages the violation of, or the bending of, operating rules. Senior management and immediate supervisors can directly influence employee safety behavior. Senior management, at times, instructs first line supervisors to operate more efficiently, overemphasizing productivity over safety. First line supervisors may then instruct operating employees to operate more efficiently, sometimes sending mixed messages about whether to comply or not to comply with operating rules. Because of this, corporate cultures have been created on some railroads which encourages employees to violate operating rules.
5. No forum exists for operating rules managers from different railroads to discuss operating rules issues on a regular basis. Since its founding in 1969, the ORA has met twice a year, because of the frequency with which operating rules change in the railroad industry. There is no day-to-day formal mechanism in place to foster on-going discussion and support. Many ORA members at the 1996 meeting in Atlantic City emphasized the importance of personal interactions among peers to keep abreast of current issues. Little interaction, however, occurs outside the biannual meetings. Some suggested that the possibility of litigation may discourage the development of any formalized method of regular communications among ORA members, especially anything in written form which would be open to discovery.

## 5. RECOMMENDATIONS

Note: *The following recommendations are based on the focus group session and individual interviews both prior to and after holding the focus group session. Some of the recommendations are from individual interviewees or focus group participants.*

1. Examine ways of improving the procedures and methods of conducting efficiency tests. Efficiency tests commonly refer to how railroad management conducts operational tests and inspections, and how they comply with those portions of the Code of Federal Regulations (CFR) which require them to observe and monitor the operational performance and general compliance of operating rules. Although minimal criteria for implementing the observation and monitoring of rule compliance and operational performance are clearly stated in the CFR (See 49 CFR 217.9), the procedures and methods for conducting efficiency tests are left up to the discretion of individual railroads. Comments from participants suggest many improvements could be made to the process of conducting efficiency tests, which should improve overall compliance with railroad operating rules, and ultimately the safety of railroad operations. A systematic evaluation of how various railroads conduct efficiency tests should help identify those methods and procedures that are most successful at improving overall compliance. These systems could then be made available, and perhaps more broadly utilized, across the railroad industry.
2. Evaluate the use of event recorders as a means for monitoring operating rule compliance. Software for analyzing data from event recorders, such as speed and brake applications, already exists. This software could be used to randomly monitor excessive speed and other rule violations of locomotive engineers. This may be a more reliable and cost-effective approach to minimizing some rule violations.
3. Establish better communications using the internet. Operating rules managers from different railroads need to communicate among themselves more often than biannual ORA meetings. Rules compliance, implementation of new technology, and operating rule development are common issues between organizations and operating environments and need on-going discussion. Internet user groups increasingly are being used among professional groups and associations to provide timely information on current issues and problems, and to more quickly identify key problem areas and problem-solving strategies. A railroad internet forum that facilitates open ongoing discussion between senior managers, operating rules managers, and operating personnel could help railroad organizations more quickly identify key safety concerns and problem-solving strategies.

The Bluecoat Project is a good example from the airlines industry of how the railroad industry might be able to better utilize internet technology to improve operations. The Bluecoat Project is an internet newsgroup comprised of airline pilots, engineers, and aero industry researchers with the basic goal of providing clear and unrestricted exchange of accurate information between participants. Discussion topics include

flight management computers, EFIS and EICAS displays, automated subsystems, flight mode annunciators, flight directors, autopilots, and the integration of all avionics equipment in the modern cockpit. For a more complete description of the Bluecoat project see the website address [//bluecoat.eurocontrol.fr/intro.html](http://bluecoat.eurocontrol.fr/intro.html).

4. Establish better intranet communications. Operating rules managers also need a consistent and effective means of communicating within the organization. Intranet communications are becoming a much-heralded tool for improving communications within organizations. As railroad operations become more complex, with ever-evolving rules and safety issues, consistent and reliable communications become increasingly important.
5. Investigate the extent to which personal, environmental, and organizational factors influence unsafe work behavior in railroad operations. When operating employees knowingly violate operating rules, they may be influenced by personal, organizational, or environmental factors. It is important to understand the extent to which this occurs, which factors are most influential, and how the organization can more effectively influence positive work behavior.
6. Investigate if and when corporate culture encourages operating rule violations. In the participants' opinion, senior managers may be a major factor in the development of an organizational culture that encourages unsafe behavior. It is important to understand whether or not this is true, and if so, how it develops. Understanding this process will aid the development of strategies to counteract these problems.
7. Evaluate existing training methods and materials as a means of embedding positive safety habits and attitudes. If organizational factors are influencing unsafe work behavior, methods need to be developed for establishing positive safety habits to help override organizational influences when they do occur. For example, the operating rule for conducting a job safety preview could be utilized by operating supervisors as a reinforcement tool for job safety. When supervisors encounter train crews and conduct a job safety preview with them, safety behavior is automatically reinforced with no fear of punishment. In this way, positive safety attitudes and habits could be more firmly developed among operating crews.
8. Document the process for identifying operating rules that need to be changed or added. Documenting the various ways, both formal and informal, of identifying circumstances where operating rules need to be changed or added, can be an effective means of coordinating these efforts, and thus improve the process itself. As the introduction of new technology continues to increase, the need for more rapid rule changes also increases. Without proper documentation of the existing process, the process itself may not develop in a manner that is conducive either to expeditious identification of deficiencies in operating rules, or to making the necessary rule changes themselves.



9. Analyze near-incident data and examine the process of collecting near-incident data. By their very nature, railroad incidents are rare events. To determine the probable cause of these rare events, one must make any number of assumptions, which inevitably reduces the level of certainty. More near-incidents, or close calls, occur for every actual incident. Analyzing near-incident data substantially increases the population data set from which to study. With a larger population of incidents (and near incidents) to study, assumptions can be minimized, and true probable causes more likely determined. In the Code of Federal Regulations, the FRA already requires railroads to collect such data. In 49 CFR 240.309, for example, the FRA mandates the collection of near-incident data related to the safety conduct of locomotive engineers. Systematic analysis of probable cause for these near incidents, however, is seldom conducted.

The Federal Aviation Administration also has a near-incident reporting system, and conducts regular evaluations of these near-incidents. Other transportation modes and organizations may have similar near-incident databases, and may conduct similar analyses. These methods for collecting and analyzing near-incident data in the transportation industry should be compared to see what can be adopted, or improved upon. It may be possible to adopt at least some of the procedures established for the aviation industry to the railroad industry. An effective system for identifying hazardous situations or practices before incidents occur could have a major impact on reducing the overall incident rate.



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