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Transportation

**Federal Railroad
Administration**

Human-Centered Incident Investigation Methods for the Railroad Industry: Conference Summary

Office of Research
and Development
Washington, DC 20590

Human-Centered Incident Investigation Methods for the Railroad Industry



A one-day educational conference on
state-of-the-art incident investigation
and corrective action tools and tech-
niques to increase rail industry safety

Wednesday, June 19, 2002
Hyatt Regency O'Hare, Chicago, IL



Sponsored by:
Federal Railroad Administration
Office of Research and Development
Human Factors Program

 Foster-Miller

Hosted by:
Foster-Miller, Inc., Waltham, MA

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16. Abstract This report presents a summary of a one-day educational conference on human-centered incident investigation methods for the railroad industry. Fifty-seven participants from the railroads, rail labor, government, and consulting/academia attended the one-day conference, held in Chicago, IL. Mr. George Gavalla, Federal Railroad Administration (FRA) Associate Administrator for Safety, provided the opening remarks. Speakers included representatives from the FRA, railroads, labor, the National Transportation Safety Board, and the Mine Safety and Health Administration. Two panel discussions addressed how to create a more collaborative incident investigation environment, and future challenges in incident investigation. Several key themes emerged from the conference: railroads are slow to adopt a human-centered approach to incident investigation, but recognize the importance of such an approach; different railroads are taking different approaches to the incorporation of human-centered approaches-some are bottom-up while others are top-down; and the next big challenge in incident investigation in the railroad industry is to study near-miss data, as well as the unsafe acts and conditions that lead to near-misses and more serious incidents. Conference participation and discussion suggest several opportunities for the FRA to continue its efforts to improve railroad safety. These include (1) improvements to FRA's website to incorporate incident prevention methods and "best practices" from the industry, (2) examination of near-miss data collection and analysis methods, and (3) sponsorship of a follow-up conference in 2-3 years to continue facilitating the sharing of "best practices" across the railroad industry.					
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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol	When You Know	Multiply By	To Find	Symbol
LENGTH								
in	inches	25.4	millimeters	mm	millimeters	0.039	inches	in
ft	feet	0.305	meters	m	meters	3.28	feet	ft
yd	yards	0.914	meters	m	meters	1.09	yards	yd
mi	miles	1.61	kilometers	km	kilometers	0.621	miles	mi
AREA								
in ²	square inches	645.2	millimeters squared	mm ²	millimeters squared	0.0016	square inches	in ²
ft ²	square feet	0.093	meters squared	m ²	meters squared	10.764	square feet	ft ²
yd ²	square yards	0.836	meters squared	m ²	meters squared	1.195	square yards	ac
ac	acres	0.405	hectares	ha	hectares	2.47	acres	mi ²
mi ²	square miles	2.59	kilometers squared	km ²	kilometers squared	0.386	square miles	
VOLUME								
fl oz	fluid ounces	29.57	milliliters	ml	milliliters	0.034	fluid ounces	fl oz
gal	gallons	3.785	liters	l	liters	0.264	gallons	gal
ft ³	cubic feet	0.028	meters cubed	m ³	meters cubed	35.71	cubic feet	ft ³
yd ³	cubic yards	0.765	meters cubed	m ³	meters cubed	1.307	cubic yards	yd ³
NOTE: Volumes greater than 1000 l shall be shown in m ³ .								
MASS								
oz	ounces	28.35	grams	g	grams	0.035	ounces	oz
lb	pounds	0.454	kilograms	kg	kilograms	2.202	pounds	lb
T	short tons (2000 lb)	0.907	megagrams	Mg	megagrams	1.103	short tons (2000 lb)	T
TEMPERATURE (exact)								
°F	Fahrenheit temperature	5(F-32)/9 or (F-32)/1.8	Celsius temperature	°C	Celsius temperature	1.8C + 32	Fahrenheit temperature	°F
ILLUMINATION								
fc	foot-candles	10.76	lux	lx	lux	0.0929	foot-candles	fc
fl	foot-Lamberts	3.426	candela/m ²	cd/m ²	candela/m ²	0.2919	foot-Lamberts	fl
FORCE and PRESSURE or STRESS								
lbf	poundforce	4.45	newtons	N	newtons	0.225	poundforce	lbf
psi	poundforce per square inch	6.89	kilopascals	kPa	kilopascals	0.145	poundforce per square inch	psi

* SI is the symbol for the International System of Units

536-Conversion Factors

(Revised January 1992)

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Abbreviations

ASRS	Aviation Safety Reporting System
BLE	Brotherhood of Locomotive Engineers
BNSF	Burlington Northern and Santa Fe Railway
BRS	Brotherhood of Railway Signalmen
FAA	Federal Aviation Administration
FRA	Federal Railroad Administration
MSHA	Mine Safety and Health Administration
NASA	National Aeronautics and Space Administration
NTSB	National Transportation Safety Board
NTSC	(Volpe) National Transportation Systems Center
SAIC	Scientific Applications International Corporation
SIDT	(FRA) Safety Improvement and Development Team
TCIU	Transportation Communication International Union
TSB	Transportation Safety Board (of Canada)
UTU	United Transportation Union

Acknowledgements

This report presents a summary of a first-of-its-kind, one-day conference on “Human-Centered Incident Investigation Methods for the Railroad Industry.” The Federal Railroad Administration (FRA) Office of Research and Development Human Factors Program sponsored this conference under Contract DTFR53-01-D-00029.

The authors express thanks to Dr. Thomas Raslear, FRA Office of Research and Development, for sponsoring this conference, and for his guidance throughout the planning stages. We would also like to thank Mr. George Gavalla, Associate Administrator for Safety, FRA Office of Safety, for speaking at the conference and showing his support.

We would also like to thank Ms. Susan McDonough, of Foster-Miller, Inc., for her excellent program administration skills and her time in helping to coordinate and arrange this conference. And lastly, we would like to thank Ms. Sarah Acton, also of Foster-Miller, Inc. for her support during the conference.

Most importantly, we would like to thank all of the speakers and panelists who volunteered their time and resources to be present and participate in the conference. Their efforts and the energy that they contributed made the conference a success. And finally, thanks to all those who attended the conference. They showed that they have a genuine interest in incorporating human factors into their incident investigations, and are willing to learn and grow.

1 Introduction

This report summarizes a one-day conference sponsored by the FRA Office of Research and Development Human Factors Program held in Chicago, IL, on June 19, 2002. The conference focused on how railroads can and do incorporate human-centered approaches to their incident investigations. Human-centered incident investigation methods emphasize multiple root causes, and focus on the acts of, and conditions created by, individuals at all levels of an organization, not just the operator who was closest in time and space to the incident.

A total of 57 railroad and safety professionals attended the conference. Participants included representatives from all Class I railroads; several shortline, regional and commuter/passenger railroads; the FRA Office of Research and Development and Office of Safety (from both FRA Headquarters and various FRA Regions across the United States); operating and non-operating craft labor unions; and government agencies responsible for safety, including the U.S. National Transportation Safety Board, Transportation Safety Board of Canada, and U.S. Mine Safety and Health Administration. A list of attendees is provided in Appendix A.

1.1 Background

The FRA Office of Research and Development Human Factors Program is responsible for a wide array of technical activities in a number of different program areas. One of these areas is railroad yard safety. The FRA Office of Research and Development Human Factors Program began examining railroad yard worker safety issues in 1995. This effort culminated in a recently published report (Reinach and Gertler, 2001). Among other results, this analysis found that railroads use a variety of techniques to investigate personal injuries and accidents. Specifically, some railroads do not incorporate any type of human-centered approach to their investigations, while others do. And of those who do, there are different approaches. Consequently, the report made several recommendations to address a perceived need within the railroad industry to better understand the benefits and methods of a human-centered approach to incident investigation. One of these recommendations was to facilitate the sharing of “best practices” across the railroad industry to disseminate the “state-of-the-art” in human-centered incident investigations. This recommendation led to the development and planning of a one-day educational conference for the benefit of the railroad industry.

The FRA Office of Safety supported this human factors educational initiative. Traditionally, the Office of Safety has focused on accidents due to some type of “hardware” failure, such as track, signal and mechanical problems, that led to train accidents. Recently, however, the Office of Safety has begun to recognize the importance and significance of human factors in the railroad industry, and in particular, its role in railroad safety. For example, a 2001 Office of Safety report (FRA, 2001; p. 3) that analyzed 1997 railroad employee fatalities notes that “Fatalities usually resulted from a chain of events or the errors of more than one individual...[And that] nearly 40 percent [of the fatalities]...involved three or more PCFs [possible contributing factors].” In addition to its own initiatives to address many of these human factors issues, the Office of Safety has partnered closely with the Office of Research and Development in recent years. This strategy has allowed the FRA to leverage its human factors expertise in tackling many of these issues. This conference is one more example of this partnership.

1.2 Conference Goals

The overall purpose of the conference was to help the railroad industry begin to move toward a more human-centered, multiple-cause, approach to incidents and their investigations, in order to further improve safety in rail transportation. To this end, the conference had four specific goals, which were conveyed to conference attendees at the beginning of the day. They were to:

1. Create and facilitate an open exchange of information and ideas among attendees.
2. Enable the sharing of “best practices” across the industry.
3. Encourage attendees to think of incidents as having multiple causes, or contributing factors.
4. Promote the idea of looking at contributing factors at all levels of an organization.

1.3 Organization of the report

This report is organized into several sections. Section 2 presents brief summaries of each of the presentations. Section 3 describes the key themes that emerged from the conference presentations and discussions. Section 4 presents recommendations derived from the conference activity. Section 5 contains a set of references for this report. A number of appendices are also included, and make up the bulk of the report. Appendix A contains a list of the conference attendees. Appendix B contains a copy of the conference program. And finally, Appendix C contains copies of speakers’ presentations, as well as presentations from those panelists who elected to use presentations to augment their discussions.

2 Presentations

This section provides brief summaries of each of the eight presentations and two panel discussions. For complete copies of presentations, see Appendix C.

2.1 Investigating for Human Factors in Rail Accidents and Incidents

Ms. Elizabeth McCullough, Manager, Human Performance Division of Transportation Safety Board (TSB) of Canada, presented a systematic and integrated process that she and her TSB colleagues developed to investigate transportation incidents for human factors. Ms. McCullough's method applies several accepted human factors methodologies in a seven-step investigative process that culminates in a risk assessment and the identification of safety deficiencies in a transportation system. A major advantage of such a system is that it focuses on safety actions to prevent further incidents.

2.2 Incorporating a Human Factors Approach in Accident Investigations at Canadian Pacific Railway

Ms. Faye Ackermans, General Manager, Safety and Regulatory Affairs at Canadian Pacific Railway (CPR), discussed her ongoing effort to incorporate human factors into CPR's incident investigation process. The underlying human factors theories (e.g., error causation) behind her methods are the same as those discussed by Ms. McCullough in her presentation; the major difference is that Ms. Ackermans' presentation focused on the real-world application of some of these methods at CPR. Ms. Ackermans discussed the initial resistance she met when applying these methods, and the resultant modifications she had to make to gain acceptance from both front-line managers and higher-level railroad officers. One of the products from Ms. Ackermans' effort has been the development of portable decision-aids and tools to incorporate human factors principles into daily investigation methods.

2.3 Getting to the Causal Roots of Incidents: An Examination of the Working Interface

Mr. Jack Balsamo, Principal Consultant, BST, Inc., discussed the importance of understanding the antecedents and consequences of at-risk behaviors to determine why and how these behaviors may be present in a system. The focus of Mr. Balsamo's talk was on preventative efforts to study and promote worker behaviors before incidents occur. However, incident data can be used to direct preventative safety efforts by targeting and modifying those risky behaviors associated with the incident under investigation.

2.4 The Anatomy of a Cooperative Safety Committee: The CSX Experience

Mr. Jerry Gibson, Locomotive Engineer, and Mr. Art Zima, Trainmaster, from CSX Transportation discussed CSX Transportation's approach to local safety committees. CSX Transportation has adopted a hands-off approach of allowing local labor to elect representatives from among their own crafts to participate on the safety committee. Basic tenets that Mr. Gibson and Mr. Zima suggested were key ingredients to a successful safety committee were trust, respect for one another, teamwork, and acceptance of change. The safety committee model that began in Wyoming Yard in Western Michigan is now being introduced in other parts of the CSX

Transportation rail system.

2.5 Panel Discussion: Creation of a Collaborative Incident Investigation Environment

This panel focused on exploring ways in which the railroad industry can create a more collaborative and open incident investigation environment. Each panelist was given 10 minutes to share his thoughts and experiences on how this type of environment may be fostered. To help provide some focus, panelists were provided ahead of time with a sample set of questions that they could choose to address during the panel. The questions were:

- How can an organizational culture that is more focused on identifying unsafe conditions and less focused on assigning blame be developed and cultivated?
- What are the barriers to this type of environment (e.g., pressure from above to show zero accidents or injuries; pressure from peers; protection from self-incrimination)?
- How may (some of) these barriers be overcome?
- What union, carrier and government resources (staffing, equipment, policies, money, regulations, formal support) are necessary to make this happen?
- What are the roles of the carriers, labor unions and the FRA with respect to creating and fostering this type of environment?

After each panelist spoke for 10 minutes, the moderator opened the floor to questions from the audience. Panel participants were the following four individuals:

- Mr. Royal Gelder, Director, Risk Management and Planning for the Belt Railway Company of Chicago
- Mr. Jeff Blomgren, Assistant General Manager, Employee Safety for CSX Transportation
- Mr. Robert Harvey, Regulatory Research Coordinator for the Brotherhood of Locomotive Engineers
- Mr. Tim DePaepe, Director of Research for the Brotherhood of Railway Signalmen

The discussion was moderated by Mr. Michael Coplen, Human Factors Program Manager for the FRA Office of R&D.

Several barriers and solutions emerged from the panel discussion. Some ideas were promoted by one panelist, while others were the concurrence of several panelists. Ideas that were put forward include:

- There is a need within the industry to share “best practices” using means such as this conference, to help improve safety.
- Use the SOFA process as a model for (1) joint industry-labor cooperation and (2) development of immediately applicable results to improve safety.
- There is currently a fear of being disciplined, of losing income, and/or being fired, when reporting injuries. A recommendation was made to do away with automatic dismissals and stop looking for blame when investigating incidents. This will help to open communication and thus, to improve incident investigations.

- Both management and labor may need to “set aside concerns about FELA” to obtain greater cooperation.
- CSX Transportation has stopped requiring an automatic discipline hearing after every injury. The number of injuries reported has increased, as expected, but this reflects an increase in reporting, not a decrease in safety. Many of the less serious injuries are now being reported, which enables the railroad to identify hazards they may not have been able to identify previously.
- One panelist suggested that an injury ratio plotted over time, such as injuries per 200,000 labor hours, is a step wise process, and that a railroad’s performance will naturally improve and then plateau. The focus should not be on the actual injury ratio for a given year, but rather the rate of improvement in the ratio. When the injury ratio plateaus, this suggests new tactics are needed to further improve safety. Another panelist felt that injury ratios can act to improve safety by serving as an incentive. He cited the Harriman Award as an example of such an incentive.

2.6 Things that go Bump in the Day: Diminished Alertness Accidents in Broad Daylight

Dr. Gerald Weeks, Chief of the Human Performance and Survival Factors Division in the Office of Railroad, Pipeline and Hazardous Materials Investigations at the National Transportation Safety Board (NTSB), spoke at lunch about two recent transit accidents that his office investigated. Although fatigue was implicated in both accidents, Dr. Weeks emphasized the safety deficiencies that existed in the system. In one case, the transit authority policy did not require safety-critical employees to report medications that may impair their performance. In the other case, the transit authority lacked educational awareness training on sleep disorders such as sleep apnea, that may affect the performance of its operators. Dr. Weeks also discussed recommended safety actions that the transit authority may introduce to prevent similar occurrences.

2.7 Accident Investigation Fundamentals-Human Factor Analysis

Mr. Terry Doyle, Railroad Safety Specialist, FRA Office of Safety, described FRA’s accident investigation methods. Mr. Doyle discussed FRA’s internal initiatives to promote and disseminate human factors approaches to its incident investigations. According to Mr. Doyle, FRA’s Safety Improvement and Development Team (SIDT) has developed several training courses that help FRA safety inspectors build human factors investigation skills. Mr. Doyle discussed several of these courses, among them an Accident Fundamentals Course that includes seven “elements” of an investigation. The focus of these courses is to build a foundation for inspectors to identify the unsafe acts and conditions that allowed an incident to occur.

2.8 MSHA’s Accident Reduction Program

To give some outside perspective on incident investigations, Mr. Terry Marshall from the Accident Reduction Program of the U.S. Mine Safety and Health Administration (MSHA) was invited to share his program’s initiatives. Whereas railroads must report incidents to the FRA, the mining industry must report incidents to MSHA. Mr. Marshall discussed MSHA’s accident reporting requirements, its accident investigation methods and tools, and industry partnerships.

MSHA began in 1977 and has been providing safety-related support to the mining industry since that time. Mr. Marshall's presentation demonstrated that MSHA views itself as a partner to the mining industry, not just a regulatory agency. Mr. Marshall provided illustrations of this support, including examples from MSHA's incident report form and its website, which shares best practices across the mining industry. In terms of incident investigations, beginning in 2001, MSHA initiated training for its investigators using commercially available TapRoot® and Root Cause Tree® root cause analysis methods.

2.9 Safety in Practice: A Shortline Railroad's Experience

Mr. Wade Swindle, Safety Coordinator from the Cedar Rapids and Iowa City Railway Company, discussed his railroad's safety initiatives. Mr. Swindle touched briefly on his railroad's safety culture and keys to change: commitment, communication and accountability. He also discussed several safety partnerships between various levels of management and front-line management and employees. He cited a number of communication tools, including job safety briefings, suggestion boxes, signs and a safety hotline. He also discussed the elements of their safety committees (including review of recent incidents) and safety audits, as well as how they conduct job safety briefings.

2.10 Panel Discussion: Future Challenges in Investigating and Correcting Incidents in the Railroad Industry

This panel focused on identifying issues and challenges related to the future of incident investigation within the railroad industry. Each panelist was given 10 minutes to share his thoughts and experiences regarding future challenges. To help provide some focus, panelists were provided ahead of time with a sample set of questions that they could choose to address during the panel. The questions were:

- How will the increasing presence of technology change the nature of incidents and incident investigation?
- Do you expect an increase in the number of security-related incidents? How might your railroad prepare for this?
- What resources will be necessary to address some of the issues raised earlier in the conference?
- What will be the role of labor contract negotiations (e.g., piloting new safety initiatives; built-in protection of those who report incidents to the railroad, etc.)?
- What organizational culture issues will need to be addressed? How may these be addressed?
- How will the nature of incidents, incident investigation, and corrective action implementation change?
- What would you like to see change in the future?

After each panelists spoke for 10 minutes, the moderator opened the floor to questions from the audience. Panel participants were the following four individuals:

- Mr. James Stem, Alternate National Legislative Director for the United Transportation Union
- Mr. Ray Grygiel, General Chairman, Brotherhood of Railway Carmen Division of the

Transportation Communication International Union

- Mr. Michael Hartung-Shuster, General Director, Safety Reporting and Analysis for BNSF Railway
- Mr. Preston Claytor, Vice President, Safety and Operating Practices for Rail America

The discussion was moderated by Ms. Judith Gertler, Manager of the Human Performance and Operations Research Division at Foster-Miller, Inc.

Participants identified the following challenges for the future of incident investigations:

- Operator fatigue is still a problem that needs to continue to be understood and addressed by the industry and labor together.
- Rail management and labor need to continue to work together to develop an atmosphere of trust. Once this trust exists, advances will be made in incident investigations.
- Due to limited resources, small railroads need to help each other and share information with regard to incident investigation methods.
- Railroads need to begin to focus their incident investigations on near-misses, unsafe behaviors and hazards. Examination of these will help to further reduce the number of actual injuries and accidents.

3 Key Themes

Several key themes emerged from the conference. They are briefly presented below.

- *Both presenters and conference participants used a number of key words repeatedly during the course of the day.* These words included: trust, empowerment, communication, change, culture, discipline (fear of, waive), recognize problems, training, commitment.
- *Railroads are slow to adopt a human-centered approach to incident investigation, but recognize the importance of such an approach.* Attendance by such a diverse set of railroads and labor organizations suggests that the industry is interested in learning more about human-centered approaches to improve safety. A negative organizational culture appears to exist within the railroad industry. This culture acts as a barrier to incorporating more human-centered approaches. However, railroads are beginning to recognize this, and many are beginning to address this negative culture using a variety of innovative means. For example, railroads are beginning to recognize that the old methods of discipline and blame are not essential to identifying and removing the root causes of incidents and improving safety. In fact, they are discovering that these methods are often barriers to the free exchange of information. Further, many attendees recognized or were familiar with James Reason’s model of human error that takes into account both unsafe acts and unsafe latent conditions, both of which combine to lead to an incident. Many attendees were also familiar with the concept that incidents have not one cause, but multiple causes. This is a necessary and critical first step toward adopting a human-centered approach to incident investigation.
- *Different railroads are taking different approaches to the incorporation of human-centered approaches.* Some are bottom-up while others are top-down. For example, some railroads are letting local management and labor work collaboratively to address safety at a local level; that is, they give local employees more autonomy. Others are “re-inventing” themselves from the top-down through changes in management and management decisions, to incorporate human-centered approaches to incident investigations. Some railroads are even hiring human factors professionals to re-tool their incident investigation procedures. It is clear that there needs to be a “fundamental change in [the railroad] culture” to conduct human-centered incident investigations such as root cause analyses.
- *The next big challenge in incident investigation in the railroad industry is to study near-miss data, as well as the unsafe acts and conditions that lead to near-misses and more serious incidents.* Several speakers and panelists made direct reference to a well-known model of safety known as “Heinrich’s Triangle” (or simply the “safety triangle” or the “DuPont triangle”). Originally developed by Heinrich in the 1930’s, Heinrich, Petersen and Roos (1980) describe the theoretical relationship among major injuries, minor injuries, and non-injury accidents (i.e., mishaps or near-misses). Figure 1 illustrates this relationship. For every one major (i.e., lost work time) injury, Heinrich et al. estimated there are 29 minor injuries, 300 mishaps (accidents that don’t result in an injury, but could have under other circumstances), and an unknown number, possibly thousands, of unsafe acts and conditions. Heinrich et al. developed these proportions based on earlier research on injury data from a number of industrial facilities. According to their model, collection and analysis of the near-misses and unsafe acts and conditions at the base of the triangle are important in understanding and preventing the minor and major injuries higher up in the triangle, and

offer more opportunities for injury prevention. One speaker noted that his railroad already examines near-misses as part of their monthly safety committee meetings; it is likely that other railroads may be doing something similar.

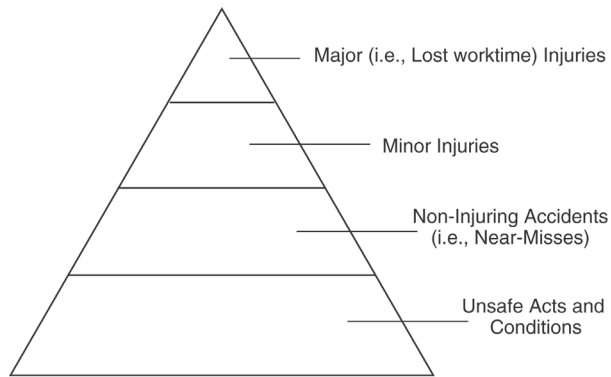


Figure 1. Heinrich's Triangle

4 Recommendations

Conference participation and discussion suggest several opportunities for the FRA to continue its efforts to improve railroad safety.

- *The FRA should consider modeling part of its website after MSHA's website (www.msha.gov).* MSHA's website includes a variety of helpful resources to both mine managers and miners, including accident prevention techniques. Some of these resources include "accident buster tips," "safety slogans," solutions to certain types of accidents, "safety ideas and tips" for specific categories of mining operation, "best practices" for certain types of operation, and numerous "hazard alerts and bulletins." Many of these resources were likely based on their accident investigations. The FRA may consider compiling and sharing these types of safety tools based on its accident investigations. The FRA may also serve as a clearinghouse for FRA- and industry-provided "best practices" and accident reduction tools and techniques. In doing so, FRA would continue to help the railroad industry help itself by disseminating safety-related information and accident reduction methods.
- *The FRA should consider initiating exploratory research to examine methods of collecting and analyzing near-miss (a.k.a. close-call, mishap, or near-incident) data to identify those hazards that are present before they cause an incident.* This research could focus on how the FRA could collect these data in a centralized system, and/or how railroads could collect these data for their own benefit. There are several benefits of a near-miss data collection and analysis system. First, since there has not been any type of loss or damage, the incident scenario and root causes can be explored in an open and non-adversarial environment. Second, because no one was injured or killed, those involved in the incident (i.e., with firsthand knowledge of the incident sequence) are available to be interviewed. Third, according to "Heinrich's Triangle," near-miss data offer many opportunities to root out hazards before they result in personal or property loss. Further, railroads continue to improve safety, and thus, at some point, the injury and incident ratios will be at such a low level that further reductions will be very difficult. At this point, the focus may need to change from reducing incidents after they occur to reducing incidents before they occur (i.e., near-misses). Addressing near-misses is also pro-active, which is a more favorable approach to safety than reactive efforts. Reinach and Gertler (2001) made a similar recommendation in their report to the FRA. Their recommendation was to examine the feasibility of a nationwide railroad near-miss reporting system, similar to the Aviation Safety Reporting System, or ASRS, sponsored by the Federal Aviation Administration (FAA) and administered by the National Aeronautics and Space Administration (NASA).
- *The FRA should consider conducting a follow-up conference in 2-3 years to continue facilitating the sharing of "best practices" across the railroad industry.* This will also help the FRA determine whether its research program should focus more resources to help the railroads adopt human-centered approaches to their incident investigation methods, and their safety prevention programs in general.

5 References

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Appendix A: Conference Attendees

Name	Position	Organization
Ms. Faye Ackermans	General Manager- Safety and Regulatory Affairs	Canadian Pacific Railway
Ms. Sarah Acton	Project Engineer	Foster-Miller, Inc.
Mr. Jack Balsamo	Principal Consultant	BST, Inc.
Ms. Lisa Benthien	Economist	Federal Railroad Administration
Mr. Bob Bernard	Vice President & Chief Safety Officer	CSX Transportation
Mr. Jeff Blomgren	Assistant General Manager - Employee Safety	CSX Transportation
Mr. Preston Claytor	Vice President- Safety and Operating Practices	Rail America
Mr. Mike Coplen	Human Factors Program Manager	Federal Railroad Administration
Mr. Tim DePaepe	Director of Research	Brotherhood of Railway Signalmen
Mr. Terry Doyle	Railroad Safety Specialist	Federal Railroad Administration
Mr. Ralph Elston	Deputy Regional Administrator	Federal Railroad Administration
Mr. Carl Fields	Investigator BLE Safety Task Force	Brotherhood of Locomotive Engineers
Mr. George Gavalla	Associate Administrator for Safety	Federal Railroad Administration
Mr. Roy Gelder	Director, Risk Management and Planning	Belt Railway Company of Chicago
Ms. Judy Gertler	Human Performance and Operations Research Manager	Foster-Miller, Inc.
Mr. Jerry Gibson	Locomotive Engineer	UTU-E / CSX Transportation
Ms. Cindy Gross		Federal Railroad Administration
Mr. John Grundmann	Assistant VP, Safety	BNSF Railway
Mr. Ray Grygiel	General Chairman	Brotherhood Railway Carmen Division, TCIU
Mr. Pete Hall	Director, Safety	Amtrak
Mr. Mike Hartung-Shuster	Director of Government Reporting	BNSF railway
Mr. Bob Harvey	Regulatory Research Coordinator	Brotherhood of Locomotive Engineers
Mr. Larry Hasvold	Regional Administrator	Federal Railroad Administration
Ms. Kim Hirschak	Safety Officer	Metra Railroad
Mr. Steve Hursh	Program Manager	SAIC
Mr. Scott Kaye	Railroad Project Coordinator	Federal Railroad Administration
Mr. Bob Keane	General Director Risk Management	Canadian National Railroad/Illinois Central Railroad
Mr. Steve Kenyon	General Manager - Safety	Union Pacific Railroad
Dr. Susan Labin	Director of Evaluation	Temple University
Mr. Moses Lacy	Manager - Safety Rules	Metra Railroad

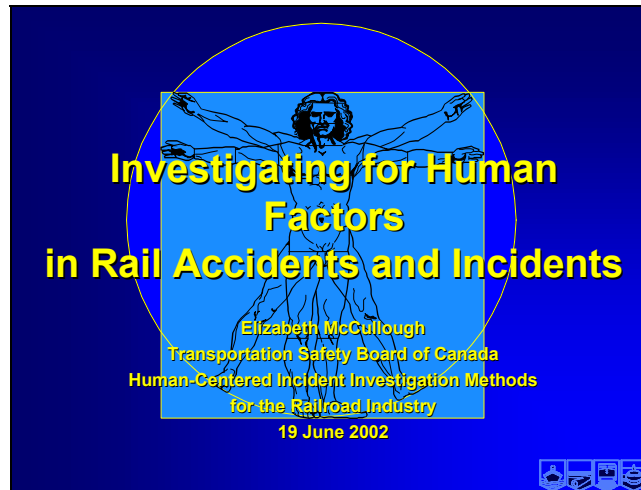
Name		Position	Organization
Mr.	Jim Lankford	Superintendent	Lake Michigan & Indiana Railroad
Mr.	Tom Leopold	General Director, Safety & Rules	Kansas City Southern Rail Network
Mr.	Rick Marceau	Vice President	United Transportation Union
Mr.	Terry Marshall	Mechanical Engineer, Accident Reduction Program	Mine Safety and Health Administration
Mr.	Lou Mayden	Manager Safety	Indiana Harbor Belt Railroad
Mr.	Rich McCord	Field Director	Federal Railroad Administration
Ms.	Beth McCullough	Manager, Human Performance Division	TSB Canada
Ms.	Susan McDonough	Program Administrator	Foster-Miller, Inc.
Mr.	Jeff Moller	Director, Casualty Prevention	Association of American Railroads
Dr.	Jordan Multer	Manager, Human Factors Rail Program	Volpe NTSC
Mr.	Chuck Mundy	Vice President	American Train Dispatchers Department / BLE
Mr.	Jim Phelan		Federal Railroad Administration
Dr.	Joyce Ranney	Organization and Behavior Specialist	Volpe NTSC
Dr.	Esa Rantanen	Assistant Professor	University of Illinois
Dr.	Tom Raslear	Senior Human Factors Program Manager	Federal Railroad Administration
Mr.	Stephen Reinach	Senior Engineer	Foster-Miller, Inc.
Mr.	John Reininger	Director-Dispatching Practices & Quality Assurance	Union Pacific Railroad
Mr.	Steve Roop	Director Multimodal Freight Transportation Program	Texas Transportation Institute
Mr.	Don Scott	System General Road Foreman	National Railroad Passenger Corporation
Mr.	Andrew Smith	Business Development Manager - Transport	Lloyd's Register Americas, Inc.
Mr.	James Stem	Alternate National Legislative Director	United Transportation Union
Mr.	Wade Swindle	Safety Officer	Cedar Rapids and Iowa City Railway Co.
Mr.	Joe Szabo	State Legislative Director	United Transportation Union
Ms.	Tammy Wagner	Regional Crossing Manager	Federal Railroad Administration
Dr.	Jerry Weeks	Chief, Human Performance Investigation Division	National Transportation Safety Board
Mr.	Barry Wells	Director of Safety	Norfolk Southern Railroad
Mr.	Art Zima	Trainmaster	CSX Transportation

Appendix B: Conference Final Program

- 7:30 a.m. **Registration and continental breakfast**
- 8:30 a.m. **Introductions**
-Thomas Raslear, Senior Human Factors Program Manager, FRA Office of R&D
- Opening Remarks**
-George Gavalla, Associate Administrator for Safety, FRA Office of Safety
- Goals for the Day**
-Stephen Reinach, Senior Engineer, Foster-Miller, Inc.
- 8:45 a.m. **“Investigating for Human Factors in Rail Accidents and Incidents”**
-Elizabeth McCullough, Manager, Human Performance Division, Transportation Safety Board of Canada
- 9:15 a.m. **“Incorporating a Human Factors Approach in Accident Investigations at Canadian Pacific Railway”**
-Faye Ackermans, General Manager, Safety and Regulatory Affairs, Canadian Pacific Railway
- 9:45 a.m. **“Getting to the Causal Roots of Incidents: An Examination of the Working Interface”**
-Jack Balsamo, Principal Consultant, BST
- 10:15 a.m. **Break**
- 10:45 a.m. **“The Anatomy of a Cooperative Safety Committee: The CSX Experience”**
-Jerry Gibson, Locomotive Engineer, UTU-E/CSX Transportation, and Art Zima, Trainmaster, CSX Transportation
- 11:15 a.m. **Panel Discussion: “Creation of a Collaborative Incident Investigation Environment”**
-Royal Gelder, Director, Risk Management and Planning, Belt Railway Co. of Chicago
-Jeff Blomgren, Assistant General Manager, Employee Safety, CSX Transportation
-Robert Harvey, Regulatory Research Coordinator, Brotherhood of Locomotive Engineers
-Tim DePaepe, Director of Research, Brotherhood of Railway Signalmen
Moderator: Michael Coplen, Human Factors Program Manager, FRA Office of R&D
- 12:30 p.m. **Break for lunch**
Luncheon Speaker: “Things that go Bump in the Day: Diminished Alertness Accidents in Broad Daylight,”
Gerald Weeks, Chief, Human Performance and Survival Factors Division, Office of Railroad, Pipeline and Hazardous Materials Investigations, NTSB
- 2:00 p.m. **“Accident Investigation Fundamentals-Human Factor Analysis”**
-Terence Doyle, Railroad Safety Specialist, FRA Office of Safety
- 2:30 p.m. **“MSHA’s Accident Reduction Program”**
-Terry Marshall, Mechanical Engineer, Accident Reduction Program, U.S. Mine Safety and Health Administration
- 3:00 p.m. **“Safety in Practice: A Shortline Railroad's Experience”**
-Wade Swindle, Safety Officer, Cedar Rapids and Iowa City Railway Co.
- 3:30 p.m. **Break**
- 3:45 p.m. **Panel Discussion: “Future Challenges in Investigating and Correcting Incidents in the Railroad Industry”**
-James Stem, Alternate National Legislative Director, United Transportation Union
-Ray Grygiel, General Chairman, Brotherhood of Railway Carmen Division, Transportation Communication International Union
-Michael Hartung-Shuster, General Director, Safety Reporting and Analysis, BNSF Railway
-Preston Claytor, Vice President, Safety and Operating Practices, Rail America
Moderator: Judith Gertler, Manager, Human Performance and Operations Research Division, Foster-Miller, Inc.
- 5:00 p.m. **Adjourn**

Appendix C: Speaker and Panelist Presentations

Appendix C contains copies of presentations for those speakers and panelists who made their presentations available. Note that panelist presentations were optional.





The TSB

- ◆ Independent multi-modal accident investigation agency
 - Separate regulation and enforcement functions from accident investigation function
 - Separate accident investigation from criminal and civil proceedings
- ◆ Sole purpose is to advance transportation safety. The TSB:
 - Does not regulate
 - Does not enforce
 - Does not assign blame
 - Does not apportion liability



TSB Approach

- ◆ Advance Safety through the identification and validation of *Safety Deficiencies* that are found through the investigation process
- ◆ Focus is on Why and How
- ◆ Communicate to the authorities who can best effect change such as:
 - the regulator
 - the transportation industry





Human Error

- ◆ All components of the system have the potential to contribute error to that system
- ◆ It is better to explain behaviour than label it
- ◆ Need to determine why individuals' assessments and actions seemed reasonable given the circumstances



An Integrated Process for Investigating Human Factors

The Need

- “Lack of specification of the deficiency of performance... practically precludes the determination of what actually happened and what specific mods might reduce the likelihood of these deficiencies.”
Wilde et al., 1980



An Integrated Process for Investigating Human Factors

The Basic Premise

- “a systematic approach.... is crucial since it would encourage the consideration of multicausality”

Kennedy, R





An Integrated Process for Investigating Human Factors

How People are Involved in Occurrences

- ◆ Directly, as a contributor through unsafe acts



An Integrated Process for Investigating Human Factors

How People are Involved in Occurrences

- ◆ Directly, as a contributor through unsafe acts
- ◆ Directly, as a receiver of unsafe conditions



An Integrated Process for Investigating Human Factors

How People are Involved in Occurrences

- ◆ Directly, as a contributor through unsafe acts
- ◆ Directly, as a receiver of unsafe conditions
- ◆ Indirectly, as a contributor to unsafe conditions through unsafe acts

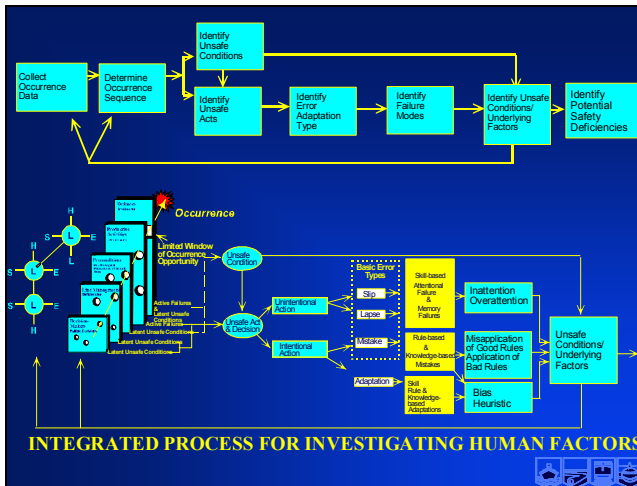




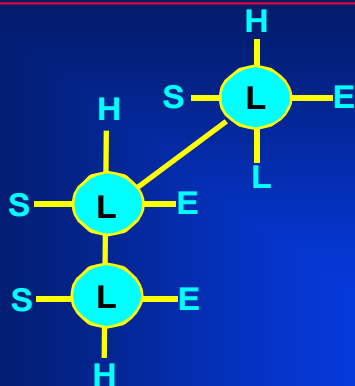
An Integrated Process for Investigating Human Factors

Seven Step Process

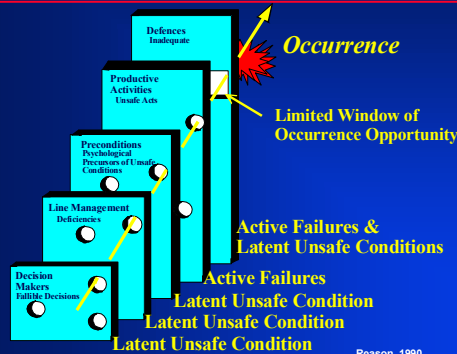
- ◆ Collect Occurrence Data
- ◆ Determine Occurrence Sequence
- ◆ Identify Unsafe Acts/Decisions and Conditions
- ◆ Identify the Error Type or Adaptation
- ◆ Identify the Failure Modes
- ◆ Identify the Behavioural Antecedents or Unsafe Conditions/Underlying Factors
- ◆ Identify the Potential Safety Deficiencies



Step 1 - Collect Occurrence Data

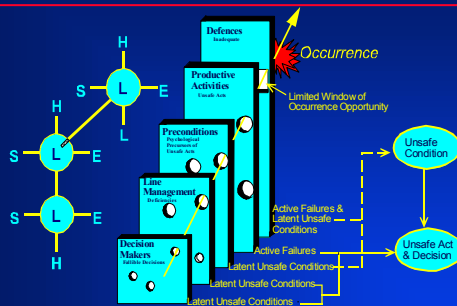


Step 2 - Determine Occurrence Sequence



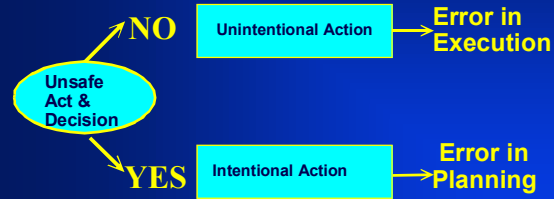
Reason, 1990

Step 3 - Identify Unsafe Acts & Conditions



Step 4 - Identify the Error Type

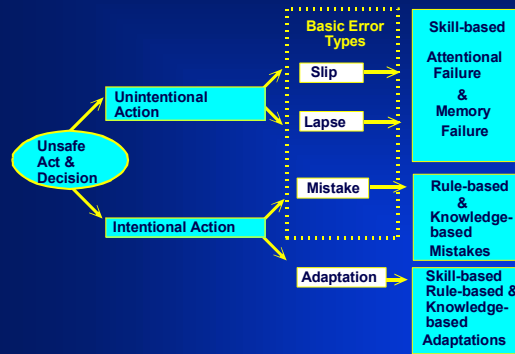
Did the action go as planned?



Reason, 1990



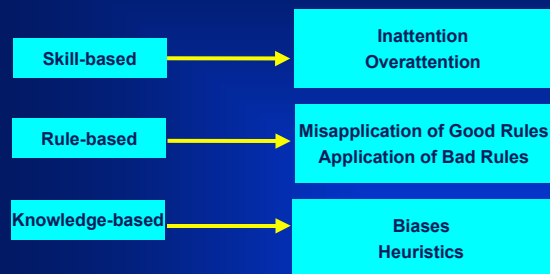
Step 4 - Identify Error Type



Reason, 1990



Step 5- Identify Failure Modes

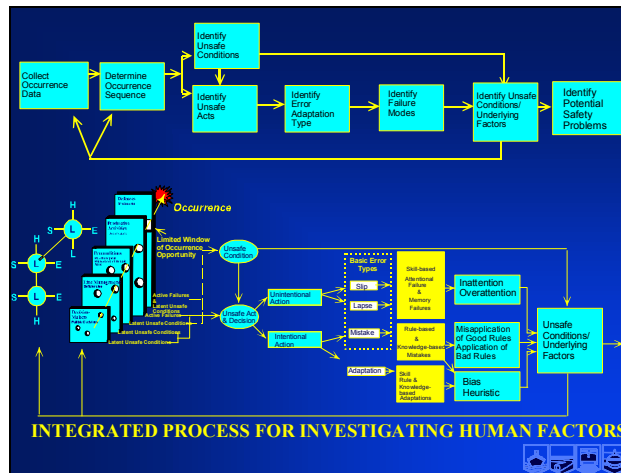


Reason, 1990



Step 6a) Identify Underlying Factors 6b) Repeat if Necessary

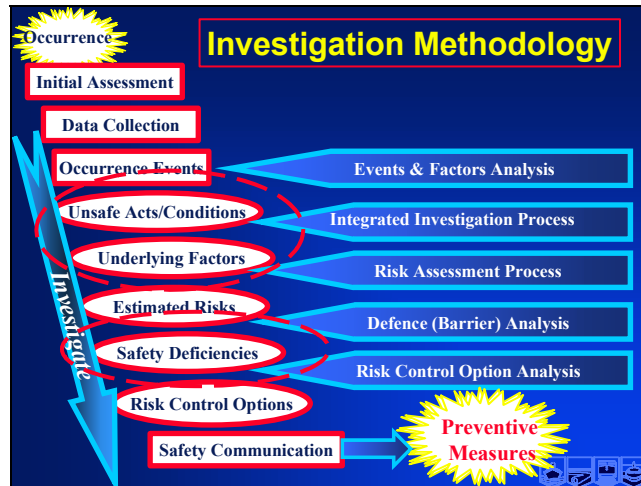
- **Definition:** Any factors in the work system that facilitate the expression of an unsafe act
- **Factors:** unsafe acts/decisions & unsafe conditions
 - ◆ Intrinsic Factors: physical, physiological, psychological, psychosocial
 - ◆ Extrinsic Factors: environmental, task, management, organizational
- Repeat the process until the underlying factors (unsafe conditions) worthy of risk analysis have been identified




Step 7 - Identify Potential Safety Deficiencies

- ◆ Formulation of safety problems associated with unsafe conditions/underlying factors identified in Step 6
- ◆ Linkage of potential safety deficiencies to unsafe acts/decisions as causal to an occurrence




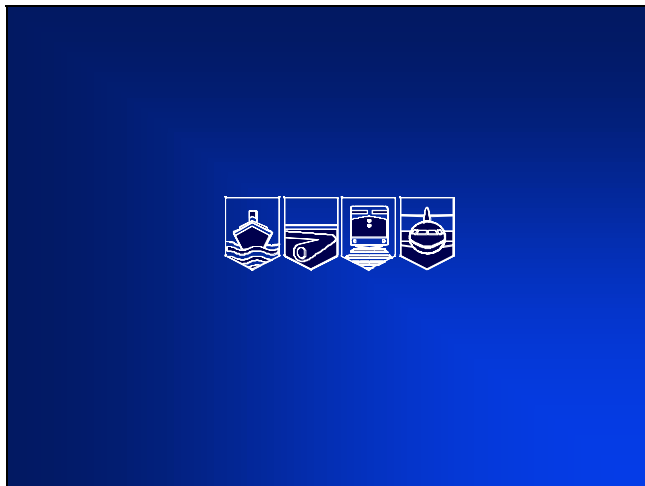


 **An Integrated Process for Investigating Human Factors**

Application and Utility

- ◆ Systematic approach to investigations
- ◆ Focussed safety action
- ◆ Data recording guides data collection





Human – Centered Incident Investigation Methods for the Railroad Industry



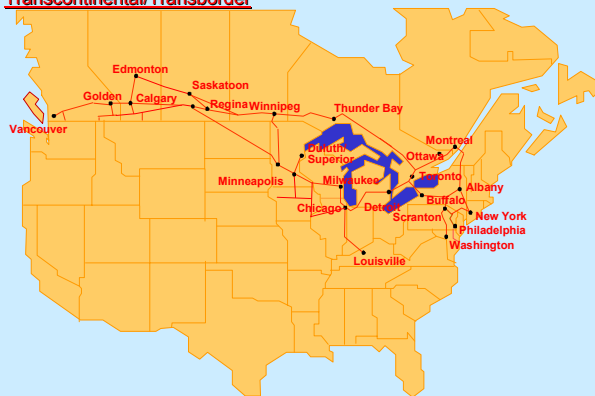
June 19, 2002
Chicago
Faye Ackermans
General Manager,
Safety & Regulatory Affairs

Incorporating a human factors approach to investigating rail accidents at Canadian Pacific Railway

CANADIAN PACIFIC RAILWAY

CPR - Our Network

Transcontinental/Transborder



CANADIAN PACIFIC RAILWAY

Human Factors Approach to Investigating Accidents

- Train accident performance metrics
- Efforts to diagnose and mitigate human error
 - Fatigue management
 - Crew resource management
 - Accident / incident investigation
- HF accident /incident investigations
 - Track Occupancy Permit violations
 - Mainline collision
 - Northern Alberta
 - Rail Traffic Control
 - Employee fatality
- Human factor investigation tools
- Summary of experience

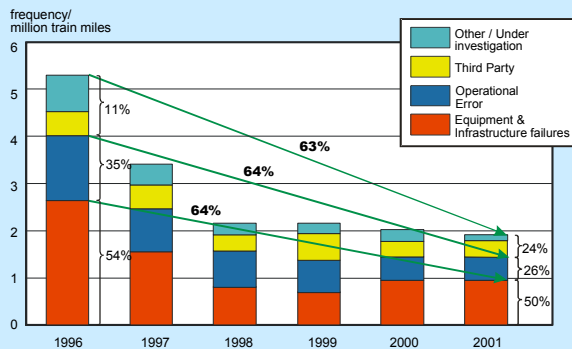
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Train Accident Performance Metrics

- Cardinal Rule violations
- Accidents at road/rail intersections (crossings)
- Trespasser accidents
- Non-accident releases of Dangerous Goods
- Train accidents
 - FRA Reportable
 - Non-FRA Reportable

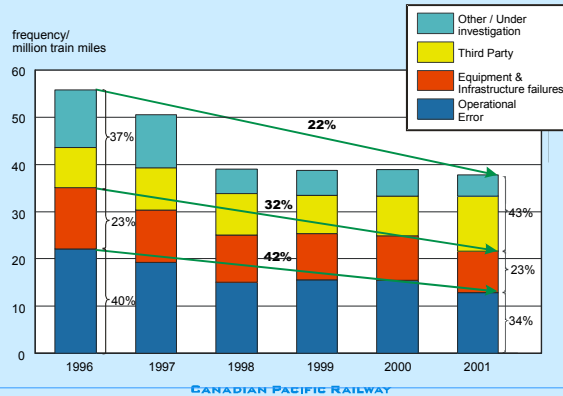
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Frequency of FRA-Reportable Train Accidents

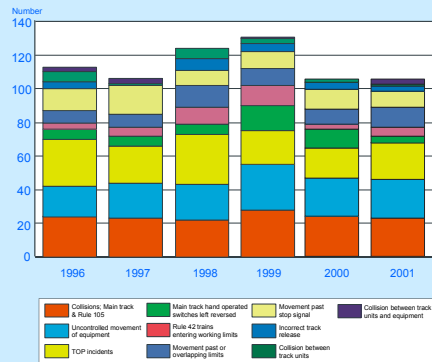


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Frequency of Non-FRA Reportable Train Accidents



Cardinal Rule Violations - Canada¹

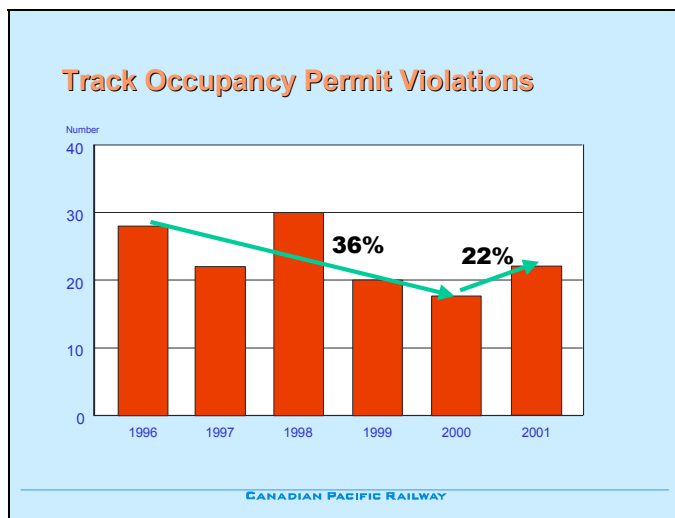
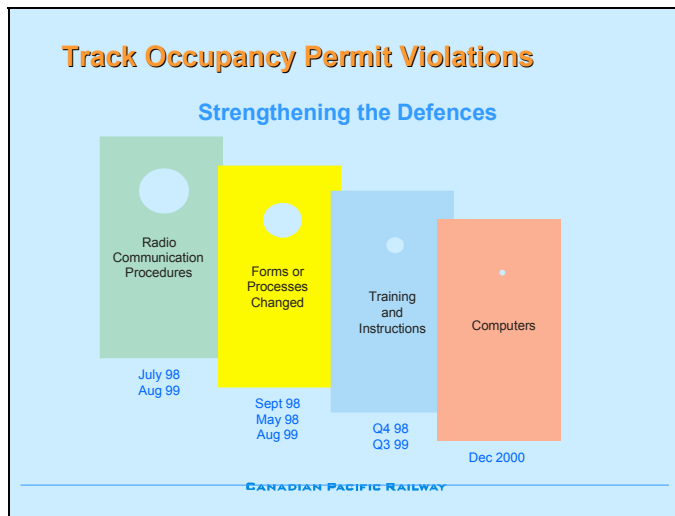
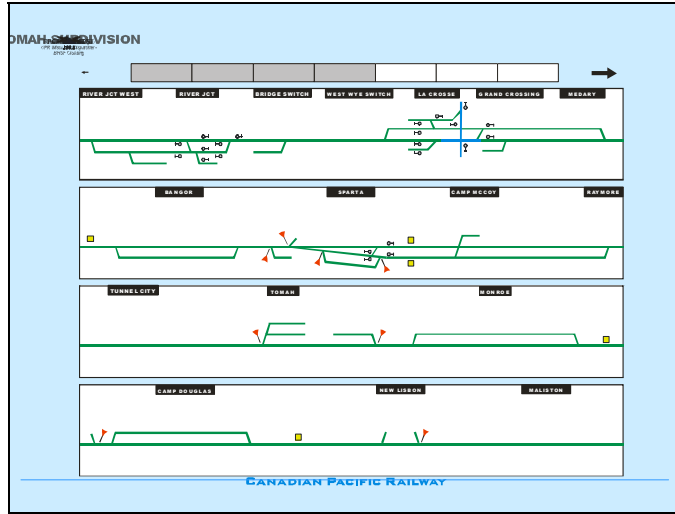


¹ CRVs are recorded for all CPR's operations now, but we do not have historical information for our U.S. properties. Thus, only the trend for Canadian violations is shown.

Human Factors Investigations Track Occupancy Permit Violations

- September 1997, consultant's report received
- 1998
 - Forms used in field changed
 - TOP refresher training to engineering
- In April, 1999
 - Despite best efforts, TOP violations continue to increase
 - Transport Canada prohibit use of sub-foremen procedures
 - Clearance form revised
 - 3 System Special Instructions issued
 - Limit of 3 sub-foremen
 - Q&A package
 - Transport Canada direction lifted August 1999
- Fall 1999 - Track diagrams issued with timetables
- 2000 - computer terminals on-track tested

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Human Factors Investigation Train Collision - Kemnay, Manitoba

- September 30, 1998, hired human factor specialist
- October 20, 1998, two trains collided at 1 a.m.



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Kemnay - 1998

- Discipline waived with approval of vice-president of transportation and the general manager of district.
- Series of human factors interviews conducted
- Draft report
 - ◆ Not well received
 - ◆ Not what Ops expected to see (did not blame the employee)
- Final report
 - ◆ Fatigue
 - ◆ Accuracy of train line - ups
 - ◆ Booking rest
 - ◆ Teamwork & communication in cab of locomotive
 - ◆ In depth understanding vs training
 - ◆ Interaction between rail traffic controller and crew
 - ◆ Assumptions made and their impact on situational awareness
 - ◆ General compliance with rules
 - ◆ Visibility of rear-end marker

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Human Factors Investigations Train Accidents in Northern Alberta - 1999



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Train Accidents in Northern Alberta

Who

- 192 operating employees

Why

- High frequency of accidents

What

- Local managers up to general manager
- Union leaders up to general chairman
- Discipline waived
- Interviews rather than investigations (format statements)
- Detailed flow charts
- Possible contributing factors
- Root causes
- High level contributing factors
- Follow-up interviews
- Employee survey

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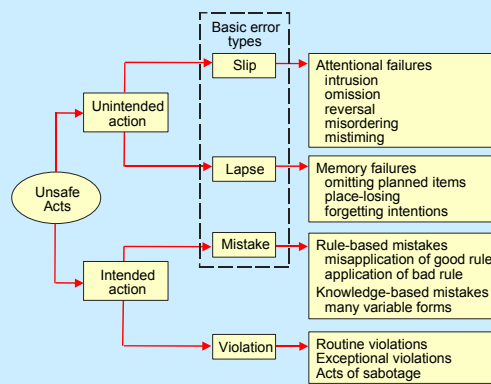
Train Accidents in Northern Alberta

Findings

- 64 accidents/incidents investigated
 - ♦ Run-through switches
 - ♦ Shoving equipment over derails or stop blocks
 - ♦ Sideswiping equipment
 - ♦ Cardinal Rule violations
- Three broad categories of error
 - ♦ 20% slips and lapses
 - ♦ 56% mistakes
 - ♦ 23% violations

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Unsafe Acts



Taxonomy of unsafe acts (From Reason, 1997)

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Train Accidents in Northern Alberta (cont'd)

Findings

- Most frequent “high level” contributing factors
 - ♦ 52% Lack of teamwork
 - ♦ 48% Operating based on assumptions
 - ♦ 47% Technical/operating errors; lack of knowledge
 - ♦ 39% Rule violations
 - ♦ 31% Lack of/vague communications
 - ♦ 27% Poor situational awareness
- Two key variables
 - ♦ 25% of accidents occurred between the 4th and 5th hour on duty
 - ♦ 45% of employees had 5 years or less experience

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Train Accidents in Northern Alberta (cont'd)

Interventions

1. Wide distribution of incident investigations (communication from management)
2. Structured job-briefing checklists
3. Crew Resource Management training program
4. 30-Day Proficiency Test follow-up for rule violations
5. Operating procedures at one customer siding changed
6. Switch target changed
7. Incidents used in scenario-based training

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Train Accidents in Northern Alberta (cont'd)

Safety Policy

“No job on our Railway will ever be so important that we can't take the time to do it safely”

Employee Edmonton

“Changing people's attitudes is the only way to create a safer work place. This will take a long-term commitment and must be undertaken by all of us - not just one manager and a few believers”

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Human Factors Investigations

Rail Traffic Controller Errors

- Review of Cardinal Rule violations
- Employee/management committee review:
 - ♦ form layout
 - ♦ order information presented on computerized dispatching system
 - ♦ overlapping information on adjoining subdivisions
 - ♦ database to collect factors

Employee fatality investigation

- ♦ no witnesses
- ♦ HF investigation used to probe “culture” of the workgroup
- ♦ findings extremely controversial
- ♦ not accepted by unions or management

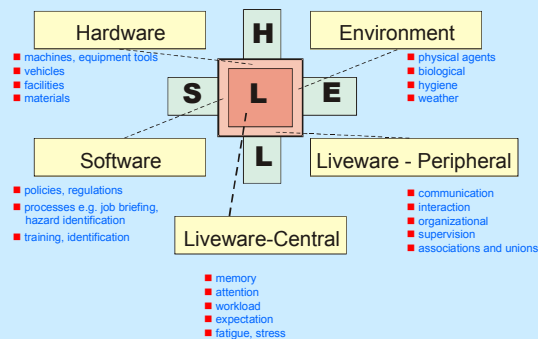
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Human Factors Investigations - Next Step

- Creation of new tools to incorporate human factors into day-to-day investigation of accidents / incidents
- Investigation processes and tools will be brought together in one manual (draft)
- Human factors “tools” include:
 - ♦ data collection guide
 - ♦ corrective action guide
 - ♦ “info-flip”
- Modeled on “SHEL(L)”

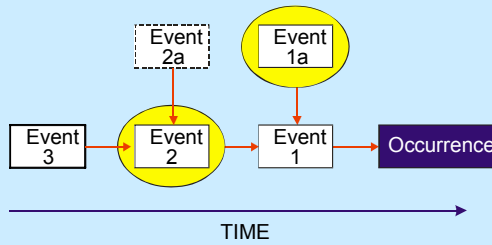
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SHEL(L): Interaction of people with the system – puts emphasis on the interfaces



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Data Analysis – Events Diagram



- Put yourself inside the events
- Try not to let the known outcomes distort your analysis

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Data Collection Guide

A series of 27 separate checklists grouped in 4 categories

- Individual factors
 - attention
 - memory
 - experience / knowledge / training
 - fatigue
 - alcohol / drugs
- Interaction with others
 - communication
 - organizational factors
 - supervision
- Policies, procedures, environment
 - rules, procedures
 - written information
 - immediate environment
- Equipment and other hardware
 - workspace and comfort
 - physical space and arrangement

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Data Analysis – Determine Safety Concerns, Risks and Priorities

Risk of Recurrence Assessment Matrix

	Severity / Consequence					
	Minimal 1	Marginal 2	Serious 3	Critical 4	Catastrophic 5	
FREQUENCY	Frequent 5	low 5	medium 10	high 15	very high 20	very high 25
	Probable 4	low 4	medium 8	high 12	high 16	very high 20
	Occasional 3	very low 3	low 6	medium 9	high 12	high 15
	Remote 2	very low 2	low 4	low 6	medium 8	medium 10
	Improbable 1	very low 1	very low 2	very low 3	low 4	low 5
(f)(s) RISK	01 – 03 Very Low	04 – 06 Low	07 – 11 Medium	12 – 18 High	19 – 25 Very High	

- Use to guide development of corrective actions

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Corrective Action Guide

- Suggested types of corrective actions appropriate for the factors, depending on underlying cases
- Individual factors, issue of processing information
 - ♦ lack of attention
 - ♦ memory
 - ♦ experience / knowledge / training
 - ♦ poor decision-making
- Causes / possible corrective actions

<u>Cause</u>	<u>Corrective Actions</u>
Slip / lapse	<ul style="list-style-type: none">♦ Location and design of physical defences such as switch targets, guard rails♦ Job memory aids♦ Task rotation
Mistake	<ul style="list-style-type: none">♦ Job orientation (briefing)♦ Retraining
Violations	<ul style="list-style-type: none">♦ Increased proficiency testing♦ Discipline

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The New “Tools”

Their Purpose

- Standardize investigative procedures
- Improve amount and type of data collection
- Improve ability to determine underlying factors
- More effective corrective actions

What They Will Not Do

- Change current structure of investigations and statement taking
- Change the current discipline system
- Cause a significant increase in work or time
- Conflict with existing processes and training

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Summary: CPR Experience With a Human Factors Approach

- We are four years into our journey
- Excellent acceptance by some managers and employees
- Suspicion and distrust by others
- Next step is to incorporate into Front Line Manager's investigation processes and thinking

Fundamental change in culture

CANADIAN PACIFIC RAILWAY

Getting to the Causal Roots of Incidents:



An Examination of the Working Interface

Presented by: Jack Balsamo
Principal Consultant · BST, Inc.
jack.balsamo@bstsolutions.com



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JBA FMC (0206) – 1

Objective:

To create an understanding of the “working interface” concept, understand its practical application, and utilize the principles going forward.

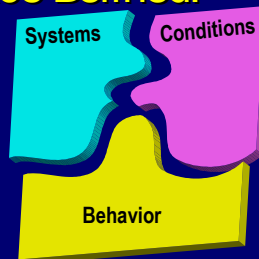


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JBA FMC (0206) – 2

Working Interface Defined:

The intersection of behavior with systems and/or conditions.



- Behavior- observable action
- Conditions- Physical working environment.
- Systems- Procedural guidelines written or unwritten that are intended to influence behavior or do influence behavior.



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JBA FMC (0206) – 3

Avoid Oversimplification:

- There are incidents that occur in absence of a working interface. They are rare; beware when “many” exist in your findings.
- Common evidence from Corrective Action statements:
 - “I counseled the employee”.
 - Fix-its: “We painted a line on the platform”.



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JBA FMC (0206) - 4

Investigation?

2 ways to think about it:

1. “INVESTIGATE”

- Criminals
- Gather Evidence
- Trial
- Conviction
- Punishment



*Short-term:
“capture those who
caused this”*



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JBA FMC (0206) - 5

Investigation?

2 ways to think about it:

2. “INVEST”

- R = Reduction
- O = Of
- I = Injuries



Prevention of future injuries has greater reward than managing existing ones. Utilize a process that gets as close to the truth as possible and focuses on changing the accident causing system.



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JBA FMC (0206) - 6

Utilizing Incidents for RCI

1. Define Critical Behaviors.
2. Measure the frequency of their occurrence.
3. Provide frequent information about how often those behaviors occur and why (systems/conditions).
4. Action plan ways to improve the 3 interface components: ↑ safe behavior and prevent risk .

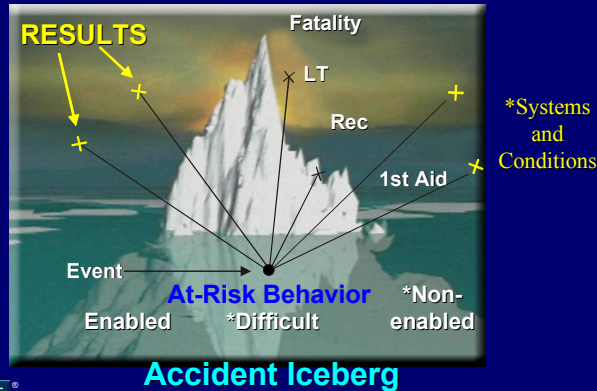


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JBA FMC (0206) – 7

Understanding the Behavioral Interface:



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JBA FMC (0206) – 8

Behavioral Sequence of Events:

An Incident Occurs.
You begin trying to talk to people involved and witnesses: what do you need to looking for?



“WHAT” first...then “WHY”

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JBA FMC (0206) – 9

Sample Incident Report



As a mechanic was breaking into a hydraulic line, his helper was burned on the face by fluid escaping from the flange that the mechanic was opening.

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JBA FMC (2006) – 10

Breaking Down the Behavioral Interfaces

- Helper was standing in the path of potential escaping fluid (Line of Fire)
- Line was being opened without blocking and bleeding pressure (Lock and Tag)
- Helper was not wearing face protection (PPE)

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JBA FMC (2006) – 11

ABC Analysis: 1 per risk Now Focus on “WHY”

- **Antecedent** = in a hurry, never had a problem before, didn't think it was necessary in this situation, 5 minutes before shift end, Night shift
- **Behavior** = Line was being opened without blocking and bleeding.
- **Consequence** = Injury, save time, go home faster, satisfy supervisor

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JBA FMC (2006) – 12

3 Factors That Affect Consequences

Timing

Sooner / Later

Consistency

Certain / Uncertain

Significance

Positive / Negative



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JBA FMC (0206) - 13

Getting Proactive by Addressing the Antecedents and Consequences: Action Planning

Behavior: not bleeding a hydraulic line

Example antecedent: "Didn't think it was necessary".

In the scheme of a singular event you will want to "counsel the employee". In reality there are many times where someone may not think about the appropriate safety precaution.

There is almost universal value in having people engaged in a practice of conversation about such issues ("feedback").

Action Plans should include line-items that address all possible antecedents and consequences!



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JBA FMC (0206) - 14

Utilizing Incidents for RQ

1. Define Critical Behaviors.

(Break your existing injury information down to the behavioral level)

2. Measure the frequency of their occurrence.

(monitor the behaviors that create the highest level of risk at the point of risk, not just injury)

3. Provide frequent information about how often those behaviors occur and why.

(Talk to people about their situations and when those risks occur (systems and conditions))

4. Action plan ways to promote safe behavior and prevent risk.

(Use ABC analysis to understand and improve the antecedents and put more SC+ consequences in place for critical behaviors done safely and prioritize which systems and behaviors will get most of your limited resources.)



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JBA FMC (0206) - 15

Getting to the Causal Roots of Incidents:



An Examination of the Working Interface

Presented by: Jack Balsamo
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JBA FMC (0206) - 16



Belt Facts

- ❖ 475 Employees
- ❖ 28 Miles of two-main track track mainline
- ❖ Single crest/two classification yard hump facility
- ❖ All within Cook County, Illinois
- ❖ Connects to all Chicago carriers except IAIS
- ❖ Handled 2.2 million cars in 2001
- ❖ Incorporated in 1882 and operated as joint facility until 1989
- ❖ Stand-alone operating agreement effected 1990
- ❖ 88 Percent of manhour exposure directly involves yard switching

3528.ppt



What We Have Done to Continue the Evolution

- ❖ Unprecedented and sustained effort to clean the property and the will to keep it so
 - ♦ Remove a source of bad attitude/"They don't care" mentality
 - ♦ Visible effort, high impact, immediate results
- ❖ Restructured employee safety committee
 - ♦ Led by employees, NOT management
 - ♦ Focus on the right tasks, only issues that cannot be corrected locally
 - ♦ Management helps by building confidence in decisions so "Empowerment" and "Trust" are meaningful
 - PPE Evaluation
 - Industry Switch Track Audit Program

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What We Have Done to Continue the Evolution (continued)

- ❖ Involve Federal Railroad Administration
 - ♦ Visible partnership at meetings and in the field
 - Opens communication with Labor and Management
 - FRA buys in and becomes/owns part of the process
- ❖ Align Management to sustain change and focus on behavior
 - ♦ Observe, reinforce, coach, share the expectation
 - ♦ Discipline must be utilized and it must be consistent
 - ♦ "Non-traditional" departments can help
 - Risk Management, Real Estate, Labor Relations, Human Resources, Purchasing
 - ♦ Department head individual safety interview with every employee

3528.ppt



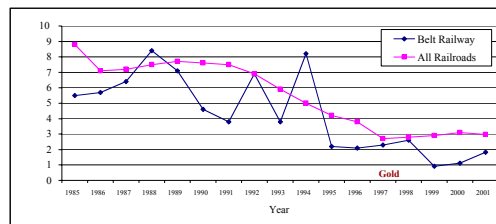
What We Have Done to Continue the Evolution (continued)

- ❖ Advertise safety in all ways possible
 - ◆ Publications
 - ◆ Incentive programs
 - ◆ Wearing PPE and evaluating new and improved gear
 - ◆ Equipment and tool inspections and procurement

3528.ppt



Belt Railway and all Reporting Roads Annual FRA Ratio 1985 to 2001



- ❖ Our results have been in steps
- ❖ Each step requires reinforcement and evolution of method

3528.ppt

**Things that go Bump in the Day:
Diminished Alertness
Accidents
in Broad Daylight**

Gerald D. Weeks, Ph.D.
Chief, Human Performance &
Survival Factors Division



National Transportation Safety Board

**Maryland Transit Administration
Light Rail Vehicle Collisions
With Bumping Posts
at Baltimore Washington
International Airport Station
February 13, 2000
August 15, 2000**



National Transportation Safety Board







NTSB Investigation Team

- **Member** - John Hammerschmidt
- **Investigator in Charge** - Bob Campbell
- **Event Recorders** - Dave Case
- **Human Performance** – Rick Narvell
- **Mechanical** – Russ Quimby



National Transportation Safety Board

NTSB Team (cont'd)

- **Operations** – George Cochran
- **Signals** – Ruben Payan
- **Survival Factors** - Rick Downs
- **Track** – Bob Campbell



National Transportation Safety Board

Parties to Investigation

- Maryland Transit Administration
- Maryland Department of Transportation
- BWI Airport Fire & Rescue
- BWI Police Department



National Transportation Safety Board

The February Accident Train Operations

- The train operator reported for duty at 9:30 a.m. for his 10:01 a.m. assignment
- Departed Pennsylvania Station in downtown Baltimore for Baltimore/Washington International Airport Station at 10:44 a.m.
- Took lunch break at 12:30 p.m.



National Transportation Safety Board

Train Operations (cont'd)

- Departed on second trip south to BWI from Penn Station at 1:51 p.m.
- Last signal displayed an approach signal - yellow aspect
- Collision at 2:37 p.m.



National Transportation Safety Board

Passenger Statements

- At North Linthicum Station, the operator failed to respond to a green signal for 10 to 15 seconds and shook his head and body before moving forward
- Operator appeared to have fallen asleep while entering BWI Station



National Transportation Safety Board

February Operator Post-Accident Toxicological Tests

- Specimens collected 4 ½ hours after the accident
- Tests were positive for:
 - Benzoyllecgonine
 - Codeine
 - Morphine



National Transportation Safety Board

Medications Used by the February Operator

- **Acetaminophen and oxycodone**
- **Acetaminophen and codeine**



National Transportation Safety Board

Cocaine Use by the February Operator

- Benzoyllecgonine indicated likely withdrawal phase from cocaine
- Withdrawal phase associated with sedation



National Transportation Safety Board

Conclusion

- The effects of the prescription pain-relieving medications and/or recent cocaine use impaired the performance of the operator in the February accident



National Transportation Safety Board

Conclusion

- Because the MTA did not require safety sensitive employees to report their use of prescription and over-the-counter medications, it lacked information that could have had a bearing on the conditions and performance of such employees



National Transportation Safety Board

Drug Regulations (Federal) Pertaining to Prescription and Over-the-Counter Medications

- FTA (49 CFR 653) – None
- FRA (49 CFR 219.103b) – “this subpart does not restrict any discretion available to the railroad to require that employees notify the railroad of therapeutic drug use or obtain prior approval for such use”



National Transportation Safety Board

Recommendation to the Federal Transit Administration

Authorize and encourage rail transit systems to require their employees in safety-sensitive positions to inform the rail transit system about their use of prescription and over-the-counter medications so that the rail transit system can have qualified medical personnel determine the medication's potential effects on the employee performance. (R-01-25)



National Transportation Safety Board

The August Accident Train Operations

- The train operator reported for duty at 3:00 a.m.
- Completed one round-trip from Penn Station to the BWI Station and was making another identical trip when the accident occurred



National Transportation Safety Board

Train Operations (cont'd)

- Observed lowered crossing gates at the last grade crossing before BWI Station
- Observed that the signal at Milepost 115 displayed a restricting signal - red over yellow aspect
- Collision with bumping post at 7:14 a.m.



National Transportation Safety Board

Obstructive Sleep Apnea (OSA)

- Operator clinically tested for sleep disorders after the accident
- Diagnosis: severe obstructive sleep apnea
- Chronic disorder often present for years before diagnosed
- Excessive daytime sleepiness is almost uniformly present



National Transportation Safety Board

Risk Factors for Obstructive Sleep Apnea

- Male
- Overweight
- Over 40 years old



National Transportation Safety Board

Conclusions

- The August operator was suffering from severe obstructive sleep apnea at the time of the accident
- The fatigue he was experiencing due to undiagnosed obstructive sleep apnea likely caused the operator to fall asleep as the light rail vehicle approached the station



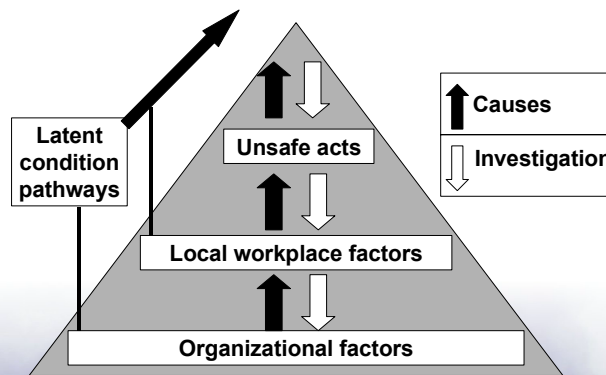
National Transportation Safety Board

Recommendation to U.S. rail transit systems

Ensure that your fatigue educational awareness program includes the risks posed by sleeping disorders, the indicators and symptoms of such disorders, and the available means of detecting and treating them.
(R-01-27)



National Transportation Safety Board



©James Reason, 1997, *Managing the Risks of Organizational Accidents*



Accident Investigation



Human Factor Analysis



Safety Improvement & Development Team

FRA Administrator's Objective

“.....reducing numbers, frequency and severity of rail-related accidents and crashes, fatalities and injuries.”

The Goal of this conference certainly supports this objective, and we appreciate the interest and participation of such a wide group of people on this topic.



Safety Improvement & Development Team

Human Factor Caused Accidents and Injuries

The Year 2001 was the best year in the past five years:

- Human Factor Accidents were down 16%
- Human Factor Injuries were down 11%

So far this year:

- Human Factor Accidents are down 7%
- Human Factor Injuries are down 28%



Safety Improvement & Development Team

Human Factor Cause Relationships

Safety, productivity and quality of life on the job all contribute to human factor caused accidents and injuries.

Training, staffing, work/rest scheduling, rules and operating practices, and situational awareness factors all have a bearing on safety in general, and human factor failures specifically.

FRA recognizes this, and these elements are closely examined in all of our accident investigation endeavors.

Recognizing these elements also contributes to the success of any of our safety initiative involvements such as **SOFA** and our **Focused Inspection Process**.



Safety Improvement & Development Team

FRA's Strategy

To accomplish any safety improvement we must first isolate the problem areas. This is accomplished by:

- Reviewing Railroad Accident And Employee On-duty Injury Data.
- Conducting On-site Inspections and On-Board Train Inspections.
- Reviewing Part 217 Operational Tests and Inspection Records.
- Accompanying Carrier Officials on Operation Tests & Inspections.
- Conducting Thorough Accident and Incident Investigations.
- Providing Relevant Training to the FRA Inspector Workforce.



Safety Improvement & Development Team

Safety Improvement and Development Team (SIDT)

The SIDT Team is primarily responsible for developing and delivering technical training to the FRA inspector work force.

The Team is comprised of a Training Specialist in each of the following disciplines.

- Operating Practices
- Hazardous Materials
- Track
- Signals and Train Control
- Motive Power and Equipment



Safety Improvement & Development Team

Training Focused on Human Factor Issues

The following courses have been developed and delivered by the SIDT Team to assist our inspector workforce improve awareness associated with the many unsafe behaviors and conditions generally associated with human factor related accidents, injuries and fatalities, and to investigate them.

- **Basic Investigative Skills**
- **Accident Investigation Fundamentals**
- **Train Handling Techniques**
- **Part 217 – Operating Rules**



Safety Improvement & Development Team

The *Basic Investigative Skills* course is designed to develop and improve skills in the following areas and is offered to inspectors in all disciplines:

1. Interviewing Skills
2. Note Taking Accident Investigations
3. Photography.

NOTE: This course is a pre-requisite to the *Accident Investigation Fundamentals* course.



Safety Improvement & Development Team

Accident Investigation Fundamentals

This course covers the following:

- FRA's Authority To Investigate
- Establishing Investigative Priorities, Mind Mapping, and Investigative Action Plans.
- Communication guidelines.
- NTSB and OSHA Joint Investigations
- Information Gathering – Seven Elements of Accident Investigations.
- Drug and Alcohol Issues.
- Event Recorders.
- Hazardous Materials.
- Report Writing.



Safety Improvement & Development Team

Elements of a Thorough Accident Investigation

The *Accident Fundamentals Course* includes a training module that specifically addresses accidents and incidents where there is suspected human factor issues.

The module identifies *Seven Elements* of a *Thorough Accident Investigation*.

These elements are not included in any priority order, but must all be addressed during the investigation.



Safety Improvement & Development Team

Element #1

Evaluate all applicable rules or standards, and ascertain whether or not there are **conflicts** amongst them.

Determine if the applicable rules are clear and unambiguous.



Safety Improvement & Development Team

Element #2

Analyze all applicable Railroad Operational or Safety Tests data, and determine if the company requires job briefings.

If job briefings are required, give the details, including whether or not the requirements are followed.



Safety Improvement & Development Team

Element #3

In addition to interviewing the people directly involved in the accident, conduct a number of additional interviews (six or so) with people also assigned to the facility, but not involved in the accident..

Ascertain from them, whether rules compliance is strictly enforced, or if shortcuts are common and encouraged.

Determine if *Operational Pressures* sometimes cause supervisors to encourage or overlook rules infractions.



Safety Improvement & Development Team

Element #4

If the accident or injury occurs at a location that is an industrial facility, do OSHA and/or state safety rules apply?

If so, is OSHA or the PUC going to cite these rules as casual?



Safety Improvement & Development Team

Element #5

As an accident investigator, develop a checklist for the yard or facility, and for the person or persons that were involved in the incident.

These checklists will vary for different types of facilities (railroad yards/property; industrial facility) and for the person or persons involved (duties will vary by job type).

The checklist will represent a *Job Task Analysis* designed to help determine what duties are required, what procedures are specified, what rules and special instructions in effect, etc.



Safety Improvement & Development Team

Element #6

Evaluate any risks involving loss of *Situational Awareness* that could have jeopardized the employee's safety during the performance of their assigned tasks.

Determine if the company has a *Crew Resource Management* program in effect, and if the employees involved had received training in it.



Safety Improvement & Development Team

Element #7

If FRA rules are involved, the investigation has to include a significant number of comprehensive interviews with a broad representation of all employees at the facility.

This would include officers, other crew members, and other crafts of employees working at the facility.

The people directly involved in the incident would be given the FRA Drug and Alcohol Questionnaire.



Safety Improvement & Development Team

Investigating Accidents is Not Enough, Prevention is the Goal

FRA is proactive in the prevention of accidents and injuries through our *Focused Inspection* process and supports these efforts through training in:

- Train Handling Techniques and On-Board Inspections
- Part 217 Operating Rules and Operational Tests



Safety Improvement & Development Team

FRA's Focused Inspection Approach

- Identify the locations where accidents and injuries are occurring.
- Identify the railroad or railroads that have habitually high numbers of accidents or injuries or those where accidents and injuries are on the rise.
- Identify the causes of all accidents and injuries; either reportable or accountable.
- Identify the rules or regulations that cause the majority of accidents and injuries.
- Identify patterns: day of week, time of day, specific crews, specific locations, etc.
- Identify where and how to effectively focus inspection activities.



Safety Improvement & Development Team

Conduct On-Site Inspections

- Inspections must focus on the causes of accidents and injuries.
- It is *essential* that the inspector record all defects and deficiencies in order to maintain a factual database.
- Categorize the findings of these inspection activities for further analysis.



Safety Improvement & Development Team

Part 217 Operational Tests and Records Review

The objective is to compare FRA findings with those of the carrier officials to determine if the carrier's program of operational tests and inspections is effectively implemented.

- Acquire and review the carrier's program.
- Determine if carrier officers comply with program requirements.
- For specific locations, compare carrier findings with FRA findings and normalize the data.
- Does the carriers testing focus on the "root causes" of the accidents and injuries at that location?



Safety Improvement & Development Team

Accompany Carrier Officials On Operational Tests

- Are tests conducted in accordance with program requirements?
- Do carrier officials concentrate on relevant rules?
- Do carrier officials take appropriate action when deficiencies are observed?
- The Inspector will determine if the carrier officials accurately record the results of their operational tests and inspections?



Safety Improvement & Development Team

Correction Process

- Utilize performance based oversight to correct identified problems.
- Meet with the carrier officials to:
 1. Develop Problem statements.
 2. Agree on standards that the carrier can achieve.
 3. Set time limits and allow opportunity for results.
 4. Offer FRA assistance.
- Carrier must understand it is accountable for it's actions and there will be consequences for inaction.
- **FRA follow-up is the most important element.**



Safety Improvement & Development Team

Carrier Accountability

To insure Carrier Accountability, FRA will:

- Conduct timely follow-up inspections.
- Determine if the inspection results are consistent with the carrier action plan.
- Immediately address any discrepancies with the carrier.



Safety Improvement & Development Team



Terry Marshall

MSHA

Technical Support

Accident Reduction Program (ARP)

Triadelphia, WV

Phone: 304-547-2325

Fax: 304-547-2071

E-mail: marshall-fred@msha.gov

1



Agency Mission:

The mission of the Mine Safety and Health Administration (MSHA) is to administer the provisions of the *"Federal Mine Safety and Health Act, 1977 (Mine Act)"* and to enforce compliance with mandatory safety and health standards as a means **to eliminate fatal accidents; to reduce the frequency and severity of nonfatal accidents; to minimize health hazards; and to promote improved safety and health conditions in the Nation's mines.** MSHA carries out the mandates of the Mine Act at all mining and mineral processing operations in the United States, regardless of size, number of employees, commodity mined, or method of extraction.

2



**MSHA Involvement in your
Information Exchange Workshop**

.....governing agencies responsible for injury and accident
collection.....lessons learned.....

3



The Accident Reduction Program

Today, I will

- Introduce and explain the program
- Discuss ARP efforts
- Discuss MSHA's Accident Reporting Requirements
- Discuss MSHA's Accident Investigations
- Discuss Data Collection & Storage by MSHA
- Discuss MSHA's Accident Investigation Techniques/Tools
- Discuss Industry Partnerships

4



5



Accident Reduction Program

MISSION: Address root causes of accidents, injuries, and near misses with an emphasis toward *providing engineering controls and solutions* to reduce or eliminate future accidents and injuries.

6



Accident Reduction Program

puts another “HOW” into the MSHA mission.

We strive to determine the underlying cause of accidents
AND identify solutions (both technical and procedural) on
how these accidents can be prevented.

7



Accident Reduction Program

Statistics

Tell where problems exist

Tell Who - What - Where

BUT

Don't tell how to fix the problem

8



Accident Reduction Program

Areas in which ARP directs its efforts:

- Collect and analyze information
- Develop and Share Solutions
- Assist Implementation of those solutions

9



Accident Reduction Program

Multi-faceted approach:

- Internet
- Outreach -Trade Shows, Associations, Labor Unions, Manufacturers.
- Site visits - Participants include Enforcement (compliance assistance specialists), EFS and Technical Support.

10



All information/solutions developed from our efforts is put onto MSHA's internet site:

www.msha.gov

11



This site to acts as a forum for the mining community to share successful mining techniques and ideas that are used at their operations and may be applicable and helpful to others in the mining industry.

12

Department of Labor - Mine Safety and Health Administration (MSHA) Home page - Microsoft Internet Explorer provided by US...

Address: http://www.msha.gov/

MSHA Mine Safety and Health Administration
Department of Labor

SEARCH MSHA Go More Search Options Search Help

What's New? Site Map Events CODE-A-PHONE

Latest Fatality Numbers

Mine Type	#	Last Fatal
Coal Fatalities	12	05/11/02
Non-Coal Fatalities	14	04/24/02
Total to Date:	26	

The Assistant Secretary
District Home Pages
Education & Training
Employment Opportunities
Fatality Information
FOIA Reading Room
Forms & On-line Filings
General MSHA Information
News Room
Office of the Solicitor
Our Page for Kids

Links to Special Initiatives

Safety is a Value
Top 20 Cited Standards

NOISE
A SINGLE SOURCE PAGE

Accident Prevention is a Program

Safety Alert Posted...
Are You Dying to Fix It?

HAZCOM
HAZARD COMMUNICATION
SINGLE SOURCE PAGE

Safety Contests
It's Time for Safety Stages of the Month

TRAINING MAKES A DIFFERENCE
PAST IS TRAINING

DIESEL PARTICULATE RULES
SINGLE SOURCE PAGE





SOSA 2002
STAY OUT STAY ALIVE
Poster Safety Campaign

MSHA Highlights

MSHA - Accident Prevention Program - Microsoft Internet Explorer provided by US Dept of Labor / MSHA


Address: http://www.msha.gov/techsupp/app/appmain.htm

Mills and Plants

 Coal Plants	 Metal Mills
 Nonmetal Mills	 Stone Mills

- [Murphy's Laws for Coal Mine Safety](#)

Please Note:

 **You could make a difference!**

My Suggestion Submit your own suggestion for a "Smart Choice During Mining" or "Miner's Tip". Please specify what category (mining type) this is for and whether you want your submission to be anonymous or not.

MSHA Mine Safety and Health Administration
Department of Labor

Accident Reduction Program

Ideas ⇒ More Ideas ⇒ Better Ideas

The process is evolving.

15

Some Methods of Participation

- Suggestion Post Cards
- Tip / Safety Idea Suggestions
- Tips and Safety Idea Implementation
- Accident Investigation Information

16

Philosophy of Human Centered Data Collection

17

Heinrich's Triangle

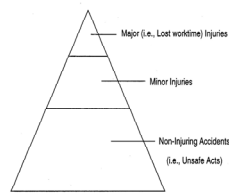
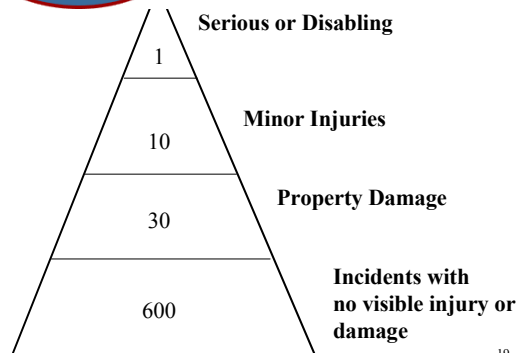


Figure 22. Heinrich's triangle

Figure Source: Reinach, S. and Gertler, J., "An Examination of Railroad Yard Worker Safety", July 2001
DOT/FAO/RD-01-20

18



Source: Bird and Loftus, Loss Control Management, 1982

19

Method of Data Collection

Proactive vs Reactive aspects of Δ

REACTIVE

- Accident Investigations
- Incident Investigations

PROACTIVE

- Self-Reporting
- Audits & Self-Assessment

20

Reactive Methods (Data Collection)

- MSHA accident, incident, and exposure reporting requirements

21

Reporting Requirements CFR 30, Part 50

- Immediate Notification of Accident (in some cases)
- Mine Accident, Injury, and Illness Report Form 7000-1
- Report of Investigation & Corrective Measures
(Prepared by company)

22

MSHA Accident Investigations

- Investigates Immediately Reportable Accidents
- Accident Investigation Team
- MSHA Report prepared by the District having jurisdiction

23

Data Collection & Storage

- Electronic Storage of 7000-1 into Teradata database
- Company Report stored at the District Level
- MSHA Report stored at the District Level
- MSHA Report on Web Page if it involves a fatality

24



Data Queries

- Hummingbird GQL used to query Teradata database
- Available to MSHA personnel on MSHA Intranet



7000-1 Data

- Foster-Miller references Form 7000-1 in 7/01 Report

Mine Accident, Injury and Illness Report
 U.S. Department of Labor
 Mine Safety and Health Administration

MSHA Form 7000-1 (Rev. 10-2002)

1. Mine Name: _____ Mine No.: _____

2. Date of Incident: _____

3. Location of Incident: _____

4. Type of Incident: _____

5. Nature and Circumstances of Incident: _____

6. Name of Person(s) Involved: _____

7. Name of Person(s) Injured or Ill: _____

8. Name of Person(s) Killed: _____

9. Name of Person(s) Property Damaged: _____

10. Name of Person(s) Equipment Damaged: _____

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Proactive Methods (Data Collection)

- Needs to be established by company management
- Industry research data needs to be readily available
- Data fields need to be compatible
- Voluntary pilot programs are recommended

28

Identification of Critical Data

- Additional critical data fields should be incorporated in reporting formats as identified

29

Subject Matter Expert (SME) Workgroups

- Required to develop a list of data needed to more effectively assess human factor aspects
- Identify data fields that may require supplemental reporting requirements
- Success requires commitment from all interested parties

30

MSHA Investigation Techniques/Tools

- TapRoot® - - Root Cause Tree® Implementation
- Group training of TapRoot® for MSHA accident investigation personnel initiated in 2001

31

Root Cause Analysis Training

- Helps identify root causes and provides a mechanism to assure better data collection
- Instills a thought process into the investigator to ask the right question or acquire the right information

32

Partnering

The key to preventing future accidents and injuries is to have workers, companies, contractors, manufacturers, associations, and government **all work together** to achieve safety goals.





Accident Reduction Program

In a nut-shell, the ARP is an effort by MSHA to partner with all portions of the mining industry, to improve the safety of mining operations.

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www.msha.gov



Thank You

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Safety in Practice

“A Shortline Railroad’s Experience”

Wade Swindle
Safety Officer
Alliant Transportation



Work Experiences

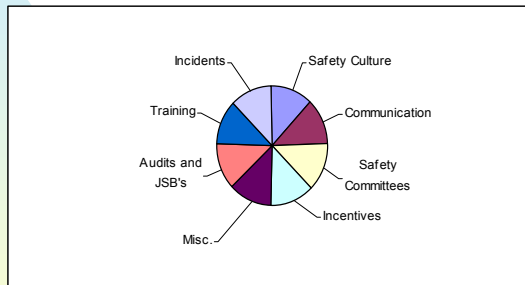
- CRIC Railway
- Private Industry
- CRIC Railway



Alliant Transportation Company Profile

- Cedar Rapids and Iowa City RR
a.k.a...CRANDIC
- IEI Barge Services
- Williams Bulk Transfer
- Transfer Services

CIC Safety Program



Safety Culture

- Keys to CIC change
 - ◆ Commitment
 - ◆ Communication
 - ◆ Accountability

Safety Working Relationships

Partnerships		
Senior Management		First Line Supervisors
Senior Management		Employees
First Line Supervisors		Employees
Employees		Employees
Railroad		Customers

Communication Tools

JSB's	Safety Slogans	Special meetings
Suggestion Box	Contests	Signs
E-Mail	Safety Hotline	Open door policy of mgmt
Safety Committee Meetings	Celebrations	Newsletters

Safety Committee

- Group Committee Membership
- Membership Activities
 - ◆ Review close calls and incidents
 - ◆ Review clearance issues
 - ◆ Discuss Items of concern
 - ◆ Vote on the Monthly Safety Slogan.
 - ◆ Each department selects 4 safety rules to be focused on for the month.

Other Committee Activities

- Annual Review of Safety Rule Book.

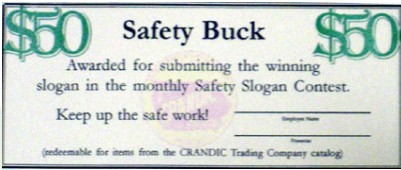


- Other special assignments.

Special Safety Committee

- Individual Train Service Safety Committee
- Activities include:
 - ◆ Bi-monthly meetings
 - ◆ Attendance by local FRA representative.
 - ◆ Focused effort on changing the Culture in this department.

Incentives



Audits

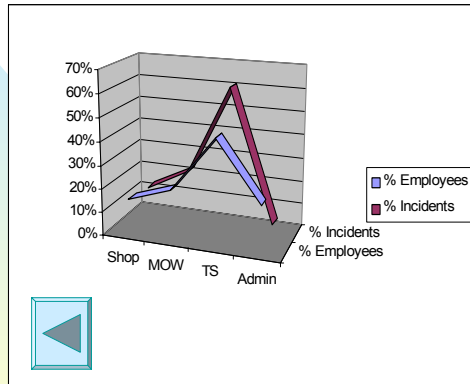
- Supervisors required to perform 4 safety audits per month.
- Safety Department performs 8 per month.
- Audit results

Job Safety Briefings

- ◆ Employee JSB's
 - SOFA
 - Employee empowerment
 - Safety Hazards Encountered
 - Close clearances
 - Defective Equipment

CIC Injury Stat's

- 1/3 of Incidents are recordable
- ▶ ▪ Department comparisons
- Strains, sprains
 - ◆ Knees and backs
- ▶ ▪ Tasks performed

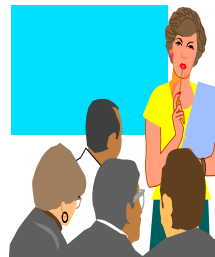


Task	% Total Incidents
Slips, trips, falls	19%
Mounting/ Dismounting	19%
Operating Switches Derails	19%



Training

- New Employees
- Safety Rules
- FRA
- OSHA
- Environmental
- Company Policies and Procedures
- Customer Training



STD

- Short Term Disability
 - ◆ 60 % of Gross
 - ◆ Illness vs. Injury

Exercise Program

- Department Specific
- Mandatory Participation
- Low Impact



Employee Suggested Improvements

- Implemented 200 individual safety improvements
- Changed Switch handles.
- Purchased lighter weight tools hydraulic tools

Thanks for Listening



Future Challenges in Rail Accident Investigations



James Stem, Alternate National Legislative Director UTU,
Representing President Byron Boyd

What We Are Working On

- Safe Work Environment
- Our Job Security
- Our Health Care
- Our Pensions



Cultural Issues

- Reinvestment strategies of railroads
- New territories and company policies because of mergers
- Size of dispatching, territories

Cultural Issues

- Fatigue – the 24/7 lifestyle
- Acceptance of change
 - New technology
 - Improved Work Technique

Change Is Hard To Accept

To: President Andrew Jackson

The canal system of this country is being threatened by the spread of a new form of transportation known as "railroads." The federal government must preserve the canals for the following reasons:

One. If canal boats are supplanted by "railroads," serious unemployment will result. Captains, cooks, drivers, hostlers, repairment and lock tenders will be left without means of livelihood, not to mention the numerous farmers now employed in growing hay for horses.

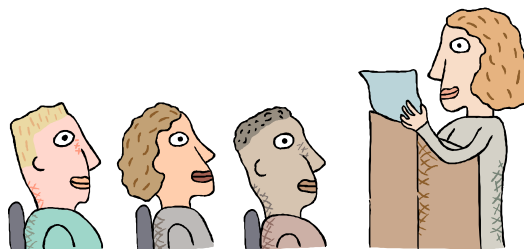
Two. Boat builders would suffer and towline, whip and harness makers would be left destitute.

Three. Canal boats are absolutely essential to the defense of the United States. In the event of the expected trouble with England, the Erie Canal would be the only means by which we could ever move the supplies so vital to waging modern war.

As you may know, Mr. President, "railroad" carriages are pulled at the enormous speed of 15 miles per hour by "engines" which, in addition to endangering life and limb of passengers, roar and snort their way through the countryside, setting fire to crops, scaring the livestock and frightening women and children. The Almighty certainly never intended that people should travel at such breakneck speed.

Martin Van Buren
Governor of New York
1829

Training



Goal of All Training:

**Create a safe, confident,
competent and comfortable
worker that will take
ownership of their job**



Law of Diminishing Returns

The tendency for a continuing application of effort or skill toward a particular project or goal to decline in effectiveness after a certain level of result has been achieved.



American Heritage Dictionary of the English Language: 4th Edition, 2000

Fatigue

- Counter measures – regular schedule
- Calling windows
- 8-hour call
- Should include dispatchers and track inspectors



Fatigue is Cumulative



**Focus on
Prevention of
Future
Accidents from
Related
Causes!**



RailAmerica, Inc.



Preston Claytor
Vice President Safety &
Operating Practices
RailAmerica

Human-Centered Incident Investigation Methods for the Railroad Industry

June 19, 2002

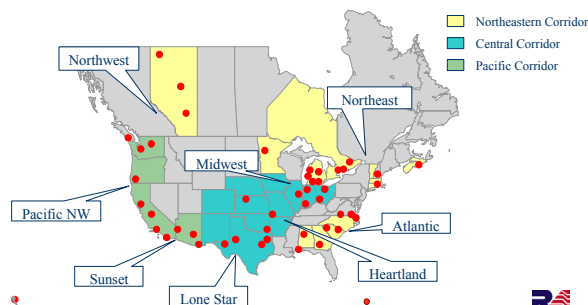
Company Profile

- World's largest short line and regional railroad operator
 - 48 railroads / 13,000 miles of track
- Formed in 1986 / IPO in 1992
- NYSE Listed: **RRA**
- Expect 2002 revenues to approach \$480M
- Growing organically & through acquisition
- One of the most efficient & profitable rail operators in the world



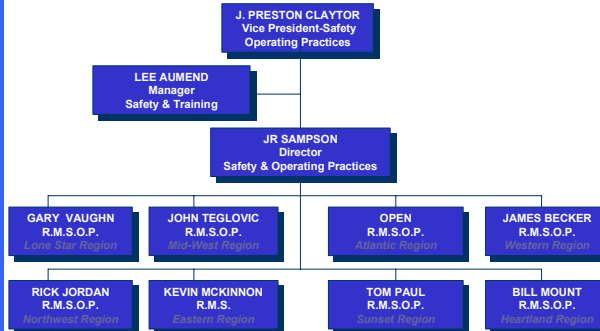
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North American Rail Group



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RA Safety & Operating Practices



R.M.S.O.P.s

- Regional Managers – Safety & Operating Practices
- RMSOPs work for Regional Vice Presidents
- Each RMSOP is a member of the local management team – and not part of the corporate structure
- Main focus of the job is accident and injury prevention
- Education is the main weapon in the war against incidents
- Accident investigation is an important, but secondary, job function



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RailAmerica Incident Investigation

- Local Management responsible for accident investigation
- RailAmerica's size insures that specialized accident investigation expertise is available within the corporation
- RailAmerica maintains relationships of consultants and contractors to aid in accident/incident investigation



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American Short Line & Regional Railroad Association



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ASLRRA

- ASLRRA members vary in size – from several miles in length to hundreds of miles
- RailAmerica is the largest member as a result of its large number of member companies
- Of the other 400 members, many are “Mom & Pop” operations
- Accident/incident investigation capabilities vary depending on size of the organization



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Two Guys and a Train



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Accident/Incident Investigation on Small Railroads

- Even small accidents can cause major problems
- Small railroads may not have the resources to properly investigate accident or incidents
- Prevention measures vary greatly dependant on the organization, not on the size of the railroad
- Major accidents or incidents may require extensive involvement and/or assistance from Federal Agencies such as FRA or the NTSB

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Future Challenges in Incident Investigation & Correction

- Communication of root causes and preventative measures is the key
- Some companies such as BNSF share safety information and accident alerts with their short line partners
- ASLRRA shares publishes a monthly Safety Bulletin and promotes safety through seminars and industry awards

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What do short lines do with accident/incident information?



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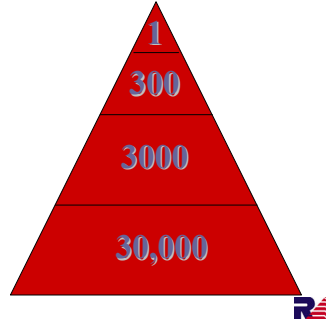
Heinrich's Safety Triangle

Fatalities

Reportables

Non-Reportables

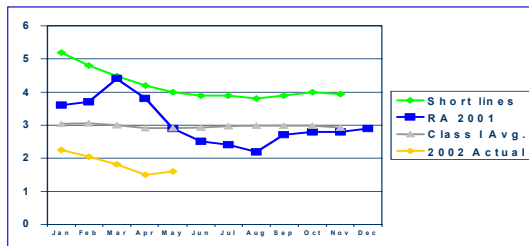
Unsafe Behaviors
Near Misses
Hazards



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Safety Comparison

FRA Injury Frequency Rate – 2001-2002



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