“Rail Safety: Lessons Learned, Improvements and Opportunities”

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Association of American Railroads

Date: Friday, May 1, 2015          Time: Seminar Begins 12:20
Location: Newmark Lab, Yeh Center, Room 2311
         University of Illinois at Urbana-Champaign

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Agenda

- Recognize Industry’s Outstanding Safety Performance
- Rail Incidents that had an Impact on the Railroad Industry
- Plaguing Issue Confronting the Railroad Industry
U.S. Railroad Safety Statistics:

- In 2014, U.S. railroads achieved their safest year ever by the following train accident yardsticks:
  - Train Accidents and Accident Rates, down 6% and 8% respectively from 2013.
  - Track-Caused, Equipment-Caused, and Human Factor Caused Train Accident Rates, all down between 6% and 13% from 2013.
  - 10 Employee Fatalities, down from previous record low of 14 in 2013.
Train accidents per million train-miles have dropped 46% since 2000, to a new low

Human factors accidents per million train-miles have dropped 45% since 2000, to a new low.

Trespasser fatalities continue to be a significant safety problem.

Note: Excludes fatalities in highway-rail crossing collisions. Data for 2014 are preliminary.
Rail Incidents that have Significant Impact on the Industry
Chase Maryland; January 4, 1987
16 Fatalities, 174 Injuries, $16.5 Million

Resulting Regulations

- §219  D&A Testing
- §240  Engineer Certification
Garden City, Georgia
October 9, 1997; 7:12 a.m.
1 Serious 11 Minor Injuries

Resulting Regulations
§234 Emergency Notification & Signage

REPORT PROBLEM OR EMERGENCY
1-800-555-5555
X-ING 836 597 H
XYZ RAILROAD

1" C
1" C
1" D
1" C
0.5" D

I-13 EMERGENCY NOTIFICATION SIGN
12" x 9"
6:48 a.m. -- The truck driver calls 911, saying his tractor-trailer is stuck at the Hawkinsville Road railroad crossing.

6:50 a.m. -- A Garden City police officer is dispatched to the crossing.

6:51 a.m. -- A Chatham County Police Department dispatcher contacts CSX Transportation -- which owns the tracks -- about the truck on the crossing.

6:52 a.m. -- The Garden City officer radios back to the dispatcher, asking that CSX be contacted.

6:54 a.m. -- A CSX official calls Chatham County dispatching, asking to be called back when the truck is removed.

7 a.m. -- A request is made by the officer for a tow truck to remove the tractor-trailer.

7:01 a.m. -- The officer is notified the tow truck is on the way.

7:03 a.m. -- The officer radios dispatchers, confirming that CSX owns the track.

7:12 a.m. -- The officer radios dispatchers, saying a train has just crashed into the trailer.

Source: Chatham County police 911 records
Graniteville, South Carolina
January 6, 2005; 9 Fatalities, 75 Injuries, $6.9 Million

Resulting Regulations

§217 Operational Testing

§218 Operating Practices
- Turnouts Misaligned
- Cars Left in Foul
- Unprotected Shoves

Photo Courtesy of NTSB
Chatsworth, CA
September 12 2008; 25 Fatalities
Redondo Jct. (Los Angeles)
January 22, 1956
30 Fatalities; 122 Injuries
PTC
Hours of Service
T&E / Signal - Passenger
Camp Cars
Safety Training
Conductor Certification
§219 Testing – MW
Emergency Escape Breathing
Risk Reduction Program
Fatigue Management Plans
FRA / PHMSA
2 Emergency Orders
• Securement
• Classification of Oil
Notice of Proposed Rule
• Tank Car Design
• Operating Restrictions
3 RSAC Working Groups
• Securement
• Haz Mat
• Crew Size

TSB Canada
5 Safety Advisory Letters
4 Recommendations
Investigation to be Published 8/19
Since 10/11 All DOT 111 cars ordered for Crude / Ethanol Service:

- Thicker, puncture-resistant shell
- Extra protective head shields at both ends of tank car
- Additional protection for the top fittings
- Higher flow capacity pressure release valves
Santiago D Compostela, Spain
Renfe  Eight carriages, one dining car, two generator cars, two locomotives derailed
24 July 2013  8:41 p.m.
79 Fatal 139 Injured
What happens in one mode affects another

Periodic Psychological Examination of Train Drivers' Fitness in Belgium

Deficits Observed and Efficacy of the Screening Procedure

Elke De Valck, PhD, Ludo Smeekens, MSc, and Luc Vantrappen, MD

Objective: We report on a procedure for early detection of individual psychological deficits that adversely influence cognitive driving abilities in train drivers. Methods: Records of 1266 train drivers sent for recertification examination in 2012 and 2013 were reviewed. Performance on attention and memory tests in the first step of the procedure, and results of extended psychological examination for those not succeeded, are described. Results: Nine percent of train drivers were referred for extended psychological examination; 1.5% was considered unfit for driving. Most frequently, the background was a sleep disorder, intolerance for irregular working hours, psychosocial stress, and depression. Conclusions: Periodic psychological examinations allow the detection of relevant deficits in functioning in a substantial portion of train drivers. The stepwise procedure adds to the feasibility of such examinations in large groups of professional drivers.

Various job characteristics make train drivers vulnerable to human errors. First, shiftwork in general turns out to be a risk factor for occupational and traffic accidents, because of the curtailment of sleep duration that goes together with it, among other reasons. In a group of 91 train drivers working a rotating shift schedule in Brazil, 10-day actigraphy recording confirms the challenge of the working schedule, with drivers on average reaching only 4.5 hours of sleep per night. Second, the nature of the train driving task makes it error-prone. Specifically, a train driver’s task is largely repetitive, especially when the driver is familiar with the routes and control tasks. As a consequence, task demands in terms of vigilance or sustained attention, defined as the ability to detect signals or events that occur irregularly over a prolonged period of time, are very high. In accordance with that, the rate of accident increase with accumulating driving hours is higher in train driving than in car driving. Various studies 14 hours after 4 hours of consecutive driving in
A Plaguing Issue Confronting the Industry
Intentional Deaths on the ROW

650.579.0355
Crisis Hotline

1.877.723.7245
Transit Police 1.877.SAF.RAIL
Trespasser fatalities continue to be a significant safety problem.

Note: Excludes fatalities in highway-rail crossing collisions. Data for 2014 are preliminary.
Overview

Potential order of events preceding a suicide on right-of-way

Can intervene at many points

Discussion of countermeasures that have been proposed

Not all are recommended
May depend on specific carrier needs or environmental factors
Forthcoming paper discusses feasibility in greater detail
Potential Points of Intervention

I. Reduction or Prevention of Suicidal Ideation in the Railroad Environment

II. Reduction of Perceived Viability of the Railroad Right-of-Way as a Means for Suicide

III. Prevention of Access to the Right-of-Way

IV. Increased Ability to Avoid a Train-Person Collision

V. Reduction in Lethality of Train-Person Collision
Points of Intervention - Countermeasures

- Blue Lights
- Gatekeeper Training
- Public Awareness Campaigns (Suicide Focused)
- Signage (Crisis Center)
- Training of Mental Health Providers
- Media Guidelines/Media Training
- Public Awareness Campaigns (Rail Focused)
- Means Restriction/Fencing
- Platform Edge Doors (PEDs)
- Anti-Suicide Pits
- Long Range Acoustic Device (LRAD)
- Speed Restrictions
- Track Surveillance
- Train Modification
I. Reduction or Prevention of Suicidal Ideation in the Railroad Environment

Blue Lights

Gatekeeper Training

Public Awareness Campaigns (Suicide Focused)

Signage (Crisis Center)

Training of Mental Health Providers
I. Reduction or Prevention of Suicidal Ideation in the Railroad Environment

Blue Lights

- Implemented in Japan and now piloted in UK

Gatekeeper Training

- Mechanism by which this would reduce suicide is not well understood.

Public Awareness Campaigns (Suicide Focused)

Signage (Crisis Center)

Training of Mental Health Providers

Little evidence of effectiveness – more testing needed.
I. Reduction or Prevention of Suicidal Ideation in the Railroad Environment

Blue Lights

Gatekeeper Training

Implemented in UK and various other locations including Australia

Most easily implemented in stations.
I. Reduction or Prevention of Suicidal Ideation in the Railroad Environment

- Blue Lights
- Gatekeeper Training
- Public Awareness Campaigns (Suicide Focused)
- Signage (Crisis Center)
- Training of Mental Health Providers

Implemented in locations around the world, but little known of impact when implement in rail stations or along right-of-way.

Most easily implemented in stations.
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Unclear how exactly the railroad can assist.

Not yet demonstrated that incidents in the US occur close to MHP facilities.
II. Reduction of Perceived Viability of the Right-of-Way as a Means for Suicide

Media Guidelines/Media Training

Public Awareness Campaigns (Railroad Focused)
II. Reduction of Perceived Viability of the Right-of-Way as a Means for Suicide

Media Guidelines/Media Training

Guidelines exist in many countries, including the US, but are often not followed.

How best to design guidelines for railroad fatalities is still being explored.
II. Reduction of Perceived Viability of the Right-of-Way as a Means for Suicide

Such campaigns are used widely around the world and in the US. True impact is not well understood.

Public Awareness Campaigns (Railroad Focused)

Potential for unintended increase in suicide if not phrased carefully (e.g., inadvertent advertising of a means of suicide)
III. Prevention of Access to the Right-of-Way

Means Restriction/Fencing

Platform Edge Doors (PEDs)
III. Prevention of Access to the Right-of-Way

Means Restriction/Fencing

Platform Edge Doors (PEDs)

Used throughout the railroad community around the world.

Exact impact is not well documented.

Both maintenance and installation costs should be considered.
III. Prevention of Access to the Right-of-Way

Means Restriction/Fencing

Platform Edge Doors (PEDs)

- Used in some stations around the world, e.g., Hong Kong.
- Very expensive and heavy.
- Implausible outside of station environments.
IV. Increased Ability of Avoid a Train-Person Collision

Anti-Suicide Pits

Long Range Acoustic Device (LRAD)

Speed Restrictions

Track Surveillance
IV. Increased Ability of Avoid a Train-Person Collision

Anti-Suicide Pits

Only implemented in a few stations, such as some in the UK.

Expensive to retro-fit stations.

Implausible outside of station environments.

Little evidence of effectiveness.
IV. Increased Ability of Avoid a Train-Person Collision

Anti-Suicide

Long Range Acoustic Device (LRAD)

Not yet tested in the rail environment.

No evidence of effectiveness.

Potential human rights concerns if too loud.

May be disorienting and cause unintended effects.
IV. Increased Ability of Avoid a Train-Person Collision

- Anti-Suicide Pits
  - Often used by railroads in times/areas of concern.

- Long Range Acoustic Device (LRAD)
- Speed Restrictions
  - Time delays.
  - Braking distance is dependent on many factors, not just speed.

- Track Surveillance
  - Slow trains may still be deadly.
  - Identifying areas of concern may be challenging.
IV. Increased Ability of Avoid a Train-Person Collision

- Anti-Suicide Pits
- Long Range Acoustic Device (LRAD)
- Speed Restrictions
- Track Surveillance

Currently being tested.

Monitoring may be technological, human, or a combination thereof.

Cannot work without clear plan of action or enforcement.
V. Reduction in Lethality of a Train-Person Collision

Train Modification

- Considering Suicide (Suicidal Ideation)
  - Yes
  - Railroad Right-of-Way Seen as Viable Means for Suicide
    - Yes
    - Decision to attempt suicidal act on railroad right-of-way
      - Yes
      - Trespass on right-of-way with self-harm intent
        - Yes
        - Collision between trespasser and train
          - Yes
          - Outcome of collision is fatal
            - Yes
            - Completed suicide on right-of-way
              - No
              - No suicidal ideation - no immediate threat for suicide by any means
                - No
                - Right-of-way not viable means for suicide – no immediate threat for suicide on railway
                  - No
                  - Access to the tracks prevented or trespassing deterred
                    - Yes
                    - Collision between train and trespasser avoided
                      - Yes
                      - Collision between train and trespasser is non-fatal
                        - No
                        - Done
V. Reduction in Lethality of a Train-Person Collision

Train Modification

**Never tested in the rail environment.**

No evidence of effectiveness.

Physics of a train-person collision indicate fatalities may not be reduced.
Conclusions

- Many countermeasures have been proposed – few evaluated
- Evaluations are challenging given small sample sizes
- Implementing multiple kinds of countermeasures may be most effective
- Coordination with communities and other resources is vital
QUESTIONS?
Thank you.
Have a SAFE year.

Association of American Railroads

THANK YOU