New Initiative Needed to Prevent Railroad Trespassing & Suicides

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Presentation Outline

• Causes of railroad fatalities
• Trends in railroad safety
• Institutional successes & challenges
• Further understanding is essential to effective solutions
• Macro and micro-level risk based approach
• Technology options to quantify
• Pokémon Go: a new threat (and a new opportunity?)
• Possible path forward
Cause Distribution of U.S. Railroad Fatalities

- Five year averages

<table>
<thead>
<tr>
<th>Category</th>
<th>Average Annual Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passengers</td>
<td>7</td>
</tr>
<tr>
<td>Employees</td>
<td>15</td>
</tr>
<tr>
<td>Others</td>
<td>22</td>
</tr>
<tr>
<td>Grade Crossing</td>
<td>246</td>
</tr>
<tr>
<td>Trespassers &amp; Suicides</td>
<td>461 + 286 = 787</td>
</tr>
</tbody>
</table>

Total: 787
Train derailment rate dropped steeply following deregulation, then leveled off, and has begun declining again:

- 80% since 1980, and
- 39% since 2000
25-year decline in grade crossing collision rate

- Grade crossing collision rate has dropped steadily:
  - 81% since 1980, and
  - 52% since 2000

FRA Data
No significant progress in trespasser fatalities

- Trespasser fatality rate has fluctuated over the past 30 years, but essentially unchanged
- Concern about increase in last two years
- Beginning in 2011, FRA began recording suicides
- Shone new light on the magnitude of the problem

FRA Data
Why so much progress in train derailments and grade crossings, but not trespasser/suicides?

- **Institutional**
  - Railroads control most causes of derailments
  - Railroads and highway departments have long-established, relationships and protocols for grade crossing safety
  - Complex set of stake-holders for trespassing and suicide prevention and no thoroughly unified approach

- **Technical**
  - Railroads have deep, well-established understanding of operating safety protocols and safe designs for infrastructure and rolling stock
  - Railroads and highway departments have a well-established set of standards for warning systems and prioritization of installation
  - Incomplete understanding of problem and the effectiveness of feasible technical solutions
Why so much progress in train derailments and grade crossings, but not trespasser/suicides?

- **Organizational**
  - Coordinated commitment to R&D by AAR, FRA and railroads
  - Coordinated commitment through Operation Lifesaver, Inc. (OLI)
  - Trespassers are part of OLI mission, but should this be expanded?

- **Funding**
  - Railroads have inherent financial interest in derailment prevention
  - Dedicated Section 130 funding for grade crossing safety improvement
  - No dedicated funding source to address the problem

- **“Ownership”**
  - Railroads “own” derailments
  - Railroads and highway departments “own” grade crossings
  - Who “owns” trespasser and suicide problem?
Railroad safety & technology research and investment

- Systematic, data-driven approach to railroad safety R&D and investment
  - Analysis of FRA, AAR, and railroad data
  - Coordinated, pro-active, R&D program addressing most-important topics
    - Improve component and system designs
    - Develop new technologies
  - Extensive investment in most promising approaches
- Parallel success with highway-rail grade crossing safety
  - Decades of research to understand problem
    - Development of engineering solutions and new technologies
    - Strong, coordinated focus on educational programs
  - Quantitative models to identify highest risk crossings
  - Prioritized investment in engineering, education and enforcement of grade crossing safety
No comparable parallel focus to solve trespasser/suicide problem

• OLI and others have made this a substantial focus of their efforts
• FRA and others have conducted useful and informative research
• But the data speak to the need for something *new, additional or different* than previous efforts
• We are doing the same thing but hoping for a different outcome
• We need to *change* our approach to this problem
  – More implementation
  – Smarter application
  – New solutions
• Trespasser problem has multiple dimensions
• Where are they?
  – Stations
  – Grade crossings
  – Along ROW
• Who are they?
  – Passengers
  – Pedestrians
• Why are they there?
  – Pedestrians
    • Barrier to cross
    • Path to destination
  – Destination
    • Loitering and socializing
  – Impaired – Judgment affected by drugs or alcohol
  – Homeless & hoboes
  – Malicious – theft or vandalism
  – Suicidal – use railroad to inflict harm on one’s self
What is the role of technology?

- Detection
- Quantification
- Prevention
- Mitigation
Trespassing versus Suicide

• Problems are related in some ways but highly distinct in others

• Some types of preventive measures may address both problems, but others will only help one or the other

• These distinctions must be understood when evaluating which solutions to use and under what circumstances
Havârneanu et al. review and analysis of literature on railroad trespasser & suicide prevention

- Havârneanu with the International Union of Railways
- Conducted an extensive review of the literature
- 139 publications ranging from 1978 to 2014

*Accident Analysis and Prevention* 81 (2015) 30–50

A systematic review of the literature on safety measures to prevent railway suicides and trespassing accidents

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US Railroad Network is Vast

140,000 miles – too large to effectively patrol & prevent trespassing
Where do we allocate resources?

• Risk-based approach needed
• First step geographical - must understand where the problem occurs
  • **Macro** – Statistical analysis of network level factors affecting trespass occurrence and incidents
    – GIS analysis of trespasser & suicide incidents
    – Need precursor data, where & when do “near hits” occur?
    – Develop technology to automatically identify and geocode
    – Identify areas and predictive factors requiring more detailed analysis
  • **Micro** – Focused analysis of specific local conditions
    – Where, when & why occurring
    – What factors affecting
    – Targeted prevention and mitigation
Estimate* of population density exposure to U.S. railroad train traffic

* This distribution is derived from a different, prior study and is presented here for illustration purposes and it should not be considered representative. A new, up-to-date investigation is planned.
Front-facing locomotive cameras

Photos credit: Union Pacific Railroad

- Can this technology be adapted to quantify trespasser occurrences?
Front-facing locomotive cameras

- Develop machine-vision algorithms to detect trespassers
- Integrate with GPS location info
- Automated quantification of trespasser locations
- Identify “hot spots” for prioritized prevention and mitigation

Photo credit: FRA Trespass Prevention Research Study – West Palm Beach, FL
Localized detection & monitoring technologies

- Surveillance (personnel or CCTV)
- Automated intrusion detection technologies: fences, visual, infrared, etc.
- UAVs - offer a whole new set of opportunities for detection (and possibly deterrence as well)
Pokémon Go: A new hazard

- Pokémon Go ("Augmented Reality" game) has created a new incentive to trespass
- Players chasing Pokémon have been found trespassing on railroad tracks and entering railyards
- FRA and AAR wrote a joint letter to Niantic Labs CEO (Pokémon Go creator) requesting that they seek ways to discourage unsafe behavior near railroad tracks
Pokémon NO!

- Can Pokémon Go be used to discourage railroad trespassing?
- Challenged some Pokémon players for some ideas
  - Developer should never place any game feather on railroad property
  - Railroad routes and affected areas could be marked in red on the Pokémon Go map, so players can easily see them
  - Disable Pokémon App when too close to railroads including when crossing tracks at grade crossings
  - If a player gets too close to a rail line an audio and visual alarm would alert the player
  - If the player does not depart they will lose a Pokémon buddy or downgrade their level
Pokémon YES!

- Positive incentives as well
- A reward policy could be set up
  - When a player finds a rail route or rail area not marked on the Pokémon Go map, they can report it
  - They will have a chance to choose a new Pokémon they do not own, or get Pokémon candy

- More generally, are there ways we can use personal device technology to help with the trespasser/suicide problem?
A Cliché, a Corollary and an Approach

• No “Silver Bullets”
  – Complex, multi-faceted problem – no one or two solutions will solve it

• Perfect is the Enemy of the Good
  – We should not shy away from implementation of partial solutions

• But we must be “data-driven” in search of the most effective solutions

• Develop, risk-based approach that can be effectively adapted to local conditions

• FRA, AAR, OLI, APTA, FTA, State agencies and others should take leadership in understanding problem, developing solutions and assisting communities to implement them
New Initiative

• Interdisciplinary Task Force to thoroughly understand problem and develop suite of solutions – both general and contextual

• Leadership and expertise in:
  – Railroad engineering, transportation and casualty prevention
  – Human factors
  – Psychology
  – Law enforcement
  – Pedestrian safety
  – Drug and alcohol
  – Risk analysis
  – Communities
  – Education & educators
  – Urban and community planning

• *Sustained funding, implementation and ongoing follow-up essential*
Thank You

Questions and Discussion

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