Trust, Public-Private Partnerships and Transportation Safety

Applicability of the Aviation Model for Railroads

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Introduction

- MITRE is Currently Researching Parallels between aviation and the Railroad Industry
  - DOT challenged FAA to assist other modal administrations applying lessons learned from aviation system safety model
  - MITRE’s Center for Aviation System Development (CAASD) expertise in Safety Management System (SMS) sought by rail transit industry

Three Questions Posed:

1. *Given the operational similarities between rail and air, could rail benefit from a collaborative safety partnership like air?*
2. *If so, can lessons learned from air accelerate the realization of these benefits?*
3. *Does the recent history of aviation safety contain any insights?*
Timeline of Recent Aviation Safety History
(Late 1990s to 2010s) Growing Partnerships

- **1995**: Gore Commission
  - Goal: 80% Accident Reduction
  -PPP (Partnership for Peaceful and Prosperous Partnership)

- **1997**: Commercial Aviation Safety Team (CAST)

- **1998**: Aviation Safety Information Analysis and Sharing (ASIAS) Program Formed

- **2000**: Aviation Accidents Significantly Decrease Post-CAST formation

- **2005**: Government and Industry adopts Safety Management System both within US and Internationally

- **2010**: Images Sourced at Wikimedia.org

**Gore Commission**

Government and Industry adopts Safety Management System both within US and Internationally

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Quick Overview of Safety Management Systems

**Safety Policy**
Establishes organizational processes and commitments.

**Safety Assurance**
Requires information capture to ensure risk controls throughout system life cycle.

**Safety Promotion**
Creates a positive safety culture to achieve safety objectives.

**Safety Risk Management**
Formalized process to assess and control system risks.
A public-private partnership (P3) is a contractual arrangement between a public agency and a private sector entity.

Through this agreement, the skills and assets of each sector (public and private) are shared in delivering a service or facility for the benefit of the general public.
Evolving a Public-Private Partnership
Standard Regulator-over-Industry Model

- **Features:**
  - Regulator Inspects/Enforces
  - Industry Reports/Complies

- **Applied throughout last century**

- **Benefits:**
  - Ensures industry meets minimum safety standards

- **Drawbacks:**
  - creates “letter-of-the-law” attitude toward safety
Evolving a Public-Private Partnership
Regulator-over-Industry Model with Voluntary Reporting

- **Examples of use:**
  - Mid-Air Collisions during 1960s
  - Initial Aviation Safety Reporting System (ASRS) late 1970s

- **Benefits:**
  - Ensures minimum safety standards
  - Provides additional data

- **Drawbacks:**
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  - Limited by industry’s trust of the regulator

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Evolving a Public-Private Partnership
Regulator-over-Industry Model with Trusted Third-Party

- **Examples of use:**
  - Mid-Air Collisions during the 1960s via Flight Safety Foundation
  - ASRS during late 1970s administrated by NASA

- **Benefits:**
  - Ensures industry meets minimum safety standards
  - Provides safety data
  - Trust facilitated through third-party

- **Drawbacks:**
  - Limited by focal areas, duration, and legal protections for reporters
  - Limited by industry’s trust of regulator and third-party
Early Public-Private Partnership (1998-2007)  
Regulator-Industry Collaborative Model

- FAA Split Functions between Safety Inspection and System Safety
  - Benefits:
    - Allows industry to exceed minimum safety standards
    - Enables direct conversation between industry and regulators
  - Drawbacks:
    - Limited by known risk areas, continued priority of P3 trust environment
    - Identified need to use flight and voluntary reporting data to find accident precursors

The innovation here is that FAA did not use a regulator-on-top model
Current Public-Private Partnership (2007- Pres.)
Regulator-Industry Collaborative Model with 3rd Party Analytics

The addition of third party support enabled data analytics and protected data stewardship
Comparison between Air and Rail Industries

- Four major air carriers;
- Two major freight carriers;
- Approximately 15 minor air carriers; and
- Numerous regional airlines and air taxis.

- Seven major Class I freight railroads;
- Three intercity passenger railroads;
- Thirty five regional railroads; and
- Numerous short line railroads.

Operational similarities between aviation and rail operations
- Railroads often operate on shared facilities, e.g., rails, yards (like flight routes, airports)
- Mission: safe separation, capacity, passenger experience
- Capital intensive, de-regulated industries
- Role of Dispatchers and Air Traffic Controllers
- Few manufacturers of cars, engines, technologies (ground & vehicle)
Assessment for Potential Applications in US Rail

- **SMS Experiences**
  - Canadian rail SMS has mixed outcomes mostly due to lackluster effort.

- **Confidential Reporting**
  - UK Rail’s CIRAS system has been extremely successful
  - US Confidential Close Call Reporting System (C3RS) gaining momentum

- **Safety Culture in Railroads**
  - Recent court case wins by safety whistleblowers illustrated poor culture
  - Since, major US railroads made strong commitments to improving safety culture.

- **Examples of Successful Public-Private Collaboration in Rail**
  - Several safety and technological research organizations, but regulator still remains “top dog.”
  - Examples:
    - Transportation Technology Center Inc. (TTCI)
    - Switching Operations Fatalities Analysis Group (SOFA)
Rail Industry Current Safety Focus is Technology, But Focus is Changing

- An AAR Strategic Research Initiatives objective: “Improve Safety” by “Reducing track and equipment-related derailments through technology development” (Source: TTCI)
- Beyond technology improvements FRA Broad Agency Announcement (Mar-2016) includes, a human factors/safety culture elements.
  - FRA-HF-003 R&D Safety Culture Strategic Roadmap and Implementation Plan
Non-Punitive Safety Reporting Comparison
Aviation vs. Rail

(Gray fields indicates relative equivalency)

**NASA Aviation Safety Reporting System (ASRS)**
- Carrier *Not Identified*
- Involved Personnel Contact Information
- Event Type, Time/Date Stamp
- Reporting Individual Experience/Qualifications
- Weather Conditions
- Event Operating Environment
- Event Visibility/Limitations
- Aircraft Equipment Description/Certification/Mission
- Flight Plan Filing (e.g., VFR, IFR, etc.)
- Location/Altitude/Airspace
- Nearest Airport or Navigational Facilities
- Operating Phase of Flight (e.g., Take-Off, Climb, Descent, etc.)
- Conflict Event Factors (e.g., Alerts Sounded)

**NASA Confidential Close Call Reporting System (C3RS)**
- Carrier Name
- Involved Personnel Contact Information
- Event Type, Time/Date Stamp
- Reporting Individual Experience/Qualifications/Location During Event
- Weather Conditions
- Event Operating Environment
- Event Visibility/Limitations
- Train Equipment Description/Certification/Mission
- Rules in Effect (e.g., Auto Signals, PTC, etc.)
- Location/Facility, Milepost
- Nearest Station
- Train Activity Phase (e.g., Departure, En Route, Station Arrival, etc.)
- Operation Type (e.g., Pulling, Push/Pull)
Railroads Developing Positive Trail Control (PTC) Systems

Overview:
- Congressional mandate for Dec 2018.
- AAR estimates cost at $10B, with $6.5 spent as of 2015 by railroads.
- FRA studies admit little industry benefit

Implementation Challenges
- Requires new components and frequency spectrum
- All sharing railroads must be interoperable
- Largest RRs data systems suffer from scale
- Hard for smaller railroads

PTC will generate vast amounts of new operational data

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Example Accidents Considered Preventable by PTC

AMTRAK 188 Derailment

2 BNSF Trains Head on Collision
Near Amarillo, TX Fatal Accident (2016)

Occurred when engineer was distracted by window impact and entered a curve above the safe speed.

A BNSF Train failed to slow at a yellow warning signal and continued past a red signal before striking an oncoming BNSF train.
Example Accidents *NOT* Considered Preventable

Union Pacific Coal Trail Derailment
Northbrook, IL Fatal Accident (2012)

Occurred when maintenance crew failed to complete inspection and identify heat-related rail buckling, causing derailment.

Montreal, Maine and Atlantic (MMA) 2 Derailment
Lac-Megantic, Quebec Fatal Accident (2013)

Occurred due to an improper break setting that gave a false impression that train was safely secured.
Data-Driven Train Control Environment Presents Opportunities for Collective Data Analytics

Opportunities:
- PTC Infrastructure Data Collection
  - New infrastructure increases the electronic data collected across the system
  - Allows combination with
- Archived data could allow for detailed analysis and predictions

Challenges:
- Lack of Standards
  - Data collected in different formats by different systems
- Interoperability Requirements
  - May not require creating a common data set
- Railroad Attitudes toward Data Sharing
- Trust between Regulator and Industry
Conclusions

- Rail industry could be in a position to benefit from applying a similar public-private partnership model.
  - Requires fostering trust between industry and regulator
  - Some advantages from *Lessons Learned* from aviation
  - But aviation safety history indicates development of trust takes time and commitment

- Common understanding of rail operations and emerging data environment is key to benefits for rail safety analytics.