Causal Analysis of Passenger Train Accidents on Freight Rail Corridors

Chen-Yu Lin, M. Rapik Saat, Ph.D. (mohdsaat@illinois.edu)
Rail Transportation and Engineering Center, Department of Civil and Environmental Engineering, University of Illinois at Urbana-Champaign, Urbana, IL, USA

A number of economic, technical and political factors have limited the development of new, dedicated, very-high-speed rail systems in North America. Consequently, most, near-term development of improved or expanded passenger rail service in the U.S. involve use of existing railroad infrastructure or rights of way. Comprehensive understanding of train accidents on shared-use corridors is critical for rational allocation of resources to reduce train accident risk. Nevertheless, little research has been undertaken to quantify the risk of a passenger train operating on or next to a freight train in a shared track or shared-use corridor setting. This study presents the initial results to understand what the most important contributors to the risk of train accidents on shared-used rail corridors are. This work can be used to better understand how to most efficiently and effectively manage the risk on shared-use rail corridors.

Background

Shared or Mixed Use Rail Corridors (SRC) refer to different types of passenger and/or freight train operations using common infrastructure in one way or another. Figure 1 shows three types of SRC: shared track, shared right-of-way and shared corridor, defined by the U.S. Department of Transportation, Federal Railroad Administration (FRA).

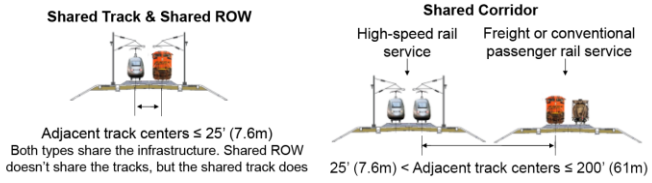

Figure 1. Definition of SRC by FRA

Mainline Passenger Train Accident Analysis

Based on a mainline passenger train accident data analysis from the FRA Rail Equipment Accident database over the 20-year interval from 1993 to 2012:

- Derailments and collisions were identified as the most potentially significant train accident types (Figure 2)
- Human factors accidents and track failures were the primary causes of those accidents (Figure 3)
- Some accident causes related to human factors on train operations were identified to have high risk such as train speed violation and not obeying signals (Figure 4)
- Some high-risk infrastructure-related factors include track geometry defects and broken rails or welds (Figure 4)

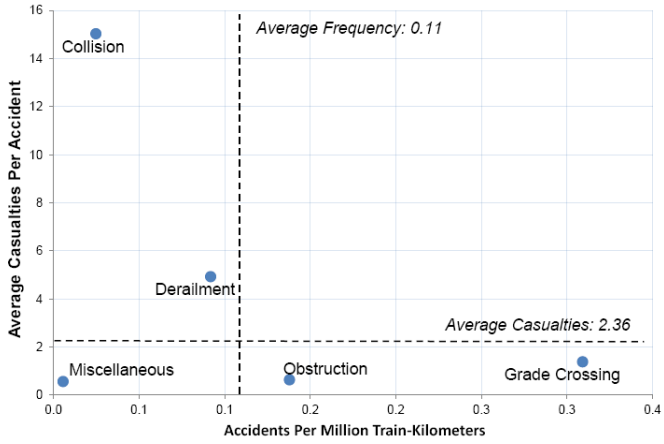

Figure 2. Frequency and Severity Graph of Mainline Passenger Train Accidents by Type of Accident

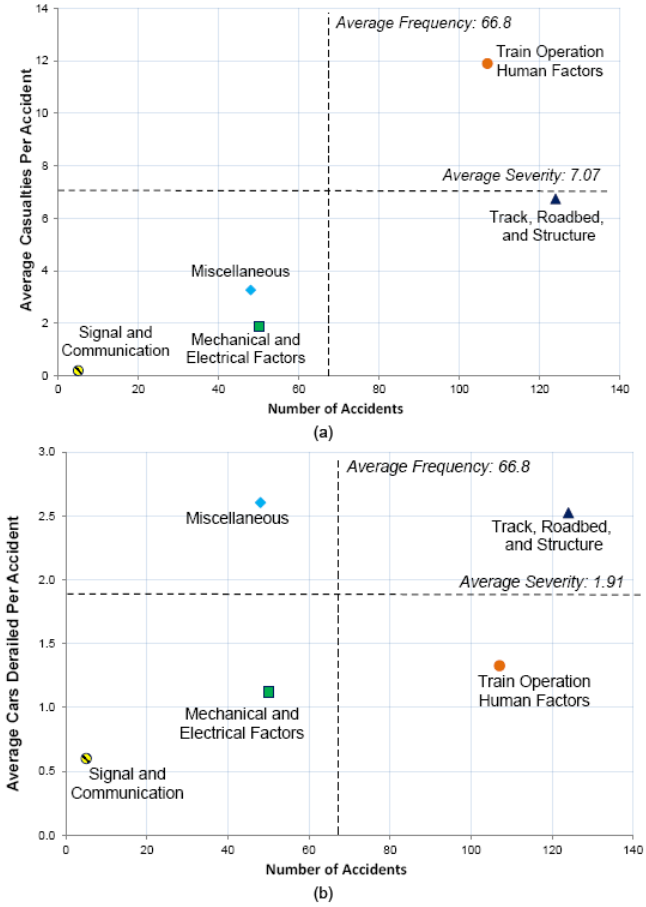

Figure 3. Frequency and Severity Graph of Mainline Passenger Derailments and Collisions, 1993-2012, by Accident Cause Category with (a) Average Casualties and (b) Average Cars Derailed as Severity Indicator

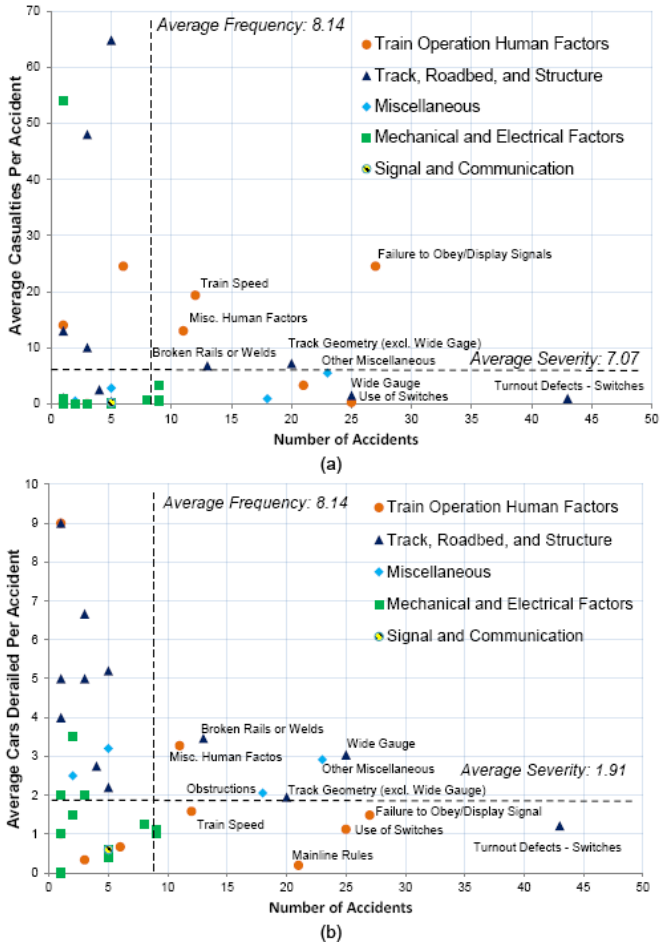

Figure 4. Frequency and Severity Graph of Mainline Passenger Derailments and Collisions, 1993-2012, by Accident Cause Groups with (a) Average Casualties and (b) Average Cars Derailed as Severity Indicator

Conclusions

The completed causal analysis of train accident is critical for rational allocation of resources to reduce accident occurrence and consequences on shared-use corridors. Future work in this area should include comparisons of the major accident causes with those incurred by freight trains, how to quantitatively evaluate the risk from these causes and how these accident causes affect the likelihood of adjacent track derailments.