REPORT SUMMARY

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FTA RESEARCH
FEDERAL TRANSIT ADMINISTRATION

FTA STANDARDS DEVELOPMENT PROGRAM: NEEDS ASSESSMENT FOR TRANSIT RAIL TRANSMISSION-BASED TRAIN CONTROL (TBTC)

Background

In rail transit, Transmission-Based Train Control (TBTC) is often referred to as Communications-Based Train Control (CBTC); for commuter rail applications, it is referred to as Positive Train Control (PTC). TBTC consists of a series of wayside transceivers that continuously communicate via secure, radio- to-railcar TBTC equipment. Train and wayside control information is consolidated by wayside control equipment, fed through servers, and displayed at central control locations. Train speed and positional information are consolidated and compared against track equipment states, providing a safe zone of moving blocks surrounding each train. The system automatically brakes trains where necessary, ensuring proper train separation and collision avoidance. Legacy train control systems include various tiers of fixed-block, Automatic Train Control (ATC) and Automatic Block Signaling (ABS) systems, each possessing different levels of train control.

Objectives

Based on NTSB safety recommendations issued to FTA regarding the implementation of transmission-based train control (TBTC), a rail transit industry needs assessment and research was performed to identify standards, systems and products that have the potential to provide risk reduction benefits from the industry.

Findings and Conclusions

Through NTD data analysis, a rail transit agency survey, and a literature review, it was determined that TBTC can reduce risks for rail transit agencies; the technology merits further investigation and research to determine the most appropriate application to mitigate specific hazards within operational environments.

NTD data analysis indicated that approximately 400 FTA reportable events occurred during a nine-year period, from January 1, 2008, to May 31, 2017, that may have been mitigated with TBTC. Agency survey results indicated that approximately 9,000 hazardous conditions across the industry during a five-year period may have been mitigated using TBTC. To better understand the most appropriate risk reduction approach, a cost-benefit analysis may provide much-needed insight into the financial and operational impact of adopting TBTC across the industry.

A rail transit agency (RTA) survey was conducted to gather information regarding train control-related incidents that occurred at agencies but may not have been reported to the NTD due to NTD reporting thresholds. In part, the survey requested that RTAs provide a count of train control-related incidents from the previous five years that were the direct result of operator error risk classes mitigatable by TBTC or similar technologies. Survey results were received from all 53 regulated transit agencies and are summarized as follows:

- For non-exclusive right-of-way such as a shared lane with vehicular traffic, TBTC will not be able to stop a rail vehicle before it collides with a non-rail vehicle stopped in a shared lane.
- An analysis of NTD data suggests that 4% or fewer rail-related incidents reported to NTD were directly related to TBTC mitigatable risk classes.
- In total, 9,348 (83%) of train control-related hazardous conditions that have occurred across the industry have the potential to be mitigated by TBTC.
- Overall, 73% of transit lines use ATC or ABS, approximately 8% use CTC, and approximately 19% of lines do not use any train control signal system.
- The most widely used train-control relevant standard is 49 CFR 236.1005, Requirements for Positive Train Control Systems, with 20 transit lines reported using it for development and implementation.
- Due to the limitations of the NTD noted, the data analysis highlights a need for more descriptive information to be captured as part of NTD incident reporting, such as the "Primary Cause Code" and "Secondary Cause Code" fields, with pre-defined and selectable values similar to those used for FRA Accident/Incident Reporting.
- Numerous TBTC systems are available on the domestic and international markets, the majority of which are designed to mitigate train-on-train collisions and overspeed operation of a train and to enforce stop train stops as appropriate.
- An in-depth cost-benefit analysis may be required to fully understand the financial and operational impact of TBTC on the rail transit industry; this analysis should include the potential positive impact of reducing overall operational risk (i.e., incidents avoided) as well as the potential financial and operational impact that the development, installation, and implementation of TBTC may have on each RTA.

Benefits

The standards, systems, and products identified in this report have the potential to provide risk reduction benefits to the rail transit industry. TBTC's potential as a risk reduction technology merits further investigation and research into the most appropriate use in the rail transit industry. Identification of solutions should consider specific mitigatable hazards and operational risk classes to scope the requirements for the various modes and RTA specific operating environments.

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Project Information

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