



U.S. Department of Transportation
Federal Transit Administration



Inward- and Outward-facing Audio and Video Recordings for Transit Rail Vehicles

Background

The National Transportation Safety Board (NTSB) has investigated numerous railroad and rail transit accidents for which inward- and outward-facing camera and audio recorders provided, or could have provided, an unequivocal record of a train operator's actions. Recognizing the importance of this technology, the Fixing America's Surface Transportation (FAST) Act of 2015 mandated that the Federal Railroad Administration (FRA) issue regulations requiring video recorders and gave the Secretary of Transportation the discretion to require audio recordings on all FRA-regulated passenger trains operating on the general railroad system.

As a result of additional events and ongoing investigations, NTSB issued a safety recommendation (R-17-13) to FTA associated with inward- and outward-facing cameras that requires the installation, in all controlling locomotive cabs and cab car operating compartments, of crash- and fire-protected inward- and outward-facing audio and image recorders capable of providing recordings to verify train crew actions and train operating conditions.

Objectives

The objective of this research was to research the use of inward- and outward-facing camera and audio recorders in the rail transit industry and develop a recommended practice for their installation consistent with NTSB recommendation R-17-13.

Findings and Conclusions

Survey data indicated that implementation of inward- and outward-facing cameras is significant in transit rail, but very few agencies with inward- and outward-facing cameras have data modules that are crash- or fire-protected.

The research team conducted a literature review of available standards related to inward- and outward-facing camera and audio recording devices and their use on all rail modes. An evaluation of the standards compared the criteria to the NTSB recommendation. A survey was developed by the team and disseminated by APTA to U.S. rail transit agencies to determine the degree to which inward- and outward-facing cameras and recording devices are being used. Findings from the literature review and survey results were discussed with the Transit Standards Working Group at the Center for Urban Transportation Research for their input and feedback.

Results of a gap analysis of available standards meeting the NTSB recommendation indicated that:

- All standards for cameras are missing a component of the major categories identified in NTSB R-17-13, specifically crash and fire protection and minimum recording time.
- No rail-specific standards are provided for audio recordings.

Survey data collected indicated that implementation of inward- and outward-facing cameras is significant in transit rail, with light rail installations of almost 100%. However, very few agencies with inward- and outward-facing cameras have data modules that are crash- or fire-protected.

The Transit Standards Working Group identified the following three key findings:

Finding 1: Industry standardization of inward- and outward-facing camera and audio devices can aid future agency procurements. Standards may include location of video cameras (inside and outside controlling cabs), audio/microphone recording to verify train crew actions, minimum recording data retention time (onboard and agency requirements) necessary for the transit environment, data output format standardization, crash- and fire-protected memory module requirements, and data upload guidelines for real-time viewing and data downloads. In addition, voluntary standards organizations may consider developing guidelines on data upload for real-time viewing (wireless) instead of relying solely on manual downloads.

Finding 2: Implementation of these devices and incorporation of expanded and corresponding technology applications can provide additional data and benefits to transit agencies. These may include but are not limited to inward-facing cameras with machine learning agents and image algorithms that can monitor operator performance, detecting fatigue and awareness, outward-facing cameras that can be used to monitor wayside assets to detect obstructions and defects, and outward-facing cameras with image algorithms currently used in the freight rail industry that examine ties and track-related infrastructure.

Finding 3: Research indicates that several existing industry standards already incorporate both technical and performance standards and/or specifications related to inward- and outward-facing cameras, including operation of inward- and outward-facing cameras, required maintenance, practices to effectively use recordings for accident/incident investigations, and overall safety improvement initiatives..

Benefits

Industry standardization of inward- and outward-facing camera and audio devices can aid future agency procurements. After technology evaluation and implementation, the additional data generated by these devices could provide additional benefits to transit agencies.

Project Information

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This research project was conducted by MaryClara Jones and Travis Gorham of the Transportation Technology Center, Inc., a subsidiary of the Association of American Railroads. For more information, contact FTA Project Manager Raj Wagley at (202) 366-5386 or Raj.Wagley@dot.gov. All research reports can be found at <https://www.transit.dot.gov/about/research-innovation>.