

<u>Measure Name</u>	Risk assessment using Forward Facing Closed Circuit Television (FFCCTV)
<u>Definition</u>	Use FFCCTV to review trespass, suicide, and close-call incidents to better understand the actions of individuals in the moments before a strike or near miss.
<u>Tags</u>	
<i>Incident Type</i>	Both trespass and suicide
<i>Location</i>	Both Station and right-of-way
<i>Intervention Strategy</i>	Data: application and planning
<i>Measure Group</i>	Risk assessment

Description

Forward Facing Closed Circuit Television (FFCCTV) refers to cameras placed on the front end of trains that face forward during travel. Video captured by FFCCTV systems can be used to better understand the actions of individuals before a strike or a near miss. This information may help determine the intent of the individual. FFCCTV video data can also be used to better understand locations along the right-of-way (ROW) where high risk trespass activity is most common.

In July 2019, FRA proposed a rule, “Locomotive Image and Audio Recording Devices for Passenger Trains,” that would require both forward and inward facing cameras to be installed in all passenger trains. The recorded data from these cameras is preserved in the event of a crash [1]. Although risk assessment was not the original intent for the rule, FRA suggests in the Notice of Proposed Rulemaking (NPRM) that “safety benefits of this proposed rule could accrue from the collection of accident causation information, which is critical to prevent future accidents” [2].

FFCCTV can provide railroads with a visual record of events for analysis, including fatalities, injuries, and close-call incidents. Important information can be captured that may not be otherwise recorded, for example:

- Locations where trespass activity is higher.
- Locations where objects near the tracks provide cover or conspicuity.
- Status and condition of mitigations that are already present in the area.
- Actions of trespassers at the time of the incident and other activity on or near the tracks.
- The condition of the track, surrounding area, and other trains passing by.

A rail carrier may gather information by manually reviewing videos to seek out specific information, which may be time consuming. Alternatively, it may be possible to use artificial intelligence (AI) or other machine learning approaches to automatically identify certain features present in these videos. Such a use was proposed as a next step following the successful use of AI algorithms to detect trespass using a fixed camera [3]. This technology is becoming adopted more frequently as AI advancements make data processing more efficient, though as of 2024 no additional studies have been identified about the use of FFCCTV for risk assessment. See the CCTV and other detection systems measure for more information about advancements in CCTV and AI for applications outside of FFCCTV use.

Additional search terms: *cameras, behaviors, front-end, head-end, recordings*

Advantages

Research has documented the following potential benefits of FFCCTV [4]:

- Aid investigations of other types of accidents, close-calls, and signal issues.
 - Better understand pedestrian and passenger behavior.
 - Aids in assessing the conditions of other trains and equipment, infrastructure, and the area surrounding the track (e.g., litter and vegetation/landscaping).
 - Assist in the identification of unlawful activity.
 - Possible creation of scenarios for simulator training.
 - Provide input for fleet management systems.
 - Help to reduce the time associated with trespass and suicide incident investigation and restoration of service.
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Drawbacks

- There are possible privacy concerns for individuals recorded with the camera. This includes individuals on or near the ROW, including in vehicles or on foot [1].
 - It may be time consuming to use FFCCTV for data exploration purposes, especially if the video is manual reviewed.
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Notable Practices

- Make FFCCTV data available as quickly as possible after the incident to allow for an assessment of the incident and the circumstances leading up to it [4].
 - Data protection is essential, particularly if video surveillance management systems allow remote access to FFCCTV data [4].
 - If planning to use FFCCTV to better understand trespasser activity, consider opportunities to utilize advanced data processing capabilities such as machine learning or artificial intelligence.
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References

[1] Department of Transportation. (2019). [*Locomotive Image and Audio Recording Devices for Passenger Trains PIA*](#).

Description: Section 11411 of the Fixing America's Surface Transportation Act, Pub. L. 114-94, 129 Stat. 1686 (Dec. 4, 2015) (FAST Act), codified in the Federal railroad safety laws at 49 U.S.C. 20168, requires

FRA (as the Secretary of Transportation’s delegate) to promulgate regulations requiring each railroad carrier that provides regularly-scheduled intercity rail passenger or commuter rail passenger transportation to the public to install inward-and outward-facing image recording devices (cameras) in all controlling locomotives of passenger trains. In light of the FAST Act mandate and consistent with the Federal railroad safety laws at 49 U.S.C. 20103, relevant National Transportation Safety Board (NTSB) recommendations, discussions of the Railroad Safety Advisory Committee (RSAC) Recording Devices Working Group, and recent accidents and other railroad safety incidents to require the installation of inward- and outward-facing recording devices in all lead locomotives of passenger trains to promote railroad safety. In addition, FRA is proposing to require that these devices record while a lead locomotive is in motion, and retain the data in a crashworthy memory module. The notice of proposed rulemaking (NPRM) does not propose to require recording devices in freight locomotives. For a summary of the proposed camera functions in the NPRM, See the link below or Appendix A to this Privacy Impact Assessment.

[2] [Locomotive Image and Audio Recording Devices for Passenger Trains](#), 84 FR 35712 (Proposed 07/24/2019).

Description: FRA is proposing to require the installation of inward- and outward-facing locomotive image recording devices on all lead locomotives in passenger trains, and that these devices record while a lead locomotive is in motion and retain the data in a crashworthy memory module. FRA also proposes to treat locomotive-mounted recording devices on passenger locomotives as “safety devices” under existing Federal railroad safety regulations to prohibit tampering with or disabling them. Further, this NPRM would govern the use of passenger locomotive recordings to conduct operational tests to determine passenger railroad operating employees' compliance with applicable railroad rules and Federal regulations. FRA requests comment on the need for and effects of potential, additional safety requirements.

[3] Searcy, S., Cunningham, C., Vaughan, C., Coble, D., & Avr, A. (2019). [Rail Corridor Trespass Severity Assessment](#). FHWA/NC/2017-15. Raleigh, NC. North Carolina Department of Transportation.

Abstract: This research project builds on NCDOT RP 2015-18 (“Reduction in Railroad Right-of-Way Incidents”). For NCDOT RP 2015-18, the research team analyzed Federal Railroad Administration (FRA)-reported trespassing incidents along the 174- mile North Carolina Railroad (NCRR)/Piedmont corridor between Raleigh and Charlotte, NC using strike rates, Amtrak train crew surveys, and geospatial methods to identify communities with the highest risk of railroad right-of-way trespass. Since the FRA started geolocating trespass data in July 2011 through June 2016, this corridor had 65 reported trespasser strikes, or an average of one strike for every 677 trains. Based on an analysis of historic trespass strike data, associated environmental features, and survey data provided by Amtrak train crews who travel along the portion of the NCRR under study, the communities with the highest trespass risk were identified as Durham, Mebane, Elon/Burlington, and Greensboro. The rate of strikes from the 5 year study period indicated that these communities have the highest risk corridors. The close proximity of pedestrian generators to the railroad in these areas shows some correlation to the high number of strikes. The NCDOT Rail Division currently has no baseline data on the universe of trespassing along the railroad right-of-way in North Carolina beyond limited data on trespass incidents resulting in fatalities and injuries as reported by railroads and the FRA. Using the hotspot locations identified in NCDOT RP 2015-18, NCDOT RP 2017-15 (“Rail Corridor Trespass Severity Assessment”) seeks to provide an estimate of the universe of trespassing within the Piedmont corridor via a pilot of static and dynamic thermal video detection.

[4] RESTRAIL. (2014). *Evaluation of measures, recommendations and guidelines for further implementation, Pilot test #11, Forward Facing CCTV in trains – MTRS3*.

Document Excerpt: Viewing the recorded images provides factual information, confirming witness information and enabling determination of the nature of the incident as either non suspicious or

suspicious (potentially involving criminal activity). Knowing whether the circumstances are a suicide, accident or homicide is a key input for the police investigation of the circumstances and benefits the [railway undertakings] and [infrastructure managers] as well as passengers, by helping minimise the incident investigation time, allowing resumption of operation as quickly as possible and reducing the associated costs. To gain the maximum benefit FFCCTV images need to be available to the police as quickly as possible after the incident to enable an assessment of the circumstances leading up to and the actual incident.

Related Measures

- CCTV and other detection systems
- Identify access points for potential trespassers
- Identify and monitor hotspots
- Identify funding opportunities
- Improved data collection after an incident
- Incident cost estimation
- Rail corridor risk assessment
- Improving the safety of individuals experiencing unsheltered homelessness Removal of obstructions to increase visibility