



Log# R-673 A

SR-1

National Transportation Safety Board

Adopted: 12-18-97

Washington, D.C. 20594

Safety Recommendation

Date: January 5, 1998

In reply refer to: R-97-55 through -58

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Administrator
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About 6:28 a.m. on Saturday, November 23, 1996, eastbound National Railroad Passenger Corporation (Amtrak) train No. 12 derailed while crossing Portal Bridge, a swing bridge spanning the Hackensack River in Secaucus, New Jersey. When the train derailed, it sideswiped Amtrak train No. 79, which was crossing the bridge in the opposite direction on an adjacent track. All 12 cars of train No. 12 derailed, with both locomotives, 1 material handling car, and the 3 head passenger coaches coming to rest at the bottom of an embankment at the east end of the bridge. Train No. 79 sustained damage but was able to stop with the entire train intact and on the rails some distance west of Portal Bridge. No fatalities resulted from the accident, but 42 passengers and crewmembers aboard train No. 12 were injured, as was 1 passenger aboard train No. 79. Estimated cost of the damaged train, track, and signal equipment and site cleanup exceeded \$3.6 million.¹

The National Transportation Safety Board determined that the probable cause of the accident was the failure of Amtrak management to foster an environment that promoted adequate inspection, maintenance, and repair of the miter rail assemblies on Portal Bridge and to permanently correct defects in the miter rail side bars that were discovered 10 months before the accident. Contributing to the accident were (1) the failure of the Federal Railroad Administration to develop track inspection standards for special trackwork and to periodically inspect such track as part of its oversight responsibilities and (2) Amtrak's removal of the miter rail position detection circuitry without installing replacement circuitry or implementing procedures to compensate for the loss of this safety-critical system.

¹For further information, see Special Investigation Report — *Derailed Amtrak Passenger Train No. 12 and Sideswipe with Amtrak Train No. 79 on Portal Bridge in Secaucus, New Jersey, November 23, 1996* (NTSB/SIR-97/01).

The derailment occurred because the opening and closing mechanism on the bridge had failed to operate correctly earlier on the day of the accident. At 4:00 a.m. on November 23, 1996, the bridge operator at Portal Bridge received a call from a marine vessel requesting that the bridge center be swung open. The first steps in the bridge opening sequence were completed normally. In accordance with standard operating practice, the operator used a bypass switch to continue the bridge opening sequence. When he attempted to swing the bridge open, the swing span would not rotate. Feeling the bridge shake and vibrate, the operator aborted the opening.

The accident investigation determined that either prior to or during the attempt to lift the miter rail for the north rail on the west end of track 1, both side bars joining the miter rail to a longer running rail broke. As the lift rod pushed up on the miter rail, the miter rail and the running rail separated at the joint. The lift rod continued to lift the heel of the miter rail, but the toe of the rail remained seated in the bed plate for the stationary rail on the bridge approach span. When the bridge operator attempted to swing the movable span, the miter rail hung in the bed plate on the stationary span, preventing the bridge from opening.

When the bridge operator aborted the bridge opening, the lift rods lowered the miter rails, but the heel of the hung miter rail did not seat properly. Instead of falling back into the bed plate, it came to rest on top of the broken side bar sections attached to the running rail. The 5-inch difference in elevation between the two tracks created a ramp that would derail the next train to cross the bridge on track 1 (which was train No. 12 later that morning). The rail position detection circuitry that would have indicated on the operator's control panel that the rail was not seated properly had been removed in 1987. Because electrical continuity was maintained across the rails despite the misalignment, the signals governing the Portal Interlocking displayed a clear indication.

Federal oversight of special trackwork was a key issue in the Portal Bridge investigation. Special trackwork such as that found on Portal Bridge, unlike virtually all other segments of track, is not routinely included in Federal Railroad Administration (FRA) track inspections and is therefore not subjected to the same FRA standards of maintenance and inspection as other track on the general railroad system. In the view of the Safety Board, such exception to the standards is not provided for in the FRA regulations promulgated in 49 *Code of Federal Regulations* Part 213. Furthermore, this exception is totally inappropriate in that inadequately inspected and maintained special trackwork can have serious safety implications, as it did in this accident. The tracks leading up to Portal Bridge were held to FRA standards, and, while these Class 4 tracks accommodated about 300 trains per day operating at speeds approaching 70 mph, the special trackwork on the bridge was subjected to the same traffic. Yet, the condition and operation of this complex configuration of movable and stationary rails were virtually ignored by the FRA during its normal track inspections. The Safety Board concluded that if Amtrak had been required to meet Federal standards for inspection and maintenance of the special trackwork on Portal Bridge, the defects in the miter rail side bars may have been detected and repaired before they could cause a derailment.

Several issues regarding locomotive event recorders were also raised by the investigation of the Portal Bridge accident. The Safety Board understands that the FRA considers the

recording of traction motor current (TMC) to be an acceptable method of monitoring throttle position on those locomotives, such as the AEM-7 locomotives involved in this accident, whose throttle controls do not have a finite number of predefined throttle positions. The Safety Board is concerned, however, that TMC data do not reflect the operator's actions, but only the response of the locomotive's traction motor to those actions. Depending on the circumstances, the traction motor will not always react the same way to a given throttle setting. While a high TMC value "generally" corresponds to a high throttle position and a low TMC value "generally" denotes a low throttle setting, the throttle position cannot be derived from TMC with reasonable accuracy, reliability, and precision because the response of the system depends on grade and other track conditions that vary continuously while the train is in operation.

Additionally, for the locomotives involved in the Portal Bridge accident, the TMC data were invalid because of an improperly configured electric current module (a condition that was later found to be a fleet-wide problem with Amtrak's AEM-7 locomotives). However, even if the recording system had recorded TMC properly, the data would not have provided any information indicating the exact throttle settings used by the operator. While TMC alone is a valuable operating parameter, knowledge of throttle position can be critical in the analysis of train handling. The Safety Board concluded that TMC data do not accurately indicate throttle position and, therefore, use of the data for this purpose by Amtrak does not meet FRA requirements for monitoring and recording train throttle position.

Findings during the Portal Bridge investigation also brought into question the adequacy of event recorder inspections. Amtrak inspects each locomotive, including the event recorder, every 60 days, and each of the accident locomotives had been inspected and approved within 6 weeks of the accident. These inspections did not, however, identify the incorrect current module configuration that rendered invalid all recorded TMC information. Amtrak's event recorder specialist told the Safety Board that the problem was not detected earlier because TMC was not considered a significant parameter. In the view of the Safety Board, TMC *is* an important parameter, particularly since potentially critical cab signal data are recorded on the same channel. The Safety Board concluded that if the entire event recorder systems, including sensors, wiring, etc., in the three Amtrak locomotives involved in the accident had been thoroughly tested during their most recent 60-day inspections, the incorrect current module configuration would likely have been found and corrected, and the TMC data retrieved after this accident would have been useful in determining preaccident cab signals received by the traincrews.

It is important to note that the invalid data found during this investigation resulted from failed or inappropriately configured "sensors" and not from the event recorder units themselves. Most solid-state recorders have a self-test feature that can diagnose problems with the event recorder, but this feature does not test the validity of the data being provided to the unit. For example, a broken speed sensor might send the event recorder a speed of 0 mph. The recorder cannot detect whether the sensor is broken or the train simply is not moving, and the self-test does not extend to sensors or sending units. Currently, no testing or inspection is required for microprocessor-based self-testing recorders so long as the recorder indicates no faults during self-tests. Even for recorders that have no self-test feature, regulations do not require that the entire system be inspected, only the recording unit itself.

The issue of inadequate event recorder testing and inspection is not new to the Safety Board. As a result of its investigation of an accident involving the derailment of a freight train near Cajon Junction, California, in February 1996,² the Safety Board made four safety recommendations to the FRA regarding event recorders. One of those recommendations specifically addressed event recorder maintenance and inspection procedures. It called for the FRA to

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Revise 49 *Code of Federal Regulations* 229.25(e)(2) to require that event recorders, including microprocessor-based event recorders that are equipped with a self-test function, be tested during the quarterly inspections of the locomotive in such a manner that the entire event recording system, including sensors, transducers, and wiring, is evaluated. Such testing should include, at a minimum, a review of the data recorded during actual operation of the locomotive to verify parameter functionality as well as cycling all required recording parameters and determining the full range of each parameter by reading out recorded data.

In an August 15, 1997, letter to the Safety Board, the FRA stated that it had referred this recommendation to its Rail Safety Advisory Committee (RSAC). The letter stated that "the RSAC process will lead to expedited action" on the recommendation. The Safety Board will follow the progress on this recommendation closely. Based on the FRA letter, the Safety Board has classified Safety Recommendation R-96-70 "Open—Acceptable Response."

At the same time, however, the Safety Board believes that additional FRA action is needed immediately. All three recorders involved in the Portal Bridge accident, as well as the one recorder involved in the Cajon Junction accident, were tested and found to be fully functional after the accident. The problems discovered with all four recorders were not related to the recording units themselves, but to the vital system components that send signals to the recording device. The self-test functions do not, nor are they intended to, detect failures in these components.

Finally, the investigation of the Portal Bridge accident indicated that better information about movable bridge inspections would be of value to the industry. The Safety Board discovered that although the FRA inspected 321 movable bridges throughout the United States following the Portal Bridge accident, you did not distribute the survey results in complete or summary form. Based on its review of the survey, the Safety Board concluded that the results of the FRA movable bridge survey would be beneficial to the railroad and rail rapid transit industry in preventing accidents similar to the derailment on Portal Bridge.

Based on the foregoing information, the National Transportation Safety Board recommends that the Federal Railroad Administration:

²Railroad Accident Report — *Derailment of Freight Train H-BALTI-31 Atchison, Topeka, and Santa Fe Railway Company near Cajon Junction, California, February 1, 1996* (NTSB/RAR-96/05).

Inform the railroad industry that traction motor current is not a valid indicator of throttle position, and the requirement to record throttle position contained in 49 *Code of Federal Regulations* 229.5(g) cannot be met by recording traction motor current. Ensure that all operators currently using traction motor current as a substitute for throttle position modify their event recording systems to monitor and record throttle position directly. (R-97-55)

Pending the results of your Railroad Safety Advisory Committee Event Recorder Working Group and your implementation of suitable requirements concerning event recorder system maintenance, require that microprocessor-based event recorders equipped to perform self-tests be subject to the testing and inspection procedures currently applicable to all other types of event recorders. (R-97-56)

Expand the scope of your track safety standards to include special trackwork such as movable miter rails and ensure that the condition and operation of special trackwork are included, when appropriate, in all Federal Railroad Administration track inspections. (R-97-57)

Provide, in full or summary form, the results of the Federal Railroad Administration movable bridges survey to all railroads and rail rapid transit agencies. (R-97-58)

Also, the Safety Board issued Safety Recommendations R-97-49 through -54 to the National Railroad Passenger Corporation, R-97-59 to the Association of American Railroads, and R-97-60 to the American Short Line Railroad Association. Please refer to Safety Recommendations R-97-55 through -58 in your reply. If you need additional information, you may call (202) 314-6488.

Chairman HALL, Vice Chairman FRANCIS, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in these recommendations.

By:


Jim Hall
Chairman