

Log# R-669A



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: MAR - 5 1997

In Reply Refer To: R-96-70 through -73

Honorable Jolene M. Molitoris
Administrator
Federal Railroad Administration
Washington, DC 20590

About 4:10 a.m. on February 1, 1996, Atchison, Topeka and Santa Fe Railway Company (ATSF) freight train H-BALT1-31, en route from Barstow, California, to Los Angeles, was traveling westbound on the ATSF south main track when it derailed at milepost 60.4 near Cajon Junction, California. After the derailment and the subsequent rail car pileup, which involved five cars containing hazardous materials, a fire ignited that engulfed the train and the surrounding area. The conductor and the brakeman sustained fatal injuries; the engineer suffered serious injuries.¹

The event recorder system installed on third-unit locomotive ATSF 342 of the freight train did not record any wheel data, and, consequently, no speed or distance data could be calculated. Postaccident testing at the Q-tron facility in Calgary, Alberta, Canada, revealed that the axle generator was wired and reassembled in a manner inconsistent with the manufacturer specifications. The Safety Board, therefore, concluded that the wheel data were not recorded due to a broken wire in the axle generator as a result of an improper modification to the axle generator.

The event recorder on locomotive ATSF 342 was a microprocessor-based type equipped with a self-test function. The ATSF stated that it had an understanding with the Federal Railroad Administration (FRA) that this type of recorder would require a download and inspection on an annual versus a quarterly basis; therefore, this event recorder was not inspected during the December 1995 quarterly inspection. In addition, the ATSF did not inspect or download the recorder during the most recent annual inspection before the derailment on June 12, 1995. However, the FRA indicated that no such agreement existed between it and the ATSF and that, citing the existing requirement for event recorder maintenance, any such agreement would not be an issue. Microprocessor-based event recorders with the self-test function are exempt from quarterly inspections. Under 49 Code of Federal Regulations [CFR] 229.25(e)(2), "A micro-processor based event recorder, equipped to perform self tests, has passed the pre-maintenance

¹For more detailed information, read Railroad Accident Report--*Derailed Freight Train H-BALT1-31, Atchison, Topeka and Santa Fe Railway Company, near Cajon Junction, California, on February 1, 1996* (NTSB/RAR-96/05)

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inspection requirement if it has not indicated a failure." Unless indicating a failure, microprocessor-based event recorders with the self-test function never have to be downloaded or tested. Thus, the Safety Board concluded that the FRA regulations for the periodic inspection of event recorders are inadequate.

During postaccident testing, the self-test function indicated no faults, and the recorder was found to be fully operational and within manufacturer specifications. The speed had not been recorded because of a failed axle generator, which sends the speed data to the event recorder. Additionally, the event recorder on locomotive ATSF 342 was found to have been improperly programmed, which resulted in the recording of certain parameters only once every 8 minutes. Because the timing was programmed into the configuration of the event recorder, the self-test function of the event recorder did not identify it as a fault.

After the October 3, 1995, accident in Milford, Connecticut,² involving a commuter rail control car that had been serviced before the accident, Safety Board investigators found the axle generator was not adjusted properly following the service, and as a result, no speed data were recorded. This event recorder was also a microprocessor-based with a self-test function and indicator light. During the postaccident testing, the self-test function showed no faults, and the event recorder was fully functional and within the manufacturer specifications.

Furthermore, the Safety Board is investigating a grade crossing accident that occurred in Tickfaw, Louisiana, on May 27, 1996. Although the investigation is still ongoing, preliminary findings show that two of the inputs to the event recorder were wired incorrectly, resulting in anomalous data being sent to the event recorder. Inspection records reveal that the event recorder was inspected 2 days before the accident and no problems were reported. However, because it was a microprocessor-based and self-test event recorder, the inspection procedure was only a status check of the self-test indicator light on the outside of the event recorder.

The self-test functions of existing event recorders do not test speed and other data inputs for validity; as a result during quarterly inspections, failures, such as those noted above, are unnoticed if the sole means of inspecting the event recorder is the self-test function of the event recorder. The Safety Board concluded that had the entire event recorder system from locomotive ATSF 342 been properly tested during the December 1995 quarterly inspection, both the broken speed sensor and the improper configuration of the event recorder would likely have been noticed and corrected at that time. Therefore, the Safety Board believes that the FRA should revise 49 CFR 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.

²Highway Accident Report--*Highway/Railroad Grade Crossing Accident, Metro North Commuter Railroad, Milford, Connecticut, October 3, 1995* (NTSB/NRH-96-MH-003).

After this accident, the ATSF could not provide any documentation that the ATSF 342 event recorder was ever tested or inspected in accordance with 49 CFR 229.25(e), nor could it provide statistical information about the pass/fail rate of its locomotive event recorder inspections. Title 49 CFR 229.25(e)(5) requires that 90 percent of all event recorders inbound for quarterly inspections be fully functional. The Safety Board concluded that the FRA was not monitoring the compliance of the carrier with periodic inspections of event recorders as prescribed under 49 CFR 229.25(e)(5). Therefore, the Safety Board believes that the FRA should develop and implement a program that specifically addresses carrier compliance with 49 CFR 229.25(e)(5).

Had this event recorder system been inspected and tested at the most recent 92-day periodic inspection on December 14, 1995, by downloading the recorded data and evaluating it, the failure in the axle generator and the improper recorder configuration, if existing at that time, should have been noted and corrected. The diagnostic testing would indicate whether the recorder was working but would not show what, if any, type of data was being recorded by the unit. Only by downloading the unit can the type of data being recorded be examined.

The H-BALT1-31 consist had an event recorder that was not fully operational. The self-diagnostic light on the unit was insufficient to fully examine the unit and ensure that it was recording the data. The FRA required that the carrier indicate whether a locomotive is equipped with an event recorder in the remarks section of form F6180-49A. Under 49 CFR part 229.135, "any train operated faster than 30 miles per hour shall have an in-service event recorder in the lead locomotive. The presence of the event recorder shall be noted on Form FRA F6180-49A, under the REMARKS section." In so doing, the opportunity for oversight is present: first, the carrier not listing the event recorder for inspection on form F6180-49A, and second, the inspector not observing the remarks section on the back of the form. Consequently, the Safety Board concluded that FRA form F6180-49A is not adequate for recording the inspection of event recorders and allows oversights to be perpetrated during inspection procedures. By revising this form to include the event recorder in the other items to be inspected section, an inspector likely would not overlook examining the event recorder. Therefore, the Safety Board believes that the FRA should revise its form F6180-49A to include event recorders in the other items to be inspected section on the form.

In its preamble to the final rule on event recorders (58 *Federal Register* 36610-11), the FRA advised that it "has determined that the recorder will be most helpful if it records the events happening in the locomotive occupied by the engineer, that is, the lead locomotive." The final rule stated that all trains traveling faster than 30 mph must have an event recorder in the lead locomotive; however, a petition for reconsideration was filed, and as a result, a clause was added to the final rule that allows placement of the event recorder "elsewhere than the lead locomotive." Also in response to the petition, the FRA reiterated that its "primary concern is still as it was when the preamble was written: to provide the best data for analysis, the recorder must capture what the engineer sees and does" but determined that requiring the event recorder to be placed in the lead locomotive was "unnecessarily geographically strict" (*Federal Register*, Volume 60, Number 102, May 26, 1995). The provision allowed that if the event recorder monitored and recorded the required data as though it were located in the lead locomotive, the event recorder could be placed elsewhere than in the lead locomotive.

The Safety Board is concerned that the result of allowing the recorder to be placed elsewhere than in the lead locomotive is not as the FRA intended. One alternative practice, placing the event recorder in any locomotive that is train lined to the lead locomotive, does not result in monitoring and recording the required data as though it were located in the lead locomotive. The train line data are intended to be the same for all locomotives in the train line so the control inputs made by the crew in the lead unit are carried out by the trailing locomotives as well. In the preamble to the final rule, however, the FRA noted:

Only the lead locomotive's device will record the engineer's actions in throttle control or in setting up the dynamic brake – recorders in trailing units will note the 'message' received, the action they were requested to take, but only the lead locomotive will record the direct input of the person in control.

Furthermore, those parameters that are monitored locally can only reflect the condition of the locomotive on which the event recorder is installed and are not shared among locomotives through the train line. Therefore, event recorders installed on trailing locomotives are not capable of recording any parameters that are local to the lead locomotive.

Train speed and independent brake are two of the locally sensed parameters required under 49 CFR 229.5(g) to be monitored and recorded. Actual speed will be the same for a trailing locomotive and lead locomotive; however, speed is derived from a signal-generating device, which is attached to the locomotive axle generator. Should an event recorder be installed in the third unit of a locomotive consist, it monitors the third unit axle generator signal and not the lead unit signal. Axle generator signals can vary significantly from locomotive to locomotive; consequently, an event recorder in the third unit cannot monitor and record speed as though it were in the lead locomotive. A locomotive is typically configured to use the axle generator to provide data to the speed indicator in the cab as well as to the event recorder. To best monitor what the engineer sees, the speed signal in the engineer's locomotive unit should be recorded, as opposed to a signal in a trailing locomotive, and could prove important should the axle generator fail or be improperly adjusted. As speed indicators are required under 49 CFR 229.117 to be tested "as soon as possible after departure," any anomalies in the speed sensing and recording system are likely to be noticed in a timely manner. A malfunction in the speed system of a trailing locomotive could go unnoticed for extended time, as occurred in this accident.

Independent brake is usually recorded as either a discrete value (on or off) or as an actual air pressure. The data come from the locomotive on which the recorder is installed. As a result, an event recorder in the third locomotive unit will only monitor the status of the independent brake in the third unit and not the status of the independent brake in the lead unit. Failure to monitor and record independent brake data in the lead locomotive can result in unnoticed independent brake activity or incorrect indications of the time that an independent brake application is made on the lead locomotive.

Other parameters are also only recorded on lead locomotives, including the horn and the engineer-induced emergency. The horn is an important parameter in many grade crossing accidents, and the engineer-induced emergency allows investigators to determine whether an emergency brake application was the result of engineer action. Although not required under regulation, most event recorders monitor and record both of these parameters if the recorder is in the lead locomotive.

Other available data that can only be recorded by an event recorder in the lead locomotive are:

- Cab signal information (aspect or acknowledgment or both)
- Crew vigilance system data (alerter data and penalty brake)
- End-of-train device data (pressure, marker, battery status, and motion status)
- Traction motor current for the lead locomotive
- Pneumatic control switch state for the lead locomotive
- Additional train brake data (equalizing reservoir pressure and suppression)
- Wheel slip data
- Locomotive speed limiter data
- Overspeed penalty
- Distributed power data

The Safety Board has demonstrated that an event recorder in the lead locomotive can provide more accurate and diverse data than one in a trailing locomotive. The Safety Board, therefore, concluded that the requirement to monitor and record data as though it were in the lead locomotive cannot currently be met by the placement of an event recorder elsewhere than in the lead locomotive. The Safety Board believes that the FRA should inform the industry that the placement of event recorders other than in the lead locomotive will not record the required data as though the event recorders were in the lead locomotive and ensure compliance with 49 CFR 229.135(a).

Therefore, the National Transportation Safety Board recommends that the Federal Railroad Administration:

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. (R-96-70)

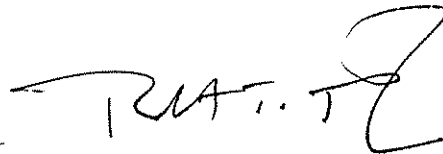
Develop and implement a program that specifically addresses carrier compliance with 49 Code of Federal Regulations 229.25(e)(5). (R-96-71)

Revise your form F6180-49A to include event recorders in the other items to be inspected section on the form. (R-96-72)

Inform the industry that the placement of event recorders other than in the lead locomotive will not record the required data as though the event recorders were in the lead locomotive and ensure compliance with 49 Code of Federal Regulations 229.135(a). (R-96-73)

Also, the Safety Board issued Safety Recommendations R-96-67 through -69 to the Burlington Northern and Santa Fe Railway Company, R-96-74 through -78 to the Association of American Railroads, R-96-79 to the International Association of Fire Chiefs, and R-96-80 to the Chemical Manufacturers Association.

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


for By: Jim Hall
Chairman