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LogR-496

NATIONAL TRANSPORTATION SAFETY BOARD  
WASHINGTON, D.C.

ISSUED: March 20, 1985

Forwarded to:

Mr. Graham Claytor  
President and Chief Executive Officer  
National Railroad Passenger Corporation  
400 North Capitol Street, N.W.  
Washington, D.C. 20001

SAFETY RECOMMENDATION(S)  
R-85-13 and-14

About 6:45 p.m., on March 5, 1984, southbound Amtrak train No. 81, The Silver Star, traveling at 79 mph and consisting of 3 locomotive units and 18 cars, derailed 1 locomotive unit and 18 cars on Seaboard System Railroad track near Kittrell, North Carolina. Of the 274 passengers and 19 crewmembers on board, 52 persons were injured in the accident. Damage was estimated to be \$2,536,000. 1/

Postaccident inspection revealed that the No. 1 axle of the third locomotive unit (Amtrak 378) was broken on the pinion (left) end in the traction motor support bearing area. The bearing was destroyed, the lubricator wick burned and charred, and the axle in the bearing area showed evidence of intense heat. The axle was broken at an uneven angle; the short end was 6 7/8 to 8 inches long when measured from the face of the axle gear hub. All other support bearings, lubricator wick assemblies, and axles on the locomotive unit were inspected and found to be lubricated and in good condition.

The traction motor/wheel/axle assembly was a D 77B traction motor manufactured by the Electro-Motive Division (EMD) of the General Motors Corporation and carried serial No. 83-F-3-1028. Amtrak maintenance records indicated that the traction motor/wheel/axle assembly was assembled from new and reconditioned parts at Amtrak's New Haven, Connecticut, shop and was installed in an overhauled locomotive truck assembly at the facility on February 7, 1984. The overhauled locomotive truck was transported on February 27, 1984, by truck, to Amtrak's Rensselaer, New York, shop, where it was installed in Amtrak locomotive unit 378 on March 1, 1984.

Amtrak locomotive unit 378 was placed in service in Albany, New York, on March 2, 1984, and operated from Albany to Chicago, Illinois, in train No. 49 on that date. The unit was inspected in Chicago and operated in train No. 50 from Chicago to Washington, D.C., on March 4, 1984. After an inspection in Washington, the unit was operated from Washington to the derailment site in train No. 81 on March 5, 1984. The locomotive unit had traveled approximately 2,000 miles after receiving the overhauled truck.

1/ For more detailed information, see Railroad Accident Report--"Derailment of Amtrak Train No. 81, The Silver Star, on the Seaboard System Railroad, Kittrell, North Carolina, March 5, 1984" (NTSB/RAR-85/03).

A check of the facilities and inspection procedures at Rensselaer, Chicago, and Washington and interviews with the Amtrak personnel involved in the inspection and maintenance of Amtrak locomotive unit 378 in the 5 days before the derailment disclosed no irregularities in the inspection and maintenance of locomotive units at these locations.

Amtrak's New Haven maintenance facility employees involved in assembling the traction motor/wheel/axle assembly generally knew the proper procedures and work practices involved. However, while observing assembly procedures at the facility, Safety Board investigators noted that the assemblers were not using any instruments to check the finish of the traction motor support bearing journals. The profilometer in the adjacent wheel and axle shop was used to check the finish on several support bearing journals being assembled. The support bearing finish on these axles varied from 10 to 22 microinches, which was 3 to 15 microinches above the manufacturer's recommended standard and Amtrak's adopted standard of 7 microinches.

The New Haven shop maintenance instruction library contained EMD maintenance instruction MI 1518, revision C, which was dated 1977. This maintenance instruction prescribed a motor support bearing finish of 15 microinches. A check with EMD revealed that MI 1518 had been revised (revision D) in 1981. Revision D of MI 1518 reads as follows:

Motor Support Bearing Area

The motor support bearing surface finish must be 0.18 microns (7 micro-inches) or finer. If support bearing surface is not at least 0.18 microns (7 micro-inches) grind the surface to 0.64 to 1.27 microns (25 to 50 micro-inches) and then polish to obtain a 0.18 microns (7 micro-inches) or finer surface.

Amtrak had adopted the EMD maintenance instructions on the traction motor assembly as its own maintenance standard.

Safety Board investigators contacted locomotive maintenance personnel of other railroads who disclosed that 15 microinches was the support bearing finish most prevalent in the industry. Investigators learned that there is also industry concern about the adequacy of the present traction motor support bearing design because the higher horsepower, higher speed locomotives develop pinion end bearing loads approximately three times the loading on the commutator end due to the increase in torque applied.

The failed locomotive axle was examined by Safety Board investigators and representatives of the parties to this investigation and was sent to the Association of American Railroads (AAR) Metallurgical Laboratory in Chicago for further testing. The report of the examination and testing by the AAR indicates that the axle exhibited a grossly overheated condition and extensive bearing metal penetration. The original condition of the support bearing surface in the failed end (pinion end) could not be determined due to damage; however, the support bearing area on the other end (commutator end) exhibited out-of-roundness in the support bearing journal surface. The average surface finish on the commutator end support bearing journal was found to be about 30 microinches.

Safety Board investigators interviewed many of the passengers concerning the environment in the cars during the crash sequence. Some of the passengers stated that they were thrown from their seats by the deceleration forces. Most of the injured passengers stated that they felt their injuries resulted from luggage which fell from the overhead luggage racks; although some of the seats in the cars rotated on their frames due to broken latches, the seat frames remained intact and securely anchored to the floor.

As a result of a passenger train accident in Wilmington, Illinois in 1983, <sup>2/</sup> the Safety Board issued Safety Recommendation R-84-40 on November 29, 1984, recommending that Amtrak:

Correct the identified design deficiencies in the interior features of existing and new passenger cars, which can cause injuries in accidents, including the baggage retention capabilities of overhead luggage racks, inadequately secured seats, and inadequately secured equipment in food service cars.

Although Amtrak has not replied to the recommendation, Amtrak has made attempts in the past to incorporate better securement of both seats and baggage. The newer passenger cars will withstand a longitudinal force in excess of that which will propel a person out of the seat. Safety Board investigators observe that in most crash instances, the seats sometimes partially rotate due to broken seat positioning latches, but the seat frames and seats normally remain in place in the retaining tracks. Further refinements may be needed, but this accident demonstrated that seat back and seat frame failures have been markedly reduced.

Amtrak has made design changes in the overhead luggage racks by adding rubber bumpers along the length of the luggage racks to reduce end-to-end luggage movement. In addition, the portion of the luggage rack which faces the aisle has an added raised edge to provide better luggage retention. However, these design changes did not eliminate luggage being propelled out of the overhead racks in this accident or in an accident at Woodlawn, Texas, on November 12, 1983. <sup>3/</sup> Further design changes are needed to reduce injuries from unrestrained luggage in accident situations.

Therefore, the National Transportation Safety Board recommends that the National Railroad Passenger Corporation:

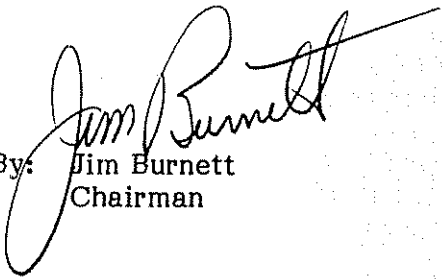
Develop and install a system on all passenger train locomotive units that will detect and inform crewmembers of the presence of overheating traction motor support bearings. (Class II, Priority Action) (R-85-13)

Review current quality control procedures on locomotive wheel shop practices and the method of updating locomotive maintenance information to ensure that quality control procedures are adequate and that current information is available to the maintenance forces at all Amtrak locomotive maintenance facilities. (Class II, Priority Action) (R-85-14)

<sup>2/</sup> Railroad Accident Report—"Collision of Amtrak Passenger Train No. 301 on Illinois Central Gulf Railroad with Marquette Motor Service Terminals, Inc., Delivery Truck, Wilmington, Illinois, July 28, 1983" (NTSB/RHR-84/02).

<sup>3/</sup> Railroad Accident Report—"Derailment of Amtrak Train No. 21 (The Eagle) on the Missouri Pacific Railroad, Woodlawn, Texas, November 12, 1983" (NTSB/RAR-85/01).

BURNETT, Chairman, GOLDMAN, Vice Chairman, and BURSLEY, Member,  
concurred in these recommendations.

  
By: Jim Burnett  
Chairman