R- 66 7A

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: NOV 26 1996

In Reply Refer To: R-96-60 through -62

Mr. Albert Justin
Executive Director
National Board of Boiler and Pressure Vessel Inspectors
1055 Crupper Avenue
Columbus, Ohio 43229

About 7:20 p.m. on June 16, 1995, the firebox crownsheet of Gettysburg Passenger Services, Inc., (Gettysburg Passenger Services) steam locomotive 1278 failed while the locomotive was pulling a six-car excursion train about 15 mph near Gardners, Pennsylvania. The failure resulted in an instantaneous release (explosion) of steam through the firebox door and into the locomotive cab, seriously burning the engineer and the two firemen. The firemen were taken by ambulance to area hospitals. The engineer, who had third-degree burns over 65 percent of his body, was airlifted to a burn center near Philadelphia. None of the 310 passengers or other crewmembers were injured. Locomotive damage was limited to the firebox grates and crownsheet, with some ancillary smoke and debris damage to the locomotive cab.[1]

Investigators found that the crownsheet failed from overheating because the traincrew had allowed the water in the locomotive boiler to drop to a level that was insufficient to cover the crownsheet. When the investigators examined the locomotive components closely, they found that the boiler and its associated equipment had not been maintained well enough to ensure safe operation and that some repairs had been done incorrectly. Investigators determined that the deficiencies were the result of a lack of the specialized knowledge, skills, and training necessary to properly maintain a steam locomotive. It was further determined that those operating the locomotive did not understand the full scope of their duties and did not coordinate their efforts to ensure the highest degree of safety.

[1]For further information, read Railroad Special Investigation Report – *Steam Locomotive Firebox Explosion on the Gettysburg Railroad near Gardners, Pennsylvania, June 16, 1995* (NTSB/SIR-96/05).

The National Transportation Safety Board determines that the probable cause of the firebox explosion on steam locomotive 1278 was the failure of Gettysburg Passenger Services management to ensure that the boiler and its appurtenances were properly maintained and that the crew was properly trained.

Although not a warning or preventative device, the design of the accident locomotive boiler appeared to mitigate the effects of the crownsheet failure. The locomotive had alternating rows of straight-thread and button-head crown stays to help ensure that any crownsheet failure due to low water would occur relatively gradually and in stages, rather than instantaneously and catastrophically.

The design (which appears to have been unique to the company that built locomotive 1278, Canadian Locomotive Company, Ltd.) may well have prevented a more sudden catastrophic failure of the crownsheet, which could have sent the boiler rocketing off the frame, killing or injuring the crew and passengers. The Safety Board believes such a design may be worthy of further study for incorporation in steam locomotives when they are repaired or rebuilt. The Safety Board also believes that the Federal Railroad Administration (FRA), in cooperation with the National Board of Boiler and Pressure Vessel Inspectors (NBBPVI) and the tourist-railroad industry steam-locomotive operators should explore the feasibility of requiring progressive crown-stay failure features in steam locomotives.

Locomotive 1278 lacked a feed-pump gage. It had an incorrect injector disk and a leaking check valve. Its dynamo was inoperative, and its water-glass light did not function. The Safety Board is concerned that all these problems together reflect a disturbing pattern of poor maintenance and/or improper repair. Such maintenance, in the opinions of the investigation steam-locomotive experts, clearly indicated a lack of knowledge and expertise on the part of the locomotive owners and crew. Steam-locomotive expertise is gone from most modern commercial railroads, and generally only a small number of experts and a limited supply of knowledge and skill remain. Today, many operating steam locomotives are in the hands of a generation that has had to develop steam-locomotive maintenance and operation second- or third-hand, much like the personnel of Gettysburg Passenger Services. One way to establish a minimum level of steam-locomotive expertise and thereby better ensure the safety of operators and the public would be to establish an education and certification program that establishes and enforces basic standards for steam-locomotive operation and maintenance.

The NBBPVI and the tourist-railroad industry steam-locomotive operators have agreed to establish a program for the safe maintenance and operation of boilers. The Safety Board supports such efforts and believes that the FRA, in cooperation with the NBBPVI and the tourist-railroad industry steam-locomotive operators, should develop certification criteria and require steam-locomotive operators and maintenance personnel to be periodically certified to operate and/or maintain a steam locomotive.

The Safety Board believes that the FRA, in cooperation with the NBBPVI and the Tourist Railway Association, Inc., should update 49 *Code of Federal Regulations* Part 230 to take advantage of accepted practical modern boiler-inspection techniques and technologies, to minimize interpretation based on empirical experience, and to maximize the use of objective measurable standards.

Therefore, the National Transportation Safety Board issues the following recommendations to the National Board of Boiler and Pressure Vessel Inspectors:

> Cooperate with the Federal Railroad Administration and the Tourist Railway Association, Inc., in exploring the feasibility of Federal regulations requiring a progressive crown-stay feature in steam locomotives. (R-96-60)
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> Participate with the Federal Railroad Administration and the Tourist Railway Association, Inc., in developing criteria to be used in the periodic certification of steam-locomotive operators and maintenance personnel. (R-96-61)
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> Participate with the Federal Railroad Administration and the Tourist Railway Association, Inc., in updating 49 *Code of Federal Regulations* Part 230 to take advantage of accepted practical modern boiler-inspection techniques and technologies, to minimize interpretation based on empirical experience, and to maximize the use of objective measurable standards. (R-96-62)

The Safety Board also issued Safety Recommendations R-96-53 through -59 to the Federal Railroad Administration and R-96-63 through -66 to the Tourist Railway Association, Inc.

The National Transportation Safety Board is an independent Federal agency with the statutory responsibility "to promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations" (Public Law 93-633). The Safety Board is interested in any action taken as a result of its safety recommendations. Therefore, it would appreciate a response from you regarding action taken or contemplated with respect to the recommendations in this letter. Please refer to Safety Recommendations R-96-60 through -62. If you need additional information, you may call (202) 314-6438.

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

By: Jim Hall
Chairman