

Log R-426p. 20

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

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Forwarded to:

Mr. W. Graham Claytor
President
National Railroad Passenger Corporation
400 North Capital Street, N.W.
Washington, D.C. 20001

SAFETY RECOMMENDATION(S)

R-82-89 through -97

About 2:35 a.m., on March 29, 1982, Amtrak locomotive Extra 769 East, a rescue locomotive which had been dispatched from the 30th Street Station in Philadelphia, collided head-on with standing disabled train No. 195 near Bristol, Pennsylvania. The rescue locomotive was not derailed, but the locomotive and first car of train No. 195 were derailed. Twenty-three passengers and 6 crewmen were treated at local hospitals; 2 passengers and 1 crewman were admitted because of cuts, abrasions, strains and sprains. Damage was estimated at \$823,000. 1/

During the trip from New Haven to New York, locomotive unit No. 933 experienced electrical problems, including the pantograph dropping away from the catenary on two occasions, at Pike Tower and at Cos Cob. At both of these locations, the engineer was able to cope with the problems without undue delay to the train by following prescribed procedures from either the engineer's operating position or the equipment room.

The trip from New York to Trenton was made without incident, but within seconds after passing Grundy Tower, located at milepost 65.6, the pantograph dropped away from the catenary again and a penalty service brake application was automatically imposed which caused the engineer to bring the train to a stop. The train was stopped at milepost 66. The pantograph dropping at milepost 66, as well as at Cos Cob and Pike Tower, was probably caused by low battery voltage, which could occur as a result of a faulty battery, a short circuit in the battery cable, or insufficient output from the battery charger.

The engineer said that when the 11,000 V.a.c. catenary power was lost on the locomotive, the battery protector relay was tripped which caused all the lights on the locomotive to go off including the headlight and the marker lights. He said he does not remember seeing any indication lights on the Fault and Indicator Light Panel, and to the best of his memory there was complete darkness. At the same time the pantograph dropped on the locomotive, the main lights in the coaches went off and only the battery-operated emergency lights remained illuminated. During this time, the engineer did not attempt to use the locomotive radio. The battery apparently had sufficient energy for the engineer of train No. 195 to successfully restore the pantograph to the catenary east of New York when the restoral procedures given in the AEM-7 operating manual were followed but insufficient energy for the engineer to successfully restore it at milepost 66, even by removing virtually all of the power drain on the battery.

1/ For more detailed information, read Railroad Accident Report--"Head-on Collision of Amtrak Trains Extra 769 East and No. 195, Bristol, Pennsylvania, March 29, 1982." (NTSB-RAR-82-5)

The low battery voltage was probably a result of the battery charger's having been inadvertently switched off or having become disconnected from the battery or its not functioning properly en route from New Haven. Even if the battery were not charged to 55 volts or more during the operation of the locomotive, an output voltage greater than 55 volts from the battery charger should have prevented the battery protector relay from becoming deenergized. This, in turn, would have prevented the main circuit breaker from opening and the pantograph would not have dropped because of low voltage. It could not be determined whether the battery charger control switch was "on" before the accident. However, the engineer of train No. 195 east of New York stated that on boarding the locomotive at New Haven he did not see either no-charge light illuminated. If the battery charger had been disconnected, the battery no-charge indicator light on the Fault and Indicator Light Panel should have been illuminated. Since experience has shown that an AEM-7 locomotive battery will provide power to operate the essential low voltage control circuits for 1 to 1 1/2 hours when it is not being charged, and since there was insufficient power for the engineer to raise the pantograph at milepost 66, even after removing all the power drain on the battery, the Safety Board concludes that the battery charger was either not activated or did not have sufficient output to maintain the battery in a fully charged condition, or that the battery had an undetermined fault.

Since the electrical equipment on the locomotive derives its power from the catenary via the pantograph, a separation between the two results in the locomotive and thus the train becoming electrically dead. The locomotive battery will provide power for emergency lights and radio until the battery voltage drops below 55 volts. At that time, the headlight, marker lights, and most of the low voltage control circuits are no longer powered adequately by the locomotive battery, and the locomotive has no visible identifying lights. This creates a potentially hazardous condition when a rescue train might be required to move in against a standing train in order to couple to and move it, especially at night. The passenger coaches have their own batteries from which emergency lights and rear marker lights are powered, but these lights would not be visible to a train approaching from the front.

Excessive speed was a factor in the failure of the engineer to stop Extra 769 East before it struck train No. 195. The engineer had testified that the speed indicator was inoperative, but the trainmaster stated that he had observed it at one point and that the train was moving about 40 mph. The speed tape indicated that a maximum speed of about 50 mph had been attained on the outward trip and that the train was traveling between 45-48 mph when it passed Bristol Station. The test results from the 24-month inspection made on March 5, 1982, and the results of the postaccident tests made on March 31, 1982, revealed that the speed indicator and tape essentially indicated the same speeds and that they were accurate.

Although the conductor and the trainmaster recently had passed the required operating rules examination and were considered by their supervisors to be qualified, neither man knew that a 30-mph speed restriction was imposed by the special instructions in the current timetable applicable to the operation of a light model GP-9 locomotive. Moreover, neither made the effort to check to see what speed restrictions might apply. The engineer, who also recently had passed the required operating rules examination, stated that he knew a speed restriction existed; nevertheless, he did not attempt to determine that speed. Had the engineer checked to find out what the restricted speed for the locomotive was and informed the trainmaster and conductor, it is possible that the traincrew would have assured that the train adhered to the restricted speed, thus providing sufficient time for Extra 796 East to have been stopped once train No. 195 had been sighted. The series of postaccident sight and stopping tests disclosed that Extra 769

East could have stopped safely before striking train No. 195 at several combinations of speeds and distances. However, the results of test No. 9, which was designed to duplicate the circumstances preceding the accident, indicates that Extra 769 East could not have been stopped from the approximate 45-mph speed.

Had the engineer and conductor been tested and qualified to operate trains over the extended Philadelphia terminal area, which includes Bristol when the area was extended, they would have been familiar with the area and the accident might not have occurred.

The actions of the conductor of train No. 195 and some actions of the trainmaster, the conductor, and the engineer of Extra 769 East reflect a recurring problem involving railroad employees of which the Safety Board has become acutely aware as a result of a number of accident investigations. In a number of instances, crewmembers and other employees have been able to cite operating rules verbatim, but it has been clear that they did not understand how to apply them. The Safety Board issued a special report and made recommendations about training ^{2/} as a result of circumstances found in several accident investigations. In most instances, railroad management has responded by putting more emphasis on training, but there is still need to determine that employees not only know the rules but that they know how and when to use them. This can be done through training, including the use of simulator instruction, that deals with the application of the rules as well as their precise wording. In addition, there was a lack of good crew coordination which may have contributed to this accident which also can be corrected through training.

The conductor of train No. 195 knew that rear-end flagging was required by operating rule No. 99 in the State of New Jersey and under certain circumstances in the Commonwealth of Pennsylvania. However, since his train was not stopped by an emergency brake application and since the train was operating in automatic signal territory, rule No. 99 was not applicable in the Commonwealth of Pennsylvania.

The trainmaster was aware that the operating rules provided for a rescue locomotive or train to move in an opposing direction to reach a stalled train and that a speed restriction applied. However, he did not recognize the Form "Q" train order when it was issued to him, and the order was not so identified by the block operator and hence it did not occur to him that the train was restricted to a 20-mph maximum speed for this movement.

When the block operator at Holmes Tower told the trainmaster of Extra 769 East to copy the train order, he did not identify the order as a Form "Q" order nor was he required to do so by the operating rules. If he had identified the train order as a Form "Q" before he transmitted it, the men on the locomotive may have associated the form of the order with a reduced speed requirement. However, the body of the order has a fixed format and there is no reference to a speed restriction. The fact that a train operating on the authority of a Form "Q" train order must observe a reduced speed movement is set forth in a note in the operating rule book following the train order format. The Safety Board believes that it is possible and quite likely that an individual could operate for long periods of time without receiving and having to operate on the authority of a Form "Q" train order. Therefore, the Safety Board believes that the transmission of a Form "Q" train order should be prefaced with the identity of the train order format, and further that the speed restrictions imposed by that order should be included in the body of the

^{2/} Results of a Survey on Occupational Training in the Railroad Industry.
(NTSB-SIR-79-1)

order. An employee should not be forced to rely entirely upon his memory for information concerning the movement of a train that he may not see regularly and that he will be required to apply only infrequently. Means should be devised to provide employees reminders of rules which arise only infrequently. If such a procedure for the speed of the locomotive or for the Form "Q" train order had been followed in this instance, the accident might have been avoided.

The conductor of Extra 769 East had successfully passed the operating rules examination and should have known that by operating rule No. 906 he was in general charge of the train. However, he instead allowed the trainmaster to assume that role. The trainmaster as a pilot was not authorized to take charge of the operation of the train; he was authorized to provide guidance and instructions about the territory over which the train was to move since the conductor and engineer were not authorized to operate a train in that area.

The engineer did not determine the destination of the locomotive he was assigned to operate even though reaching that destination could involve his operating the locomotive into an area over which he was not authorized to operate. According to his testimony of the events that occurred, he apparently operated the locomotive unmindful of the unfamiliar surroundings. The engineer was also qualified on the operating rules and should have known his responsibilities according to the operating rules which in part assign him the responsibility for safe operation of the locomotive including observance of signals and controlling the speed of the train.

The employees involved in this accident had satisfactorily passed examinations on the operating rules, but apparently some of them were unable to apply and execute the rules in the situations they encountered. In general, when employees participate in a reexamination rules class and are able to cite rules and pass the examination on the rules, their supervisors believe that the employees comprehend and understand the rules, when in fact in many instances they are unable to apply the rules in an actual situation.

The conditions on a railroad that affect the movement of the trains are always changing, and pertinent information regarding these changing conditions must be disseminated to operating personnel. From time to time, operating personnel change their job assignments. However, they may or may not be required to pass an examination on that particular assignment before they report since they may be considered to be qualified on the basis of prior examination. It is possible that an employee could work an assignment for one tour of duty and not work the same or similar assignment for a number of months. It is difficult for such an employee to stay abreast of all operating information that is essential for that employee to work an assignment safely. Information that is often released in the form of a bulletin order or a general order may eventually become part of the special instructions of the timetable. The timetable then becomes a formidable document with which traincrews have to become familiar and by which they must safely move trains entrusted to them. Information of a current nature, such as information given in a train order, generally presents no problem, but information that is seldom needed for train movement and is buried in a timetable can become obscure or forgotten.

On May 18, 1981, the Safety Board issued Safety Recommendation R-81-57 to Amtrak as a result of its investigation of an accident involving an Amtrak train at Dobbs Ferry, New York. ^{3/} The recommendation was made in an attempt to prevent passengers from receiving leg injuries in the event of an accident as a result of having their legs

^{3/} Railroad Accident Report--Head-End Collision of Amtrak Passenger Train No. 74 and Conrail Train OPSE-7, Dobbs Ferry, New York, November 7, 1980. (NTSB-RAR-81-4).

extended beneath the seat in front of them. The Safety Board recommended that Amtrak "Establish a retrofit schedule to provide skirts at the bottom of seats to prevent leg injuries because of leg entrapment." On August 3, 1981, Amtrak made the following response to Safety Recommendation R-81-57: "Amtrak has reviewed this recommendation and believes it is impractical. For operational reasons, seats must be capable of rotation. For their comfort, passengers use the space below the seat base to stretch their legs. Providing a skirt would prevent Amtrak from properly cleaning the floors of the cars under the seats. It is our belief that leg injuries would best be minimized by installing locking devices on rotating seats to prevent their undesired rotation." The Safety Board is currently classifying Recommendation R-81-57 as Open---Unacceptable Action.

After receiving Amtrak's response to this recommendation, the Safety Board directed a letter to Amtrak on April 7, 1982, asking that Amtrak reconsider recommendation R-81-57. Amtrak responded in a letter dated June 22, 1982, that Amtrak management was still of the opinion that skirts fitted to the bottom of the seats are not practical nor the solution to the problem and that only seven cars remained to be fitted with the anti-rotational device installed pursuant to recommendation R-81-58, which was issued on the same date as recommendation R-81-57.

In this accident, one passenger is known to have received injuries because one of his legs was extended beneath the seat in front of him, and one other passenger is known to have been injured because the seat unlocked and rotated during the collision. The Safety Board continues to believe that Amtrak should reevaluate the intent of recommendation R-81-57 and if the proposed solution is not acceptable, determine if an alternate solution is feasible.

As a result of its investigation of this accident, the National Transportation Safety Board recommends that the National Railroad Passenger Corporation (Amtrak):

Install highly visible emergency marker lights on the front of model AEM-7 and similar locomotives that can be operated reliably from the locomotive battery or from an independent power source for an extended period of time. (Class II, Priority Action) (R-82-89)

Provide the engineer of model AEM-7 locomotives a d.c. current readout at the operating position, other than a light indication, so he can determine whether the locomotive battery is being charged or discharged, and a voltmeter so that the battery voltage can be read in volts. (Class II, Priority Action) (R-82-90)

Review the control circuitry on the model AEM-7 locomotives to determine if modifications can be made to either automatically or manually disconnect nonessential battery operated circuits, when catenary power is not available, to extend the battery's capability to provide power for emergency marker lighting and the locomotive radio. (Class II, Priority Action) (R-82-91)

Preface Form "Q" and similar train orders with the format identifier before the orders are transmitted, and include any speed restrictions within the limits covered by the order in the body of the train order. (Class II, Priority Action) (R-82-92)

Post the maximum allowable speed in a conspicuous location adjacent to the operating position when a locomotive has a speed restriction imposed because of operating restrictions. (Class II, Priority Action) (R-82-93)

Provide guidance for flag protection to the front and rear of passenger trains, including commuter trains, when the train is disabled and unable to proceed without assistance, and until a rescue locomotive or train has arrived and is ready to depart. (Class II, Priority Action) (R-82-94)

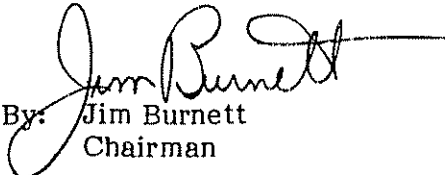
Review Amtrak's current method of conducting operating rules examinations and review classes to determine if is adequate to permit employees to demonstrate that they not only know the wording of the rules, but that they understand how the rules are to be applied under actual conditions. If these objectives are not being achieved, restructure the operating rules classes to accomplish this goal. (Class II, Priority Action) (R-82-95)

Establish and implement training procedures to improve traincrew coordination particularly when crews work under unfamiliar and unusual circumstances. (Class II, Priority Action) (R-82-96)

Review the Northeast Corridor timetable format and contents to determine if its complexity can be reduced to make it easier to ascertain those schedules and special instructions that affect a train's operation over a given division and make appropriate changes. (Class II, Priority Action) (R-82-97)

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." (P.L. 93-633). The Safety Board is vitally interested in any actions taken as a result of its safety recommendations. Therefore, we would appreciate a response from you regarding action taken or contemplated with respect to the recommendations in this letter.

BURNETT, Chairman, McADAMS, BURSLEY, and ENGEN, Members, concurred in these recommendations. GOLDMAN, Vice Chairman, did not participate.


By: Jim Burnett
Chairman