



# National Transportation Safety Board

Washington, D.C. 20594

## Safety Recommendation

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**Date:**

**In reply refer to:** R-98-58 through -61

Mr. George D. Warrington  
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About 5:56 a.m., on August 9, 1997, Amtrak train 4, the Southwest Chief, derailed on the Burlington Northern Santa Fe Railway (BNSF) tracks about 5 miles northeast of Kingman, Arizona. Amtrak train 4 was en route from Los Angeles, California, to Chicago, Illinois, and had just left the Kingman station. The train was traveling about 89 mph on the eastbound track when both the engineer and assistant engineer saw a “hump” in the track as they approached bridge 504.1S. They applied the train’s emergency brakes. The train derailed as it crossed the bridge. Subsequent investigation revealed that the ground under the bridge’s supporting structure had been washed away by a flash flood. Of the 294 passengers and 18 Amtrak employees on the train, 173 passengers and 10 Amtrak employees were injured. No fatalities resulted from the accident. The damages were estimated to total approximately \$7.2 million.<sup>1</sup>

The National Transportation Safety Board determined that the probable cause of this accident was displacement of the track due to the erosion and scouring of the inadequately protected shallow foundations supporting bridge 504.1S during a severe flash flood because the BNSF management had not provided adequate protection, either by inspection or altering train speeds to fit conditions. Contributing to the accident was the failure of the BNSF management to adequately address the erosion problems at bridge 504.1S.

The Safety Board identified several concerns as a result of its investigation, including the injuries to passengers of the Amtrak train. The investigation examined passenger safety and emergency response procedures, in addition to other issues.

The Safety Board investigated Amtrak’s passenger and crew accounting procedures. During the emergency response to the Kingman accident, the Incident Commander requested a

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<sup>1</sup>For more detailed information, read Railroad Accident Report—*Derailed of Amtrak Train 4, Southwest Chief, on the Burlington Northern Santa Fe Railway, near Kingman, Arizona, August 9, 1997* (NTSB/RAR-98/03).

copy of the train 4 manifest from an Amtrak employee. The conductor told Safety Board investigators that a passenger manifest was located in the dormitory car, but he did not have time to obtain it because he was helping passengers. The chief of on-board services said that he gave a copy of a sleeping car manifest to a firefighter. It took several days for Amtrak to provide an accurate passenger count of the entire train.

A complete manifest is necessary, in addition to the counts provided by the conductor, so that emergency responders will be able to locate people on the train as quickly as possible and be alerted about those people who may need immediate assistance because of injuries or disabilities. Although a complete manifest of train 4 was eventually available, infants and small children were not included on it because Amtrak does not require tickets for infants and small children. Because the survival of passengers or crewmembers could depend on their timely rescue by emergency responders, the complete manifest should be provided to the Incident Commander as soon as he arrives on scene. Although no complete manifest was available during the emergency response in this instance, the lack of one did not appear to negatively affect the efficiency of the emergency response.

As a result of the Safety Board's investigation into the Amtrak train accident in Mobile, Alabama,<sup>2</sup> the following safety recommendation was issued to Amtrak on September 30, 1994:

R-94-7

Develop and implement procedures to provide adequate passenger and crew lists to local authorities with minimum delay in emergencies.

Amtrak responded to the safety recommendation on July 18, 1995, stating that a three-phase project to provide a satellite and messaging system between long-distance trains and the corporate entities associated with their operation would be implemented. According to Amtrak, phase I would install the system, phase II would expand the system to more trains, and phase III would provide nationwide voice communications. In a letter dated October 4, 1995, the Safety Board stated that it was pleased to learn that Amtrak was about to implement this project to provide satellite communications capability on trains and that the new system would provide more accurate passenger manifests. Pending implementation of the new system, the Board classified the safety recommendation "Open—Acceptable Response."

On October 19, 1997, an Amtrak official provided the Safety Board with an update of Amtrak's progress in developing the satellite system. The official stated that it would be difficult to account for passengers on Amtrak's unreserved trains because of the frequent stops such trains make. He compared the unreserved trains to transit systems. However, he said that a procedure to account for passengers on reserved Amtrak trains is possible, and that Amtrak has a computer system in place that could do it.

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<sup>2</sup>Railroad Accident Report—*Derailment of Amtrak Train No. 2 on the CSXT Big Bayou Canot Bridge Near Mobile, Alabama, September 22, 1993* (NTSB/RAR-94/01).

The Safety Board recognizes the practical limitations concerning Amtrak's providing a manifest on unreserved trains because those trains are frequently commuter trains on which passengers may board and detrain quickly, purchase tickets ranging from a per ride to a monthly basis, and not be confined to certain cars or seating. However, reserved trains do not have these characteristics and the procedure currently used to account for reserved train passengers, by counting tickets, can be improved. The Safety Board is aware that Amtrak has taken steps to improve its means of communication and ability to account for all occupants on board its reserved trains, and the Safety Board is encouraged by Amtrak's progress in this area.

Nevertheless, the Safety Board concluded that because an accurate passenger manifest was not provided by the Amtrak train 4 crew to the Incident Commander, the emergency response to evacuate and account for all passengers from the train could have been delayed, thus endangering passengers whose locations or circumstances were unknown to emergency responders. The Safety Board reclassified Safety Recommendation R-94-7 to Amtrak "Closed—Reconsidered."

The Safety Board also found problems concerning the adequacy of emergency training provided to Amtrak train 4 employees. Even though passengers were safely evacuated from the train, statements from the on-board service personnel and a review of their training records indicated that the reactions of several of them were based on instinct rather than organized emergency training. For example, one Amtrak attendant stated, "We had no real instruction or direction. We all went on instinct to help one another to see if there were injuries." He also stated that they needed more emergency training. Another train attendant had attended Amtrak's P.R.E.P.A.R.E. training course, which she said made her feel more "Knowledgeable, prepared, and focused on what needed to be done." This attendant recommended that all Amtrak crewmembers take the P.R.E.P.A.R.E. course on at least a 2-year cycle.

The Safety Board reviewed Amtrak's emergency situation training records for the 18 on-board service persons and operating crewmembers involved in this accident. The training time intervals recorded varied between employees. The most recent training that could be identified within the employee records ranged from training taken 2 months before the accident to training taken as much as 7 years before the accident. Eight employees did not have any emergency situation training dates listed in their training records. These findings are inconsistent with Amtrak's stated policy of scheduling emergency situation training at least every 3 years for on-board service attendants. Also, although the operating crew participated in refresher or recertification training, their training records indicate that the operating crew did not participate in emergency situation training with on-board service attendants.

Train 4's on-board service personnel did not use the public address system to communicate evacuation information to the passengers. Although some crewmembers believed that the public address system did not work, they did not attempt to use it even though Amtrak's emergency training procedures, as provided in the Amtrak training manual, call for its use in emergency situations. (Wreckage documentation showed that the public address system was inoperable in some of the cars because of the damage sustained by the equipment.)

During emergency situations, particularly those involving passenger evacuations, the train crew and on-board service personnel are responsible for managing and directing the safe evacuation of passengers. Passengers rely on the training, experience, and leadership of the on-board service personnel. Required periodic emergency situation training should prepare the train crewmembers to confidently perform their duties when emergency situations occur.

Since 1984, the Safety Board has addressed the need for Amtrak to improve its emergency situation training program. Over the years, the Safety Board has recognized improvements in Amtrak's training program. Following its investigation of the Amtrak train accident in Lugoff, South Carolina, on July 31, 1991,<sup>3</sup> the Safety Board recommended that Amtrak:

R-93-23

Require that all on-board service personnel periodically take training in emergency operating rules and first aid, cardiopulmonary resuscitation, and the use of the public address system during train emergencies.

In a letter dated December 27, 1993, Amtrak concurred with the merit of this recommendation. Amtrak formed a committee to develop an appropriate program to address these issues. The Safety Board responded on February 10, 1994, that a meeting with Amtrak would be postponed until the committee began its review of the issues. As a result, the Safety Board classified Safety Recommendation R-93-23 "Open—Acceptable Response."

Based on the personnel training record data reviewed in this accident, however, not all Amtrak employees appear to have received the necessary training or retraining in accordance with Amtrak's program. All employees should be provided the same level of emergency situation training within a reasonable time period. Although the evacuation went well in this accident, the responsibilities of train crewmembers should not be carried out in an ad hoc manner. Amtrak employees should be trained in their emergency responsibilities and not have to rely on instinct alone.

The lack of communication between the conductor and on-board service chief in providing a complete passenger manifest to the Incident Commander demonstrates a need for additional training of Amtrak personnel to emphasize their responsibilities when receiving requests from emergency responders and coordinating the emergency response on scene. In the Safety Board's investigation of an accident that occurred on February 16, 1996, near Silver Spring, Maryland,<sup>4</sup> the importance of the timely exchange of information between train crew personnel and the Incident Commander was examined. Coincident with the accident investigation, the Federal Railroad Administration (FRA) published, on February 24, 1997, the Notice of Proposed Rulemaking for *Passenger Train Emergency Preparedness*, which proposed requiring minimum Federal safety standards for the preparation, adoption, and implementation of emergency

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<sup>3</sup>Railroad Accident Report—*Derailment and Subsequent Collision of Amtrak Train 82 With Rail Cars on Dupont Siding of CSX Transportation, Inc., at Lugoff, South Carolina, on July 31, 1991* (NTSB/RAR-93/02).

<sup>4</sup>Railroad Accident Report—*Collision and Derailment of Maryland Rail Commuter MARC Train 286 and National Railroad Passenger Corporation Amtrak Train 29 Near Silver Spring, Maryland, on February 16, 1996* (NTSB/RAR-97/02).

preparedness plans by railroads connected with the operation of passenger trains, including freight railroads hosting the operations of rail passenger service. The rule also required each affected railroad to instruct its employees about the provisions of the plan. The FRA issued the final rule on *Passenger Train Emergency Preparedness* on May 4, 1998, with an effective date of July 6, 1998.

The Safety Board concluded that Amtrak's current system for providing emergency training for train crews and on-board service personnel has not been effective, which has resulted in personnel being provided differing levels of emergency situation training.

The Safety Board also investigated how Amtrak train 4's emergency lighting and public address systems were affected by the derailment. The failure of emergency electrical systems to provide emergency power can be a serious problem in critical situations such as derailments. The emergency electrical system for each passenger car on train 4 was either at minimal output or at no power as a result of the derailment. Extensive undercarriage damage resulted in severed wiring and electrical conduits. Consequently, neither the interior emergency lights nor the public address system was reliable for operation, and no back-up system was provided. Passengers either had to rely on the instructions they were given by the Amtrak personnel in their car or to evacuate the train on their own.

Following a June 15, 1982, derailment of an Amtrak train in Emerson, Iowa,<sup>5</sup> the Safety Board issued the following safety recommendation to Amtrak:

R-83-25

Evaluate and modify, as necessary, emergency lighting systems in passenger-carrying cars to better protect the functioning of emergency lights in emergency situations.

Amtrak responded in 1984 that the emergency lighting system was designed to provide a minimum of 2 hours of acceptable illumination when the primary power source was interrupted. Amtrak believed that this 2-hour period was a reasonable length of time in an emergency situation. Amtrak also stated that using the existing commercial, battery-operated, self-contained fixtures on railway cars is not feasible. The safety recommendation was classified "Closed—Unacceptable Action" in April 1988.

On September 22, 1993, Amtrak train 2 derailed into the Big Bayou Canot near Mobile, Alabama,<sup>6</sup> at about 2:53 a.m. Forty-two passengers and 5 crewmembers were killed; 103 passengers were injured. The Safety Board issued the following safety recommendation to Amtrak:

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<sup>5</sup>Railroad Accident Report—*Derailed of Amtrak Train No. 5 (the San Francisco Zephyr) on the Burlington Northern Railroad, Emerson, Iowa, June 15, 1982* (NTSB/RAR-83/02).

<sup>6</sup>NTSB/RAR-94/01.

R-94-8

Equip cars with portable lighting for use by passengers in an emergency.

In July 1995, Amtrak stated that it was evaluating the use of portable chemical light sticks for permanent installation on all Amtrak trains. Such light sticks are weatherproof, maintenance-free, nontoxic, nonflammable, and not sources of ignition. They provide immediate and dependable light for up to 8 hours. Amtrak placed light sticks on all its passenger trains, and Safety Recommendation R-94-8 was classified “Open—Acceptable Action.”

In the Kingman accident, the Amtrak light sticks provided sufficient emergency lighting until the arrival of emergency responders. Light stick use was limited, but the usefulness of the light sticks was well acknowledged by the passengers, and they provided a measure of safety when the emergency lighting failed. Based on these actions by Amtrak, the Safety Board classified Safety Recommendation R-94-8 “Closed—Acceptable Action” on March 26, 1998.

The Safety Board is, however, concerned that not enough is being done to provide for passenger safety when emergency power is lost. In the 1996 Silver Spring accident,<sup>7</sup> a contributing factor to the severity of the accident and the loss of life was the lack of appropriate regulations to ensure adequate emergency egress features on railroad passenger cars. The Safety Board concluded that passenger car interiors must have interior emergency lighting because a sufficient quantity of light sticks may not always be available, and light sticks may not be suitable for a large-scale evacuation such as the one that occurred in this accident. In addition, while the light stick may serve adequately as a personal emergency light source during an evacuation, it is not a self-contained emergency lighting source.

The Kingman derailment also raised issues concerning seat securement. Inspection of train 4’s seats indicated that none had become separated from their floor mountings. However, 18 seat assemblies were found with their rotating locking mechanisms not engaged. A disengaged seat lock can result in an uncontrolled rotation of the seat assembly, even in cases of a minor derailment, which may result in serious injuries to passengers. In the August 23, 1990, Batavia, Iowa,<sup>8</sup> accident report, the Safety Board stated its concern regarding Amtrak’s seat locks and noted that seats can become unlocked either because the locking mechanisms are disengaged en route by passengers or because they are defective. The Safety Board issued the following safety recommendation to Amtrak:

R-91-71

Implement procedures for on-board-service personnel to periodically check passenger seats en route for unlocked anti-rotational devices and take action to ensure seats are functional.

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<sup>7</sup>NTSB/RAR-97/02.

<sup>8</sup>Railroad Accident Report—*Derailed of Amtrak Train No. 6 on the Burlington Northern Railroad, Batavia, Iowa, April 23, 1990* (NTSB/RAR-91/05).

On May 22, 1992, this safety recommendation was classified “Closed—Acceptable Action,” based on Amtrak’s response that it was immediately issuing instructions systemwide to check and ensure that seat locks are functional and engaged.

Absolute assurance is not always possible, however, because passengers can readily disengage the mechanism to rotate the seat to suit their personal requirements and may fail to ensure that the locking mechanism is again positively engaged. Further, on-board service personnel may not be able to provide the constant vigilance necessary to ensure that the seat locking mechanisms have been properly restored, because the seat locking mechanism is not readily visible. The Safety Board concluded that the current procedures used to check and ensure that passenger car seat locks are functional and engaged are inadequate. A simple solution may be to employ a positive locking mechanism that requires use of a special keying feature accessible only to crewmembers (such as a conductor’s coach key). This procedure could provide for seat locking security and effectively eliminate manipulation by passengers.

Therefore, the National Transportation Safety Board makes the following safety recommendations to the National Railroad Passenger Corporation:

Expedite the development and implementation of a passenger and crew accountability system on reserved trains. (R-98-58)

Implement effective controls to monitor and ensure that all train crews and on-board service personnel receive the necessary initial and recurrent emergency training to provide for passenger safety. (R-98-59)

Install, in all new passenger equipment purchased after January 1, 2000, and in existing passenger cars during their major overhaul/rebuild operations, fixtures that use a “self-contained back-up energy reserve feature” to make the fixtures less vulnerable to the disruption of electrical power during derailments. (R-98-60)

Install a positive seat securement system to prevent disengagement and undesired rotation in all new passenger cars purchased after January 1, 2000, and incorporate such a system into existing passenger cars when they are scheduled for overhaul. (R-98-61)

Also, the Safety Board issued Safety Recommendations R-98-48 through -53 to the Burlington Northern Santa Fe Corporation, R-98-54 through -57 to the Federal Railroad Administration, H-98-41 to the Federal Highway Administration, H-98-42 to the Arizona Department of Transportation, R-98-62 to the Mohave County Sheriff’s Department, R-98-63 to the International Association of Chiefs of Police, R-98-64 to the National Sheriffs’ Association, R-98-65 to the Association of American Railroads, and R-98-66 to the American Short Line and Regional Railroad Association.

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 vitally 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-98-58 through -61 in your reply. If you need additional information, you may call (202) 314-6430.

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

By: Jim Hall  
Chairman