



# National Transportation Safety Board

Washington, D. C. 20594

## Safety Recommendation

---

Date: May 17, 1991

In reply refer to: R-91-1 through -8

Mr. Louis J. Gambaccini  
Chief Operations Officer/General Manager  
Southeastern Pennsylvania Transportation Authority  
714 Market Street  
Philadelphia, Pennsylvania 19106-2385

---

At 0821 on March 7, 1990, westbound Southeastern Pennsylvania Transportation Authority (SEPTA) Market-Frankford Subway Elevated (MFSE) train 61 derailed in a tunnel 238 feet west of the 30th Street station platform in Philadelphia, Pennsylvania.

Train 61 had 2 crewmembers and about 180 passengers aboard when the derailment occurred. Extensive car damage, together with darkness, cramped wreckage conditions, and debris in the tunnel complicated rescue efforts that took about 5 hours to complete. Four passengers were killed, and 158 were injured. One crewmember and a firefighter sustained minor injuries. Damage to the equipment and track was estimated by SEPTA to have been about \$2 million.<sup>1</sup>

Postaccident inspection of the track and switch 7E at the 30th Street station revealed no deficiencies in the track structure that were causal to this accident. The extent of crashworthiness was not, as a practical matter, a factor in the severity of this accident. Also, the train crew complied with SEPTA rules in operating train 61.

After leaving the 30th Street platform, train 61 continued to travel west to a remote-controlled interlocking switch (7E) that was 238 feet from the platform. The first two cars proceeded through the switch and remained on the rails. At the same time, the No. 2 traction motor on the A end of the third car dropped to the track, striking the ties. It passed over the switch, damaging the switch mechanism. The third car and the lead truck of the fourth car continued over the damaged switch and remained on the track. But the traction-motor had bent the switch points to the open position, allowing the rear truck of the fourth car to be diverted. The body of the fourth car was directed sideways as westbound movement continued until the

---

<sup>1</sup>For more detailed information, read Railroad Accident Report--"Derailment of Southeastern Pennsylvania Transportation Authority (SEPTA) Commuter Train 61, Philadelphia, Pennsylvania March 7, 1990," (NTSB/RAR-91/01).

car derailed and struck the steel H-columns between the eastbound and westbound right-of-ways. The side of the car struck the columns, which penetrated 30 feet into the car, resulting in injuries and fatalities. The lead truck of the fifth car derailed in the crossover switch as it followed the fourth car. The sixth car derailed but remained coupled to the fifth car.

The Safety Board believes that had SEPTA properly inspected the motor mount and safety connection on the No. 2 traction motor at the inspections it had after it was installed on October 4, 1989, the deteriorated condition of the top connection could have been detected and corrected and the accident could have been avoided.

In the investigation of this accident, the Safety Board considered the poor quality of SEPTA's mechanical inspection procedures and maintenance practices, as well as oversight of SEPTA maintenance practices by State and Federal agencies.

The motor support bolt on car 817 (the third car) ostensibly was inspected three or more times--on January 4, February 10, and March 2, 1990--in the 63 days before this accident.

On January 4, 1990, the car received its State-certified B inspection at the 69th Street car shop. The inspection form was submitted as required, but no problems with the bolt assembly were found.

On February 10, 1990, the car was scheduled to receive its A inspection at the 69th Street shop, and the inspection form was submitted. However, neither the mechanic on duty nor his foreman remembered any specific information about their activities during that shift. The car work order was not signed by the foreman and did not show the I.D. number of the mechanic or the time involved. The foreman stated that the handwriting on the card was his and that the card indicated that the inspection had been completed. The possibility exists that the inspection was never performed. The Safety Board concludes that SEPTA records are not sufficient to ensure that required inspections are in fact being performed.

The general foreman signed the motor support bolt inspection form on March 2, 1990, 5 days before the accident, with no exceptions.

Postaccident testing for 88 days has shown that it would take a great deal of time for the horizontal safety rod to completely wear through the motor support brackets. If any of these inspections had been thoroughly and conscientiously performed, the condition of the motor support bolt brackets would have been detected and this accident prevented.

Discussions with the mechanics revealed many problems with the SEPTA inspection procedure. Preventive and quality maintenance apparently received low priority because of the pressure to release cars for rush hour service. In addition, nearly all maintenance training was completed on the job, and classroom training was limited. The inspection standards and formal training were inadequate. Engineering diagrams apparently were not used by mechanics or were unavailable; and in one case concerning motor support bolt installation, the diagram inaccurately depicted the proper motor mount assembly. Many mechanics involved in installing and inspecting the accident motor stated that supervisors did not check their work. Also, one mechanic's statement suggested the existence of a spare parts problem, including difficulty in obtaining needed parts and improper reuse of parts, that

could signify serious safety concerns. The Safety Board believes that SEPTA did not pay proper attention to quality inspection and maintenance.

In addition, SEPTA's drawing No. C-1004 and overhaul manual, which SEPTA used for a guide in the installation of the vertical support bolts for traction motors differ from the Budd Car Company's original 1960 design. The drawing and manual omit a washer under the lower vibration isolator of the upper isolator mount assembly. Either SEPTA or PTC further changed the installation by making the bottom and top isolator spacer sleeves the same length, contrary to requirements shown on the Budd Car Company drawing and on drawing No. C-1004. This change, which was made in the late 1960's when gear drive units were changed, is not documented by an engineering study, and SEPTA has no records of when or why the change was done. Consequently, when assembled according to SEPTA practices, the proper dimensional relationship between the upper and lower vibration isolator assemblies probably was not maintained, which resulted in excessive slack in the stacking arrangement. These conditions could allow the traction motor to move vertically and horizontally, causing abnormal stress on the vertical support bolt and nut connections.

The Safety Board believes that SEPTA should review and take appropriate action concerning the lack of available and accurate shop manuals and assembly diagrams, the limited amount of supervisory oversight of the work, and the shortage of parts in its mechanical department.

In this regard, it is noted that approximately a year and a half before this accident, a new general manager was hired by SEPTA. He had initiated a reorganization and was already in the process of instituting management and organizational reforms when the accident occurred. During the Safety Board investigation, he offered full cooperation and has begun implementing changes, such as increasing availability of manuals and drawings, improving communications of instructions with followup, and improving record keeping. In the year since the accident, there have been no further accidents on the SEPTA system.

Based on the available evidence, the motorman's performance was not a factor in the accident. The passengers and other SEPTA employees did not see the motorman behave in an unusual way either before the accident or during the emergency response and evacuation. Eyewitnesses stated that there was no warning before the accident. A statement from a towerman about a 1975 incident in which a motor separated entirely from a SEPTA subway car also indicated motor separation could occur without any warning to the motorman. However, this incident could not be located in SEPTA records.

Postaccident toxicological testing showed high concentrations of cocaine and the metabolite of cocaine in the motorman's urine specimen. While not causal to this accident, the levels suggest that the motorman was a frequent or heavy user of cocaine, that this level of use was not a new practice, and that this use may be associated with the motorman's absenteeism problem.

Although we do not have conclusive evidence that the motorman was under the influence of cocaine at the time of the accident, it is troubling that this motorman was apparently operating trains for some time while using cocaine. In this case and undoubtedly in most circumstances, the accident sequence developed quickly, leaving little possibility that the motorman could have known of the failure until it occurred. Thus, the motorman had little time to respond. Nevertheless, no

matter what scenario develops, the motorman must be alert, possess good judgment, and be prepared to respond quickly to a myriad of situations presented to him in the conduct of his duties. Indeed, in many accident situations, the severity can well depend on the ability of an operator to respond to emergencies.

SEPTA had an active drug testing program that included preemployment, random, reasonable suspicion, and postaccident testing. It was one of the first and most comprehensive programs in the transit industry. According to testimony at the public hearing, SEPTA began drug testing in September 1985 and added random testing in September 1989. Its random testing program was among the first in the transit industry. However, the accident motorman had not been tested for drugs before the accident because the SEPTA program was relatively new. The motorman was hired before SEPTA had preemployment screening, and he had experienced no other accidents that would have qualified him for postaccident testing. In addition, his long absences occurred after the return-to-work testing requirement had been struck down in court. At the time of the accident, the random testing program had been in effect for 6 months; and no more than 20 percent of the employees had been tested.

Furthermore, the MFSE assistant general manager was a passenger on train 61 on the accident morning and stated that he spoke briefly to the motorman. Such senior managers are an important part of the drug program, since reasonable suspicion testing is performed when a supervisor trained in the detection of drug and alcohol use recognizes and substantiates specific behavioral, performance, or physical indicators of probable drug or alcohol use. This assistant general manager had received 4 hours of substance-abuse training from the SEPTA office of safety and training. However, cocaine can be very difficult to detect, especially during a brief encounter.

Although the motorman's record showed that his attendance had been so poor that he had been disciplined, he had never been tested for cause based on his performance record. As determined by union agreement, discipline is based on the number of work days an employee misses. In 1984 the motorman had received an "involuntary termination" for substandard attendance. He had been suspended once in 1988 and twice in 1989 for substandard attendance and for being AWOL. Poor attendance can often be an indicator of a drug abuse problem. However, under the current SEPTA drug program, poor attendance is not a basis for reasonable cause drug testing.

The Safety Board recognizes that it may be difficult, due to court challenges and resistance from labor unions, to devise a program in which drug testing is triggered solely because of poor attendance. Although an effective drug program cannot be based solely on one factor, such as poor attendance, a program based on a combination of factors, such as absenteeism (tardiness, extended weekends, AWOL, and unsubstantiated use of sick leave), driving records, rules violations, and other indicators, should be viable. SEPTA's current drug testing program could be improved by developing a program based on a combination of these factors to corroborate the possibility of a drug or alcohol problem. Such a change might lead to the early detection of drug problems before they become the cause of serious safety violations.

Despite the difficulty of extricating the passengers who were trapped in the wreckage, the emergency response was timely and involved a sufficient number of employees and amount of equipment. However, communications below surface

were poor during the emergency rescue operations and had to be achieved by line of sight or hard wire application. This difficulty was compounded by the fact that SEPTA and the Philadelphia Fire Department do not use the same terms. The Safety Board believes that SEPTA and the Philadelphia Fire Department should develop a common language.

Passengers stated that they were confused and did not know what to do. Had train 61 been equipped with a public address system, the traincrew could have given clear, immediate instructions to passengers, such as instructions about staying aboard until rescuers arrived, about the doors to be used, about the direction to be taken during the evacuation, and about how to avoid the 600-volt third rails and other rail traffic. Had the passengers received such directions, they would have been less likely to leave.

The uninjured and slightly injured passengers evacuated train 61 by walking through the tunnel before rescue personnel arrived to coordinate the evacuation. According to the SEPTA dispatcher audio tapes, at least two subway cars were operating on adjacent tracks. The passengers were fortunate that they were not struck by other vehicles. They might have stayed aboard if emergency evacuation instruction placards had been posted in the cars. The Safety board believes that had clear, concise emergency instructions been posted, passengers might have read and retained information instructing them to remain aboard until the coordinated evacuation was instituted. In addition, SEPTA has not provided any information on passenger procedures in the event of fire, loss of power, emergency evacuation, or an accident. The Safety Board believes that this information, as well as the posting of emergency placards, would have proved helpful to passengers.

The Safety Board also believes that crewmembers should be required to participate in emergency evacuation drills that would include passengers and emergency rescue personnel. Such training should be part of the new-employee orientation. The result would be employees who are better able to provide guidance to passengers in emergency situations.

This accident also demonstrates the importance of portable radios. After the accident, train crewmembers, not having portable radios, had no means of communicating with each other on the train. The motorman walked to the tower and fortunately had a key that allowed him to enter and use the telephone. Although he and the trolley operator gave clear information to the SEPTA dispatcher about the derailment and subsequent injuries to passengers, the accident's severity and magnitude were not emphasized in the radio transmission to the fire department. Since the motorman had no portable radio with which to relay the information himself through his dispatcher, the fire department did not realize the severity of the accident until the first units arrived on the scene.

The Safety Board believes that portable radios could have been valuable in three ways: the traincrew could have coordinated the evacuation of the passengers with other crewmembers so that the best possible evacuation route could have been planned; the train crew could have transmitted information about the accident directly to the SEPTA train dispatcher; and the train dispatcher would have had valid information to relay to the fire department emergency services, thus eliminating the confusion and misinterpretation that occurred because the information had had to pass through five persons.

Therefore, the National Transportation Safety Board recommends that the Southeastern Pennsylvania Transportation Authority:

Revise existing maintenance and inspection programs on all rail lines to include comprehensive, current, and specific standards for the inspection, repair, replacement, and quality control of all parts and components used on Southeastern Pennsylvania Transit Authority rail transit equipment. (Class II, Priority Action) (R-91-1)

Develop and conduct comprehensive training programs for supervisors, mechanics, and inspectors, detailing proper inspection and record keeping methods sufficient to ensure that inspections are performed as required. (Class II, Priority Action) (R-91-2)

Develop and conduct emergency evacuation drills in new and recurrent employee training that include passengers and emergency rescue personnel. (Class II, Priority Action) (R-91-3)

Provide a reliable emergency public address system in each subway elevated car that is independent of third-rail car wiring for its power source. (Class II, Priority Action) (R-91-4)

Provide train crews with self-contained radios that will function in the event car power sources are lost. (Class II, Priority Action) (R-91-5)

Post at conspicuous places in all Southeastern Pennsylvania Transportation Authority subway cars emergency evacuation instructions for passengers, including how to escape from disabled or burning cars; how to locate and use emergency telephones, ladders, and fire extinguishers; and how to exit safely from a tunnel. (Class II, Priority Action) (R-91-6)

In cooperation with the city of Philadelphia Fire Department, review and revise the procedures and terminology that train dispatchers and the fire department can utilize for notification of emergency and rescue personnel, in order to eliminate delays and provide information necessary for proper assessment of equipment and manpower requirements. (Class II, Priority Action) (R-91-7)

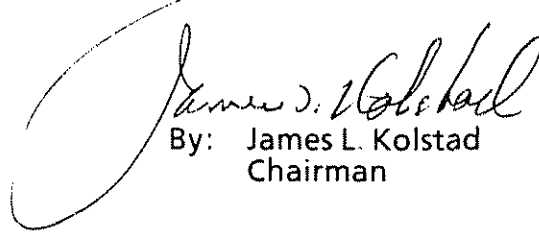
In conjunction with the Transport Workers Union, modify existing programs for testing employees for drug or alcohol use, focusing on poor attendance in combination with rules violations, changes in work habits, and motor vehicle driving violations. (Class II, Priority Action) (R-91-8)

Also, as a result of its investigation, the Safety Board issued Safety Recommendation R-91-09 to the Transport Workers Union and R-91-10 to the city of Philadelphia Fire Department. Also, the Safety Board reiterated Safety Recommendation R-87-38 to the governor of Pennsylvania.

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 recommendation in this letter. Please refer to Safety Recommendations R-91-1 through -8.

KOLSTAD, Chairman, COUGHLIN, Vice Chairman, and BURNETT, LAUBER, and HART, Members, concurred in these recommendations.



By: James L. Kolstad  
Chairman