Log R-415

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: July 22, 1982

Forwarded to:

Mr. John Simpson
President
New York City Transit Authority
370 Jay Street
Brooklyn, New York 11202

SAFETY RECOMMENDATION(S)
R-82-49 through -54

On December 15, 1981, at 5:50 a.m., a nine-car New York City Transit Authority (NYCTA) southbound No. 3 subway train departed on track No. 2 after making a station stop at Times Square Station in New York City, New York. Moments later, while the train was accelerating, a traction motor fell from under the third car. The third car derailed and caused the fourth car to derail also. As the fourth car derailed, it turned away from the track structure and its front end struck the steel posts separating tracks Nos. 1 and 2. The rear of the car then struck the concrete curtain wall that separated track No. 2 and track M. Twelve passengers were injured and damage was estimated to be $287,000. 1/

Three other derailments involving a traction motor falling from an NYCTA car to the tracks occurred between January 12, 1981, and March 7, 1982. The derailment of December 15, 1981, was the most severe of the four derailments; however, because of the Safety Board's concern that four similar derailments should occur within 15 months, and its continued concern about inspection and maintenance practices of the NYCTA, all four derailments were investigated.

On January 12, 1981, at 12:08 a.m., an eight-car NYCTA subway train was approaching Kings Highway Station, Brooklyn, at about 30 mph when a traction motor dropped to the tracks from under the third car. The truck came out from under the third car and derailed the fourth car. When the fourth car derailed, it turned crossways in the track and came to rest leaning at a 45° angle. At 12:19 a.m., the New York City Fire Department was called to assist in evacuating the passengers. The fire department arrived at 12:30 a.m., and the passengers were evacuated along the track to the Kings Highway Station. The fire department departed at 1:13 a.m. after all passengers, including three injured persons, had been evacuated. Damage was estimated to be $129,000.

1/ For more detailed information read Special Investigation Report—"Derailments of New York City Transit Authority Trains Involving Traction Motor Mount Failures" (NTSB-SIR-82-2).

On June 8, 1981, at 2:33 p.m., a 10-car NYCTA subway train was crossing from track No. 2 to track M as it approached the East 180th Street Station, Bronx, when a traction motor fell from the last car, No. 8724, and derailed the car in the switch of the crossover. The train continued for 30 feet after the car derailed until the brake pipe separated and the train brakes applied in emergency. There were no injuries and the passengers were discharged from the train through the first and second cars, which were in the station. Damage was estimated to be $120,000.

Car No. 8724 had been reported as defective the day before. At 8:19 p.m., on June 7, 1981, while the car was in service in a 10-car train and while in the Atlantic Avenue Station, the train motorman reported to the NYCTA command center that smoke was issuing from his train. The passengers onboard were discharged and the train was moved to the New Lots Yard (Livonia Inspection Barn), Brooklyn. When the train arrived at the New Lots Yard about 9 p.m., it was placed in the yard on track No. 57 because there was no room in the inspection barn. The assistant supervisor of the inspection barn noted in the trouble book the car number, "8724;" under code of component causing defect, "S/1 smoke issuing and noise;" under defect and action taken, "D/M [dead/motor] no indication of S.1.;" and in the border area the word "hold." He then contacted the yardmaster and notified him what cars were to be held. He also sent a list to the yardmaster, but before the list was delivered, the train was dispatched into service with car No. 8724. On the morning of June 8, 1981, shortly after midnight, a train trouble team was sent into the yard to check the train. They could not find it, and noted on the hold-order report sheet, "not in yard." No further search was made to locate the car and at 2:33 p.m., the traction motor fell from the car and the derailment occurred.

On December 15, 1981, a nine-car NYCTA subway train departed Lenox Terminal, 148th Street, Manhattan, on time. As the southbound train made its scheduled station stops, the motorman was operating the train from the operating cab of the first car and the conductor was alternating between the fourth and fifth cars, opening and closing doors at the station stops. The motorman and conductor did not take any exception to any of the cars or the manner in which the train was operating after leaving Lenox Terminal.

A regular scheduled station stop was made at the Times Square Station, and after discharging and receiving passengers, the conductor closed the doors in preparation for departure. There were approximately 100 passengers onboard the train. When the motorman received the indication to proceed, he released the brakes and applied power and the train began to move out of the station on track No. 2. Moments later, when the head end of the train was approximately 300 feet south of the station and moving about 25 mph, the motorman felt what he described as a "serious pulling along with a bumpy feeling" in his train, followed immediately by an emergency application of the train brakes and a power failure. The motorman could not contact the command center with the onboard radio, so he went to a phone on the tunnel wall and reported at 5:50 a.m that his train brakes had applied in emergency, and he requested supervisory assistance. Simultaneous with the motorman's report, the power system operator reported to the command center that the power was out on tracks Nos. 2 and 3. The motorman then went back to inspect his train to determine what had happened.

A traction motor had fallen from under the third car, derailed the rear truck, and derailed the fourth car. The fourth car was turned away from the track structure with the front of the car between tracks Nos. 1 and 2 and had struck the steel posts between the tracks. The rear of the fourth car was between track No. 2 and track M and had struck the curtain wall separating those tracks.

At 5:55 a.m., a motorman instructor (a supervisor) arrived at the train and found that the third and fourth cars had derailed and that there were passengers with injuries onboard the train. He reported the conditions to the command center and requested medical assistance. The command center notified New York City's Emergency Medical Service at 5:56 a.m. The last two cars and half of the third car were next to the Times Square Station platform, so the conductor at 5:58 a.m. discharged the passengers from the last five cars through these cars and onto the station platform. Because the fourth car was turned and the car end doors were not aligned with the other cars, passengers could not move through this car or from this car to the rear cars. The command center notified the fire department of the accident at 6:02 a.m. and requested assistance in evacuation of passengers and removal of the injured. At 6:18 a.m., the fire department arrived at the cars and began the evacuation. All injured persons and passengers were evacuated by 6:48 a.m. Of the 12 injured passengers taken to the hospital, 5 were admitted and 7 were treated and released. Damage was estimated to be $287,030.

On March 7, 1982, at 3:26 p.m., a 10-car NYCTA subway train had departed the Brooklyn Bridge Station on track No. 3 when a traction motor fell from the first car in the train and derailed the first and second cars in the train. A rescue train was dispatched from Grand Central Station at 3:58 p.m., and arrived alongside the derailed train at 4:05 p.m. The 96 passengers on the derailed train were evacuated to the rescue train between 4:10 p.m. and 4:14 p.m. Two passengers were treated for minor injuries and released. Damage was estimated to be $115,000.

The accident of December 15, 1981, occurred when the safety lugs were worn off the traction motor that was lying on the rotating lead axle of the trailing truck of the third car. When sufficient material had been worn off the safety lugs and motor housing, the traction motor was then loose enough to drop to the track. When the traction motor dropped to the track and reduced the under-car clearance, it was struck by other components of the truck, and the truck was then knocked out of the center casting, which is designed to keep the truck under the car and in its correct position. When the truck was no longer in the center casting, it came out from under the car; the car body, no longer being carried by the truck, then dropped to the track level. The loose truck was derailed after it struck and bounced over the loose traction motor. The derailed truck was then struck by the lead truck of the fourth car, which derailed when it was dislodged from its proper position. This derailment sequence also occurred in each of the other three derailments.

The car which initiated the accident that occurred on June 8, 1981, should not have been in operation. The car had been identified as being defective the previous day and sent by the command center to a yard for repairs. The smoke and noise associated with the car was probably caused by the traction motor lying against the axle of the car. The noise heard was most likely from the metal-on-metal contact with the rotating axle, and the smoke was most likely from the burning grease since the coupling, shaft, and gear box were damaged. Allowing a defective car to be returned to service without any repairs being performed indicates that the NYCTA's current control procedures to insure that repairs are made to defective cars are inadequate.

The NYCTA does not require that a defect tag be attached to a defective car or that a notice be placed in the motorman's cab of the train to indicate that the train has a defective car. The prescribed preservice inspection of a train probably would not detect a traction motor lying on the axle of a standing train because the traction motor area of the car is hidden by the truck frame and wheel from the view of a person walking beside the car. If there had been some obvious indication, such as a tag, that the car was defective, the crew would have been aware of the defect and probably would not have put the car into service.

When the assistant supervisor telephoned the yardmaster regarding the numbers of the cars to be held for repairs, the yardmaster apparently failed to record the information and failed to remember it when he sent the train out for service. Later, neither the train trouble team, the assistant supervisor at the inspection barn, nor the yardmaster made an attempt to locate the car and have it returned to the yard for repairs. The irresponsible handling of this car after it was found to be defective resulted in a derailment that could have been prevented.

The existing NYCTA inspection and maintenance procedures are not accomplishing the intended purpose of detecting and correcting defective car components. This is evident in the failure of NYCTA inspection and maintenance crews to detect the dropped traction motors that resulted from motor mount failures. Thus, the cars remained in service with the axles wearing away the safety nose lugs and the motor housings sufficiently to allow the motors to drop to the tracks, derailing the four trains.

The A inspection procedures instituted in December 1980 and fully implemented in November 1981 did not detect the failed motor mounts, nor did the B and C inspections which are intended to be the most comprehensive of all the inspection procedures. The preservice inspections, which had begun in July 1981, utilizing additional personnel, also did not accomplish the NYCTA's stated intent of "permitting detection and repair of a potential problem." The Safety Board concludes that the inspections are not sufficient in detail to detect incipient traction motor mount failures because the criteria are vague as to the scope and procedures for the inspection of specific components.

Two of the accidents occurred after the reorganization of the quality assurance personnel on October 17, 1981. Apparently, NYCTA superintendents still are not able to "closely monitor the quality of work done and take quick action should a potential maintenance or inspection problem arise." The NYCTA management must reexamine its methods of achieving the goal of detecting defects before they result in problems and accidents. One step could be revising the C inspection requirements to include a closer examination of all traction motor mount welds and the removal, examination, and reapplication of torque to the motor mount bolts.

It appears that the decision to replace the original mount bolts with the higher strength bolts was made without a system analysis of the mounts, bolts, or alignment being made. This decision may have only transferred the failure point to the lower mount bolts. Moreover, it is probable that in all of the derailments, both the upper and lower mount bolts were improperly torqued. Since no torque wrench could be found in the shop during the investigation of the December 15, 1981, derailment, and it is necessary for the NYCTA to obtain torque wrenches to carry out its recently announced action plan, it is likely that when applying the bolts the maintenance personnel have been using standard wrenches which would lead to improper torquing of the bolts and resulting failure. The condition of the mount bolting surface, with respect to inadequate perpendicularity and parallelism, was a contributing factor. Any irregularities in the motor mount bolting surfaces could have resulted in low or false torque reading and/or bending of the bolts during the tightening sequence. Both of these conditions could increase the probability of failure; however, with the proper analysis these problems might have been identified and corrected before these accidents occurred.

In the derailment of March 7, 1982, the use of a rescue train was successful. However, the decision to use a rescue train was not made until 22 minutes after the accident. It then took another 6 minutes to locate a train and to discharge passengers so that it could be used as a rescue train. Then, 16 minutes more were used to prepare the

train and to travel to the position adjacent to the derailed train. The NYCTA should review its procedures for using rescue trains and make necessary changes to reduce the elapsed time from accident to evacuation.

As a result of its complete investigation of these four derailments, the National Transportation Safety Board recommends that the New York City Transit Authority:

> Following its planned wear tests of the safety lugs, review the maintenance requirements of the "B" and "C" inspections to determine if the interval between inspections will permit a motor to drop onto the axle and wear sufficient material from the motor safety lugs and motor frame to allow the traction motor to fall to the tracks. Change the inspection interval to prevent this occurring if required. (Class II, Priority Action) (R-82-49)
>
> Modify the maintenance and inspection practices in all New York City Transit Authority shops to provide improved quality control of work accomplished during car maintenance. (Class II, Priority Action) (R-82-50)
>
> Establish positive safeguards to prevent the return to service of cars with known defects until they are repaired. (Class II, Priority Action) (R-82-51)
>
> At each "C" inspection require the removal and examination of the traction motor mount bolts for cracks, bending, thread distress, or other discrepancies; discard and replace all defective parts. (Class II, Priority Action) (R-82-52)
>
> Institute a running noise test on all subway cars when entering a yard for layover to determine if metal-on-metal rubbing or scraping is evident, and correct all discrepancies. (Class II, Priority Action) (R-82-53)
>
> Review the current procedures for using rescue trains, and make necessary changes to reduce the elapsed time from accident to evacuation. (Class II, Priority Action) (R-82-54)

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

By: Jim Burnett
Chairman