

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: November 15, 1985

Forwarded to:
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Chairman
New York State Public Transportation
Safety Board
New York State Department of
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SAFETY RECOMMENDATION(S)
R-85-113 through -116

Fire safety is critical in a rail rapid transit system because fire and smoke in the physical and operating environment of such a system can be extremely hazardous and difficult to control, particularly in the confined space of an underground subway tunnel. Consequently, the National Transportation Safety Board has been concerned with these issues since its inception in 1967.

In 1980 the Safety Board undertook a special investigation of fire problems on the New York City Transit Authority (NYCTA). ^{1/} The Board examined eight car equipment fires spanning a 13-month period that resulted in 53 injuries and property damage to subway cars in excess of \$500,000. As a result of its investigation, the Board issued Safety Recommendations R-81-103 through -115 on December 30, 1981, to the NYCTA concerning training of personnel, inspection and maintenance of car equipment, emergency equipment, testing of emergency equipment, emergency procedures, and the NYCTA management information system.

Fires have continued to be a major problem in the NYCTA subway system, and the Safety Board has continued to monitor the fire incidents since its special investigation in 1980-1981. For example, in the first 11 months of 1984, there were 4,958 confirmed fires, of which 2,449 involved track and surrounding structures and 1,957 involved car equipment. The New York Fire Department (NYFD) responded to 946 of these fires.

Because of its continuing concern about the large number of fires occurring on the NYCTA subway system, the Safety Board undertook a special investigation on December 10, 1984, to examine the issue of fire safety as it relates to track and structures, electrical equipment, car equipment, train operations, emergency response activities, and data collection. As part of this special investigation, the Board investigated six accidents involving fires that occurred before the special investigation and one that occurred during the special investigation. The special investigation identified the following fire safety issues: fire incident data collection, trash in tunnels,

^{1/} Special Investigation Report--"Eight Subway Fires on New York City Transit Authority with Evacuation of Passengers" (NTSB-SIR-81-5).

emergency response and equipment, car equipment fires, training, and safety oversight. ^{2/} As a result of this investigation, the Safety Board issue interim Safety Recommendations R-85-25 through -34 to the NYCTA on March 28, 1985. The NYCTA responded to the recommendations on May 16, 1985.

During this special investigation, the Safety Board reviewed fire incident data of subway fires on the NYCTA from January through November 1984 and documented the scope of these fires for two major areas of concern--track and structures and car equipment.

The Safety Board special investigation in 1980-1981 identified the inability of NYCTA management to obtain useful data from its management information system about failures and incidents that might affect the safety of passengers. Following that special investigation, the Board issued Safety Recommendation R-81-115 on December 30, 1981, recommending that the NYCTA:

Revise the NYCTA automated management information system to provide sufficient detailed information to permit analysis of the incidence and causes of failures or malfunctions of equipment which may affect the safety of passengers.

The Board classified the recommendation as "Closed--Acceptable Action" when the NYCTA advised that it had installed a new system. However, the current special investigation revealed that the management and distribution of fire safety information for the NYCTA now rests with three different departments--track and structures, car equipment, and system safety. The Track and Structures Department prepares a number of data sheets on the total confirmed NYCTA fires by month and general type, i.e., car equipment fires, track and structures fires, and station fires. The Car Equipment Department also provides data on car-related fires. The System Safety Department reviews the data from the two other departments and attempts to resolve discrepancies between the two car data bases. The Board's investigation found that the figures reported by the departments regarding car equipment fires did not coincide and, therefore, could not be relied on as an accurate representation of the NYCTA fire problem.

The NYCTA reported that there were 2,449 confirmed track and structures fires from January through November 1984; 1,487 of the fires occurred in the first 7 months of 1984. In comparison, there were 1,773 confirmed track and structures fires in the first 7 months of 1985, according to the NYCTA. However, the NYCTA believes that the increase is due to better recordkeeping since the Safety Board's special investigation began in December 1984. The NYCTA's fire statistics for the months were reported to NYCTA senior management by the chief engineer of the Track and Structures Department. The NYCTA categorized track and structures fires as trash fires, which accounted on a monthly average for 35 to 40 percent of the fires; fires of unknown origin, which accounted for approximately 35 percent of the fires; burning/scorched ties or burning/scorched slatting, which accounted for from 5 to 10 percent of the fires; and bad order train sparks, cables, steel dust, lubrication, third-rail insulation material, and sparks, which accounted for the remaining fires.

^{2/} For more detailed information, read Special Investigation Report--"New York City Transit Authority Subway System Fires" (NTSB/SIR-85/04).

The track and structures fire data are incomplete, however. Although the confirmed fires were reported to the Track and Structures Department control office, there was no consistent system that provided followup on a description of the damage. Moreover, although 35 percent of the fires were of unknown origin and reported to senior management as confirmed fires, Safety Board investigators could not determine why some of the fires were categorized as a confirmed fire for track and structures. The reports reviewed by the Board indicated that refuse fires in almost all cases resulted in no physical damage to track or structures. The track and structures personnel were confident that the data reflected all serious track and structures fire incidents.

The Safety Board believes that the NYCTA should effect improvements in the track and structures fire data reporting system to differentiate between fire reports and actual fires. The NYCTA should develop a more precise definition of a confirmed fire and should categorize its track and structures fire reports to reflect accurately the hazards posed to the traveling public. The current system on which management is relying is not providing adequate assistance to NYCTA senior management in the identification of serious track and structures fire hazards.

The NYCTA has not fashioned a link between the reported track and structures fire data and its system safety assessment efforts. The NYCTA should develop a system that periodically analyzes the track and structures fire data. This would necessitate improvements in the reporting system, documentation of each incident, and cause determination. The track and structures fire data should be assessed by the NYCTA System Safety Department, and this department should recommend courses of action to senior management for safety improvement. The track and structures fire data as currently reported are not a reliable indicator of track and structures fire safety conditions on the NYCTA; therefore, the data cannot be used to do such analyses.

Car equipment fires pose one of the greatest hazards within the close confines of a subway system. NYCTA car equipment fire data were more accurate than the track and structures fire data. The car equipment fire data did not reflect an "unknown" fire category as was found in the track and structures data. The NYCTA reported that there were 1,957 confirmed car equipment fires from January through November 1984; 1,293 of the fires occurred in the first 7 months of 1984. In comparison, there were 1,899 confirmed car equipment fires in the first 7 months of 1985, according to the NYCTA. Like the increase in track and structures fires, the NYCTA believes that the increase in car equipment fires is due to better recordkeeping. In addition, the NYCTA stated that the severity of the fires in 1985 has been less and that no cars have been destroyed or persons evacuated because of motor control group fires. Three equipment systems stand out as posing potential risks for fire--the traction motors, which accounted for approximately 50 percent of the confirmed car equipment fires; the trucks, which accounted for 10 percent of the fires; and the motor control groups, which accounted for about 10 percent of the fires; about 30 percent were from a variety of other electrically related sources.

Two NYCTA data systems document and report motor control group and other equipment fires. One reporting system is prepared from car equipment fire report cards and entered into the car equipment information system. This report is submitted to NYCTA senior management for inclusion in the NYCTA system fire statistics. Another report of car fires is prepared by the management systems group within the Car Equipment Department. This report is provided only to the System Safety Department. From January through November 1984, there were from 202 to 283 motor control group fires, a difference of 29 percent, depending on which data system was queried.

A review by Safety Board investigators of the motor control group fire data for the first 11 months of 1984 indicated that the upward trend in motor control group fires continued and that the majority of motor control group fires still were occurring on cars operating on the IRT division, and that motor control groups with controllers manufactured by the Westinghouse Electric Company still had more fire incidents than motor control groups with controllers manufactured by the General Electric Company.

The Safety Board believes that the difference in the two data bases for reporting motor control group fires should be resolved. The car equipment fire data should be reported directly to the System Safety Department, which should undertake periodic safety assessments of these data. At present, the System Safety Department undertakes an assessment only at the specific direction of NYCTA senior management. The System Safety Department also should forward recommendations periodically to NYCTA management to reduce the risks to the traveling public caused by motor control group fires. The System Safety Department also should institute quality control procedures to verify the accuracy of the data. Data analysis and recommendations for safety improvements to minimize car equipment fires should be undertaken as the data are collected and reviewed each month by the System Safety Department. The System Safety Department should audit annually all of the reporting systems and the data entries to ensure that proper data are reported from each of the systems.

NYFD personnel expressed concern about communications difficulties which occur when the NYFD is required to respond within the subway system. Specifically, the NYFD radios which operate on "line of sight" are incapable of transmitting or receiving effectively in the subsurface environment of the subway. NYFD personnel reported that effective radio communications can be implemented only by placing firefighters, equipped with portable radios, short distances apart and transmitting information in a relay manner. This method requires the use of a significant number of firefighter personnel who could be used in attacking a fire and/or assisting passengers to evacuate the danger area. Also, this relay method of communicating increases the time necessary to complete a transmission and significantly increases the potential for error. In the event of a major fire, two of the most critical elements in successfully attacking a fire are starting fire suppression as quickly as possible and having adequate manpower to make such an attack effective. A radio relay system such as the one that has to be used by the NYFD detracts from those vital elements and thus directly interferes with the success of the firefighting operations.

The NYFD has requested that the NYCTA install a "hardwire" communications system throughout the subway system which would have jacks at frequent points where firefighters could plug in telephone-type transceivers. This system would give NYFD personnel the capability of direct communications between units, thereby freeing manpower currently used for relaying communications. It also would reduce the potential for communication errors and delays during emergencies. The Safety Board believes that such a system should be installed to enhance the capability of the NYFD to fight fires and evacuate passengers.

A major Safety Board concern is the serious nature of fires that occur in the motor control groups and in the braking grids of passenger rail cars on the NYCTA system. The Board discussed this problem in its special investigation report in 1981. However, the number of motor control group fires on NYCTA cars has continued at a high level. Motor control group fires have caused severe damage to cars and have generated smoke that endangers passengers and NYCTA and NYFD employees. In many incidents, fires have burned through the car floor into the passenger area.

The Safety Board's investigators observed the operators' handling of 14 selected NYCTA trains to determine if train operations had a relationship to the motor control group fires. The trains observed were selected on the basis of equipment fires that had occurred during the month of November 1984. Investigators observed the ammeter readings in one car on each train to develop parameters for amperage used in the propulsion and the dynamic braking of the train. Observations were made from 5 a.m. to 10 p.m. to include both the morning and evening rush hours. The observations revealed no sustained high readings. The lack of high ammeter readings indicated that trains were not operated for sustained periods in the first power position. There was no pattern of operation, as indicated by the ammeter readings, that would have a relationship to the high incidence of onboard car fires.

The operation of trains with "dead" cars is an issue that also needs to be addressed by the NYCTA. Dead cars should not be allowed to remain in a train after reaching the end-of-line terminal; dead cars can overload the working motor control groups and cause a fire, as was the case on December 13, 1984, at the 34th Street Station. The four-car northbound NYCTA A train involved in the accident had departed the World Trade Center terminal at 1:51 p.m. After departure the train operator reported to the NYCTA Command Center that he had a slow train. The train operator attempted to reset the motors by pressing the reset button twice, but the train did not respond and continued at the slow speed. A road car inspector met the train at the West 4th Street Station and boarded the train.

The inspector began to check the motoring of each car and found by checking the ammeter reading on the first car that it was taking power. However, the second car had a zero ammeter reading, and when he attempted to reset the motors, the car took power briefly and then shut down. The last two cars also had zero ammeter readings; the motors would not reset even briefly. The NYCTA has a practice that a train is not to be dispatched from a terminal unless two-thirds of the cars in the train take power. The 800 passengers onboard were discharged at the station, which the inspector reported to the NYCTA Command Center. The inspector requested that the train be moved to 59th street and placed on the storage track. The command center authorized the move, and the train proceeded. The train, while en route to 59th Street, entered the 34th Street Station, where the inspector heard an explosion and saw an electrical arc, fire, and smoke coming from under the lead car in the train. He instructed the operator to stop the train and report the fire to the command center, which then notified the NYFD.

The decision to move the train to 59th Street was questionable. The inspector knew that only one car of the four-car train was powered. Even though the train was empty, it was predictable that with only one powered car in the train that the electrical circuits of the car would be overloaded and quite possibly cause a fire. The attempt to move the train to 59th Street under power led to a fire and to other trains being diverted or held in both directions until the fire was extinguished and the smoke had cleared. The traction motors and motor control group were damaged by the fire. The estimated damage was \$100,000. The NYCTA should reconsider its approach to the problem of resetting motors in service.

Because the New York State Public Transportation Safety Board (NYSPTSB) now has the responsibility for safety oversight of the NYCTA, the Safety Board issued Safety Recommendation R-85-35 on March 28, 1985, to the NYSPTSB recommending that the NYSPTSB, in consultation with the NYCTA, establish an action plan for the

implementation of Safety Recommendations R-85-25 through -34 made to the NYCTA on March 28, 1985. On June 3, 1985, the NYSPTSB responded that it was contacting the NYCTA to establish an action plan for implementation of the recommendations. As the Safety Board stated in its August 21, 1985, letter to the NYCTA, the Board's preliminary review of the NYCTA's May 16, 1985, response to the recommendations indicated that the NYCTA's actions were not sufficiently comprehensive to satisfy the intent of the recommendations and that the action plan for implementation addressed in Safety Recommendation R-85-35 to the NYSPTSB is needed. The Safety Board believes that rail rapid transit safety is primarily a local responsibility that is best handled by the State and local decisionmakers who are accountable for the safe, effective, and efficient operation of the rail rapid transit systems. The Safety Board is pleased to see the emergence of the NYSPTSB as a State agency charged with the responsibility for overseeing the safety of local public transportation.

As a result of its complete special investigation, the National Transportation Safety Board recommends that the New York State Public Transportation Safety Board:

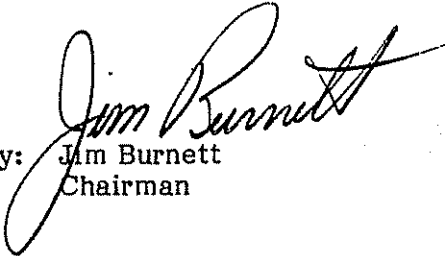
Require the New York City Transit Authority to establish integrated reporting systems on track and structures fires and car equipment fires to provide its senior management accurate and complete data for system safety assessments and corrective action plans. (Class II, Priority Action) (R-85-113)

Require the New York City Transit Authority to initiate an internal review process to ensure that all track and structures fires and all repairs and maintenance of car equipment are being reported for entry into its data collection systems. (Class II, Priority Action) (R-85-114)

Require the New York City Transit Authority to install a hardwire communications system throughout its subway tunnels for use by the New York Fire Department and other emergency personnel. (Class II, Priority Action) (R-85-115)

Require the New York City Transit Authority to establish procedures that prohibit the extended operation of subway trains that have insufficiently powered motor control groups to avoid overloading the working motor control groups. (Class II, Priority Action) (R-85-116)

BURNETT, Chairman, GOLDMAN, Vice Chairman, and BURSLEY, Member, concurred in these recommendations.

By: 
Jim Burnett
Chairman