

NATIONAL TRANSPORTATION SAFETY BOARD
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Forwarded to:

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SAFETY RECOMMENDATION(S)

R-81-103 through -115

The National Transportation Safety Board recently completed the final report of a special investigation of eight subway train fires on the New York City Transit Authority (NYCTA) with evacuation of passengers (NTSB-SIR-81-5); a copy is enclosed for your information.

This investigation examined eight fires which occurred during a 13-month period beginning in June 1980. Four of the fires -- June 25, December 10, and December 11, 1980, and April 29, 1981 -- involved car motor control groups. The other four fires -- April 21, May 6, May 15, and July 29, 1981 -- involved car current collectors. Investigation of these fires revealed serious problems in NYCTA's car maintenance program and emergency preparedness activities.

Investigation of the motor control group fires indicated that in each case the car involved had received a major maintenance inspection within 30 days prior to the fire. In one case, the car had remained in passenger service although it had been ordered off the road for correction of motor control group problems 7 days before the fire occurred. In another case, the fire occurred the day after the car was in the shop for correction of motor control group problems which were certified as having been repaired when, in fact, they had not been. The investigation revealed poor performance of inspections and maintenance, inadequate maintenance supervision, surveillance, and quality assurance, and insufficient training for car maintenance and quality assurance personnel.

Although NYCTA has a management information system which records equipment failures and car maintenance data, this system was unable to provide meaningful data concerning the incidence of major motor control group fires. However, a manual search of IRT Division maintenance shop records by Safety Board investigators indicated that NYCTA's change from a 7,500-mile car maintenance interval to a 10,000-mile interval in October 1978 contributed to an increasing incidence of major motor control group fires. In the four motor control group fires investigated, the Safety Board also found that rupture of the train's main airbrake air line contributed to the severity of the fire. In fires involving an air-activated motor control group, the severity of the fire was further increased by the rupture of the air lines to the motor control group cam. The rupture of either or both the train's main airbrake air line and the air lines to the motor control group cam provided an unrestricted flow of air to the fire which created a bellows effect.

The four current collector fires all involved current collectors manufactured by the firm Profabco. The investigation revealed that Profabco had no experience in the design and manufacture of current collectors prior to being selected to supply replacement current collectors for NYCTA's R-46 cars. This untried equipment was installed and introduced into passenger service without prior testing which could have revealed potential fire safety problems.

The investigation also examined the survival aspects of the eight fires and identified problems in NYCTA's emergency preparedness. Of particular concern were a lack of emergency training -- particularly "hands-on" training -- for motormen and conductors, the absence of fire extinguishers on passenger trains, delays in reporting a fire to the fire department, insufficient emergency information for passengers, and inadequate procedures to prevent the unnecessary exposure of passenger trains to an emergency involving fire and smoke.

NYCTA's establishment of a firefighting training center in April 1981 to provide hands-on emergency training to employees was a positive action. However, during the center's first 3 1/2 months of operation, the first 320 NYCTA employees trained were departmental supervisors and not motormen or conductors, who are the only employees immediately at the scene of a fire or other emergency involving a subway train. As of September 21, 1981, conductors and motormen had not yet been scheduled for training.

Conductors and motormen should receive high priority for this type of emergency training because they are the first line of defense for passengers against a fire or other life-threatening emergency involving a subway train. They also are immediately responsible for carrying out NYCTA emergency procedures including reporting the emergency to the Command Center, moving the train to safety if possible, fighting fires, and determining when imminent danger to passengers makes their immediate evacuation necessary. Yet, NYCTA motormen and conductors have never been given training or guidelines for evaluating emergencies, determining what constitutes "imminent danger," using firefighting equipment, or evacuating passengers. More than any other employees, subway train motormen and conductors need to know how to effectively carry out these responsibilities.

Compounding the problem of lack of emergency training is the fact that NYCTA subway trains do not carry fire extinguishers. According to testimony of the International Association of Fire Chiefs at the Board's public hearing on July 28, 1980, a fire can rapidly escalate to an intensity of 600° to 800° within 6 minutes. Yet, in the critical early moments when a fire is first detected, before a flashover occurs, the only available firefighting equipment is outside the train up to 600 feet away on the tunnel wall. In the time it takes to leave the train, identify the problem, search for a fire extinguisher, and return, it may be too late to be effective. The problem of security for on-board fire extinguishers is certainly a serious one in view of NYCTA's past experience with vandalism and theft. However, there are at least two positions in the train which provide a reasonable degree of security--the locked compartments manned by the motorman and conductor. Provision of fire extinguishers at these two positions when a subway train is made up or just prior to dispatch would provide the needed capability to control a fire before a major flashover endangers the lives of passengers.

If a flashover or major fire does occur, effective fire control will probably depend upon the prompt response of the fire department. However, in four of the eight subway train fires investigated, the fire department response was delayed because NYCTA did not immediately notify the fire department when the fire was detected. These delays are

particularly serious because the lack of adequate firefighting water supplies in most of NYCTA's subway tunnels often makes it necessary for firefighters to stretch hose lines from the street or from a subway station to reach a fire emergency in a tunnel, further delaying firefighting and rescue operations.

Although NYCTA emergency procedures provide for immediate notification of the fire department, they discourage immediate notification through their emphasis on immediate notification of NYCTA operating departments and dispatch of supervisory personnel to investigate an emergency to evaluate the situation and determine whether the fire can be extinguished with available personnel and equipment. At the Safety Board's public hearing, fire officials questioned the competence of rail rapid transit employees to judge the seriousness of a fire and testified that fire services should be notified immediately any time a fire is suspected.

Considering the potential for fire on a subway system, the lack of trained personnel and firefighting equipment on board NYCTA subway trains and the fact that help may not be requested promptly, it is particularly important that passengers know what to do in the event of an emergency. However, NYCTA does not provide passengers information on when and how to escape from a burning subway train, how to find emergency alarm boxes, ladders, and fire extinguishers, or how to safely escape from a tunnel when visibility may be almost totally obscured by darkness and dense smoke. Unless passengers are provided adequate emergency information, no amount of reassuring words or a decal informing them that locked doors will be automatically opened when necessary is likely to prevent a panic on a burning train. Even if passengers were reassured and calmed by such information, they could be trapped if the conductor and motorman are disabled, unable to operate the doors automatically, or unable to pass through a rush hour crushload of passengers to open the doors manually. In its investigation of a subway train fire in a Southeastern Pennsylvania Transportation Authority station on September 6, 1979, the Safety Board found that the motorman attempted to reach the side doors of a car to unlock them; however, as soon as the motorman opened the door of his operating compartment, he was pushed back through the compartment's window and safety bar and onto the station platform by passengers who panicked when they found they were locked in the burning subway car. Instructions to passengers to wait for the doors to open could result in a dangerous situation at crushload conditions or if the passengers jam up by the end doors, preventing the inward-opening doors from operating.

The exposure of additional passenger trains to a fire or smoke environment during an emergency, as revealed in at least one of the accidents investigated, can substantially increase the risk of passenger injuries and fatalities in such emergencies. Although NYCTA emergency procedures provide that passenger trains "should" not be operated in a tunnel when fire and smoke are present, there is no absolute prohibition on such operation. Another section of the emergency procedures appears to condone such operation by specifying that subway train air conditioning should be turned off momentarily when passing through smoke in a tunnel. The operation of subway trains with passengers aboard during BART's Transbay Tube fire was identified by the Safety Board, fire officials, the California Public Utilities Commission, and other organizations as unnecessarily exposing passengers to serious safety hazards. The occurrence of the same problem during NYCTA emergencies more than 2 years later and the apparent inconsistency in NYCTA emergency procedures which appear to permit such hazardous operation require immediate attention. Procedures for emergencies involving fire and smoke in subway tunnels should explicitly prohibit any operation of a subway train carrying revenue passengers into an area where such an emergency exists.

As a result of this special investigation, the National Transportation Safety Board recommends that the New York City Transit Authority:

Establish a systemwide program of initial and recurrent training for car repairmen, car inspectors, maintenance foremen, and quality assurance personnel. (Class II, Priority Action) (R-81-103)

Reduce the current 10,000-mile interval between major subway car inspections to provide for more frequent scheduled car maintenance. (Class II, Priority Action) (R-81-104)

Increase maintenance surveillance and enhance quality assurance of subway car inspections. (Class II, Priority Action) (R-81-105)

In conducting "hands on" training of employees for responding to emergencies, assign top priority to the training of motormen and conductors. (Class I, Urgent Action) (R-81-106)

Provide training to motormen and conductors to enable them to evaluate emergencies, communicate vital information immediately to appropriate authorities, and ascertain when conditions require the immediate evacuation of passengers. (Class II, Priority Action) (R-81-107)

Provide at conspicuous places in all NYCTA subway cars instructions for passengers on what to do in the event of an emergency, including how to escape from burning cars, the location of emergency telephones, ladders, and fire extinguishers, and how to exit safely from a tunnel under fire and/or smoke conditions. (Class II, Priority Action) (R-81-108)

Provide at least two fire extinguishers, one at each motorman and conductor position, in all subway trains. (Class I, Urgent Action) (R-81-109)

Prohibit the introduction of untried or untested equipment into passenger service. (Class I, Urgent Action) (R-81-110)

Clarify to Command Center personnel the importance of notifying the fire department immediately when a fire is detected or suspected. (Class I, Urgent Action) (R-81-111)

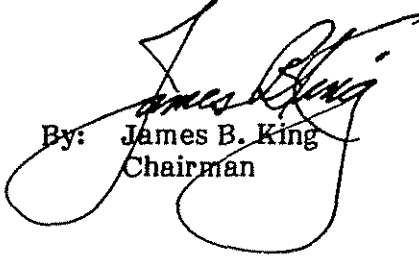
Revise NYCTA emergency procedures to prevent the dispatch or operation of a train with revenue passengers aboard into an area where there is an emergency involving fire and smoke. (Class I, Urgent Action) (R-81-112)

Relocate the main airbrake line of subway cars away from the motor control group to reduce the possibility of rupture in the event of a motor control group fire. (Class II, Priority Action) (R-81-113)

In subway cars having an air-activated motor control group cam, modify the air lines to provide a means of preventing the unrestricted flow of air in the event they are ruptured. (Class II, Priority Action) (R-81-114)

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. (Class II, Priority Action) (R-81-115)

KING, Chairman, DRIVER, Vice Chairman, GOLDMAN, and BURSLEY, Members, concurred in these recommendations. McADAMS, Member, did not participate.


By: James B. King
Chairman