



National Transportation Safety Board

Washington, D.C. 20594
Safety Recommendation

SP-20
Log R-550A

Date: May 12, 1986
In reply refer to: R-86-4 through -8

Mr. David Gunn
President
New York City Transit Authority
370 Jay Street
Brooklyn, New York 11201

At 10:11 a.m. on May 15, 1985, a New York City Transit Authority (NYCTA) southbound eight-car subway train derailed moments after departing the DeKalb Avenue Station, Brooklyn, New York. The train had made a station stop, proceeded out of the station, and then entered a track crossover section. The first car entered the crossover, but the second car derailed at the left-hand switch, continued in a derailed condition for about 120 feet, and struck a concrete-and-steel track separation wall. The right side of the derailed car struck the wall at the unoccupied conductor's cab and severed 20 feet of the car side. The third rail was damaged for approximately 40 feet, and the third-rail wooden cover board was forced up under the derailed car. Dense smoke resulted when arcing of the damaged third rail caused a fire in the cover board and the wiring insulation on the car.

An attempt was made to restore rail service on the tracks not involved in the accident 1 hour 7 minutes after the derailment by restoring the third-rail power to the northbound tracks. However, a series of explosions occurred under the derailed car when the third rail at the accident site became energized. Forty-nine passengers and 7 employees were treated for smoke inhalation by the emergency services, and 16 passengers were treated at local hospitals. Damage was estimated to be \$400,000. ^{1/}

The investigation revealed that the stock rail in the replaced rail sections involving the switch of the crossover had not been seated properly when it was replaced in the old tie plates. Also, the west stock rail braces were loose, two west stock rail braces were missing, and two spikes were missing on the gauge side of the rail. Each of these conditions allowed the loose stock rail to move as several trains traveled through the crossover and on the straight normal route so that the stock rail took a set and was sitting on top of the tie plate risers and would not reseat in the tie plates because of the set. Because of the position of the stock rail, a gap was created between the switch point and the stock rail which exposed the switch point so that the wheel of the second car in the accident train struck the switch point and derailed. If either the capital improvement division foreman or the track maintenance foreman had waited to observe the first train over the replaced track, the loose condition of the stock rail would have been noted and corrections could have been made, thus avoiding the accident.

^{1/} For more detailed information, read Railroad Accident Report--"Derailment of New York City Transit Authority Subway Train, DeKalb Avenue Station, Brooklyn, New York, May 15, 1985" (NTSB/RAR-86/01).

The Safety Board believes that it is unreasonable for the NYCTA management to leave the determination to observe the first train over an area of track where work has been performed on a case-by-case basis to the discretion of those having performed the work. The required observation of the first train following the work done by the capital improvement forces at the switch should not have been considered discretionary by the chief engineer, but should have been absolutely mandatory as prescribed by the NYCTA rule. The Safety Board believes that a strictly enforced requirement as prescribed by the NYCTA rule for observing the first train over renewed track work is just as necessary as competent inspection of the track work. Competent inspections obviously were not performed in this instance. Had competent inspections been performed, the inadequately performed track work would have been discovered.

In its investigation of a train derailment on March 17, 1984, in the Joralemon Street Tunnel, ^{2/} the Safety Board learned that no one was present at the work site when the first train passed over the track following the work, even though the NYCTA employee responsible to watch the train over the track work area was in the station 1,000 feet away from the accident site. The Safety Board believes that the requirement for observing trains pass over track where work recently has been performed should be strictly enforced so that NYCTA employees responsible for signal and track work will perform such observations when required.

During its investigation of the Joralemon Street Tunnel derailment, the Safety Board issued Safety Recommendation R-84-19 on April 9, 1984, which recommended that the NYCTA:

Require that inspectors responsible for insuring safe conditions of track know the necessary standards for maintaining those conditions.

On December 4, 1984, the NYCTA responded that its Rapid Transit Training Division has developed training courses for improving the expertise of track inspectors and track construction engineers and provides an intensive training program for "new" track inspectors. Based on those comments, the Safety Board on April 23, 1985, placed Safety Recommendation R-84-19 in an "Open--Acceptable Action" status. However, up until the time of the accident, neither the line supervisor nor the deputy superintendent had received this training. The May 15, 1985, accident demonstrated that there remain serious shortcomings, such as the lack of a competent track inspection by the line supervisor and the deputy superintendent and the lack of adequate track inspections conducted on the NYCTA. Therefore, the Safety Board reiterates Safety Recommendation R-84-19 and requests that the NYCTA give the recommendation its immediate attention.

The Safety Board's investigation of the Joralemon Street Tunnel accident also revealed a lack of coordination between divisions within the NYCTA Track and Structures Department. The Safety Board's report of the investigation stated:

The coordination between the Engineering and Construction Department, which was providing the contract inspector, and the Track and Structures Department, which was responsible for track safety, was practically nonexistent in this case.

^{2/} Railroad Accident Report--"Derailment of New York City Transit Authority Subway Train in the Joralemon Street Tunnel, New York, New York, March 17, 1984" (NTSB/RAR-85/07).

Following the Joralemon Street Tunnel accident, the NYCTA attempted to correct the lack of coordination by consolidating the Engineering and Construction Department and the Track and Structures Department. However, at the time of the May 15, 1985, derailment, NYCTA's consolidation of both departments under one head had not yet accomplished the desired result. In this accident, the crew that performed the track work did not find sufficient stock rail braces at the work site; consequently, three braces were not installed on the rail involved in the accident. There was a breakdown in departmental followup when the track maintenance forces did not insure that the necessary material was in place. When the capital improvement crew arrived at the job site, it had no means to transport material to the site. There was an equal breakdown in departmental procedures when the line supervisor left the job site, indicating that it was ready for train movements, when, in fact, material was missing from the track. The lack of coordination among the NYCTA departments involved in the track work probably contributed to the line supervisor not informing anyone about the missing material and the failure of the two deputy superintendents to have a thorough understanding as to who was performing each part of the assignment. The Safety Board believes that the lack of coordination that was demonstrated in the Joralemon Street Tunnel accident had not been sufficiently resolved by NYCTA management at the time of the May 15, 1985, accident.

It is absolutely necessary to gauge and align rail when it is being installed. Failure to gauge rail when it is being installed assumes that the rail was properly installed when previously laid and maintained at a proper gauge until replaced. To operate trains on track where such assumptions are made exposes passengers to a needless risk. When installing rail in old tie plates, it is necessary to compensate for wear on the head of the rail because the gauge widens as wear increases. Also, tie plates may have moved because of the dynamic action of train movement on the track, and tie plate cutting of the wooden ties often results in canting of the rail. To place new rail in old tie plates without realigning the track can result in improper gauge of the track. The action of the line supervisor of the capital improvement division in leaving the work site without gauging and aligning the track and reporting to the track foreman of the maintenance division that the work was completed demonstrates that the line supervisor was inadequately trained and supervised. Although the Chief Engineer Track and Structures identified the problem of seating new rail in existing tie plates, it cannot be assumed that a line supervisor would gain this knowledge from working on track. Neither the track training manuals nor the track maintenance standards manual provides any instructions that extra precautions be taken when laying new rail in existing tie plates, or the procedure to use to determine if the new rail is properly seated. The NYCTA should expedite the development and dissemination of the new track standards manual and immediately instruct all employees responsible for track maintenance in utilizing those standards.

Failure to properly tighten and lock the stock rail braces and failure to properly gauge the track allowed the stock rail to cant, allowed the gauge to widen and move away from the switch point, and permitted the wheel to strike the switch point. Not only did the line supervisor fail to properly supervise his track personnel and conduct a thorough inspection, but his supervisor, the deputy superintendent, failed to detect the loose stock rail braces during his inspection of the track site. Both the actions of the line supervisor and the deputy superintendent indicate that the management oversight of the employees and supervisors is inadequate.

The No. 7 wheel, the lead wheel on the right side of the second car, had a flat surface on the flange. Thus, it had a greater opportunity to strike and go over the switch point than if it had been more rounded. The amount of wear on the wheel could not have occurred during the derailment but probably occurred over a period of time before the derailment. The brake rigging must have been binding and holding the brake shoe against the wheel as indicated by the brake material being worn off and the steel backing plate contacting the wheel. This steel backing plate in contact with the wheel caused the wearing away of the flange of the wheel and created the flat surface on the flange. This flat surface struck the exposed switch point and went up and over the switch point and derailed. Had the wheel had a more rounded surface, as did the wheels of the first car, it is possible that it would have pushed the switch point against the stock rail and followed the first car into the crossover. However, because of the loose condition of the stock rail, a derailment eventually would have occurred even if the wheel of a car showed no wear.

There are no industry standards to determine the minimum height or the minimum radius to keep wheels in service. This wear problem is limited to those companies that use brake shoes that contact the flange of the wheel. Most rail systems use brake shoes that contact the wheel tread only. Therefore, the NYCTA should establish wear limits for the removal of wheels when the top of the flange becomes worn.

As a result of the Safety Board's special investigation of subway fires on the NYCTA in December 1984, the Safety Board recommended that the NYCTA:

Immediately establish a safe procedure for the New York Fire Department to use in an emergency to remove the third-rail power on the subway system, and disseminate the procedure to all affected parties. (Class II, Priority Action) (R-85-30)

The NYCTA responded on May 16, 1985, that such a procedure exists and that it is reinforced as part of on-going interagency training. The Board pointed out in its November 8, 1985, response that, as the special investigation revealed, the NYFD was unaware that in those instances where fire department personnel removed third-rail power at the scene of an incident, third-rail power would be restored by the NYCTA command center within 4 minutes unless further communication was received from the area. Consequently, Safety Recommendation R-85-30 is being held in an "Open--Unacceptable Action" status pending NYCTA's resolution of this problem.

This accident revealed other problems in third-rail shutdown, such as an inability for power maintainers to easily identify the circuit schematics on substation equipment panels and, when an auxiliary breaker is in use at a substation, the activation of an emergency alarm from a track receiving third-rail power through the auxiliary breaker will not cause an automatic shutdown of third-rail power. Many individuals working for the NYCTA and around the third rail do not understand this latter shutdown feature in the system and do not realize that a delay can occur while the power maintainer disconnects the auxiliary breaker. This delay could be very dangerous for an individual assuming that power is off when it is not.

Also, during the investigation, Safety Board investigators learned that there have been incidents where a track breaker had been opened by a power maintainer and that it was blocked open by an individual at the site to avoid accidental reenergizing as it occurred in this accident. If the blocking of track breakers was an enforced procedure

on the NYCTA, this accidental reenergizing, which created a life-threatening situation, would not have occurred. The circumstances of this accident and the improper understanding of the NYFD in the December 1984 special investigation demonstrate a need for the NYCTA to review the entire process of shutting down and restoring third-rail power and for providing protection for individuals working around the third rail.

A potentially dangerous situation developed when power was restored to the third rail on track No. F1 at the accident site before the derailed car had been rerailed and while NYCTA personnel were at the derailed train. The incident occurred because the power maintainer at the Hudson substation did not know that the substation's auxiliary breaker had a unique resistance loop through which power would be restored to the southbound tracks when power was restored to the northbound tracks. Both the power maintainer and his supervisor were aware that the power maintainer had not been adequately trained, that he was unprepared for the demands of the job, and that he needed additional training. For the NYCTA management to allow the power maintainer to fill such a responsible position without the necessary training and supervision was inexcusable. The assistant supervisor at the Hudson Station knew the power maintainer needed more training and acknowledged he had some responsibility for training. Nevertheless, although the assistant supervisor was present when the auxiliary breaker was closed, he did not inquire about the instructions the power maintainer had received from the system operator or accompany him when he went to restore power. If the assistant supervisor had done so, he probably would have seen that track No. F1 would be energized through the test resistance loop and he would have taken action to prevent the track from being energized.

NYCTA management has taken action to discipline the track foreman, the signal maintainer, and the power maintainer for the improper practices that were used in the replacement of the track, the adjustment of the signal system, and the energizing of the third rail at the accident site when the intent was to energize only the northbound tracks. So many failures by employees to properly perform their job tasks indicate that the NYCTA management has failed to properly supervise employees in their duties, especially since (1) before the derailment, a deputy superintendent of the track department had inspected the track and had taken no exception to the work that had been done, (2) an assistant supervisor of the power department, who was present at the substation, understood that the power maintainer was not fully qualified, but yet did not monitor the activities of the maintainer, and (3) there was a lack of qualified power maintenance personnel to man the substation. Until NYCTA management accepts responsibility for the quality of employee performance necessary to operate the NYCTA system in a safe and reliable manner, situations such as those that developed in this accident will continue to develop and may result in more accidents.

The lack of supervision of NYCTA employees has been noted in previous accidents investigated by the Safety Board. In its special investigation report of September 22, 1981, involving eight subway fires on the NYCTA, 3/ the Safety Board stated, in part:

... without ... increased surveillance and quality control, the performance and effectiveness of the maintenance program is not likely to improve significantly.

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

In its report of the Joralemon Street Tunnel derailment, the Safety Board stated,

... evidence does not explain how or why procedures had become so lax that train operators and their supervisors passed the improperly installed and missing slow signs numerous times without reporting the deficiencies ... This accident and the previous accidents indicate that lack of training and supervision of employees is not limited to only one department but pervades the NYCTA system.

Inadequate supervision was demonstrated in this accident and indicates that poor management extends throughout the NYCTA. In the 1981 report on eight subway fires, the mechanical department was noted to lack competent supervision; in the Joralemon Street Tunnel derailment, it was the operating department; and in this accident, it was the track, signal and power departments that had problems with lack of adequate supervision that resulted in the derailment and in the inadvertent energizing of the third rail at the accident site. Throughout these accidents, the undetected poor workmanship by the individuals involved was the result of poor supervision.

Top executives of the NYCTA have taken some action to correct management and supervisor performance. The Car Equipment Department management has been reorganized, and the Department of Track Construction and Track Maintenance has been combined with the Track and Structures Department. These changes were made to improve communications and to provide a more efficient management structure. Also, the Safety Department was elevated to a level that reports directly to the Chief Operating Officer. However, at the time of this accident, the management reorganization had not made a significant change at the worker level.

The lack of adequately trained NYCTA employees had been noted in previous accidents and special investigations. At the Safety Board's public hearing on Rail Rapid Transit Safety in July 1980, an NYCTA motorman testified:

NYCTA has never provided adequate emergency training to employees ... that NYCTA has emergency procedures on paper, but that employees receive no hands-on training.

At the same hearing, a representative of NYCTA management testified:

The success of any operation depends on the skilled, trained people that we have. The best developed procedures are just so much paper if the personnel that must apply them do not do it effectively.

In the special investigation of eight subway fires in 1980 and 1981, the Safety Board noted the shortcomings of motormen and conductors to respond to emergencies. As a result of that special investigation, the Safety Board recommended that the NYCTA:

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)

Following an indication from the NYCTA that operating personnel, particularly motormen and conductors, were being trained to be familiar with and respond to a fire situation and to evacuate passengers during emergency situations, the Board ultimately placed Safety Recommendation R-81-107 in a "Closed--Acceptable Action" status on May 29, 1984. According to the NYCTA, this training included refresher courses on standard operating procedures, safety sessions, and a film tailored to teach employees emergency procedures they would be expected to carry out. Because it was concerned, however, that the "hands on" training was not proceeding as quickly as it could, the Board urged the NYCTA to revise its schedule for training. The NYCTA stated that it reviewed and consequently revised its schedule for "hands on" training and indicated in a September 5, 1985, letter that by the end of 1986 over 1,900 operators and conductors will have received "hands on" training. Based on these indications, the Board placed Safety Recommendation R-81-106 in a "Closed--Acceptable Action" status. In this accident, however, the train operator (motorman) stated that he had not been to the NYCTA school for firefighting and that he could not make the decision to evacuate passengers because only command center or supervisory personnel could make that decision.

In a report of an accident involving the rear-end collision of two NYCTA trains on July 3, 1981, 4/ the Safety Board made the following statement:

The Safety Board believes that the NYCTA should immediately review the events of this accident and establish training and operating procedures to avoid the confusion and conflicting instructions in future situations of this type.

Also, the Safety Board recommended that the NYCTA:

Train operating department personnel in the differences between the two train control systems used on the New York City Transit Authority System. (Class II, Priority Action) (R-82-35)

Safety Recommendation R-82-35 is currently being held in an "Open--Acceptable Action" status pending receipt of information on the number of operators who have to date received this training.

In the Joralemon Street Tunnel derailment, track inspectors were identified as requiring training. In September 1981, following the special investigation of NYCTA equipment department training, the Safety Board recommended that the NYCTA:

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

The NYCTA developed such a training program, and the Safety Board ultimately placed Safety Recommendation R-81-103 in a "Closed--Acceptable Action" status on May 29, 1984. In December 1984, during its special investigation of NYCTA subway fires, the Safety Board reviewed the program further, found it to be thorough, and concluded that the program was an excellent effort by the NYCTA management to bring the training for the equipment department personnel up to a level necessary for the employees to be able to perform the work on cars in a satisfactory manner.

4/ Railroad Accident Report--"Rear-end Collision of New York City Transit Authority Subway Trains 142NL and 132NL, Brooklyn, New York, July 3, 1981" (NTSB/RAR-82/02).

The Safety Board believes that the May 15, 1985, accident, like the previous accidents referred to, demonstrates the continuing failure of the NYCTA management to understand the critical importance to safety of such factors as adequate staffing and shift scheduling, formal classroom and on-the-job training programs, evaluation of personnel qualifications and experience, emergency procedures and drills, and close review and assessment of supervisory and organizational functions. Apparently the lessons of past accidents that have been embodied in many Safety Recommendations to the NYCTA have not been sufficient to produce a "top-down" management commitment to improving safety of operations and maintenance through a systematic review and analysis of its training, staff, supervisory, and inspection requirements. Furthermore, where training programs and procedures have been developed in response to previous Safety Recommendations, it appears that the new programs have been poorly implemented with little assessment of their effectiveness and no assurance that all employees needing training will receive it in a timely fashion. In the May 15 accident, the train operator, with 14 years of experience operating trains, had not received any training in firefighting and did not understand his responsibility for the evacuation of passengers. This accident also demonstrated that the line supervisor and deputy superintendent did not make a competent track inspection of the work performed. The line supervisor did not bring a track gauge to the job site, and he did not gauge or align the replaced track. The power maintainer, because of his lack of experience as a helper in manual substations, could not answer the questions on the examination that pertained to manually-operated substations. After failing the examination twice, he asked questions in order to be able to answer the examination questions and successfully passed the examination on the third try without any practical experience or training. He had received only on-the-job training and was unqualified to be a power maintainer at the Hudson substation. Since the foreman, who normally would have conducted the on-the-job training of this power maintainer, had been on leave and his position had not been filled for several months, the few occasions in which the power maintainer was given the opportunity to observe one of the two regular Hudson substation power maintainers at work on their respective 12-hour shifts hardly qualifies to be called an "on-the-job" training program.

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

Establish and carry out a management review and evaluation program to improve the management control and administrative guidance available to identify and correct deficient staffing, training, procedures, inspection, and supervision in the New York City Transit Authority system. (Class II, Priority Action) (R-86-4)

Establish a standard for determining the wear limit for the top of the wheel flange to prevent wheels continuing in service that have a flat surface on the flange. (Class II, Priority Action) (R-86-5)

Inspect periodically and improve where necessary the condition and legibility of the circuit schematic drawings on the panels of all substations for easy reference by power maintainers. (Class II, Priority Action) (R-86-6)

Review and improve the procedures for management coordination between divisions that are performing comparable functions or joint systemwide programs. (Class II, Priority Action) (R-86-7)

Expedite the completion of the new track standards manual and instruct all employees responsible for track inspection, maintenance, and replacement in those standards. (Class II, Priority Action) (R-86-8)

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

By: 
Jim Burnett
Chairman