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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

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Forwarded to:
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Chairman
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SAFETY RECOMMENDATION(S)
R-85-88 through -97

About 5 p.m., on August 17, 1984, after southbound Chicago Transit Authority (CTA) eight-car "A" train No. 135 (train 135) left the Montrose Avenue Station and as it slowly ascended a 3.1-percent grade, the motorman saw "yellow dynamic" brake lights illuminated on the second and seventh cars. The train rolled to a stop, and the motorman secured the cab and went back to cut out the brakes on the second car. While the motorman was out of the cab, train 135 began to roll backward down the grade. The motorman ran back to the cab and attempted to stop the train; however, he did not stop it. Train 135, moving at about 20 mph, struck CTA eight-car "B" train No. 143 (train 143), which was standing just south of the Montrose Avenue Station. One passenger was killed, and 46 passengers and 3 crewmembers were injured. 1/

After the collision, the motorman of train 143 got off train 143 and found a ladder on the ground, which he put up to a door on the west side of train 135. The ingenuity of the motorman of train 143 in acquiring a ladder to unload the passengers from train 135 facilitated the evacuation of those passengers. A systematic analysis of rail transit operations would have shown the need for a means to evacuate passengers when trains must be evacuated at locations away from station platforms. The logical result of that analysis would have been to provide means for passengers to get from the car to the track level. The sill steps on the sides of the cars are not a practical means of unloading passengers onto the roadbed. Some other transit systems carry ladders on the cars for this purpose.

The motorman of train 135 had been diagnosed in 1950 as having Hodgkin's disease. On his initial employment application with the CTA in 1968, the motorman listed under "surgical operations" surgery on his lymph node. His CTA medical records include disability claims for surgery on lymph glands in 1980. His physical examination on July 21, 1981, noted "Biopsy of lymph gland of neck April, 1979. Revealed lymphoma - treated by X-rays." In April 1979 and again in March 1984, the motorman was operated on for removal of lymph nodes which were described as malignant lymphoma, diffuse, lymphocytic type. The motorman has been under treatment as needed, and from 1979 he has been under the care of a physician. Since March 1984, the motorman has been

1/ For more detailed information, read Railroad Accident Report--"Rear End Collision of Two Chicago Transit Authority Trains Near the Montrose Avenue Station, August 17, 1984" (NTSB/RAR-85/11)

administered a variety of drugs as part of a standard chemotherapy regimen. From March 1984 through the day of the accident, the motorman had been given a combination of chemotherapy agents, including vincristine, prednisone, cyclophosphamide (cytoxan), and cimetidine (tagamet). The particular drugs that were administered to the motorman are reported to have possible side effects of relevance to the duties of a motorman.

Based on the neurologist's postaccident evaluation and subsequent testimony regarding the extent to which the motorman's lymphoma and chemotherapy agents may have affected his performance, the Safety Board believes that the motorman's health and medical care were not factors in the accident. The Board believes, nevertheless, that several medically related issues are raised by its investigation of this accident as to the ability of the CTA to monitor effectively the physical capabilities of its operating personnel. CTA officials knew the general nature of the motorman's illness, but they were not aware of its progress, the medications taken, and the dangers and effects they may have had on his coordination and decisionmaking ability. CTA officials did not communicate directly with the motorman's physician to determine the progress of his illness or the types and dosages of his medications. The Board believes that the failure of the CTA to follow up on the nature of the motorman's illness and its treatment indicates deficiencies in supervisory and oversight functions. The Board is concerned that the CTA employed no mechanism to verify that an employee is capable of performing his operating duties safely when his physician indicates that the employee can return to work. If there had been a high probability of impaired safety due to the motorman's condition and medications, the CTA would not have detected the problem. The Board notes that the CTA now has an administrative and medical procedure to screen employees for return to active duty from sick leave.

The CTA medical department should go beyond the mere documentation of a diagnosed illness to a subsequent thorough followup determination of operating personnel's capabilities to perform safely on the job. The medical department, without direct followup communications with the motorman's physician, was not aware of the physician's knowledge of the physical and behavioral requirements of a motorman, the particular medications that had been prescribed to the motorman, and the effect of these medications on his abilities to meet these requirements.

Testimony of the CTA's medical director indicated that records of the medical examinations of the motorman by the CTA medical department were maintained in one file while correspondence from his personal physician was in another file maintained in a different department. Moreover, no mechanism was in place to ensure that the medical department was informed of the contents of the communication from the physician. Perhaps it was as a result of the dual file system that the CTA medical director failed to learn of the specific medications that the motorman was using and their dosages.

The CTA's lack of awareness of the nature of the motorman's treatment and medication is indicative of a weakness in its medical monitoring of employees. The Safety Board believes that the CTA should monitor the prescribed medication that its operating personnel use to ensure that their known side effects do not contraindicate their assignment to their usual duties. The Board cannot understand the reasons for the CTA's assumption, implied in the medical director's testimony, that all physicians prescribing medications fully inform their patients of potential or likely side effects. In point of fact, not all physicians inform their patients, and as a result, many patients are not aware of what effects to anticipate. Moreover, even knowing the side effects, some employees might be prone to continue to work. The burden for the necessary monitoring falls on the CTA and not on the personal physicians of the operating personnel because many

physicians do not know the specific on-the-job physical and behavioral skills required of operating employees. Therefore, it is important in the case of employees with safety-sensitive duties that employers such as the CTA have a mechanism to review with an employee's own physician his medications, their dosages, and the side effects.

The Safety Board believes that the CTA should also assist its operating personnel in becoming aware of the adverse effects of certain over-the-counter medications on their performance. The Board does not agree with the logic of the director of the CTA's medical department in testifying that the number of pharmaceuticals available and their possible side effects are so numerous as to preclude developing guidance for its operating personnel on the drugs to avoid while on, or about to be on, duty. Such an attitude about the potential hazards of these drugs assumes that operating personnel will be knowledgeable about the effects of medications they are taking, both over-the-counter and prescribed, an assumption without scientific basis.

The motorman encountered a routine malfunction of dynamic brakes which he knew how to troubleshoot. His attempting to troubleshoot the problem while ascending the 3.1-percent grade escalated a routine mechanical malfunction into an emergency situation. When the train stopped on the grade, his failure to inform the controller that the train was stopped was a violation of the CTA's operating rules which state explicitly that the controller should be notified when a train is stopped. The motorman compounded the problem by leaving the operating cab while the train was standing on the main track on the fairly steep grade. The Safety Board believes that the motorman's poor decisionmaking and his failure to adhere to the CTA's operating rules can be attributed, in part, to deficiencies in the CTA's training and assessment program for its operating personnel. Any deficiencies in functioning under stress could have been identified and improved by training the motorman in responding to abnormal circumstances and emergencies.

The CTA trains its new rail operating personnel, mostly motormen and conductors, in the rudimentary skills needed to perform their normal duties and responsibilities. Although the curriculum appears effective in teaching operating personnel basic routine operating procedures, it provides little opportunity to motormen and conductors to deal with abnormal and emergency procedures. While troubleshooting is covered, motormen and conductors receive no training in responding to unexpected emergency situations which could give them the skills needed to cope rationally and calmly with the unexpected. As a result, when the motorman of train 135 encountered the unexpected rollback and emergency, he had no training and little experience on which to base decisions. In addition, this training would provide the CTA with the opportunity to assess how well employees are responding to the unexpected.

The motorman had not been taught to deal with a comparable situation, he had not been required to demonstrate his ability to respond to the situation, and he had not been trained to make decisions under the stressful circumstances he faced before and during the accident. The CTA's system of checking motormen in standard operating practices at regular 3-month intervals is fairly effective in assessing performance under routine or normal conditions; however, under these conditions, decisionmaking is not ordinarily at issue, and no stress, other than the instructor's physical presence, is deliberately placed on the motorman. Accordingly, the CTA has no way of determining how the motorman will react in stressful situations. Moreover, because of the way they are carried out, these inspection rides evaluate only routine motorman operating practices. Inspection rides without periodic retraining for proficiency are not sufficient to maintain a motorman's skill at an effective level. The Safety Board believes that the CTA should expose its

operating personnel, at regular intervals, to realistic abnormal and emergency-type scenarios requiring nonroutine responses under stress, and it should assess operating personnel's ability to respond in those situations.

The CTA, in addition, does not formally and systematically test its employees to assess their knowledge of operating rules and procedures. Operating personnel are expected to carry the CTA rulebook while on duty and to be familiar with its contents as well as all standard operating procedures. However, with the exception of the quizzes during their initial training period, the CTA does not test their operating personnel periodically on their knowledge of the operating rules. The CTA, therefore, has no formal method to determine if its personnel have kept current on the rules after they first qualify for their assigned duties.

The conductor of train 135 was a full-time temporary employee (FTT) employed by the CTA during his summer vacation from college. The program of employing college students as FTT's assists the CTA in replacing personnel during the summer, when many regular employees take their vacations. The FTT initial training is the same as that of the permanent conductors. The Safety Board believes that this training, as with initial motorman training, is adequate insofar as it provides personnel with a foundation in normal and routine operating procedures. The CTA has recognized the need for recurrent training for FTT's to bridge the 9-month hiatus in which they are away from the job, and it has developed a 2-day program in which each FTT participates every year before beginning the subsequent CTA summer employment.

The conductor routinely is the first CTA employee that passengers come in contact with, and in accidents such as this, passengers look to the conductor for assistance and direction. Therefore, the Safety Board believes that the time devoted to training and practice in emergency procedures in the FTT recurrent training program should be expanded. This topic currently is covered in a classroom setting, within the overall session devoted to general operation and standard operating procedures, and shares time in a 4-hour session with two other topics: fare structures and transfers. As a result of the varied number of topics covered in the limited time period, the Board believes that the time devoted to training in emergency procedures is inadequate to prepare an FTT to respond to an emergency effectively and to deal with passengers properly, and therefore, the time should be increased.

The responsibility for monitoring and overseeing the various aspects of safety within the CTA lies with the CTA's Manager of Safety. In 1976, the Safety Board, in its investigation of the CTA's Addison Street accident, 2/ identified a number of weaknesses in the performance of the CTA's safety department. As a result of its investigation, the Board issued Safety Recommendation R-76-41 which urged the CTA to

> Develop the full potential of the Safety Department, involve it in all phases of the system operation including operations, design, maintenance, and training, and provide it with more than advisory authority so that it can require implementation of system safety programs.

The CTA responded to the recommendation by stating that the safety department was reporting directly to the CTA General Manager and that it was developing a

2/ Railroad Accident Report--"Chicago Transit Authority Collision of Trains No. 104 and No. 315 at Addison Street Station, Chicago, Illinois, January 9, 1976" (NTSB-RAR-76-9).

comprehensive safety and system assurance study. The Safety Board classified the CTA's response to the recommendation as "Open--Unacceptable Action" because a change in organizational structure and initiation of a safety and system assurance study alone does little to improve the status and function of the safety department. The testimony of the Manager of Safety in the Board's public hearing held during its investigation of the Montrose Avenue accident indicates that the safety department currently is not a key element of CTA's safety program. Moreover, the Manager of Safety no longer reports to the General Manager or Executive Director of the CTA but to the Deputy Executive Director of Administration. Although the Manager of Safety stated that his department conducts regular systematic analyses of CTA's rail accidents to identify underlying hazards to system safety, the hazards identified in this accident indicate that CTA's safety department has not developed its full potential. Therefore, the Board will place Safety Recommendation R-76-41 in a "Closed--Unacceptable Action" status.

Since the CTA is not subject to safety oversight by any outside agency, the Safety Board believes that this accident points again to the CTA's need for a rigorous internal program of safety oversight. The safety deficiencies that the Board uncovered in the investigation of this accident could have been identified by an active in-house safety department. The Manager of Safety testified that he was ". . . not aware of any weakness" in the program that tests operating personnel's knowledge of CTA rules and procedures. He testified that in his position as Manager of Safety he never had "problems or concerns" with the CTA medical department. He was unable to state whether he was satisfied that the communication between the motorman's personal physician and the CTA medical department was adequate or if the CTA medical department's own filing system, in which two separate files on the motorman's medical status were maintained in two different departments, was adequate.

Forty-two passengers were treated at hospitals and released the day of the accident. The most predominant injury was cervical strain, with almost half of the passengers complaining of this injury. Other injuries were nasal bone fractures, facial lacerations, bruised knees, bruised ribs, and muscle spasms of the back and shoulders. In the 6,000-series cars, the metal grab bars across the backs of the seats, the vertical stanchions that extend to the ceilings, and the unpadded side walls are obviously the injury-causing features. In two other CTA accidents 3/ investigated by the Safety Board, one involving 2,000-series and 6,000-series cars and the other involving the 6,000-series cars, the passengers were injured by these same interior features. The CTA is replacing the 6,000-series cars at the rate of about 10 cars per month with new cars being purchased from Transit America (formerly Budd Company). However, about 100 of the 6,000-series cars will be renovated and will continue in service. In view of the manner in which the No. 2 end of car 6648 crushed and buckled the floor, the CTA should examine the structures of those 6,000-series cars which it retains to ensure that they are entirely sound.

The new Transit America cars are designed to withstand a 200,000-pound force on the anticlimbers. The floor assembly is 3/4-inch plywood overlaid with stainless steel (0.15 inch), and underneath the plywood is fiberglass insulation covered with a stainless steel sheet so that the entire floor is encapsulated in stainless steel. The seats on these cars are equipped with metal grab bars and metal vertical stanchions similar to those

3/ Railroad Accident Reports--"Chicago Transit Authority Collision of Trains No. 104 and No. 315 at Addison Street Station, Chicago, Illinois, January 9, 1976" (NTSB-RAR-76-9); "Rear End Collision of Two Chicago Transit Authority Trains, Chicago, Illinois, February 4, 1977" (NTSB-RAR-77-10).

found in the 6000-series cars. Although crashworthiness improvements (200,000- vs. 100,000-pound end loads) have been made in the newer cars, the same injury-producing features of the seats and vertical stanchions have been carried over. Consequently, passengers will continue to be exposed to needless head and facial injuries when accidents occur.

The CTA has chosen to install seats that are equipped with the metal grab bar for several reasons. First, the CTA believes that vandalism dictates that the materials the seats are constructed of be virtually indestructible. Second, the metal grab bar and metal vertical stanchions are needed for standing passengers and cannot be eliminated. The Safety Board has observed in the three CTA accidents it has investigated that passengers do strike the metal grab bars and vertical stanchions that are used as grab bars. Simple examinations of any CTA rail car will reveal that there is a considerable amount of exposed metal in the form of the grab bars for passengers to strike. Also, given that most rail car accidents involve forward or rearward decelerations, it follows that passengers will be propelled forward or rearward into the seats and continue to be injured. The Board is aware also that there is a transit seat that is manufactured with an energy-absorbing frame and grab rail. The grab rail extends across the full width of the seat and is constructed of a tough, thermoplastic that is vandal-resistant. Another model of seat has a grab rail attached to the aisle side of a double transit type seat. The Board recognizes that vandalism of passenger seats can result in an expensive problem for the CTA. However, the CTA also has a responsibility to provide the public with as safe a ride as possible. Therefore, the CTA should provide the replacement cars with interiors that do not unreasonably expose passengers to injury in train accidents.

The Safety Board believes that motormen and conductors should not be discouraged by the CTA from using their portable radios for intratrain communications during emergency situations, particularly in the case of the 6,000-series cars that do not have permanently installed radios, unless some communications procedure is substituted. Based on the testimony of the CTA Manager, Operations, Training, and Instruction, the CTA assumes that motormen and conductors will have no need to exchange time-critical information. It also assumes that the operator-controller frequency will be clear of transmissions by operating personnel of other trains at the time that an emergency occurs. These assumptions are not borne out by the findings in this investigation.

In 1976, the Safety Board identified a similar deficiency in communications in its investigation of the CTA accident at the Addison Street Station. 4/ As a result of its investigation, it issued Safety Recommendation R-76-38, which urged the CTA to

> Insure that the train phone system provides dependable, reliable and backup communication for operational control and that proper procedures are in effect to provide emergency warnings and instructions.

In response to the recommendation, the CTA wrote

> Maintenance procedures have been intensified for both carborne and wayside train phone equipment. A survey of signal strength has been made over trackage. This has led to the installation of additional wayside equipment. More train phones are being acquired to provide a

4/ Railroad Accident Report--"Chicago Transit Authority Collision of Trains No. 104 and No. 315 at Addison Street Station, Chicago, Illinois, January 9, 1976" (NTSB-RAR-76-9).

greater reserve of spares. Additionally, a radio system is being designed to supplement the existing train phone system which operates over the electrified power rail.

The Safety Board classified the CTA response to the recommendation, which addressed only additional radio and communication equipment and did not address procedural changes to rectify the problem, "Open--Unacceptable Action" because the recommendation calls for more than just hardware. For example, in this accident, the absence of procedures to use available radios and frequencies in the emergency resulted in poor communications between traincrews and the controller at a critical time.

The Safety Board believes that this accident points to the need for a procedure to ensure that immediate communication is always possible between a motorman and a conductor irrespective of the type of train or radio equipment used. The Board reiterates Safety Recommendation R-76-38 and urges the CTA to provide backup communications to "provide emergency warnings and instructions." The Board believes that the CTA should formulate procedures to use the available frequency as a discrete frequency for communications among operating personnel and the controller in emergencies.

Therefore, the National Transportation Safety Board recommends that the Chicago Transit Authority:

Provide means for unloading passengers when emergencies require evacuation of trains at locations away from station platforms. (Class II, Priority Action) (R-85-88)

Establish a medical record system which will provide the medical department with full, reliable medical records on operating personnel. (Class II, Priority Action) (R-85-89)

Require the medical department to evaluate the types and dosages of prescribed medications taken by its operating personnel. (Class II, Priority Action) (R-85-90)

Inform its operating personnel at regular intervals of the adverse effects of commonly used over-the-counter and prescribed medications on operating performance. (Class II, Priority Action) (R-85-91)

Provide its rail operating personnel initial and recurrent training both in routine operations and in simulated emergency situations. (Class II, Priority Action) (R-85-92)

Assess periodically the knowledge and understanding that operating personnel have of CTA rules and procedures and their skill in performing the required functions in practice. (Class II, Priority Action) (R-85-93)

Provide motormen and conductors initial and recurrent training in carrying out a coordinated response to emergency situations. (Class II, Priority Action) (R-85-94)

Assign the safety department the responsibility for and give it the authority to carry out the following functions:

- o Continually identify the safety risks in the CTA transit system,
- o Assess the risks as to probability of occurrence and possible loss if they occur, and
- o Recommend preventive and corrective action to CTA management.

(Class II, Priority Action) (R-85-95)

Ensure that those 6,000-series cars which will be retained for service are structurally sound before they are returned to revenue service. (Class II, Priority Action) (R-85-96)

In future new rail car procurements, specify energy-absorbing passenger seat grab bars and vertical stanchions. (Class II, Priority Action) (R-85-97)

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 recommendations in this letter.

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

By: Jim Burnett
Chairman