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National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: SEP 11 1996

In Reply Refer to: R-96-20

Mr. Gordon J. Linton
Administrator
Federal Transit Administration
400 7th Street, SW
Washington, DC 20590

About 6:12 a.m. on June 5, 1995, a New York City Transit (NYCT) southbound subway train traveling at maximum attainable speed passed a red signal and collided with the rear car of another NYCT subway train that was stopped on the Williamsburg Bridge, which spans the East River and which links the boroughs of Brooklyn and Manhattan. The operator of the striking train was fatally injured when the lead car of his train partially telescoped into the rear car of the struck train and his cab was totally crushed. Sixty-seven passengers and two emergency responders were treated at area hospitals for serious or minor injuries resulting from the accident.[1]

Research showed that the operator of the striking train had been a motorman in the New York subway system for 14 years. His most recent performance evaluation described his overall operation as "good." The Safety Board attempted to determine why a capable train operator proceeded past restrictive signal indications at high speed without slowing and why he failed to take evasive action when the collision was imminent. Another operator crossing the bridge at that time of day stated that he had no problems seeing the signals or the trains ahead. Witnesses stated that no loud noises or activity occurred either on board the train or on the bridge that may have distracted the operator of the striking train. Moreover, other transit employees did not observe any indication that his performance was impaired.

Despite observations that the operator of the striking train was alert and fit for service, anecdotal evidence suggests that he fell asleep while proceeding up the bridge approach. After applying full throttle on the approach to the bridge, he made no other responses to signal aspects requiring first that he prepare to stop (yellow) and then that he stop (red). As a experienced train operator who had taken trains across the Williamsburg Bridge for several years, he would have known that as a precautionary measure he had to slow his train in order to stop at the red signal. The position of his body after the accident supports the finding that the train operator fell asleep.

[1] For additional information, read Railroad Accident Report *Collision Involving Two New York City Transit Subway Trains on the Williamsburg Bridge in Brooklyn, New York, June 5, 1995* (NTSB/RAR-96/03).

About 7 seconds elapsed between the time that his train went into emergency braking and the time of impact. When a train goes into emergency braking, the brake system emits a loud, distinctive noise, recognizable by any crewmember. Had the train operator been alert, he would have been able to observe that a collision was imminent and probably would have tried to vacate the compartment to avoid injury. However, investigators found no indication that he had turned or moved to leave the compartment. His failure to take action in a life-threatening situation strongly suggests that he was either asleep or had just woken up and was too disoriented or sluggish upon waking to respond.

The Safety Board attempted to determine why the train operator might have been fatigued. The accident happened at 6:12 a.m., a time that coincides with a person's primary period of sleepiness. Further, the accident occurred on Monday, the first day when the train operator changed from his weekend schedule of sleeping at night to his weekday schedule of working at night. Studies have shown that shift workers who rotate schedules are especially prone to fatigue on both the first and second nights of the work week. In this case, the train operator, who was working at the time when he was asleep on the previous day, did not have the necessary time for his circadian rhythm to match his new sleep-wake cycle. As a result, he probably was not prepared to stay awake all night.

Over the last several years, the operator of the striking train had periodically been observed at work in a fatigued condition. His personnel file contained a disciplinary action (reprimand) for sleeping while on duty on January 18, 1989. He had been found napping between runs in a darkened crew room at 2:01 a.m. Another NYCT train operator who had worked with the accident train operator on and off for about 2 years stated that "he and other motormen" had problems trying to stay awake between 3 a.m. and 6 a.m. She stated that contrary to company policy, crewmembers "all took naps at work during the midnight tour."

The Safety Board has been concerned about the factor of fatigue in transportation for many years. In 1990, the Board completed a study of 182 heavy truck accidents that resulted in driver fatalities. The primary purpose of this study was to assess the role of alcohol and other drugs; however, the study found that fatigue was a factor in 31 percent of the accidents.[2]

The Safety Board has also found fatigue to be prevalent in railroad accidents. The Board determined that the probable cause of a January 1988 head-on collision of two freight trains in which the engineers and brakemen died was the "sleep-deprived condition of the engineer and other crewmembers of [the westbound train], which resulted in their inability to stay awake and alert, and their consequent failure to comply with restrictive signal aspects."[3] Investigators found that none of the crewmembers on the westbound train had had more than 2 hours of sleep during the 22 to 24 hours preceding the accident.

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[2] Safety Study *Fatigue, Alcohol, Other Drugs, and Medical Factors in Fatal-To-The-Driver Heavy Truck Crashes,* (NTSB/SS-90/01).

[3] Railroad Accident Report *Head-End Collision of Consolidated Rail Corporation Freight Trains UBT-506 and TV-61 Near Thompsontown, Pennsylvania, January 14, 1988.* (NTSB/RAR-89/02).

Following its investigation of a November 1990 head-on collision of two freight trains near Corona, California, in which the entire 3-man crew of one train and a brakeman on the other train were killed, the Safety Board found that the errant crewmembers were either asleep or too sleepy to respond.[4]

Research performed at the NASA Ames Fatigue Countermeasure Program has identified some effective measures to minimize or mitigate the effects of sleep loss, circadian disruption, and fatigue. According to a study examining the effects of strategic napping during long-haul operations, pilots who slept in the cockpit for an average of 26 minutes during low workload periods maintained higher levels of vigilance and alertness compared to pilots who did not nap.[5] The Safety Board agrees that the use of naps as a means of preventing fatigue before its onset is a worthwhile countermeasure and a strategy that transit companies should consider acceptable and advantageous. The use of punitive or disciplinary measures, such as employee reprimands or suspensions, simply is not effective in combating a physiological condition. Strategic napping by train operators and conductors could occur during extended non-operational periods on their shifts. The Board cautions, however, that these naps should be a supplement to, not a replacement for, one continuous 8-hour sleep period.

Federal regulations do not require that fatigue educational programs be developed or incorporated in training for covered employees or supervisors in transit operations. As a result of recent accidents, the NYCT took the initiative of contracting for a fatigue study and is incorporating a fatigue educational awareness program into its fitness-for-duty evaluations. As part of this accident investigation, the Safety Board contacted six other major transit agencies and found that none of them provides fatigue-related training in its employee training program. In a transit system that is not fail safe and is vulnerable to human error, the issue of fatigue is of great concern. To help reduce the number of fatigue-related accidents, fatigue training and education is critical for employees in safety-sensitive positions. Transit employees need to be informed about the need for an adequate amount of quality sleep, about the fact that a train operator can fall asleep suddenly and without warning regardless of his age or experience, about the behavioral and physiological consequences of sleepiness, and about strategies for avoiding sleep loss, such as strategic napping. The Board, therefore, believes that the Federal Transit Administration, in cooperation with the American Public Transit Association, should develop and distribute a model fatigue awareness program for transit agencies to use in their and employee training programs.

The National Transportation Safety Board therefore issues the following recommendation to the Federal Transit Administration:

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[4] Railroad Accident Report *Atchison, Topeka, and Santa Fe Railway Company (ATSF) Freight Trains ATSF 818 and ATSF 891 on the ATSF Railway, Corona, California, November 7, 1990* (NTSB RAR 91/03).

[5] Rosekind, M.R., Graeber, R.C., Dinges, D.F., Connell, L.J., Rountree, M.S., Spinweber, C.L., and Gillen, K.A. (1994) *Crew Factors in Flight Operations IX: Effects of Planned Cockpit Rest on Crew Performance and Alertness in Long-Haul Operations*. (National Aeronautics and Space Administration Technical Memorandum 108839).

In cooperation with the American Public Transit Association, develop a fatigue educational awareness program and distribute it to transit agencies to use in their fitness-for-duty training for supervisors and employees involved in safety-sensitive activities. (Class II, Priority Action) (R-96-20)

Also, the Safety Board issued Safety Recommendations R-96-21 to the American Public Transit Association, and R-96-22 through -25 to the New York City Transit.

Chairman HALL, VICE Chairman FRANCIS, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in this recommendation.

By: Jim Hall
Chairman