

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

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Forwarded to:

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Metropolitan Dade County
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44 West Flagler Street
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SAFETY RECOMMENDATION(S)

R-84-21 through -30

On Sunday, April 29, 1984, the Metro-Dade County Transportation Administration (MDTA) was conducting a nonrevenue sound level test of its trains in preparation for the May 20, 1984, opening of a portion of the Metro Rail System between Dadeland South and Overtown. At 6:12 p.m., a northbound two-car train, which was being operated by a supervisor who had been working long hours on consecutive days, collided with the rear of a standing four-car train near Vizcaya Station. Neither train derailed or caught fire in the 30-mph impact; however, the supervisor and operator of the standing train were taken to a nearby hospital where they were treated and released. Damage was estimated at \$2,400,000.

During its on-going investigation of the accident, the Safety Board has identified a number of safety deficiencies which, if continued into revenue operations, could lead to accidents with serious consequences.

The Metro Rail System has been designed to operate using an automatic train control (ATC) system which consists of three control subsystems: automatic train operation (ATO), automatic train protection (ATP), and automatic train supervision (ATS). The ATO subsystem performs the functions of speed regulation, programmed stopping, performance level regulation, and other functions normally performed by the train operator in a manually operated system. The ATP subsystem maintains safe train separation and strict adherence to speed restrictions to provide safe operation of the system. At interlockings, ATP allows train movement only when a route is available through the interlocking and the switches are locked securely in position. When two or more trains are routed onto a single segment of track or the same interlocking, the ATP prevents occupancy by more than one train. The ATS subsystem monitors the status of the entire system and provides appropriate control to direct the operation of trains so that traffic patterns are maintained. It also minimizes train delays by controlling arrival and departure times using central control computer programs to accomplish minor schedule adjustments.

However, since construction of the ATC will not be completed by the May 20 opening, Metro Rail System will have to be operated manually by train operators (rail attendants) without the redundancy of the automatic safeguards of the ATC. Therefore, MDTA, on May 10, 1984, adopted a plan, "Operating Plan Metrorail Dadeland South-Overtown," to put into place the procedures and requirements for continuing operations using a manual block (absolute) train system. The Safety Board has reviewed the plan and is concerned about its provisions for enforcing adherence to the plan, the sufficiency of the training of operating personnel who will be using the plan, the adequacy of the provisions to require communications between train operators and train dispatchers (train controllers), the use of permissive blocks, the lack of blocking devices on control consoles, and the lack of limits on duty-time to be worked by operating employees.

Adherence to rules, training, and monitoring.—It is essential that a manual block (absolute) system be maintained strictly until the ATC is operational. This task will be particularly difficult in Miami because the operating employees, particularly supervisors, train dispatchers, and train operators, have had no previous experience in rail transit operations. Therefore, these employees must be trained thoroughly in manual block (absolute) train operations if trains are to be operated safely. These rules must be practiced by the involved employees so that they will be thoroughly familiar with them and can employ them instinctively during revenue operations. Additionally, employee performance must be monitored regularly to assure compliance with the rules.

Elimination of permissive block.—The Safety Board believes that MDTA rules 4048 and 4049, "Operations, Rules and Procedures Manual," for the operation of a permissive block, allowing the operation of two trains in the same block or for a train to operate against established flow of traffic, involve unacceptable safety risks. In the absence of an operational ATC system, the permissive block could be used to allow a train to move into a block behind another train and close up to it when trains are delayed. The Safety Board believes that until automatic safeguards are in place the only safe method for accomplishing this result is the use of specific train orders. When the April 29 accident occurred, permissive block rules were authorized and were in use. All possibilities of a similar accident in revenue service must be eliminated.

Secured switches.—The Safety Board notes that the MDTA operating plan for manual block (absolute) operations does not call for clamping of switches so that they cannot be tampered with or inadvertently misaligned. The Safety Board believes that all main line switches in the manual block (absolute) sections should be clamped for the normal route to avoid misrouting of trains or the operation of a train manually at authorized speed into a reversed switch where it could derail as a result of excessive speed. The ATC would avert the latter situation by automatically reducing the speed of the train before it entered the switch.

Communications.—During its investigation, Safety Board investigators noted that some radio transmissions were garbled and unintelligible. Since it is vital that the operator of a train know when a train has left the block into which he intends to enter, clear and reliable communications must be available between trains. Terminology must be developed and standardized to eliminate the possibility of misunderstanding among train operators. All operating employees must be trained in the principle that a train is not to be moved if (1) there has been no communication, (2) a communication which was transmitted has not been acknowledged, or (3) a communication which has been received cannot be understood. Moreover, the communications frequency for train operations should be dedicated to train operations only. Communications on the same frequency, other than those for train operations, can override or cause confusion in train operations communications.

Blocking devices.—Investigators also noted that blocking devices are not used at the control console. The use of blocking devices on signal and switch operating buttons at the console prevents a controller from inadvertently lining a route for a train before a preceding train has cleared the block. This is an accepted method of control in most rail operating departments, which should be made a part of the Metro Rail System protection procedures in which its employees are trained thoroughly.

Duty-time limitations.—After protracted study the hours of service performed by railroad operating employees in standard rail systems has been limited by the Federal Railroad Administration (FRA) to 12 hours per day. The April 29 accident involved an employee who had been working longer hours on consecutive days. The Safety Board recognizes that the accident occurred in nonrevenue service; however, since MDTA does not have an hours of service rule, it would be possible for operating employees to work extended hours when revenue operations begin. The Safety Board believes that the MDTA should limit the hours that operating employees perform service to not more than 12 hours, and preferably less since rail rapid transit operations can be more rigorous than typical train operations.

In addition to the urgent safety issues discussed above, which should be addressed before opening the system, there are other safety concerns that need to be resolved. These include better speed signs and more efficient emergency response procedures. Safety Board investigators observed that some speed signs along the right-of-way could not be read from a train as it traveled over the track. This appeared to be due to sun glare and the lack of a good contrast between the numbers and background of the speed signs. MDTA should improve the contrast and locate signs to minimize glare.

While the MDTA operations, rules, and procedures manual includes emergency procedures, they are only in an outline form and only cover MDTA employee activities. Standard operating procedure should be developed in which local fire/police departments concur and which present in detail the responsibilities of all involved personnel.

Finally, in responding to the April 29 accident, emergency response personnel encountered difficulty in ascertaining that third rail power was shut off. This determination will remain difficult until a permanent power board is in place; a method for determining that third rail power is shut off must be developed for operations in the interim.

Based upon its review of "Operating Plan Metrorail Dadeland South-Overtown," the National Transportation Safety Board recommends that the Metro Rail System of the Metropolitan Dade County Transportation Administration:

Until the MDTA automatic train control (ATC) system is certified and put in service, operate trains in accordance with the manual block (absolute) system outlined in the MDTA "Operating Plan Metrorail Dadeland South-Overtown" dated May 10, 1984, and require that all main line switches in the manual block (absolute) sections to be clamped for the normal route. (Class I, Urgent Action) (R-84-21)

Emphasize in the training of all operating personnel the operation of the MDTA manual block (absolute) system for safely and effectively operating trains in revenue service. (Class I, Urgent Action) (R-84-22)

Establish a method of periodically monitoring employees for compliance with the MDTA system of operating rules. (Class II, Priority Action) (R-84-23)

Provide a dedicated means of communication for train operations using standardized terminology for train operations and require that all instructions issued for the operation of trains be in the standardized terminology. (Class I, Urgent Action) (R-84-24)

When conditions, such as the disablement of a train or other emergency, require that two or more trains enter the same block when the ATC is inoperative, use train orders requiring all trains to operate at speeds not to exceed 15 mph and prepared to stop in one-half the sight distance. (Class I, Urgent Action) (R-84-25)

Require by operating rule the use of blocking devices on control consoles which govern the signal aspects and movement of switches behind trains when the manual block (absolute) system is in effect and eliminate the use of a permissive block. (Class I, Urgent Action) (R-84-26)

Limit the duty time of rail attendants (train operators), train controllers, and train dispatchers to not more than 12 hours in a 24-hour period and not more than 60 hours in a 7-day week. (Class I, Urgent Action) (R-84-27)

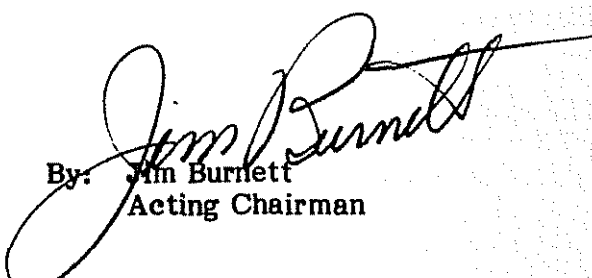
Improve the contrast of numbers and background of speed signs and locate signs so that glare from the sun does not impair their legibility to permit rail attendants (train operators) to determine proper train speed at all times. (Class II, Priority Action) (R-84-28)

In consultation with local fire and police departments, establish standard operating procedures for emergencies which outline the responsibilities of response personnel and the methods to be used to cope with specific emergencies. (Class II, Priority Action) (R-84-29)

Establish a positive method for informing all emergency personnel that third rail power is off and that it is safe to move to the track level. (Class II, Priority Action) (R-84-30)

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" (P.L. 93-633). The Safety Board is vitally interested in any actions taken as a result of its Safety Recommendations.

BURNETT, Acting Chairman, GOLDMAN, BURSLEY, and GROSE, Members, concurred in these recommendations.

By: 
Jim Burnett
Acting Chairman