



National Transportation Safety Board

Washington, D.C. 20594

Urgent Safety Recommendation

Date: July 13, 2009

In reply refer to: R-09-6 (Urgent)

Mr. John B. Catoe, Jr.
General Manager
Washington Metropolitan Area Transit Authority
600 Fifth Street, NW
Washington, D.C. 20001

The National Transportation Safety Board (NTSB) is an independent Federal agency charged by Congress with investigating transportation accidents, determining their probable cause, and making recommendations to prevent similar accidents from occurring. The urgent recommendation in this letter is derived from the NTSB's ongoing investigation of the recent collision between two Washington Metropolitan Area Transit Authority (WMATA) Metrorail trains on the Red Line near the Fort Totten station in Washington, D.C. The NTSB would appreciate a response from you within 30 days addressing the actions you have taken or intend to take to implement our recommendation.

On Monday, June 22, 2009, about 4:58 p.m., eastern daylight time, southbound Metrorail train 112 was travelling in a curve when it struck the rear end of train 214 before reaching the Fort Totten station. Train 214 had stopped before entering the station to wait for another train to leave the platform. The striking train was not equipped with onboard event recorders that would have recorded train speed and other parameters. There was no communication between the train operators and the Metrorail Operations Control Center before the collision. During the collision, the lead car of train 112 telescoped and overrode the rear car of train 214 by about 50 feet. Examination of the track and wreckage indicated that the emergency brake on train 112 was applied before impact. The District of Columbia Fire and Emergency Medical Service reported 9 fatalities and transported about 52 persons to local hospitals. Although the NTSB's investigation is ongoing and no determination of probable cause has been reached, investigators have concerns regarding the safety redundancy of WMATA's train control system, which has prompted issuance of this urgent safety recommendation.

The stopped train, 214, was a 6-car train in passenger service consisting of two 2-car sets of 3000-series transit railcars and one 2-car set of 5000-series transit railcars. The striking train, 112, was a 6-car train in passenger service consisting of three 2-car sets of 1000-series transit railcars. Each train had one operator on board.

Trains operate under the direction of WMATA's Operations Control Center and utilize an automatic train control system supplemented by wayside signals at interlockings. WMATA procedures require trains to operate in automatic mode on the mainline during the morning and evening rush hours, unless an operator requests permission to operate manually. During off-peak hours, trains operate in manual mode. Maximum authorized speed in the accident area is 59 mph. The automatic train control system is designed to prevent collisions regardless of the mode of operation by generating speed commands for individual train movements that should not allow more than one train to occupy a track circuit.¹

Postaccident testing showed that the track circuit at the accident site intermittently failed to detect a train stopped at the location where train 214 was stopped when the collision occurred. It appears that the train control system did not detect train 214's location after it stopped, and thus the following train (train 112) did not receive a command to slow or stop in order to maintain train separation. Investigators are continuing to examine train control system circuitry and recorded data to better understand how the train control system functioned prior to the accident.

WMATA maintenance records showed that an impedance bond for the track circuit where the accident occurred was replaced on June 17, 2009, 5 days before the accident. The impedance bond was replaced as part of a scheduled multi-year program to upgrade train control circuitry. After a postaccident review of recorded track circuit data, WMATA reported that the track circuit had been intermittently failing to detect trains after June 17. The NTSB has not uncovered any evidence to suggest that WMATA was aware of this track circuit problem prior to the accident.

The Operations Control Center computer system continuously receives real-time train location data and displays this information on a monitor in the control center. The investigation has found that there is no automatic monitoring that would identify and promptly report a situation in which a train stops being detected by the system. Recorded track circuit data showed errors in train detection for several days before the accident. WMATA has informed the NTSB that since the accident it has assigned personnel to review recorded data once a day to identify track circuit anomalies systemwide. The NTSB is concerned that a daily review, while a good first step, is not sufficient to address this safety issue. The NTSB believes that software algorithms or additional circuitry could be developed to continuously evaluate the validity of real-time track occupancy data and alert operations personnel when problems are detected. Alerts should prompt actions that include immediately stopping train movements or implementing appropriate speed restrictions to prevent collisions.

The NTSB is concerned that WMATA's train control system failed to prevent this collision. The accident has shown that the train control system is susceptible to a single point failure because it did not fail safe and stop the following train when train detection was lost.

¹ Each track circuit coincides with a length of track, or track block. Mainline routes are divided into track blocks from one end of the terminal station to the other. Each block is checked for train occupancy by means of audio frequency track circuits. Tuned impedance bonds (devices) provide block separation. These devices inject coded signals into the track that detect the presence of a train in the block and automatically transmit limiting and regulated speeds to passing trains. There is generally one track circuit per block with impedance bonds located at both ends of each track circuit.

Consequently, the NTSB believes that WMATA's train control system did not have adequate safety redundancy that would include timely alerts of system failures and compensation for intermittent failures or other anomalies in train detection.

Therefore, the National Transportation Safety Board makes the following urgent safety recommendation to the Washington Metropolitan Area Transit Authority:

Take action to enhance the safety redundancy of your train control system by evaluating track occupancy data on a real-time basis in order to detect losses in track occupancy and automatically generate alerts. Alerts should prompt actions that include immediately stopping train movements or implementing appropriate speed restrictions to prevent collisions. (R-09-6) (Urgent)

The NTSB also issued an urgent safety recommendation to the Federal Transit Administration.

In response to the recommendation in this letter, please refer to Safety Recommendation R-09-6 (Urgent). If you would like to submit your response electronically rather than in hard copy, you may send it to the following e-mail address: correspondence@ntsb.gov. If your response includes attachments that exceed 5 megabytes, please e-mail us asking for instructions on how to use our Tumbleweed secure mailbox procedures. To avoid confusion, please use only one method of submission (that is, do not submit both an electronic copy and a hard copy of the same response letter).

Acting Chairman ROSENKER and Members HERSMAN, HIGGINS, and SUMWALT concurred in this recommendation.

[Original Signed]

By: Mark V. Rosenker
Acting Chairman