National Transportation Safety Board

Washington, DC 20594

Safety Recommendation

Date: February 11, 2015

In reply refer to: R-15-8 through -10 (Urgent)

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The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant accidents in other modes of transportation—railroad, highway, marine, and pipeline. We determine the probable cause of the accidents and issue safety recommendations aimed at preventing future accidents. In addition, we carry out special studies concerning transportation safety and coordinate the resources of the federal government and other organizations to provide assistance to victims and their family members affected by major transportation disasters.

We urge the Washington Metropolitan Area Transit Authority (WMATA) to take action on the urgent safety recommendations issued in this letter. These recommendations address the WMATA emergency response to smoke in subway tunnels and are derived from our ongoing investigation of the electrical arcing and smoke accident near the WMATA L'Enfant Plaza station in Washington, D.C., on January 12, 2015. Facts supporting these recommendations are discussed below.

Background

On January 12, 2015, at 3:15 p.m., eastern standard time, southbound WMATA Metrorail train 302 stopped after encountering heavy smoke in a subway tunnel between the L'Enfant Plaza station and the Potomac River bridge. After stopping, the rear car of the train was about 386 feet from the south end of the L'Enfant Plaza station platform. The train operator contacted the WMATA Operation Control Center (OCC) to announce that the train was stopped due to heavy smoke.

A following train (train 510), which was stopped at the L'Enfant Plaza station at 3:25 p.m., also was affected by the heavy smoke. This train stopped about 100 feet short of the south end of the platform, but its cars were entirely within the station. Train 510 was evacuated while it was stopped at the station platform.

Police officers provided assistance in guiding passengers from the underground platform to the surface. Some of the passengers aboard train 302 self-evacuated. Emergency responders were dispatched to the scene and assisted evacuating passengers from both trains, as well as the station.

Both Metrorail trains had six passenger cars. The length of each train was about 450 feet. As a result of the smoke, 86 passengers were transported to local medical facilities for treatment. One passenger fatality occurred. Initial damages were estimated by WMATA to be $120,000.

The parties to the investigation include the Washington Metropolitan Transit Authority; the Federal Transit Administration; the Tri-State Oversight Committee; the Bureau of Alcohol, Tobacco, Firearms and Explosives; the Amalgamated Transit Union, Local 689; the International Association of Fire Fighters, Local 36; the District of Columbia Fire and Emergency Medical Services Department; and the District of Columbia Metropolitan Police Department.

Although the NTSB investigation is still in the early stages, we have identified safety issues that require immediate attention and are making one urgent safety recommendation to the Federal Transit Administration, three urgent safety recommendations to WMATA, and two urgent safety recommendations to the American Public Transportation Association.

Discussion

The WMATA subway system has ventilation fans at strategic locations to remove smoke and heat from the tunnels. These fans can be operated in either a supply mode that pulls fresh air into the tunnels and stations or an exhaust mode that pulls air from the tunnels and stations to the outside. The fans can be operated either remotely from the WMATA OCC or locally from control panels near the fans.

Smoke was not present as train 302 departed the L'Enfant Plaza station. After encountering heavy smoke, the train operator stopped the train with the lead car about 836 feet beyond the south end of the station. At 3:16 p.m., the WMATA OCC activated the under-platform fans in the exhaust mode at the L'Enfant Plaza Green and Yellow Line platforms. The location of these under platform fans was behind the stopped train 302. This action pulled smoke toward trains 302 and 510 from the electrical arcing event that caused the smoke. The source of the smoke was later determined to be about 1,100 feet ahead (south) of train 302.

A vent shaft with additional ventilation fans was about 24 feet ahead (south) of the source of the smoke. At 3:24 p.m., these ventilation fans, which are about 1/3 mile south of L'Enfant Plaza station, were activated in exhaust mode. At this point train 302 was already blanketed with smoke. Also, the train ventilation system that draws air from the outside into the cars was not shut off by the train operator. Existing WMATA procedures required the train operator to receive permission from the OCC to shut off the train ventilation system. Because both the station and vent shaft fans were all activated in exhaust mode, there was not a supply of fresh air to aid in moving the smoke through the tunnel to the exhaust.

A smoke detector located at the bottom of the vent shaft near the location of the heavy smoke activated at 3:04 p.m. Smoke detectors in the service rooms located southwest of the L'Enfant Plaza station platform activated at 3:19 p.m. and 3:20 p.m.

The vent shaft near the source of the smoke contained four fans. Each fan had a rated capacity of 50,000 cubic feet per minute (air flow). NTSB investigators found during post-accident inspection that two of the four fans had tripped an overload circuit breaker and were non-operational. This means that either (1) only two of the four fans were operational during the accident or (2) two of the fans became non-operational sometime during the accident.

Currently, WMATA does not have the means to determine the exact location of a source of smoke in their tunnel network. However, the initial reports from the train operator suggested that the smoke was ahead of train 302, since the train had travelled from a smoke-free environment into a smoke-filled environment.

The OCC rail controllers are guided by various emergency Standard Operating Procedures (SOPs). WMATA SOP No. 6, *Smoke and Fire on The Roadway*, contains a number of key actions that must be taken when a train encounters smoke in a tunnel. This SOP does not address tunnel ventilation strategies. Other transit agencies (such as the San Francisco Bay Area Transit District) have developed detailed ventilation procedures for addressing train fires and smoke events in tunnels. A common approach in these tunnel ventilation procedures is (1) to identify the most likely location of the smoke or fire, (2) to start the ventilation fans on one side of the smoke or fire in supply mode, and (3) to start the ventilation fans on the other side in exhaust mode. This strategy is designed to move smoke away from the passengers and the evacuation route. Once implemented, the controllers are to check with personnel at the site to verify the ventilation fans are properly working and to make any necessary adjustments.

WMATA told the NTSB investigators that the OCC controllers are trained on ventilation procedures and on the strategy of using ventilation fans in supply and exhaust modes to provide air to passengers. WMATA told the NTSB investigators that since this accident it has re-trained its controllers on the proper operation of tunnel ventilation fans. However, during the investigation, the NTSB investigators determined (1) WMATA does not have a written ventilation procedure for smoke and fire events in a tunnel, and (2) the ventilation strategy implemented during this accident was not consistent with best practices. This issue is critical because SOPs, which are readily available to the controllers, can serve as a checklist during an emergency.

The safety issue the NTSB has identified involve the absence of a written procedure that addresses ventilation procedures during smoke and fire events in tunnels. This vulnerability needs to be immediately addressed by WMATA and the rail transit industry. Therefore, the NTSB makes the following urgent safety recommendations to the WMATA:

R-15-8

Assess your subway tunnel ventilation system to verify the state of good repair and compliance with industry best practices and standards, such as those outlined in the National Fire Protection Association's NFPA 130,® *Standard for Fixed Guideway Transit and Passenger Rail Systems*.® (Urgent)

R-15-9

Develop and implement detailed written tunnel ventilation procedures for operations control center staff that take into account the probable source location of smoke and fire, the location of the train, the best evacuation route, and unique infrastructure features; these procedures should be based on the most effective strategy for fan direction and activation to limit passengers' exposure to smoke. (Urgent)

R-15-10

As part of the implementation of the procedures developed in response to Safety Recommendation R-15-009, incorporate the use of the procedures into your ongoing training and exercise programs and ensure that operations control center staff and emergency responders have ample opportunities to learn and practice activating ventilation fans. (Urgent)

We also issued one urgent safety recommendation to the Federal Transit Administration and two urgent safety recommendations to the American Public Transportation Association.

Acting Chairman HART and Members SUMWALT and WEENER concurred in these recommendations.

We are vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate receiving a response from you within 30 days detailing the actions you have taken or intend to take to implement them. When replying, please refer to the safety recommendations by number. We encourage you to submit your response electronically to correspondence@ntsb.gov.

[Original Signed]

By: Christopher A. Hart,
Acting Chairman