National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: June 1, 2012

In reply refer to: R-12-32 through -35

The Honorable Peter M. Rogoff
Administrator
Federal Transit Administration
Washington, D.C. 20590

On January 26, 2010, 1:40 a.m., a hi-rail vehicle—a truck or automobile that can be operated on either highways or rails—operating southbound about 0.9 miles north of the Washington Metropolitan Area Transit Authority (WMATA) Rockville Metro Station struck and fatally injured two automatic train control (ATC) technicians[1] who were working on the right-of-way (ROW) replacing an impedance bond between the tracks. The hi-rail vehicle was traveling down the track in the reverse gear at about 13 mph.[2]

The National Transportation Safety Board (NTSB) determined that the probable cause of the accident was inadequate safeguards by WMATA to protect roadway workers from approaching hi-rail vehicles, and to ensure hi-rail operators were aware of any wayside work being performed. Contributing to the accident was the inadequate communication of vital information concerning ongoing work by the Operations Control Center (OCC);[3] the lack of an appropriate and effective lookout by the hi-rail vehicle operator and crew to carefully observe the track on approach; and the ineffective lookout for trains and/or hi-rail vehicles on the part of the ATC technicians.

Operations Information

Normal Red Line train movements are controlled by an ATC system. Typically, WMATA's hi-rail maintenance vehicles and other on-track maintenance equipment are not

[1] Throughout the rest of this report, the fatally injured technicians will be referred to as ATC No. 1 technician and ATC No. 2 technician.

[2] *Washington Metropolitan Area Transit Authority Hi-Rail Maintenance Vehicle Strikes Two Wayside Workers Near the Rockville Station, Rockville, Maryland, January 26, 2010,* Railroad Accident Report NTSB/RAR 12/04/SUM (Washington, D.C.: National Transportation Safety Board, 2012). <http://www.ntsb.gov>

[3] The *Operations Control Center* communicates and controls the movement of trains and other track equipment over the entire WMATA Metrorail system.

equipped to operate with an ATC system. Instead, the authority to move the self-propelled vehicles is directed by the OCC, which issues absolute block[4] movement authorities.

The employees operating trains and other on-track vehicles and those performing maintenance, repairs, and inspections on the Red Line are governed by the WMATA operating rule book, *Metrorail Safety Rules and Procedures Handbook* (MSRPH), dated January 2004. Rules can be modified or supplemented by the issuance of special orders. Rules pertinent to this accident are found in the MSRPH and in applicable special orders. One such special order was WMATA Special Order 07-06, dated November 9, 2007, regarding working on the ROW. This special order states in part:

> Duties and Responsibilities for Employees:
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> 4.180: When it is necessary for employees to walk beyond the platform end gate where the walkway is not protected by a handrail, or to walk or work on tracks around moving trains or track equipment, they shall:
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> a. Expect rail vehicle movement at any time, in either direction, on either track. …
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> i. Maintain a careful lookout in both directions to ensure that approaching trains and track equipment are seen before they become hazards. …
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> l. When working at a stationary location, ensure that one person is designated to be the lookout for passing vehicles and to monitor the appropriate radio frequency.
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> m. When work is such that the entire crew must perform it, i.e. no lookout, implement an alternative method of protecting the work area (e.g., insertion of switch crank, application of shunt strap, etc.) prior to the work being started. This method must be authorized by OCC prior to implementation.

Preaccident Events

Prior to the accident, WMATA operations were transitioning from revenue train operations to nightly maintenance activities. Most maintenance work is prescheduled on a general order form that outlines what equipment and crews will be needed at which locations. The first two on-rail maintenance vehicles were dispatched out of the Shady Grove Metro Station while operating under absolute blocks on the A-1 track. WMATA rules require the OCC to establish absolute blocks to move on-rail work equipment to or from work areas.

On the night of the accident, the ATC No. 1 technician and the ATC No. 2 technician were troubleshooting ATC system problems on the A-2 track between the Shady Grove and Rockville stations that had been reported earlier in the day. The ATC No. 1 technician had made temporary modifications to the equipment in the train control room to establish train speed restrictions through the area where they were working. The technicians were performing their troubleshooting under traffic, clearing the tracks when trains approached. The normal shift

[4] *Absolute block* is a section of track between two specific locations onto which no train, hi-rail vehicle, or track equipment is permitted to enter while it is occupied by another train.

change time for ATC employees is 10:30 p.m. However, on that day, the ATC supervisors at the Shady Grove station conferred and determined that it would be best if the ATC No. 1 technician and the ATC No. 2 technician continued to work on the problem at Chain Marker (CM) 852.

WMATA rules require that employees on the ROW "maintain a careful lookout in both directions …" and if working in a stationary location, designate an employee to be a lookout. The afternoon-shift ATC technician who had been in the train control room told investigators that the ATC No. 1 technician working on the ROW told him that the afternoon-shift ATC helper had been designated as a lookout; however, it is not known if either the ATC No. 1 technician or the ATC No. 2 technician was designated as a lookout after the ATC helper left about 11:00 p.m. The ATC No. 1 technician and the ATC No. 2 technician continued their work on the A-2 track at CM 852.

On the night of January 25, 2010, several on-rail maintenance vehicle movements were scheduled to depart the Shady Grove station. At 11:42:08 p.m., the ATC No. 1 technician on the ROW called the OCC on the telephone and told the operator that there was a bad impedance bond[5] on track A-2, CM 852+00, and that track circuits A-2, CM 852 and A-2, CM 846 would not be operating while the bond was being changed. The OCC operator offered to notify other work groups in the area of the work being done at CM 852 and asked the ATC No. 1 technician to provide a cell phone number. The ATC No. 1 technician asked, "They know the chain marker we're at, right? Can you relay that to them?" Operator No. 1 agreed to arrange for the additional workers to contact the ATC No. 1 technician on the cell phone.

The ATC No. 1 technician provided a cell phone number, and the OCC operator agreed to give the number to anyone entering the work area so they could communicate directly with the technicians. The ATC No. 1 technician stated that he and the ATC No. 2 technician would watch for any equipment entering the work area.

The third maintenance vehicle to depart the Shady Grove station was the striking hi-rail vehicle (15802). The four track workers[6] on board had been assigned to inspect and replace third-rail cover boards[7] on the A-2 track between the Shady Grove and Rockville stations.

Operator No. 2 was handling the communication with the leadman on hi-rail vehicle 15802 and indicated in interviews a belief that Operator No. 1 had communicated to the leadman on the hi-rail vehicle a contact cell phone number for the two ATC technicians. However, recorded audio tapes of the conversation between the first OCC operator and the hi-rail vehicle showed that the operator did not give the contact cell phone number to the hi-rail crew.

At 11:55:27 p.m., the hi-rail operator contacted the OCC operator by telephone and was told to move down to CM 787+00 on the A-2 track, located south of where the ATC No. 1 technician and the ATC No. 2 technician were working. Operator No. 2 stated,

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[5] An *impedance bond* (also known as a "Wee-Z bond") is a device used to transmit frequency signals into the rails. These bonds are split between blocks. Each one acts as a transmitter for one block and a receiver for an adjacent block.

[6] The four workers consisted of the leadman, the hi-rail operator, and the two track laborers.

[7] *Third-rail cover boards* are fiberglass covers designed to protect the electrified third rail, which provides power to trains.

"… would take them down track A-2 at Twinbrook[8] and bring them back to keep traffic because they have a loss of shunt down there between Rockville and Shady Grove and ATC is still working on it wayside."

In a subsequent conversation with the leadman for the hi-rail crew, the OCC operator said that ATC personnel were working between the Rockville and Shady Grove stations. However, the OCC operator did not give the leadman a CM location, or the ATC No. 1 technician's cell phone number. The NTSB concludes that had the OCC operators provided the crew of striking hi-rail vehicle 15802 with the cell phone number of the ATC No. 1 technician and instructions to coordinate their work, the accident could have been prevented.

The next and final radio communication between the OCC operator and the ATC No. 1 technician occurred at 12:05:13 a.m., when the OCC operator notified the ATC No. 1 technician that an engine was being moved on the A-1 track and that the hi-rail vehicle was clear of the A15-08 signal (which is located north of the where the ATC technicians were working) on the A-2 track. The ATC No. 1 technician stated that he was "momentarily" clear of the track and that the ATC No. 2 technician would monitor the radio and "stand clear if he sees a train." No further radio communication between the OCC and the ATC No. 1 technician was recorded.

The last absolute block movement authority transmitted to hi-rail vehicle 15802 was to move from interlocking signal A15-06 to clear signal A15-08 and to then stand by for further instructions. After making a series of movements at the Shady Grove interlocking,[9] hi-rail vehicle 15802 reported being clear of signal A15-08 on the A-2 track. The interlocking signals are located just south of the Shady Grove station.

Prior to receiving permission from the OCC to move, the hi-rail vehicle began traveling in the reverse direction on track A-2 from the Shady Grove station, toward a point just north of the Rockville station. Before reaching its destination, the hi-rail vehicle struck and fatally injured the ATC No. 1 and No. 2 technicians.

Interviews conducted by the NTSB revealed that prior to the accident, several maintenance employees understood that the OCC operator's permission to establish a work area conveyed authority to move to the far end of that work area, slightly north of the Rockville station.

During interviews, the leadman of the hi-rail crew indicated that he was working in compliance with WMATA rules in place at the time of the accident when he received permission to enter the work area: "WMATA rules state that no one should be in that area other than your vehicle because you were provided with the red tag authority.[10]" The track department supervisor also agreed that the hi-rail crew was working in compliance with WMATA rules. WMATA SOP #28 states that all personnel must be clear when power is restored, but mentions nothing on

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[8] Twinbrook is the next station stop, located south of the Rockville Metro Station.

[9] *Interlocking* is defined as an arrangement of signals and signal appliances so interconnected that their movements must succeed each other in correct sequence.

[10] The issuance of a red tag order begins the process of removing power to the rails so that personnel can safely perform work.

the presence or absence of personnel on the ROW when the red tag area is established. The OCC operator who gave the leadman of hi-rail vehicle 15802 permission to "place shunts per SOP" indicated to investigators that this permission only authorized the leadman to set up the north end of the red tag work area and that the hi-rail vehicle crew needed absolute block authority to move the vehicle south. The OCC operator added, "I've never experienced it where they (a hi-rail vehicle crew) would just move the unit without getting an absolute block. If I haven't released that work location to you (a crew), then that unit is still being governed by my instruction." Both OCC operators indicated to investigators that hi-rail vehicle 15802 was not authorized to leave the Shady Grove station and that when the hi-rail operator notified them of the accident, they were surprised to learn that the unit had moved.

The NTSB concludes that, without clear written procedures, there was confusion among operating personnel at the OCC and vehicle operators regarding when field crews were authorized to move on-rail equipment within red tag work areas.

The next radio transmission from hi-rail vehicle 15802 was the initial notification of the accident, made to the OCC at 1:40:34 a.m.

Roadway Worker Protection Programs

The Federal Railroad Administration (FRA) promulgates and enforces railroad safety regulations, administers railroad assistance programs, conducts research and development to support improved railroad safety and policy, and consolidates government support of rail transportation activities. Except under some very limited and clearly defined circumstances, the FRA does not regulate any urban rapid transit operation that is not connected with the general railroad system. The FRA regulations cover areas such as locomotive safety standards; event recorder standards; passenger-car equipment design and crashworthiness standards; control of drug and alcohol use; hours of service; passenger train emergency preparedness; qualification and certification of locomotive engineers; track standards; and the installation, inspection, maintenance, and repair of signal and train control systems.

The Federal Transit Administration (FTA) helps plan, build, and operate transit systems. Unlike the FRA, however, the FTA does not have statutory authority to promulgate safety regulations. The primary enforcement mechanism available to the FTA is the ability to withhold Federal funds from states that do not comply with the terms and conditions of its Federal assistance agreement. The FTA has established minimum safety requirements that all states and rail transit agencies must meet to receive Federal funding. These requirements include techniques for conducting inspections and testing; required maintenance audits and inspection programs; and procedures for employee training and certification.

The FTA has funded the development of voluntary consensus industry safety standards through the American Public Transportation Association (APTA), which issued the *Standard for Work Zone Safety*[11] on July 26, 2003.

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[11] *Standard for Work Zone Safety*, APTA-RT-S-OP-004-03 (Washington, D.C.: American Public Transportation Association, 2003).

In its enabling legislation, the FTA is prohibited from regulating the operations of a transit agency. Over time, Congress provided the FTA with safety regulatory authority in two areas: drug and alcohol use ("Prevention of Alcohol Misuse and Prohibited Drug Use in Transit Operations," in 49 *Code of Federal Regulations* (CFR) Part 655) and state safety oversight ("Rail Fixed Guideway Systems: State Safety Oversight," in 49 CFR Part 659). While the FTA's Office of Safety and Security is responsible for the administration of the drug and alcohol program and the state safety oversight program, the FTA has no direct enforcement authority of these regulations.

However, after the collision on the WMATA system at the Fort Totten Metro Station[12] that fatally injured 9 people and injured another 80 passengers, the FTA has sought congressional authority to eliminate the regulatory restriction in the Federal law. On December 7, 2009, the U.S. Secretary of Transportation transmitted a formal legislative proposal to Congress. Currently, legislation pending before Congress would eliminate the restriction and direct the U.S. Department of Transportation to develop and enforce national safety standards for public transportation agencies operating heavy rail on fixed guideways.

Under FTA regulations (49 CFR Part 659), each state is required to establish an oversight agency to carry out the oversight responsibilities specified in the regulation. The state oversight agency, which must be a state agency other than the transit agency itself, is charged with ensuring that each FTA-funded rail transit agency within that state develops and implements a safety management program that is consistent with the requirements of the regulation. Each rail transit system is also permitted to develop its own internal procedures, rules, and standards governing operating practices and maintenance standards. The oversight agency is limited by the regulation to reviewing the program submitted by the rail transit agency. The ability to develop and enforce safety regulations is limited to the authority granted by each state's legislature.

WMATA was subject to oversight under FTA regulations through the Tri-State Oversight Committee (TOC), composed of members appointed by the District of Columbia, the State of Maryland, and the Commonwealth of Virginia.

TOC reviewed and approved the WMATA System Safety Program Plan, which is composed of 21 safety elements defined in 49 CFR Part 659. Under this plan, WMATA is responsible for an internal audit each year of its compliance with about one-third of the safety elements, so that over a 3-year period, compliance with all 21 elements is audited. WMATA communicates the results of these audits to TOC in an annual report.

TOC conducted a special study[13] of WMATA roadway worker protection and issued a report on December 31, 2009. The study contained 18 findings related to WMATA's ROW safety program and directed WMATA to develop corrective action plans to address each of them.

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[12] *Collision of Two Washington Metropolitan Area Transit Authority Metrorail Trains Near Fort Totten Station, Washington, D.C., June 22, 2009*, Railroad Accident Report RAR-10-02 (Washington, D.C.: National Transportation Safety Board, 2010). <http://www.ntsb.gov>

[13] *Rail Transit Special Safety Study–Roadway Worker Protection* (Washington, D.C.: Tri-State Oversight Committee, 2009). This report is available on the TOC website at <http://www.tristateoversight.org/>.

Prior NTSB Recommendations to WMATA Relating to Roadway Worker Protection

As a result of its investigation of two separate accidents—one on May 14, 2006,[14] involving the fatal striking of a roadway worker by a WMATA Red Line train near the Dupont Circle Metro Station in Washington, D.C.; the other on November 30, 2006, involving the fatal striking of two roadway workers on its Yellow Line near the Eisenhower Avenue Metro Station in Alexandria, Virginia—the NTSB made the following safety recommendation to WMATA.[15]

> Review your *Metrorail Safety Rules and Procedures Handbook* and revise it as necessary to create additional layers of protection for wayside workers, including:
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> - Adding requirements for wayside pre-work job briefings to ensure that all workers are informed of their duties, of their respective roles in work crew safety, and of the areas that are to be used to stay clear of trains.
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> - Requiring that when train operators request permission to either enter a main track, or when a train is turned for a return trip, the train operators along the affected lines must acknowledge receipt of the updated radio announcement from the control center regarding wayside workers.
>
> - Establishing procedures to be used for members of a work crew to acknowledge a lookout's warning that a train is approaching on a particular track from a particular direction before a lookout gives an *all clear* signal to a train. (R-08-01)

WMATA made several changes to its operating procedures in response to this safety recommendation, including the development of a toolbox safety meeting checklist and stand-alone, site-specific safety checklists for its daily work reports; the implementation of a procedure in which OCC operators announce every 20 minutes the location of all current corrective-maintenance action; and the study of ways to ensure lookouts are utilized in the most effective manner possible. WMATA also revised its *Metrorail Safety Rules and Procedures Handbook* and its *Roadway Worker Protection Manual*. Safety Recommendation R-08-01 is currently classified "Open—Acceptable Response." The NTSB has received additional information from WMATA on measures it has taken to further comply with this recommendation. This information is currently being reviewed and a response will be issued upon the conclusion of the evaluation process.

Another result of those investigations was a safety recommendation to:

> Establish a systematic program for frequent unannounced checks of employee compliance with Metrorail operating and safety rules and procedures. (R-08-02)

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[14] *Washington Metropolitan Area Transit Authority Train Strikes Wayside Worker Near Dupont Circle Station, Washington, D.C., May 14, 2006*, Railroad Accident Brief NTSB/RAB-08/01 (Washington D.C.: National Transportation Safety Board, 2008). <http://www.ntsb.gov>

[15] The recommendation letter, dated January 30, 2008, is available on the NTSB website at <http://www.ntsb.gov/>.

In response to this safety recommendation, WMATA developed a policy instruction program in which random unannounced checks are performed on a regular basis. Safety Recommendation R-08-02 is currently classified "Open—Acceptable Response."

The NTSB also recommended that WMATA:

> Perform periodic hazard analyses on the deficiencies identified by unannounced checks of employee compliance in response to Safety Recommendation R-08-02, and use the results to revise Metrorail training curricula or enforcement activities, as necessary, to improve employee compliance with operating and safety rules and procedures. (R-08-03)

As a result of this safety recommendation, WMATA began performing hazard analyses on deficiencies recognized as a result of the random checks. It also revised its training program to address the deficiencies identified in these analyses. WMATA also implemented a policy where operators are retrained on the areas in which they are found deficient, and, if necessary, removed from service until able to correctly perform their duties. Safety Recommendation R-08-03 is currently classified "Open—Acceptable Response."

The final safety recommendation resulting from those investigations was that WMATA:

> Promptly implement appropriate technology that will automatically alert wayside workers of approaching trains and will automatically alert train operators when approaching areas with workers on or near the tracks. (R-08-04)

In response to this recommendation, WMATA purchased wayside, carborne, and employee-mounted equipment in anticipation of developing a pilot program to test warning devices for roadway workers and train operators. Since the vehicle involved in the January 26, 2010, accident was a hi-rail vehicle, this equipment would not have been helpful in this particular instance. Safety Recommendation R-08-04 is currently classified "Open—Acceptable Response." WMATA has provided the NTSB with information on additional measures it has taken to further comply with this recommendation.

Adequacy of Current Roadway Worker Protection Programs

Between 2002 and 2010 there were 20 roadway worker fatalities on transit properties. While the FRA has issued regulations at 49 CFR Part 214, Subpart C, which set roadway worker safety requirements that railroads must meet, the FTA does not currently have the authority to issue similar regulations to the transit industry. One of the required elements of a transit agency system's safety program plan under FTA regulations is a "description of the safety program for employees and contractors that incorporates … safety requirements that employees and contractors must follow when working on, or in close proximity to, rail transit agency property; and processes for ensuring the employees and contractors know and follow the requirements." (49 CFR Section 659.19(r)) However, in light of this accident and the other fatalities cited above, the NTSB concludes that current transit roadway worker protection programs may be ineffective in ensuring roadway worker protection. Therefore, the NTSB recommends that the FTA issue guidelines to advise transit agencies and state oversight agencies on how to effectively implement, oversee, and audit the requirements of 49 CFR Section 659.19(r) using industry best

practices, industry voluntary standards, and appropriate elements from 49 CFR Part 214, Subpart C—*Roadway Worker Protection*. Furthermore, the NTSB recommends that the FTA emphasize the effective implementation and oversight of 49 CFR Section 659.19(r) as part of its safety oversight program audits.

The NTSB recommends that the FTA notify all rail transit agencies regarding the circumstances of the January 26, 2010, accident near Rockville Metro Station and urge them to evaluate their roadway worker protection programs and procedures to ensure that they adequately and effectively address appropriate training, communication, maintenance-vehicle movement authorities, flagging procedures, rules compliance, and the sharing of a work area by multiple work crews.

The NTSB recommends that the FTA advise all state safety oversight agencies of the circumstances of the January 26, 2010, accident near Rockville Metro Station and urge them to audit the roadway worker protection programs and the procedures of all rail transit operations in their states to ensure that they adequately and effectively address appropriate training, communication, maintenance-vehicle movement authorities, flagging procedures, rules compliance, and the sharing of a work area by multiple work crews.

Therefore, the National Transportation Safety Board makes the following safety recommendations to the Federal Transit Administration:

> Notify all rail transit agencies regarding the circumstances of the January 26, 2010, accident near Rockville Metro Station and urge them to evaluate their roadway worker protection programs and procedures to ensure that they adequately and effectively address appropriate training, communication, maintenance-vehicle movement authorities, flagging procedures, rules compliance, and the sharing of a work area by multiple work crews. (R-12-32)
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> Advise all state safety oversight agencies of the circumstances of the January 26, 2010, accident near Rockville Metro Station and urge them to audit the roadway worker protection programs and the procedures of all rail transit operations in their states to ensure that they adequately and effectively address appropriate training, communication, maintenance-vehicle movement authorities, flagging procedures, rules compliance, and the sharing of a work area by multiple work crews. (R-12-33)
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> Issue guidelines to advise transit agencies and state oversight agencies on how to effectively implement, oversee, and audit the requirements of 49 *Code of Federal Regulations* Section 659.19(r) using industry best practices, industry voluntary standards, and appropriate elements from 49 *Code of Federal Regulations* Part 214, Subpart C—*Roadway Worker Protection*. (R-12-34)
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> Emphasize the effective implementation and oversight of 49 *Code of Federal Regulations* Section 659.19(r) as part of your safety oversight program audits. (R-12-35)

The NTSB also issued a safety recommendation to the APTA.

In response to the recommendations in this letter, please refer to Safety Recommendations R-12-32 through -35. We encourage you to submit updates electronically at the following e-mail address: correspondence@ntsb.gov. If your response includes attachments that exceed 5 megabytes, please e-mail us at the same address for instructions. To avoid confusion, please do not submit both an electronic copy and a hard copy of the same response.

Chairman HERSMAN, Vice Chairman HART, and Members SUMWALT, ROSEKIND, and WEENER concurred in these recommendations.

[Original Signed]

By: Deborah A.P. Hersman
Chairman