National Transportation Safety Board

Washington, D.C. 20594

Railroad Accident Brief

Accident No.:	DCA-10-FR-004
Location:	Washington, D.C.
Date:	February 12, 2010
Time:	10:16 a.m., eastern standard time[1]
Railroad:	Washington Metropolitan Area Transit Authority
Property Damage:	$174,000
Injuries:	3
Fatalities:	0
Type of Accident:	Derailment

The Accident

On February 12, 2010, about 10:16 a.m., outbound Washington Metropolitan Area Transit Authority (WMATA) Red Line Metrorail train 156, consisting of six passenger cars, departed the Farragut North station on the No. 2 main track and was routed by the automatic train control system into a pocket track.[2] The train operator completed the move into the pocket track and stopped the train briefly about 180 feet before the red signal at the exit from the pocket track. The operator then moved the train at 7 mph past the signal and through an electrically powered derail.[3] The front wheel set of the lead car derailed, causing the operator to apply emergency braking and the train to stop 27.9 feet after the point of derailment. At the time of the accident, train 156 was carrying 345 passengers.

A WMATA track supervisor was in the area of the derailment at the time when the rail Operations Control Center (OCC) was trying to establish communication with the train operator. The track supervisor assisted the operator with the subsequent train inspections and radio communications with the OCC, which instructed the operator to change the operating (controlling) position to the rear car and ask the passengers to move to the rear four cars. The rear four cars then were uncoupled from the derailed lead car and moved back to the Farragut North station, where emergency responders, police officers, and WMATA officials assisted the passengers with exiting at the platform.

[1] All times in this brief are eastern standard time unless otherwise noted.

[2] A pocket track is a track segment, located between the No. 1 and No. 2 main tracks, that is used to store equipment, cross over a train from the two main tracks, or reverse the movement of a train.

[3] A derail is a device used to prevent fouling of a track by unauthorized movements of trains or unattended rolling stock. A derail works by derailing the equipment as the equipment rolls over or through it.

Three passengers sustained minor injuries: two passengers were treated on scene and released, and the third passenger was transported to a local hospital, treated, and released on the same day. Damage to the derailed lead car was about $174,000; track and signal damage was negligible.

Accident Sequence

On Friday, February 12, 2010, about 9:30 a.m., the operator of train 156 boarded the revenue service train at the Glenmont station. The operator told National Transportation Safety Board (NTSB) investigators that the train had train identification (ID) number[4] 641 but did not have a proper destination code,[5] and the Passenger Identification Display[6] indicated "No Passengers." The train operator reported that she had asked the terminal supervisor for the correct train ID and destination code, but she was instructed instead to move the train with the existing train ID and to use a destination code of "Special." The train operator complied with these instructions and then received speed commands.[7] The train then departed the Glenmont station on the Red Line No. 2 main track. (See figure 1.)

Figure 1. Map of WMATA Red Line. Inset shows entire WMATA system.

[4] Each train has a specific train identification number.

[5] The Automatic Train Control system uses the destination code to automatically route the train to a destination.

[6] The Passenger Identification Display on the exterior of each car shows the destination of the train.

[7] A speed command maintains train separation by issuing authority for trains to move or stop.

The train was operated in manual mode, in accordance with WMATA instructions, and reached an area of track between the Fort Totten and Brookland stations, where the operator received a train stop command (0 mph) and a red signal aspect.[8] This stop command was issued because an interlocking track circuit for signal B-06-08 was malfunctioning. As a safety measure, all trains attempting to pass through this area had to stop and get radio permission from the OCC to proceed.

The operator of train 641 stopped the train and called the OCC for permission to proceed, as required. However, the operator experienced difficulty communicating with the OCC; she reportedly was "calling and calling and calling." Moreover, the train operator reported that she heard the OCC controller respond to train 156, but the radio messages were garbled and she could not understand the instructions.

A utility rail supervisor[9] located at the Rhode Island Avenue-Brentwood station heard the OCC repeating, "Train number 156, you have permission to pass B-06-08 signal red, verifying switches 7B, 3B, and 1B blocked in a normal position for a straight move, permissive block[10]…." The utility rail supervisor was at the Rhode Island Avenue-Brentwood station to assist in moving trains. This was necessary because in the days before the accident, the Washington, D.C., area had experienced heavy snowstorms that had affected WMATA operations and other transportation activities.

During her attempt to communicate with the OCC, the operator of train 641 also reported that the operator of a passing train on the adjacent track radioed, "He's talking to you." The message originating from the passing train reportedly was "very strong and clear." With that information, the operator of train 641 called the OCC again and said, "This is 641. Are you talking to me? Are you telling me that I'm 156?" The OCC controller replied, "Yes, change your ID to 156." The train operator changed the train ID to 156 and then attempted to repeat the instructions to the OCC controller. Radio records show that the train operator had a difficult time repeating the instructions satisfactorily to the OCC controller. Eventually, she repeated the instructions correctly and received a permissive block to the Brookland station from the OCC. However, the train operator reported that she was not given a destination code number.

The train proceeded to the Rhode Island Avenue-Brentwood station without incident, where the utility rail supervisor, who had overheard the previous radio communication between the OCC operator and the train operator, boarded train 156. The utility rail supervisor told the train operator that trains on the Red Line have 100- and 200-series train IDs, not 600-series train IDs, and they discussed whether the train operator was comfortable performing her duties. The train operator had been recertified for rail operations 2 weeks earlier after being off work for 9 years because of an ankle injury.[11] The utility rail supervisor reported to NTSB investigators that the train operator said that she was comfortable performing her duties and that her

[8] A red signal aspect requires the operator to stop the train. This red signal aspect was located at B-06-08.

[9] A utility rail supervisor is a train operator who acts in the capacity of a supervisor responsible for managing train and station operations. Utility rail supervisors fill in for permanent supervisors who are absent and oversee extra work such as that generated by special events, track work, or weather.

[10] A permissive block is a section of clear track ahead of a train in the established direction of traffic up to a specific point (limit) into which no other trains, vehicle, or track obstruction is permitted.

[11] The train operator's injury and refresher training are discussed later in this report.

familiarity with train operations was returning to her. At that time, the utility rail supervisor took no exceptions to the train operator's ability to operate the train.

The utility rail supervisor remained aboard until train 156 arrived at the Gallery Place-Chinatown station. When he exited the train, he noticed that the train ID indicated Farragut North and the destination code display showed dashes. The utility rail supervisor set a destination code of 10, which was appropriate to route train 156 to the Medical Center station, but not to its scheduled final destination at the White Flint station. The utility rail supervisor reported that he did not know the destination code for the White Flint station. Also, he said that he had told the train operator to recycle the train ID, which would reset the communication link between the train and the signal equipment.

The train operator told investigators that she did not recycle the train ID and was not aware that it was a necessary action; rather, she assumed that the utility rail supervisor had properly set the train ID and destination code configuration for the White Flint station before he exited the train at the Gallery Place-Chinatown station.

The train operator said that she had a flashing lunar signal aspect at the Farragut North station, which meant that a switch was not lined for the main track and the train was going to be diverted. Upon leaving the station, the train was routed into the pocket track. The operator assumed that her previous confusing communication with the OCC, or possibly another train on the single track, caused the train to be diverted into the pocket track. The operator continued to move into the pocket track under a speed command of 22 mph until she saw a red signal at the exit of the pocket track and the train speed commands dropped to zero. The train operator stopped the train about 180 feet from the signal[12] and called the OCC.

The train operator said that she could not visually identify any signs at the exit of the pocket track. Radio records indicate that brief contact was established between the train operator and the OCC. The train operator told investigators that she was given permission to move past the stop signal and onto the No. 2 main track. However, no radio records indicate that the OCC controller told the operator of train 156 to move past red signal A-02-34, nor did the train operator repeat the instructions to the OCC controller, as required. Instead, radio records show that the OCC authorized a different train (train 152) to move past signal A-02-32.

The operator of train 156 initiated a movement forward at about 7 mph toward the north end of the pocket track, past the red signal, and over a derail. The front wheel set of the lead car derailed onto the ground. The train operator reported that she was not looking for a derail and did not see one. (See figures 2 and 3.) The front set of wheels of the derailed car traveled 27.9 feet north of the point of derailment, where the train stopped.

[12] The signal sign at this location is A-02-34.

Figure 2. Three views, facing north, of the signal and reflective warning sign for the derail.

Figure 3. Derail in the normal position for a red signal.

Postaccident Inspections

Train Configuration and Equipment

Train 156 consisted of six cars, configured in three "married pairs":[13] cars 6096 and 6097 (lead pair), 1196 and 1197 (middle pair), and 6038 and 6039 (trailing pair). At the time of the accident, car 6096 was the lead car and car 6038 was the trailing car.

NTSB investigators inspected the operating cab of the lead car of the train. The sun visor was in a position that partially obstructed the line of sight of the wayside,[14] but it was not possible to determine its position at the time of the derailment. The Automatic Train Protection (ATP)[15] cutout[16] was in the proper position.

The operator of train 156 did not report problems stopping the train during her station stops, at a previous red signal near the Fort Totten station, or in the pocket track. Event recorder data show that the emergency brakes were not applied until after the derailment occurred. NTSB investigators' examination of the brake system did not reveal any deficiencies that could have contributed to causing the accident.

Radio records show communications between the OCC controllers and various train operators. Radio transmissions from train 156 to the OCC were weak and garbled at times. The operator of train 156 had a train-mounted radio and a portable radio; neither radio was reported to be malfunctioning.

The event recorder data were downloaded following the accident. A data plot was compiled for the 4 minutes before the derailment of the lead car. The data showed that train 156 stopped at the Farragut North station at 10:12:12. At 10:13:01, the master controller was advanced to the P3 position, and the train began moving. The train traveled about 800 feet and reached a speed of about 15 mph before stopping. The train remained stopped for about 1 minute 15 seconds. Then, the master controller was advanced to the P4 position and the train started moving again. Over the subsequent 3-second period, the master controller was reduced gradually to the coast position. The train continued moving at about 7 mph until the operator applied the emergency brake. The distance traveled during the second movement was about 180 feet. (See figure 4.)

[13] In revenue service, sequentially numbered pairs of Metrorail cars are semipermanently coupled together and operate only in "married pair" railcar sets.

[14] The operator stated during her interview that she could see the "red" signal at the end of the pocket track, but could not see the signs.

[15] Even though the train entered the pocket track with a 0-mph speed command, the ATP allowed the train to travel up to 15 mph in manual mode.

[16] The ATP cutout overrides the train control system when the circuit breaker is opened. The ATP cutout in WMATA vehicles is equipped with a guard and sealed in the closed position. Opening the breaker requires breaking the seal and removing the guard.

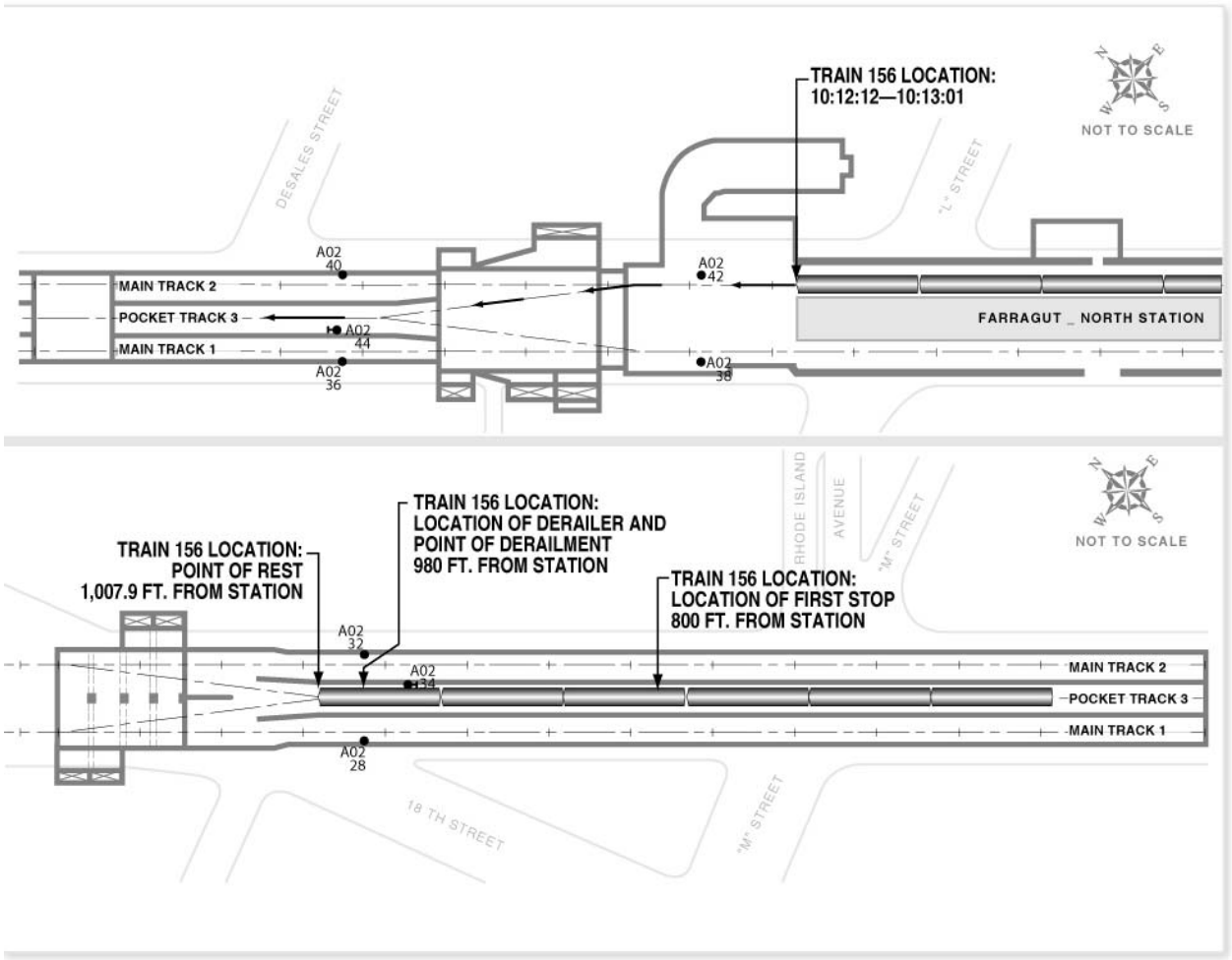

Figure 4. Schematic of track and signal locations at the Farragut North station showing the movement of train 156 from the No. 2 main track into the No. 3 pocket track.

Track and Signals

The track at the Farragut North station was inspected by WMATA on February 12, 2010. No out-of-tolerance conditions of the track or switch components were found. Prior inspections on January 20, 2010; December 10, 2009; and November 11, 2009, at Farragut North showed normal conditions within Metrorail track standards.

NTSB investigators examined the wayside signal visibility. The signal aspect was clearly visible from the entrance of the pocket track. Additionally, the train operator said that as she traveled around the curve, she saw a red signal and the train speed commands dropped to zero.

The Advanced Information Management (AIM) system[17] was examined and substantiated the normal operation of automatic train control equipment. AIM data showed that train 156 departed Farragut North in manual mode after making a normal station stop, and the signal that

[17] The AIM system consists of software used to manage data transmitted to the OCC from remote terminal units in the field. An AIM display provides OCC controllers with information they need to manage traffic flow on the WMATA system.

displayed was a flashing lunar aspect. Train 156 was routed into the pocket track where it stopped briefly. Next, train 156 moved past the red signal to the derail. Event recorder data substantiated the normal operation of automatic train control equipment, circuits, and subsystems.

Operator Information

The train 156 operator was hired by WMATA in 1976 as a bus operator and worked in that capacity for about 21 years. In 1998, she transferred to Metrorail operations as a station manager. In April 1999, she was certified as a train operator. In June 2000, she injured her ankle while on the job and was unable to work for about 9 years. WMATA personnel reports indicate that the train operator received one violation on July 22, 1999, for "[operating a train] through an improperly lined switch at K-99, a yard switch."

Operator Training

When the train operator returned to Metrorail service in late August 2009 after her extended period off duty, she was required to attend a 2-month refresher training program that consisted of individual instruction from qualified instructors, classes with other students, and on-the-job training in yard and main-line operations. In early September 2009, the train operator reinjured her ankle on the job and was unable to work for the next 3 months.

The train operator returned to Metrorail on December 7, 2009, and resumed the refresher training program. WMATA Metrorail training records indicated that she was "trained without incident."

The train operator was required to pass certification examinations before returning to work in full capacity. The certification examinations, which all WMATA operator trainees take, focus on train operations, train movement, rules, train mechanics, train exterior, and troubleshooting. The minimum passing scores required to become a certified train operator were the same for her as for other trainees. On January 27, 2010, the train operator took her certification test. She passed the *Metrorail Safety Rules and Procedures Handbook* examination with a score of 91 percent, but she failed the examination on equipment and troubleshooting with a score of 74 percent. She retook the examination the following day and passed with a score of 91 percent. She received train operator certification on January 28, 2010. None of the questions that the operator answered incorrectly on either her first or her second attempt to pass the certification test were related to the circumstances of the accident.

Once certified for rail operations, the train operator was assigned to the Day Extra Board. Under this assignment, a train operator is on duty at various times and locations Mondays to Fridays and off duty on weekends. The operator worked on several Metrorail lines prior to the day of the accident.

NTSB investigators determined that the refresher training on multiple aspects of train operations and the subsequent certification test requirements were adequate to ensure the preparedness of train operators for rail operations. WMATA provided the train operator with

sufficient training when she returned to service following her extended absence and adequately tested her on fundamental areas necessary for safe and efficient train operations.

Toxicological Findings, Medical Findings, and Operator Fatigue

In accordance with Title 49 *Code of Federal Regulations* Part 655, the train operator took a breathalyzer test to detect the presence of alcohol and provided a urine specimen for drug analysis. The toxicological test results were negative.

The train operator had normal hearing. She had prescription eyeglasses, which she wore on the day of the accident. Because of ongoing discomfort from the ankle injury, she took naproxen and ibuprofen for pain relief. The operator was not taking prescription medications. She did not have any serious illnesses, allergies, a cold, or a sleep disorder.

The train operator told NTSB investigators that she needs about 5 to 6 hours of sleep every night. She also provided investigators with an account of her work and rest times for the 4 days prior to the accident. Evaluation of that information indicated that, accounting for her commute time to and from work and other basic activities, the train operator had ample opportunity to get sufficient rest during the 3 days prior to the accident.[18] She told NTSB investigators that on the day of the accident, she awoke and felt "very refreshed," and that she did not feel tired during her shift.

Fatigue was evaluated as a possible human factors issue for the train operator. A variety of fatigue factors, including sleep (acute sleep loss and sleep quality), continuous hours awake, circadian disruption, sleep disorders, medication use, disruptive environmental factors, and shift work considerations, were examined. None of the fatigue factors emerged as an indication of fatigue at the time of the accident.

Postaccident Actions

Following the accident, the train operator was charged by WMATA with violating the following General Rules (GR) and Operating Rules (OR) from its *Metrorail Safety Rules and Procedures Handbook*:

> GR 1.46 Employees shall not permit unnecessary conversation, reading, lounging, or any other action or condition of mind to divert their attention from the safe and efficient performance of duty.
>
> GR 1.79 Employees shall not take any action until they are positive that all radio transmissions or receptions are heard, fully understood, and acknowledged.
>
> OR 3.18 Employees shall not operate any vehicle in a reckless or unsafe manner.

[18] On February 9, 2010, the train operator worked from 9:27 a.m. to 8:49 p.m. She was then off duty for about 9 hours. On February 10, 2010, she worked from 5:52 a.m. to 3:31 p.m., then was off duty for about 13 hours. On February 11, 2010, she worked from 4:28 a.m. to 2:00 p.m., then was off duty for about 12.5 hours. On February 12, 2010, she worked from 4:28 a.m. until the time of the accident (about 6 hours later).

OR 3.67 Rail vehicles shall not be operated past or closer than a point 10 feet in approach of an interlocking signal or lamp displaying a red aspect, a red flag, or a dark interlocking signal, unless authorized by OCC or the Interlocking Operator and the move is consistent with passenger safety as specified in Rule 3.1.

OR 3.79 Train operators shall not move trains with zero speed commands except after notifying OCC and being given permission to move with zero speed commands and an absolute block for the move.

OR 3.81 If operators inadvertently accept a route for other than the intended destination, they shall immediately stop and contact OCC for instructions. Any subsequent turn-back move shall be accomplished in compliance with Rule Nos. 3.78 and 3.80, and only after receiving authorization from OCC.

OR 3.91 Rail vehicles shall not be operated so as to collide with another vehicle, bumping post, or obstruction.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the accident was the train operator's failure to follow proper operating procedures, which resulted in her operating the train past a red signal and over the interconnected derail. Contributing to the accident was the failure of WMATA management to provide proper supervision of the train operator, which resulted in the incomplete configuration of the train identification and destination codes leading to the routing of the train into the pocket track.

Adopted: May 17, 2012