National Transportation Safety Board
Office of Railroad, Pipeline and Hazardous Materials Investigations
Human Performance and Survival Factors Division
Washington, D.C. 20594

Survival Factors Group Chairman's Factual Report

Crashworthiness Investigation

October 30, 2016

A. Accident Information

Railroad:	National Railroad Passenger Corporation (Amtrak)
Train	No. 89
Location:	Chester, Pennsylvania
Date:	April 3, 2016
Time:	7:50 am EDT
Number:	DCA16FR007

B. Group Members

Dana Sanzo
National Transportation Safety Board

Peter Lapré
Federal Railroad Administration

Derek Maier
Amtrak

Michael McLean
Amtrak

C. On Scene Group Participants

Larry Day
Federal Railroad Administration

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Federal Railroad Administration

Christopher Echols
Federal Railroad Administration

Karina Jacobsen
Volpe National Transportation Systems Center

D. Synopsis

For a summary of the accident, refer to the Accident Summary report, within this docket.

E. Details of the Investigation

1. Train Configuration

The following table shows the type and placement of the equipment in train 89.

1	Locomotive	627
2	Amfleet I Coach	82993
3	Amfleet I Coach	82524
4	Amfleet I Coach	82781
5	Amfleet II Coach	25034
6	Amfleet II Coach	25040
7	Amfleet II Coach	25013
8	Amfleet II Coach	25088
9	Amfleet I Cafe	43364
10	Amfleet I Business	81543
11	LDSL Baggage[1]	61028

Table 1. The consist for train 89.

2. Damage Description

Train 89 was examined at the site before the train was moved and after the cars were moved to a station and a yard. The equipment is described in reference to the direction of travel of the southbound train. The west side of the equipment is referred to as the right side, and the east side is referred to as the left side.

Locomotive 627

The lower right side of the locomotive's front end was crushed rearward and upward. The pilot was deformed rearward and under the locomotive, and the anti-climber was deformed downward. The coupler shank was rotated to the left, and the pushback feature was not engaged and did not activate. There was a long vertical impact mark on the left side of the nose of the locomotive. The left and right glazing panels were shattered. Inside of the cab, there was shards of glazing on the consoles, floor, and seats. The radio was dislodged.

[1] Long distance single level baggage car

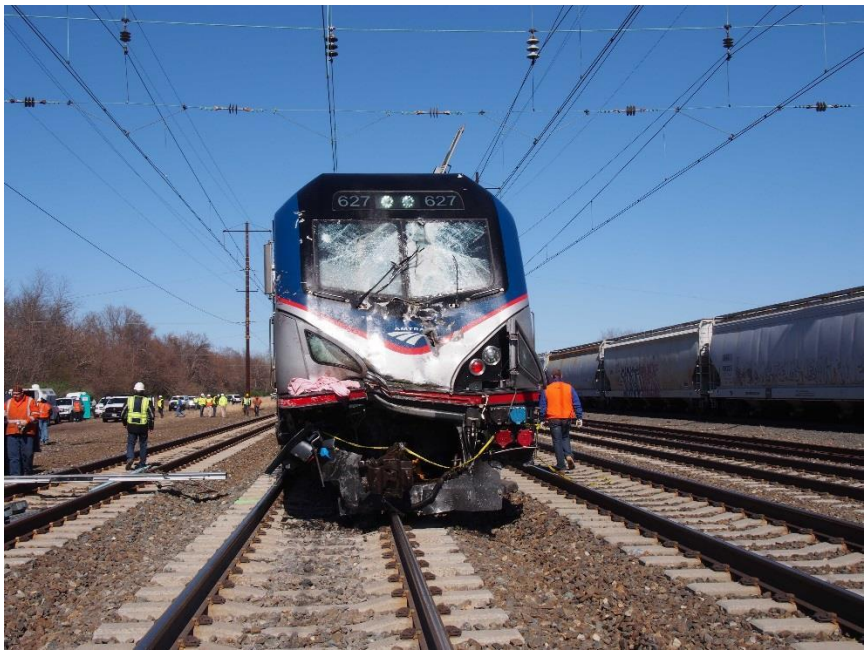

Figure 1-The front end of the locomotive

Amfleet Coaches

All of the cars came to rest upright. There was fluid splattered along entire length of the right side of the train. Inside of the rear eight cars, there was no evidence of passenger injury.

Coach 82993

On the right side exterior of car 82993, the side of the car was deformed inward between the second and fourth windows. Above the second window, there was a horizontal gouge mark on the side sheet. The rear edge of the second window was pushed partially inward. At the third window opening, the window was completely pushed into the car. There was a horizontal gouge mark in the side sheet above the window opening. Between the third and fourth windows, the side sheet was torn. At the fourth window opening, the window was completely pushed into the car. There were gouge marks and tearing of the side sheet around the window opening. At the ninth window opening, the window was completely pushed into the car. There was a gouge mark at the upper, rear corner of the window opening.

Figure 2- The right side of the first car

Inside of car 82993, the third, fourth, and ninth right side windows were found inside of the car. For the fourth window, the outer layer of the rear glazing panel was broken; the inside layer was intact. The leading edge of the window frame was bent in an inward direction.

On the right side of the car, the sixth row seat (6D/F) was separated from the wall and the floor pedestal. The bolts that secure the seat frame to the pedestal were found on the floor near the seat. The seventh row seat (7D/F) was separated from the wall and partially separated from the floor pedestal. The rear bolt that secures the seat frame to the pedestal was found on the floor below the seat. The bolts used to attach seat to pedestal had 3 rows of threads stripped. Near the eights row seat (8D/F), there were blood drops on the wall. Near these seats, the baggage rack was bent upward and, the ceiling panels had fallen onto the seats, and the interior wall panels at the windows were cracked and torn. A windshield wiper was found on the floor. The fifth and eighteenth row seats were partially rotated. The first aid kit and its supplies were found out and used.

On the left side of the car, between the seventh (7C/A) and tenth seat (10C/A) rows, there was brown splatter on the side wall and luggage rack. The eleventh row seat was partially rotated.

Figure 3- The interior of the first car

Coach 82524

On the right side of car 82524, the third window was pushed inward and found inside of the car. The zip strip was partially pulled. The carbody window frame was deformed at bottom and rear of the opening. There was no deformation on the internal window structure. Inside of the car, three seats were unlocked and partially rotated. In a vestibule, the public address system control module was found dislodged out of place. Two of the four screws that secure the module in place were missing.

3. Public Address System

According to a post-accident interview with the conductor, the public address system was not working after the accident.[2] During the on-scene examination of the train by the survival factors group, it was noted that the public address unit in the second car (82524) was dislodged from its cabinet. Two mounting screws were in place, but two screws were missing. While dislodged, the group tested the functionality of this unit. Using the handset in the first car, announcements were heard in the first car, but no announcements were heard in the remaining cars. The unit was placed back into the cabinet and retested. Announcements were not heard in the second or forth cars. In the remaining cars, the announcements could be heard.

On April 7, 2016, at 30th Street Station yard, Amtrak engineers conducted trainline wiring testing before the equipment was separated and moved (See Figure 4). In the second and fourth

[2] For a transcript of this interview, see the public docket.

cars, faults were found with the car's communications system. The fourth car was released to Amtrak for further testing at an Amfleet II shop in Florida. The second car was held at an Amtrak mechanical shop in Delaware for further examination by the survival factors group.

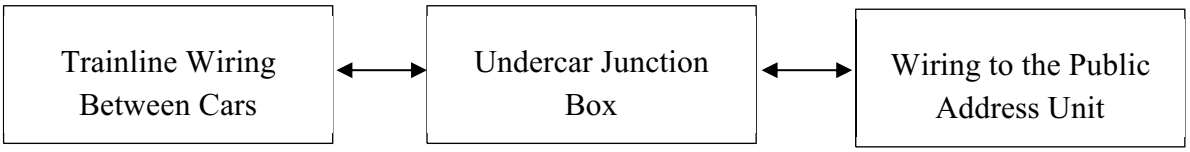

Figure 4-A diagram of the public address system wiring

On April 19, 2016, Amtrak tested the 27-point trainline communication system and the wiring from the undercar junction box to the public address unit in the fourth car (Amfleet II coach car 25034) at its Amfleet II maintenance shop in Florida. At the time of the tests, the system was found to be functioning as intended, and the coach car was returned to service. The performance of the communication system was monitored, and no faults have been reported since the car was returned to service.

On May 19, 2016, at the Bear, Delaware, and Wilmington, Delaware, maintenance shops, Amtrak technicians and survival factors group members examined and tested the public address system for the second car (Amfleet I coach car 82524). The public address unit was previously removed from its enclosure, and there was soot and melted metal visible on the power and public address wiring connecting pins. The car's 27-point communication trainlines and the wiring from an undercar junction box to the public address unit in the car's vestibule was tested. The tests demonstrated that a pair of wires between the undercar junction box and the public address unit were incorrectly wired. The public address unit itself was functionally bench tested, and no faults were found.

For further details about the public address system testing and results, see Attachment 1.

-- End of Report --