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

December 8, 2015

A. Accident Information

Railroad:	National Railroad Passenger Corporation (Amtrak)
Train	Train 188
Location:	Philadelphia, Pennsylvania
Date:	May 12, 2015
Time:	9:21 pm EDT[1]
Number:	DCA15MR010

B. Group Members

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[1] Times in this report are Eastern Daylight Time.

C. On Scene Group Participants

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D. Accident Summary

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

Table of Contents

E. Details of the Investigation

1. Accident Site Description

At the accident location, Amtrak's Northeast Corridor runs next to a freight railroad yard operated by Conrail. The locomotive came to rest upright, but leaning towards its right side, in the freight yard.[2] The first passenger car was destroyed and came to rest in a grassy area between the two properties. The second and third passenger cars came to rest on their right sides on tracks in the freight yard. The café car (the fourth passenger car in the consist) came to rest on its right side in the grassy area between the two properties. The fifth passenger car came to rest upright and perpendicular to the Amtrak right-of-way. The sixth and seventh passenger cars came to rest upright, but leaning towards their right sides, on the Amtrak right-of-way.

Figure 1. An aerial view of the accident site.

Four catenary structures were damaged in the derailment. Three structures were on the northeast corridor, and one structure was on the freight railroad property.

[2] For this report, the train is described in reference to its direction of travel (north). The east side is referred to as the right side; the west side is referred to as the left side.

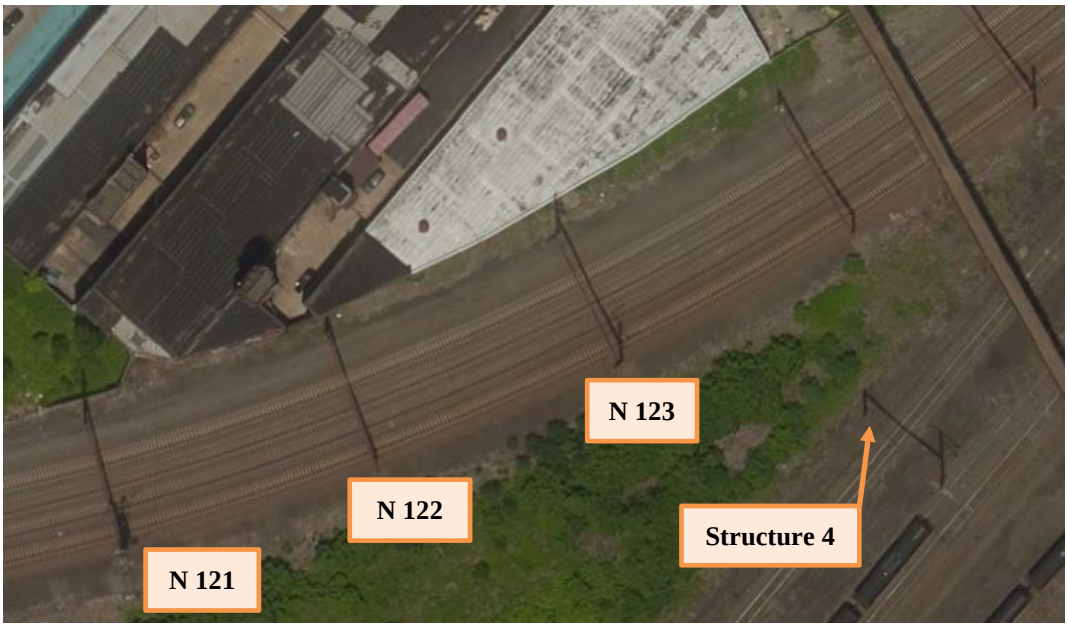

Figure 2. An aerial view of the accident site.

For the first catenary structure, N-121, the west side pole and horizontal cross member were bent down toward the tracks.[3] The horizontal cross member came to rest on and across the tracks near the seventh passenger car. The east side of the structure had two vertical poles. The outer pole was upright, but leaning, toward the tracks. The inner pole was separated from its foundation. A catenary pole was found near the sixth and seventh passenger cars. Near the east side pole foundations, there were several broken catenary wire insulators scattered along the ballast. For the second catenary structure, N-122, the west side pole was broken near its concrete foundation, and it came to rest on and across the tracks near the sixth coach. The cross member came to rest on the tracks, generally in line with the direction of the tracks. The east side pole was rotated 90 degrees counterclockwise (in the north direction) at its foundation and was embedded into the ballast parallel to the sixth passenger car. Near this pole, there were red pantograph components on the ground. On the pole, there were sections of material that looked like plymetal and carpet.

[3] For this report, the catenary portals are described in reference to the in reference to the train's direction of travel (north). The numbering begins at the south end of the accident site and increases to the north of the site.

Figure 3. A view of the accident site showing the damage to the catenary system.

For the third catenary structure, N-123, the entire structure remained upright. The base of the east side pole was rotated counterclockwise (the north direction). A section of undercar piping and an undercar equipment box was found near the base of this pole. For structure 4, the west side pole was fractured at its base. This pole was twisted and embedded into the top and sides of the second passenger car. The east side pole and cross member were bent down toward the track.

The following list describes additional observations at the accident site:

- There were multiple sections of windows zip strips on and next to the track between the point of derailment and the first struck catenary pole
- A seat frame, tray table, and window were on the ground near the fifth passenger car
- The locomotive pantograph was on the ground near the fourth passenger car
- Two pieces of insulation were found on the catenary wires near the seventh car

2. Train Configuration

The following table shows the type and placement of the equipment in train 188.

Position in Consist	Equipment Type	Number	Placement in Consist
1	Locomotive	601	A-end forward
2	Business coach	81528	B-end forward
3	Coach	82776	B-end forward
4	Coach	82664	A-end forward
5	Cafe	43346	A-end forward
6	Coach	82761	B-end forward
7	Coach	82797	B-end forward
8	Coach	82981	A-end forward

Table 1. The consist for train 188.

All of the passenger cars were Amfleet I equipment manufactured by The Budd Company. The length of the cars over pulling couplers is about 85’4”, the maximum width is 10’6”, and the height from top of rail to the car roof is 12’8”. The cars were designed to meet the car construction requirements of the Association of American Railroads industry standard S-034-069.

The passenger cars have a vestibule at each end of the car, and both side doors have an interior emergency release above the door. In the coaches, the seating area is in the center of the car, and the passenger area has four interior emergency escape windows. In the café, the service area is in the center of the car. The seating areas, with booths and bench seating, are located at the ends of the car. Each seating area has two interior emergency escape windows. Every car has emergency equipment cabinet stocked with a pry bar, first aid kit, fire extinguisher, and glow sticks. The following figure shows a plan view and a side view of a passenger coach.

Figure 4. A side and plan view of an Amfleet I coach class car (A-end to the right)

3. Damage

Locomotive 601 was examined at the site before the equipment was removed from the scene. The passenger coaches were examined post-recovery at an Amtrak facility. The equipment is described in reference to the direction of travel of the northbound train. The east side of the equipment is referred to as the right side, and the west side is referred to as the left side.

3.1. Locomotive 601

On the front of the locomotive, there were two round cracks in the left side glazing panel. The right side glazing panel was cracked and in place. On the front right corner, the body panel housing the light and marker was not present, and the light and marker were damaged. Above this area, the body panel next to the right glazing panel was crushed inward.

Figure 5. The front and right side of locomotive 601.

On the right side of the locomotive, the side window was cracked and in place. Near the front right side door, the sill steps at the door were bent upward and rearward. The two vertical hand holds were in place, but the lower half of the rear hand hold was bent and separated from the unit. There was horizontal scraping along the locomotive body sheathing. Forward of the cab door, this scraping extended along the full height of the unit. Behind the side door, there was horizontal scraping on the lower half of the body sheathing and on about two-thirds of the length of the roofline. At the rear of the right side, both steps were bent upward and rearward.

On the left side of the locomotive, there was minimal damage noted. Near a vent panel next to the rear cab door, there was slight buckling of the side body sheathing. On the left side operating cab, the door, window, and vertical hand grips were intact. The sill steps were bent slightly rearward.

On top of the locomotive, there was heavy damage to the rear section of the roof. The roof structures at the B-end including the pantograph and insulators were missing.

The inside of the operating cab was generally intact and undamaged. The crew seats were secure to the floor. There were drops of blood on the engineer's console, a seat, and the floor.

3.2. Passenger Car 1 – Business Coach 81528

The first coach came to rest with the front of the car (the B-end) generally facing south and the rear of the car generally pointed to the northeast. The rear end structure of the passenger

compartment was torn away from the remainder of the car and found next to the front of the second passenger car.

Because of the accident damage and subsequent recovery efforts, the examination of this car on scene was limited. The following figure shows a plan view of the underframe of a passenger car. The segments in color show the sections of the underframe that were recovered from the scene and later examined by the group at an Amtrak facility.

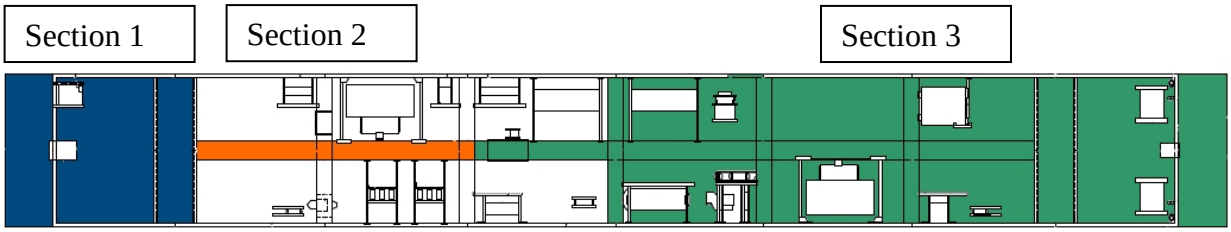

Figure 6. A plan view of a passenger car underframe. The B-end (the front of car 81528) is on the left side.

The following figures show damaged noted by the group members present for that examination.

Section 1

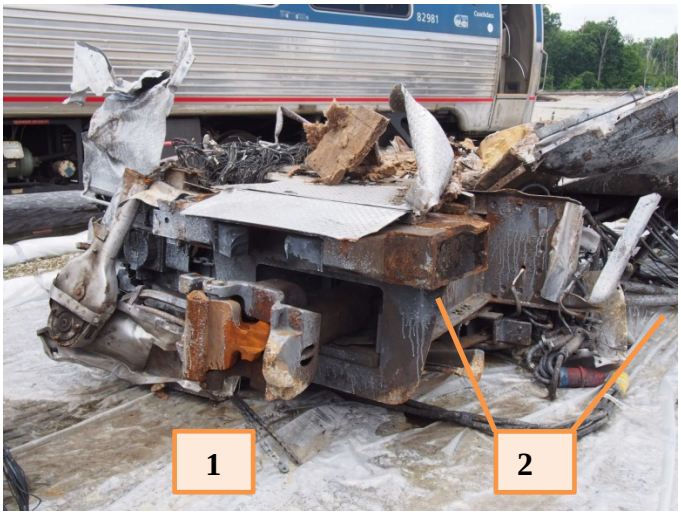

Figure 7. Section 1, looking rearward.

1. Undamaged coupler

2. Missing front left corner structure: collision post, corner post, and entry steps

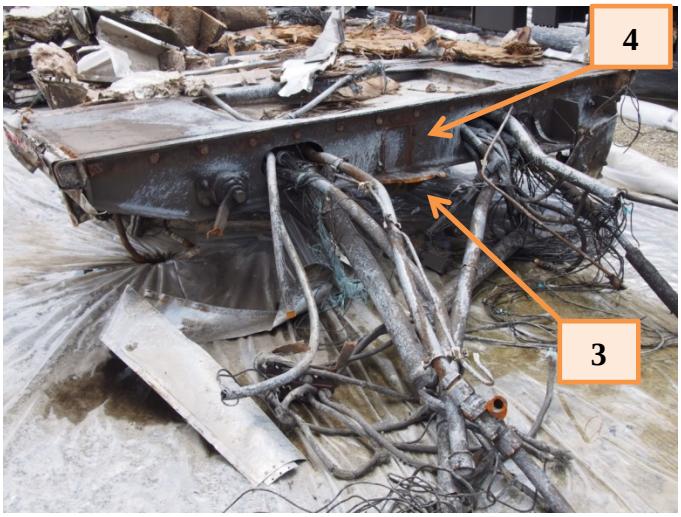

Figure 8. Section 1, looking forward.

3. Fractured body bolster plate

4. Fractured center sill bolster weld

Section 2

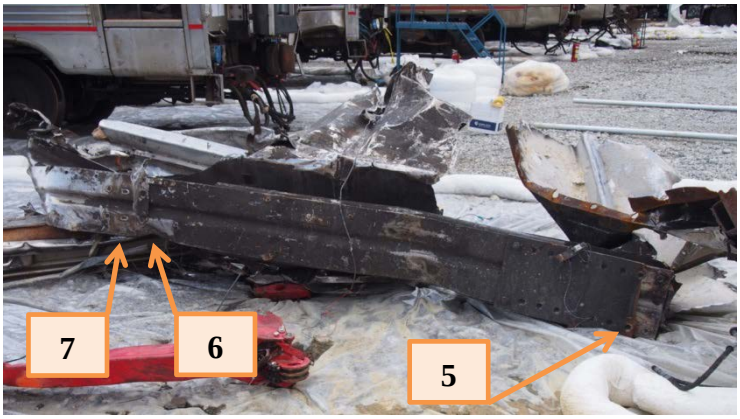

Figure 9. Section 2, the bottom of the center sill.

5. Mating piece of the fractured body bolster plate

6. Strike mark and dent on the bottom of the center sill

7. Cross bearer separated from the center sill

Figure 10. Section 2, the forward section of the center sill.

8. Center sill: twisted to the right about 45 degrees and bent vertically about 80 degrees

Figure 11. Section 2, the top and right side of the center sill.

9. Center sill: bent to the left about 45 degrees

10. Widening of the center sill

Section 3

Figure 12. Section 3, looking rearward.

11. Center sill fracture

12. Cross bearer separated from the center sill

Figure 13. Section 3, the left side of the underframe.

13. Fractures of the left side sill forward of the cross bearers

Figure 14. Section 3, the right side of the underframe.

14. Right side sill intact

15. Draft pocket and coupler carrier fractured

16. Carbody end structure missing: end frame, coupler, and entry steps

3.3. Passenger Car 2 – Coach 82776

Because structural damage compromised the stability of this car, the examination was limited to the exterior of the car.

At the front of the car, the front right corner of the car was crushed rearward into the vestibule door. The vestibule door window was not in place. The roof and top third of the carbody side was crushed downward. On the right side of the car, the middle third of the length of the car bulged outward, and the bottom third of the car was scraped along the side sill. There was some vertical scraping on the blue decal near the R1 and R9 window and side doors, but minimal horizontal scraping on the decal.[4] The rear top corner of the car was crushed downward.

Figure 15. The right side of the second passenger car as viewed from the rear of the car.

On the right side of the car, the R1 and R2 windows were not in place. The R3 and R4 windows were separated from the opening and dislodged inward into the car. The R5 and R6

[4] For this report, the windows are numbered in reference to the in reference to the train's direction of travel (north). The numbering begins at the front of the car and increases toward the rear of the car.

windows were slightly dislodged inward, and their zip strips were not in place. The R7 window separated from the opening and dislodged inward into the car, and the frame of the window was warped. The R8 window was slightly dislodged inward, and its zip strip not in place. The R9 window was not in place.

On the left side of the car, above the L2 window, there was a breach in the carbody that extended over and across the roof extending to the right side of the car near the R3 and R4 windows. The L1 and L2 windows were not in place. The L3 through L5 windows were in place. The L6 window was not in place. The L7 through L9 window frames and gaskets were in place, but the glazing panels were not in place.

3.4. Passenger Car 3 – Coach 82664

At the front of the car, right corner was crushed rearward, inward, and upward. On the right side of the car, the front vestibule door was crushed rearward and inward into the vestibule. The vestibule door was not in place. There was horizontal scraping on the blue decal along the length of the car. None of the windows were in place on the right side of the car. There was a tear and indentation on the lower side sheet that began ahead of the R1 window and extended rearward toward the R5 window. There was a tear between the side sheet and side sill that extended between the R2 and R4 windows. Between the R2 and R4 windows, the side sheet was deformed inward, and the side sheet corrugations were flattened. The rear vestibule door was pushed inward, and there was dirt, debris, and tree branches in the vestibule. The vestibule door window was in place.

Figure 16. The right side of the third passenger car as viewed from the front of the car.

On the left side of the car, there was vertical scrapping on the blue decal along the length of the car. The L1 window was partially dislodged inward, and its zip strip was in place. The L2 and L3 windows were not in place. They were found just inside of the car, and their zip strips were partially pulled. The L4 window was partially dislodged inward, and its zip strip was partially pulled. The L5, L6, and L7 windows were partially dislodged inward, and their zip strips were partially pulled. For the L6 window, the emergency window that opens from the inside of the car was not in place. The L8 and L9 windows were not in place. They were found just inside of the car, and their zip strips were partially pulled.

In the front vestibule, there was dirt and debris was on the floor. The right vestibule door was closed, and the door window was in place. The left side door was crushed inward into the vestibule. For the emergency equipment cabinet, the pry bar and maul were taken out of the cabinet, the first-aid kit was unused, and several light sticks were found throughout the car.

In the passenger compartment, dirt covered all interior surfaces of the car increasing in amount toward the rear of the car. Seat cushions window components were found in the baggage racks.

Figure 17. The interior of the third passenger car as viewed from the front of the car.

On the right side of the car, the seats in rows 2, 4, 5, 6, and 13 were fully separated from the car. Two windows were on the floor in the aisle near seat row 3. Wall panels around the windows were torn and separated from the walls. Ten seat pairs on the left side of the car and ten on the right were shifted out of their locked position. At the rear of the passenger area, dirt, debris, a zip strip section, and a glazing panel were packed in the left side baggage rack. Three windows were found in this area of the baggage rack.

In the rear vestibule, the right side door was crushed inward. Dirt, debris, and tree limbs were packed into the opening. The left side door was open.

3.5. Passenger Car 4 – Café 43346

At the front of the car, the right corner was crushed rearward, inward, and upward. On the right side of the car, the front vestibule door was crushed rearward and inward into the vestibule. There was horizontal scraping on the blue decal; the heaviest scraping was between the front of the car and the first window. Between the side sill and top of the windows, the side sheet corrugations were flattened and scraped the length of the car. At the rear of the windows, the R1 and R3 windows were dislodged inward. The zip strips were partially pulled. The R2 window was not in place. The R4 and R7 windows were not in place. The R5 and R6 windows were

partially dislodged inward, and their zip strips were not in place. There was dirt on the windows and embedded in the window gaskets. The rear, right corner of the car and entry steps were deformed rearward.

Figure 18. The right side of the fourth passenger car as viewed from the front of the car.

On the left side of the car, the L2 window was not in place, and there was a dent and scraping at the rear lower corner of the opening. The L3 window was not in place, and there was a dent and scraping at the rear top corner of the opening. The emergency window that opens from the inside of the car in L4 was not in place.

In the front vestibule, the right side door was crushed inward into the vestibule. The door window was separated from the opening. There was a ballast, dirt, and debris in the vestibule. The left side door was closed, and the door window was in place.

In the front of the car, there was a dirt film on the floors, tables, and the right side wall and ceiling. The emergency tools were out of the storage cabinet. Seat cushions were dislodged from the seats. On the left side of the car, second table on the left side was separated from the wall and its support. The wall panel around the window at the third table was torn. There was a large hole in the bulkhead behind the third table. On the right side, pieces of insulators, sections

from window frames, and sections of window gaskets and glazing were found at the third table and seats. One section of glazing was broken. The wall panel at around the window at this table was torn.

Figure 19. The interior of the fourth passenger car as viewed from the front of the car.

In the galley in the center section of the car, there was paper and plastic service materials scattered on the floor and counter. There were two sets of microwaves and ovens in the service area. One set was secure in place. One microwave door was broken. The second set was on the counter, but shifted out of their normal position. All of the lower storage cabinet doors were closed, and two of the upper doors were unlatched and open. There were two coffee makers in the service area. The bases of both coffee makers were secure on the counter, and one coffee container was on the counter.

In the rear section of the car, there was a dirt film on the floors, tables, and the right side wall and ceiling. Seat cushions were dislodged from the seats. All of the tables were secure in place.

In the rear vestibule, there was ballast, dirt, and debris on the vestibule floor next to the right door. The left side door was closed. Both door windows were in place.

3.6. Passenger Car 5 – Coach 82761

On the right side of the car, the lower front corner of the car was slightly deformed upward and rearward. Below the windows, there were sections of the side sheet and corrugations that were flattened and scraping on the side sill. The R1 through R4 windows were intact and in place. On the R5 window, the zip strip was partially pulled. Beginning near the R5 window, there were horizontal scrape marks that extended to the rear of the car on the blue decal. The R6 window was intact and in place. On the R7 window, the zip strip was partially pulled. For the R8 and R9 windows, the zip strips were partially pulled, and the rear, top corners of the windows were pushed inward. The rear right corner was deformed forward into the vestibule door.

Figure 20. The right side of the fifth passenger car as viewed from the front of the car.

On the left side of the car, the lower front corner of the car was deformed upward and forward. The L1 window was intact and in place. For the L2 window, the interior emergency window was not in place. On the L2 window, there was an area of the gasket that was lifted up, and there were scrape marks on the blue decal near that area. There were two vertical impact marks on the side sheeting below the L2 window. The L3 and L4 windows were intact and in place. The L5 window was not in place. For the L6 window, the interior emergency window was

not in place. There was a circular dent in the side sheeting below the L7 window. The L7 through L9 windows were intact and in place.

In the front vestibule, the right side door was wedged closed, and there was a gap between the door and the steps. The left side door was wedged open a few inches, and there was dirt and debris pile on the floor near the left side door. On the left side of the car, the aisle armrest of the row 4 seat pair was broken. A window was on the floor in the aisle in the center of the car. Two small (few inch) blood smears on the aisle face of the baggage rack. The emergency equipment was in cabinet. The right rear vestibule door was wedged partially open, and the left vestibule door was open.

Figure 21. The interior of the fifth passenger car as viewed from the rear of the car.

3.7. Passenger Car 6 – Coach 82797

On the right side, the front corner of the car was crushed upward and rearward into the side passenger door. There was vertical scraping between the front side door and the R1 window. There was horizontal scraping along the side sill, and inward bending of the side sheeting beginning near the R4 window and continuing to the rear of the car. Portions of the sheet corrugations were flattened, and there was dirt on some areas of the corrugations. The rear of the R1 window was dislodged inward. The R2 and R3 windows were intact and in place. For the R4

window, the exterior zip strip was partially pulled from the gasket, and the interior emergency window was not in place. For the R5 window, the zip strip was partially pulled from the rear corner of the window. For the R8 and R9 windows, the zip strips were fully pulled from the window, and the windows were partially dislodged inward. For the R8 window, the interior emergency window was not in place. There were sections of horizontal scraping on the blue decal between the R5 window and rear side door. The rear right corner of the car and the vestibule steps were bent and deformed rearward. On the left side of the car, the two interior emergency windows were not in place.

Figure 22. The right side of the sixth passenger car as viewed from the front of the car.

Inside of the car, the front center vestibule door was jammed closed, and there were streaks of blood on the door. The door release panel was broken. There were some smears of blood on the tray table in front of the right aisle seat in row three, the left aisle seat in row three, and the right aisle seat in row seven. There were smears of blood on both aisle armrests for seating row 19. The armrests for the left side seats in rows 16 and 19 were broken. On the left side of the car, seat pairs in rows 3, 4, 5, 6, 7, and 9-17 were shifted out of their locked position. The pry bar, maul, and first aid kit were in the emergency tool cabinet. About four of the 10 glow sticks were not in their box. In the rear vestibule, the right side door was wedged partially open. There was a pile of ballast on the floor near the door. The left side door was open.

Figure 23. The interior of the sixth passenger car as viewed from the rear of the car.

3.8. Passenger Car 7 – Coach 82981

On the right side of the car, there was a rectangular-shaped impression mark with brown discoloring next to the front side door. There was horizontal scraping on the blue decal that began between the vestibule door and the R1 window and extended along the length of the car. There was scraping and tears on the side sheeting that began between the front side door and the R1 window. This scraping continued toward the rear of the car along the lower third of the carbody. The R1 and R2 windows were in place. The R3 and R9 windows were in place, and their zip strips were partially pulled. The rear sides of windows R8 and R9 were partially dislodged inward. The right rear corner of the car was bent and deformed rearward.

Figure 24. The right side of the seventh passenger car as viewed from the rear of the car. (Credit: Amtrak)

In the front vestibule, the right side door was closed, and the door window was not in the door. The left side door was open. There was a dent under the left-side baggage rack near the row 5 seats. The zip strip for the rear right side interior emergency window was partially pulled. The frame of this window was bent inward. The pry bar and maul were not in the emergency equipment cabinet. The first-aid kit was not used. At least one glow stick was used and found on the floor. In the rear vestibule, the left side door was open. The right side door was wedged closed, and the window was in the door. There was an opening between the door and rear corner of the car. There was blood on the door and a grab iron. There was ballast and debris on the floor next to this door.

Figure 25. The interior of the seventh passenger car as viewed from the front of the car.

On the left side of the car, the row 12 seat pair separated from its frame. The seat pair was found on top of the right side seats. There was an extensive amount of blood on the right side seats and on the wall at rows 12 and 13. The pivot assembly was found separated from the frame and attached to the seat.

Figure 26. The row 12 seat frame.

Figure 27. The separated seat.

4. Railroad Personnel Information

The operations and human performance groups interviewed the crew of train 188, the Amtrak dispatcher on duty at the time of the accident, an off duty Amtrak dispatcher traveling on train 188, and a Conrail engineer that was working in the freight yard at the time of the accident. The following information is summarized from these interviews; the interview transcripts are available in the public docket. For additional crew information, see the *Operations Group Factual Report* and the *Human Performance Group Factual Report*.

4.1. On-Duty Amtrak Train Dispatcher

Prior to the accident, the dispatcher was handling an emergency with a SEPTA train.[5] While the dispatcher was working on this emergency, he saw on his display that signal power was suddenly lost, and everything on his display turned red.

Because signal power was down, he spoke with the power director, who also had noticed that power was down. Just before the dispatcher tried to contact train 188 and the SEPTA train about the loss of power, an assistant conductor on train 188 called out over the radio that there was an emergency, the train had derailed, and the car she was in was on its side. She told the dispatcher that there were multiple people injured, and that emergency personnel were needed. The dispatcher then reported this information to the assistant chief dispatcher.

A freight crew working in the Conrail yard contacted the Amtrak dispatcher to report that there were a lot of passengers walking in the yard towards them. The dispatcher asked the freight crew to help the passengers and report what they were seeing at the site.

4.2. Conrail Engineer

The Conrail freight engineer reported that he briefly saw train 188, and then he saw catenary poles sparking. He said that he observed a few explosions, one of which he described as "one giant explosion." He reported that he went to the yard office to notify railroads in the area about the accident.

While returning to the site, he reported that he could see people starting to come out of the yard's west end. During this time, they were in contact with the Amtrak dispatcher by radio. As emergency vehicles were arriving at the site, they showed the responders access points to the

[5] For further information about this event, see the *Operations Group Factual Report* and the *Human Performance Group Factual Report*.

site.[6] He and his conductor got flashlights and tried to help people at the site. Some people were already leaving the passenger cars, but the freight crew asked for others in the cars to wait for emergency responders and ladders.

4.3. Train 188 Engineer

The engineer reported that after the derailment, he took his cellphone out of his bag, turned it on, and called 911. The 911 dispatcher told him that the accident had already been reported. He said that when he saw emergency responders on the tracks, they pointed him toward a triage area where he was given a green tag. He reported that he was transported to a hospital in a police wagon for treatment.

4.4. Train 188 Assistant Conductor

The assistant conductor reported that she made safety announcements after departing Philadelphia. At the time of the derailment, she was sitting on the left side of the café car. She said that she could see something flash, the train began to violently shake, and the car rolled and slid on its side. She said that she could see things blowing up and catenary poles falling down.

After the train came to a stop, she told the dispatcher over her radio that there was an emergency and the train derailed. She told investigators that there were about 15 people in the café car. The assistant conductor said that although she was sitting on the left side of the car, she ended up on the right side of the car hanging out of a window. Because she was not sure about the security and position of the car, she asked people to remain where they were. She reported that firefighters opened windows from the left side of the train to help people out of the car.

4.5. Train 188 Assistant Conductor

The assistant conductor was in the last passenger car at the time of the derailment. He estimated that there were 40 people in the car. He said that he felt a few seconds of shaking and two major impacts as if his car had hit the car ahead of him. He was walking through the car and was thrown into a seat. He reported that when he got up he saw seats disconnected or rotated and a large amount of blood in one area of the car. He said that although he had the wind knocked out of him from hitting the seat, he did not feel hurt at the time. He looked for and found his hat so that people would be able see someone in charge of the situation. He said that he radioed the emergency to the dispatcher and could hear the other assistant conductor also reporting the emergency.

[6] During the night, the engineer, conductor, and a trainmaster moved some of the freight cars to provide responders better access to the site.

The assistant conductor reported that a rear side door was jammed and broken, but people were still trying to exit the car through that door, so he opened the rear end door. He told people to move to the right side of the car to avoid the catenary wires. Some injured passengers in the car could not walk out of the car. The assistant conductor said that one passenger was covered in blood, and the passenger said that she could not see. He helped her out of the car to waiting responders.

After assisting passengers in the seventh car, the assistant conductor moved to the sixth car to assist passengers. In that car, there was an off-duty police officer who had a flashlight assisting passengers. The assistant conductor next went to the fifth car. He tried to pry the side doors open with a crowbar, but they could not be opened. Someone began to open the emergency windows, and passengers starting to exit the car through the windows. The assistant conductor then took glow sticks from the train and handed them out to people outside of the cars.

The assistant conductor reported that an emergency responder asked him for the number of people on the train. The responder took the assistant conductor to a street. The assistant conductor said that he was asked to wait there for questions, but the responder left and did not come back. The assistant conductor was given a triage tag and taken to a hospital in a police wagon.

4.6. Off-Duty Amtrak Dispatcher

The off-duty Amtrak dispatcher was in the café car. He reported that he felt a huge violent shaking, and the train went off the track. He said that his window popped out, and everything was thrown around the car.

When the train stopped, the dispatcher was able to move, so he went to find the conductor. He said she was in pain and could not move. He found a radio and reported the accident to CETC. The dispatcher said that firefighters were on the side of the car to help people get out. With assistance, he was able to pull himself out through a window. Once on a street, he borrowed a phone to call the New York dispatch office to give them information about what had happened. He was then transported to a hospital.

5. Emergency Response

5.1. Philadelphia Fire Department Response

5.1.1. Overview

The first call to 911 to report the derailment was placed by a passenger and received at 2125:37. The first fire department companies were dispatched to the area near the intersection of Coral Street and Wheatsheaf Lane. Two engines, two pipelines, two ladders, and two battalion chiefs, a medic unit, a rescue squad and an EMS supervisor were dispatched at 2128.[7] The first arriving company reported on scene at 2131. The first incident commander was battalion chief who arrived on scene at 2132. A staging area was established at Frankford Avenue and Wheatsheaf Lane. The incident commander requested 5 additional medic units at 2133. The medic units and two EMS supervisors were dispatched. The incident commander reported to the fire communications center that there were people on the tracks, cars were overturned, and Amtrak should be notified to shut down the corridor. While in route at 2135, a deputy fire chief ordered the incident classified as a mass casualty incident. A second alarm was ordered, and the mass casualty unit was dispatched.

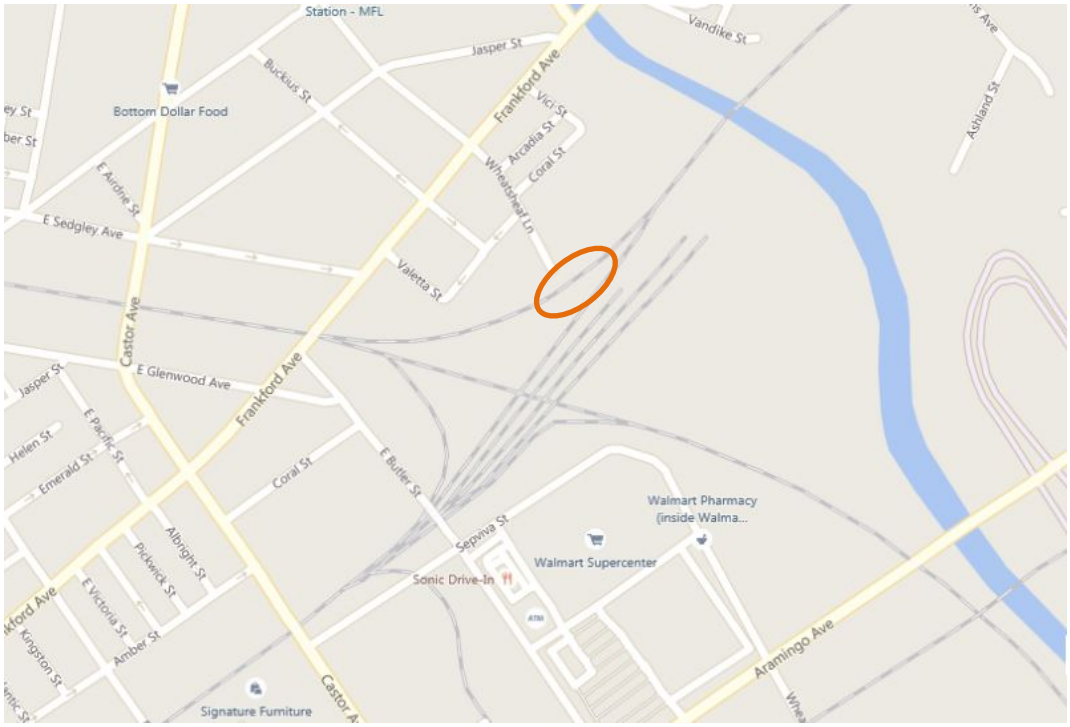

Figure 28. A map showing the area around the accident site.

The incident commander established two operating divisions, an east division and a west division, to manage the response. A battalion chief was assigned to lead each division. The west division was established at Wheatsheaf Lane and Frankford Avenue, and the east division was established at 2121 Wheatsheaf Lane. The incident commander requested confirmation from Amtrak that the corridor was de-energized. The fire communications center contacted Amtrak at 2136. The second alarm was dispatched at 2137, and a battalion chief was designated as the incident safety officer. The second alarm units dispatched included four engines, two pipelines,

[7] A pipeline is a specialized type of engine.

five medic units, a foam unit, an air unit, and a collapse unit. At 2144, the incident commander request that Conrail be notified of the accident, and Conrail was notified at 2148.

Some passengers were assisted and transported from the site by police officers. Some passengers self-evacuated from the train and left the site in two directions: toward Wheatsheaf Lane and toward the Conrail property. At 2145, the fire communications center notified the incident commander that there was a report of 50 injured people located 2267 East Butler Street. A third alarm and 5 additional medic units were ordered at 2147, and the staging area for this alarm was designated at Frankford Avenue and East Butler Street.

At 2151, the deputy fire chief arrived on scene and took command of the incident. The incident commander surveyed the accident site and established a command post near a pedestrian bridge that crossed over the accident site. Firefighters and police officers worked to extricate occupants that were trapped in the damaged cars. Searches for passengers were conducted outside of the cars.

At 2155, the fire communications center reported to the incident commander that Amtrak was working to confirm that power is down. At this time, a ladder company was assigned as the rapid intervention team.[8] The incident commander reported that they still had multiple rescues to complete and patients to treat in the area. At 2157, EMS collection point was established at Wheatsheaf Lane and Frankford Avenue. A second EMS collection point was established at Frankford Avenue and East Sedgley Avenue. At 2201, a special operations deputy fire chief was dispatched to lead search and rescue operations.

At 2204, a medic unit reported that they were transporting a patient to Temple University Hospital. At 2209, the fire communications center reported that Temple cannot take any more patients. At 2211, the fire communications center confirmed that SEPTA busses have been dispatched to the site. Two busses were used to transport patients to hospitals, and one bus was used to transport passengers to a school that was used as a shelter.

At 2219, a deputy fire commissioner arrived on scene and assumed command. At this time, the deputy fire chief was designated as the operations lead. At 2224, the incident commander ordered a fourth alarm which included two engines and two pipelines. The fourth alarm companies were instructed to stage their vehicles at Frankford Avenue and Castor Avenue and to respond to the accident site with manpower.

[88] A rapid intervention team is a fire company on standby and ready to rescue trapped or injured firefighters.

At 2300, the incident commander reported that all patients had been removed from the accident site.[9]

5.1.2. Search and Rescue Operations

The special operations deputy chief was notified of the accident during the second alarm. Three members of the Pennsylvania Task Force 1 and a regional search and rescue task force were requested to respond to the accident site.[10] On arrival, he surveyed the accident site and checked in at the command post. After consulting with the chief inspector of the Philadelphia Police Department's Homeland Security Bureau, fire and police department technical rescue operations were conducted jointly. The deputy chief coordinated with Amtrak personnel to plan for movement of the damaged passenger cars and conduct recovery operations.

5.1.3. Emergency Medical Services Operations

The deputy commissioner for emergency medical services was notified of the accident by telephone. On his arrival, he went to the command post to check in with incident commander. He observed police officers assisting passengers from the accident site and transporting patients to hospitals. The deputy commissioner said:

> They took patients to Temple. They did identify and recognize that some of those people were severely hurt. They did understand that a number of those people needed to go to a trauma center and I think that they didn't realize they were overwhelming Temple University Hospital because of that. But they're pretty much aware that, hey, if you have a significant injury, you need to go to a trauma center. Unfortunately, they did not go through the normal triage treatment and then transportation process…

According to the deputy commissioner, 26 patients were transported to hospitals by fire department medics, and forty-six patients were transported by bus. The deputy commissioner reported that there is a plan to incorporate the police department into the city's mass casualty plan so that those involved in treating and transporting patients will report to an emergency medical services transportation group supervisor.

5.2. Amtrak Response

[9] Four people were later transported to a hospital from the school.
[10] Pennsylvania Task Force 1 is a federal resource that is staged in Philadelphia.

After the train crew the announced emergency over the radio, the Amtrak train dispatcher then reported the emergency to the assistant chief train dispatcher. The assistant chief train dispatcher then began to notify other Amtrak operating departments and the Amtrak Police Department. As previously noted, a freight crew was operating on the Conrail property next to the accident site. The train dispatcher stayed in contact by radio with the Conrail crew for information updates from the scene.

As a result of the damage to the catenary system, circuit breakers for the catenary lines in the accident area were tripped. Traction and electric personnel including the deputy chief engineer for electric traction and a supervisor arrived at the site about 30 minutes after the accident. Around this time, the assistant division engineer, the road foreman of engines, and the assistant superintendent of operations arrived the site. After confirming with the power director that power was down, on scene traction and electric personnel were cleared to begin grounding the lines at about 10:45 pm.

5.3. Philadelphia Police Department Response

The chief inspector of the Philadelphia Police Department's Homeland Security Bureau was the liaison with the Philadelphia Fire Department and the Office of Emergency Management. After he was notified of the accident, he contacted a deputy commissioner with the Amtrak Police Department to ensure that they were notified of the accident.

Because the accident was classified as a mass casualty incident, the chief inspector confirmed that all available emergency patrol wagons were sent to the scene in the event that additional transport vehicles were needed. According to the chief inspector, the police department has medics trained by the fire department. The chief inspector ordered that on-duty police medics respond to the scene and report to the fire department's medical command.

The chief inspector ordered SWAT (special weapons and tactics) units and counter terrorism operations units to respond to the scene with medical and technical rescue equipment to assist the fire department. For the police department resources, he organized working groups and relayed information from the fire department to them. According to the chief inspector, Amtrak representatives were sometime present at the command post, but that their knowledge was needed throughout the site, so they sometimes were pulled away from the command post.

A chief inspector, captain, and sergeant coordinated perimeter control and closing streets around the accident area. Bomb squad and detection canines swept the area; no evidence of a device was detected. An Amtrak representative assisted the officers and verified the point of derailment. A sergeant with the SEPTA Police Department coordinated with the chief inspector. SEPTA busses were used to transport people from the scene. An aviation unit helicopter over the

scene was used to help light the scene, and a lieutenant with the towing unit brought lighting equipment to the scene. CSX police responded to the scene and coordinated with the chief inspector to obtain information about the tank cars on the freight property. The chief inspector and the director of the Office of Emergency Management coordinated to have additional lighting and the city mobile command post, staffed with emergency management personnel, brought to the scene.

Police department vehicles were used to transport patients from the scene to hospitals. According the chief inspector, their policy is to coordinate patient transportation with the fire department's emergency medical services. The chief inspector reported that after the accident many people on the train tried to leave the site immediately. He said that if officers encountered a seriously injured person, the officers would transport the patient to a hospital.

6. Emergency Preparedness

Title 49 Code of Federal Regulations subpart 239 requires passenger railroads to have an emergency preparedness plan. Amtrak's *Passenger Train Emergency Preparedness Plan* was issued in July 1999, and the current edition is dated December 2009. The plan describes internal emergency procedures, employee training, and liaison with emergency responders.

According to the plan, the control centers will initiate the Amtrak internal emergency notification procedure to ensure that the appropriate railroad officials are informed that a passenger train emergency situation has occurred. The plan states that the manager of train operations in the three centralized electrification and traffic control facilities, the two control centers, and the Amtrak Michigan line train director are responsible for maintaining a notification list and phone numbers.

According to the plan, emergency preparedness training is conducted for on-board employees and control center employees. The training (known as *PREPARE*) includes rail equipment and territory familiarization, situational awareness, passenger evacuation, and coordination. The initial training for current on-board employees is provided within 90 days of their initial date of service. Refresher training is provided every two years. The plan states that a current copy of the initial or refresher training can be obtained from the Office of Emergency Preparedness within the Transportation Department.

The plan describes Amtrak's training for emergency responders. This course, *Passenger Train Emergency Response,* is a four hour class for emergency responders that covers safety and security topics. The training discusses the railroad environment, railroad operations, emergency access to passenger cars, hazards and safety precautions, and the typical location of railroad facilities and equipment.

Title 49 Code of Federal Regulations subpart 239 requires intercity passenger carriers to have an emergency exercise every calendar year. Prior to the accident, the most recent full-scale exercise was conducted in April 2015 in Washington, DC. The exercise simulated a collision involving an Amtrak train and a commuter railroad train in a tunnel at Union Station. Participants in the exercise included Amtrak, Virginia Railway Express, CSX, DC Fire and Emergency Medical Services, and Federal and local law enforcement agencies.

7. Post-accident Actions

The seventh car was originally a café car that was converted into a coach car. When the car was converted to a coach, the seats installed in this car were manufactured by Coach and Car Corporation.[11] In the remainder of the accident passenger cars, the seats were manufactured by AMI Inc. For both types of seats, the seat is secured to the frame with a pivot assembly. For the Coach and Car seats, the base of the assembly is disk shaped. For the AMI seats, the base of the assembly is square shaped.

[11] The Coach and Car seats are typically used on Amfleet II coaches.

Figure 29. A view under the frame of a Coach and Car seat.

Figure 30. A view under the frame of an AMI seat.

Beginning in July 2015, Amtrak began replacing the original pivot assembly, with the disk base, on Coach and Car seats during the interior overhaul of the cars. The interiors of the cars are overhauled every 8 years. The pivot assemblies will be replaced on all Coach and Car seats. Additionally, Amtrak created a written procedure for the overhaul process for passenger seats.

-- End of Report --

Attachment List