



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

---

October 20, 2015

## **HUMAN PERFORMANCE GROUP CHAIRMAN'S FACTUAL REPORT**

### **A. ACCIDENT**

NTSB Accident Number: DCA-15-MR-010  
Date of Accident: May 12, 2015  
Time of Accident: 9:21 p.m. (EST)  
Type of Train and No: Passenger Train No. 188  
Railroad Owner: Amtrak  
Crew Members: 1 Engineer, 1 Conductor, 2 Assistant Conductors, and 1 on-board service attendant  
Location of Accident: Philadelphia, Pennsylvania

### **B. HUMAN PERFORMANCE GROUP**

#### Group Chairman

Stephen M. Jenner, Ph.D.  
Human Performance Investigator  
National Transportation Safety Board

#### Group Members

David Nichols  
Chief Transportation Officer  
Amtrak

Johnathan Hines  
System General Road Foreman  
Amtrak

Edward Mruk  
System General Trainmaster  
Amtrak

Mike Bull  
Operating Practices Inspector  
Federal Railroad Administration

Jim Gee  
Operating Practices Inspector  
Federal Railroad Administration

Donald Hill  
BLET-STF, Party Spokesman  
Brotherhood of Locomotive Engineers and Trainmen

Carl Fields  
BLET-STF, Coordinator  
Brotherhood of Locomotive Engineers and Trainmen

Willie Bates  
UTU/SMART Spokesperson  
SMART

**C. SUMMARY OF THE ACCIDENT**

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

**D. DETAILS OF THE INVESTIGATION**

**1. Behavioral Factors<sup>1</sup>**

a. Sleep/Wake/Work Hours.

The engineer’s 72-hour work/rest schedule is detailed in Table 1. He told investigators that he usually sleeps between 6-8 hours or more per night and “usually feel pretty good” when achieving at least 6 hours sleep. He did not have any sleep disorders. He did not take naps during the day. He did not recall feeling tired on the day of the accident.

**Table 1**

<b>Day</b>	<b>Duty Times</b>	<b>Activities at Home</b>	<b>Sleep</b>
Saturday	(Departed for work 1:20 p.m.) On duty from 2:20 p.m.to	Arrived home Sunday morning about 1:00 a.m. Relaxed for 1-3	Fell asleep between 2:00 a.m. and 4:00 a.m. Awoke between

---

<sup>1</sup> During the on-scene interview with investigators, the Amtrak engineer described his injuries as a result of the accident as a possible concussion (multiple stitches on forehead), a sprained right knee, stitches on his right knee, and multiple cuts and bruises on both legs. He had a CT scan and x-rays were taken at the hospital. He told investigators that he was unable to recall events close to the time of the accident. Several months after the accident the engineer continued to report loss of memory prior to the accident.

	11:57 p.m.	hours	10:00 a.m. – 11:00 a.m.
Sunday	(Departed for work 1:20 p.m.) On duty from 2:20 p.m. to 11:57 p.m.	Arrived home Monday morning about 1:00 a.m. Relaxed for 1-3 hours	Fell asleep between 2:00 a.m. and 4:00 a.m. Awoke between 10:00 a.m. – 11:00 a.m.
Monday	(Departed for work at 12:20 p.m.) On duty from 1:20 p.m. to 10:44 p.m. est. Arrived at terminus 11:30 p.m.	Arrived home Tuesday morning about 1:00 a.m. Relaxed for 1-3 hours	Sleep began between 2:00 a.m. and 4:00? a.m. Awoke at 10:20 a.m.
Tuesday	(Departed for work at 12:20 p.m.) On duty at 1:20 p.m. Was scheduled to work to 10:44 p.m. est. (accident at 9:31 p.m.)		

*Additional Information.*

- The engineer's commute time to the train station is about 1 hour. His commute time from the station to home ranges from 1 to 2 hours.
- He was off duty on Wednesday and Thursday prior to the accident (his normal scheduled days off).

**2. Task Factors**

a. Accident trip sequence.<sup>2</sup>

The Amtrak engineer went on duty at 1:20 p.m. in New York, and was scheduled to operate train #2121 to Washington, D.C. He participated in a job briefing with the crew prior to their departure. The trip was uneventful until they passed the Baltimore-Washington International Airport area, where they had some technical problems that delayed their arrival into Washington, D.C.

After arriving at Union Station in Washington, D.C., the crew detrained and the engineer met a friend (non-railroader) in the food court. He returned to the depot at 6:30 p.m. to prepare for his departure. He and his crew agreed to use the same temporary speed restriction bulletins (TSRB's) for the return trip to New York. The trip was on a different train (Amtrak train #188) with the same crewmembers plus a Lead Service Attendant. He described the trip back as

---

<sup>2</sup> Speeds and times referenced in this section are taken from event recorder downloads.

mostly “uneventful.”<sup>3</sup>

The Amtrak engineer’s last station stop prior to the accident was the 30<sup>th</sup> Street Station in Philadelphia, about 8 miles (12 minutes) from the site of the derailment. A couple of minutes after leaving the station he heard a SEPTA train engineer call a train dispatcher on the radio to report that his windshield had been shattered as a result of an object being thrown at it.<sup>4</sup> The SEPTA train, operating on track 1, had stopped ahead of the Amtrak train (which was operating on track 2). A few minutes later, the Amtrak engineer made a radio broadcast to inform the SEPTA crew that the Amtrak train was approaching and about to pass them.

After his last station stop, the engineer had routinely operated the train at (and occasionally below) track speed. In this stretch of track, the track speed transitioned from 30 mph to 70 mph to 60 mph to 80 mph to 65 mph to 80 mph then to 50 mph at the accident curve. He told investigators that he would normally begin braking for the 50 mph curve at the SEPTA “EL” (elevated) bridge, or at the Shore signal. (The engineer stated that he does not look for speed restriction signs - such as the 50 mph posted sign approaching the eastbound catenary structure - because he believed that sometimes they are missing and/or are wrong).<sup>5</sup> However (according to event recorder data), about 55 seconds (approximately 1½ miles) before reaching the curve, he applied full throttle / “notch 8”, and kept it at that position for about 30 seconds, reaching a speed of about 95 mph. He then momentarily (about 2 seconds) placed the throttle in notch 7, before returning it to full throttle / notch 8 for approximately 20 seconds. About 3 seconds before the train derailed - reaching a speed of 106 mph - he placed the train into an emergency brake application. The train derailed traveling 102 mph.

The Amtrak engineer told investigators that one of his last memories was passing the station platform at North Philadelphia.<sup>6</sup> The next thing he recalled was standing up in the cab of his locomotive after the train had derailed. He retrieved his cell phone from his backpack, powered it up, walked by passengers outside the train, and turned off the “airplane” mode on his phone. He then called 911 and explained that their train had derailed, but did not know the location. 911 told him they were already notified. He also lent his cell phone to a female passenger.

EMS arrived on the scene and had given the engineer a *green tag*.<sup>7</sup> He was later taken to a hospital. After receiving treatment, the Philadelphia Police department took him to their police station for questioning.

---

<sup>3</sup> The engineer told investigators that there was excessive wind noise from the engineer’s side of the locomotive when the train exceeded 70 mph.

<sup>4</sup> Investigators learned that in that same area trespassers had been known to throw rocks and other objects at passing trains.

<sup>5</sup> Amtrak indicated that the permanent speed restriction sign for the curve at Frankford was properly displayed with the correct speed of 50 mph.

<sup>6</sup> Investigators noted that the engineer was able to recall radio messages between a SEPTA train and a train dispatcher that occurred after he passed North Philadelphia Station.

<sup>7</sup> Victims who are not seriously injured are quickly triaged and tagged as “walking wounded,” and a priority 3 or “green” classification (meaning delayed treatment/transportation). Generally, the walking wounded are escorted to a staging area out of the “hot zone” to await delayed evaluation and transportation.

b. Visibility of the accident curve.

The engineer stated that additional challenges working at night include not being able to see the rail curve until he is about one or two car lengths away. Some of the external cues that he would use at night (when approaching the curve) is the Shore signal, the elevated bridge near Frankford, and a signal box to the left, which he indicated sometimes he cannot see.

c. The Amtrak engineer’s method for accelerating the train.

The engineer told investigators that his practice for accelerating trains is to “gradually increase the throttle. I don’t slam it all the way open when I’m going slow. But if you’re going kind of fast, it’s okay to slam it open. But I typically accelerate in full throttle and then back off as I approach the maximum speed.”

d. Radio communications.

At about 21:13, a SEPTA commuter train engineer, operating near MP 86.0 (North Philadelphia), made a radio transmission to the train dispatcher stating that the train’s windshield had been shattered after being struck by an object outside the train. Investigators reviewed the tapes of radio communications of the last 7 minutes before the accident. The majority of the radio transmissions during this period were between a train dispatcher and the engineer of the SEPTA train. The Amtrak engineer told investigators that he overheard these communications, and also made one radio transmission during this time. The transmissions are transcribed in Table 2.

**Table 2 Radio transmissions**

SOURCE	TIME	DURATION (Seconds)	TRANSMISSION
Train 769	21:13:11	9	Something happened to the window. It looks like a rock. Train 769 Amtrak CTEC. Over.
Dispatcher	21:13:32	3	Track CETC 6 to 769
Train 769	21:13:36	35	769, coming out of Mantua, right at, uh, almost at the Diamond Street under grade bridge. Something hit our windshield. I don’t know if somebody threw something, or somebody – but our windshield is shattered. I saw somebody by the side of the rail, but they had a light on, they had on a light on dark clothes. I couldn’t see what they looked like. But the windshield from this train is shattered. Over.
Dispatcher	21:14:14	13	Alright. Somebody either threw something or – alright. Um. Diamond Street under bridge, under bridge? bridge, uh, and you’re all right? Over.
Train 769	21:14:28	31 sec total (0-10 sec noise)	So far everything – I mean – I just got glass in my face. I saw a trespasser by the freight tracks. I blew the horn, it had a light, they put the light out. And

			that's when it happened. It's about – I dumped the train about 6 cat poles from where it happened. Over.
Dispatcher	21:14:35	2	You said you got glass on your face. Over.
Dispatcher	21:15:01	5	Alright. Roger. So you dumped the train? And you're all intact and on the rail, correct? Over.
Train 769	21:15:07	14	We're on the rail and, like I said, the windshield is shattered. Something hit it. I don't know what it was. I've seen people throw rocks here before. I don't know if it was a rock. But this windshield is shattered.
Dispatcher	21:15:22	8	Alright. Roger. And Um – Do you have like an exact milepost where that dump at Diamond Street Bridge is? Over.
Dispatcher	21:15:36	3	Where you stopped right now? 769 over.
Train 769	21:15:54	6	On the cat 4-pole where I'm stopped.
Train 188	21:16:07	6	Amtrak 188 as SEPTA 769, Hot rail, hot rail, Number 2 rail coming. Over.
Dispatcher	21:16:17	4	CETC 6, 769, what's your exact location there?
Train 769	21:16:37	10	I'm over on top of 22 <sup>nd</sup> and Diamond. Right over Diamond Street, around 22 <sup>nd</sup> . Milepost 86. It's milepost 86.
Dispatcher	21:16:47	7	All right, Milepost 86. All right. So the front windshield is completely shattered. Um, you're all right? Correct? Over.
Train 769	21:16:57	12	Kind of dinged... because there's glass all in my face.
Dispatcher	21:17:00	3	Do you need any medical attention or anything? Over.
Dispatcher	21:17:11	5	All right, I understand that, 769. Do you need medical attention or anything? Over.
Train 769	21:17:23	14	[Indiscernible response]
Dispatcher	21:17:44	3	Amtrak CETC 6, SEPTA 769. Over.
Train 769	21:17:48	12	769 answering. Over. Ah, yes, it's a good idea. Please, please. I just want to make sure.
Dispatcher	21:17:50	2	Yeh, do you need medical attention?
Dispatcher	21:18:01	3	Alright, you do want medical attention. Okay, alright. Roger.
Undetermined	21:19:08	5	First person: [Indiscernible] Second person: [Laughs] Yeh, we got rocked.
<i>Accident</i>	<b>21:20:38</b>	--	--

During the on-scene interview, the Amtrak engineer discussed his concern for the SEPTA engineer:

I just remember I think I was at about Mantua and they just called and they said

something about a windshield being busted by rocks or something and that they were in emergency. They didn't say they were in emergency until 3 or 4 radio transmissions later. And there was a little bit of debate as to whether or not they needed medical attention.

The engineer on SEPTA sounded very upset and it sounded like the dispatcher was trying to get clear information as to whether or not he needed medical help. And the train engineer was not being very clear and so they went back and forth.

The SEPTA train mentioned that (shots) and I was concerned...I was a little bit concerned for my safety. There's been so many times where I've had reports of rocks that I haven't seen anything, that I felt like it was unlikely that it would impact me. And I was really concerned for the SEPTA engineer. I had a co-worker in Oakland that had glass impact his eye from hitting a tractor-trailer and I know how terrible that is.

e. Cellular Phone Use.

The engineer told investigators that his personal cellular phone had been turned off, placed in the "airplane" mode, and stowed in his backpack while he was operating the train. Investigators obtained the engineer's cell phone and accessed his cell phone and SMS records from the carrier. Analysis of all available data indicated that no incoming or outgoing calls, SMS, or data usage occurred at the time of the accident or while he was on duty since he departed Washington, D.C. Investigators also determined that the engineer's cell phone did not connect to the Amtrak Wi-Fi.

### **3. Medical Factors**

a. Health.

The Amtrak engineer, 31, is 6-feet tall and weighs 150 pounds. His last company physical was April 12, 2015. His hearing and vision were normal (no restrictions). He told investigators that in January 2015 he underwent successful Lasik eye surgery and no longer needs prescription glasses. He also told investigators that prior to the accident he had not taken any prescription or non-prescription medications. He had not been under high levels of stress, had not been feeling ill, experiencing weakness or nausea, nor was ever diagnosed with any sleep disorders. He did not believe that he snored while sleeping. He stated that he did not feel tired on the day of the accident. (Additional medical information is provided in the NTSB's Medical Officer's Report).

b. Post-accident Toxicological Tests.

In accordance with federal regulations, the Amtrak crewmembers involved in the accident provided blood and urine specimens for post-accident toxicological testing. Specimens were collected at a local hospital. The results were negative for illicit drugs and alcohol.

Portions of the engineer's specimens were also sent to the Civil Aerospace Medical Institute (CAMI) for further analysis. Those specimens were also negative for drugs and alcohol.

#### **4. Operational Factors**

##### a. Training/Experience.

The Amtrak engineer began working in the railroad industry in 2003 as an office assistant at Columbia Terminal Railroad in Columbia, Missouri. He was also attending college at this time. In the summer of 2004 he worked as a brakeman. He began working at Amtrak in 2006 as an assistant conductor in St. Louis, Missouri. In 2008 he moved to San Francisco, California and worked at Caltran as an assistant conductor. On March 16, 2009 he went to Amtrak's school for locomotive engineers, and completed the classroom portion on May 26, 2009. In 2010, he worked as a student engineer Oakland, California, and later that year became a certified engineer that same year. He operated trains over Caltran territory through 2011. In 2012, he moved to New York and spent about a year training with Amtrak on new territories and equipment to operate as a qualified locomotive engineer with Amtrak. He became qualified in 2013, and began working out of New York until the time of the accident. He told investigators "there are a lot of ways the training could have been better, but I feel fully qualified to operate trains." He specifically stated that additional simulator training may have been helpful.

##### b. Overview of Amtrak's training program.

Candidates who are selected for student engineer training go to Amtrak's training facility in Wilmington, Delaware. This initial (classroom) training lasts between 8 to 10 weeks. Trainees for those who will be operating on the Northeast corridor training lasts 10 weeks (due to the additional equipment they may be operating), while those operating 'off corridor' train for 8 weeks. The training program consists of several components, including mechanical (inspecting, testing of various locomotives and equipment; troubleshooting; simulator training; and air brakes) and regulatory requirements for certification (including rules and signals). There is a required passing score: Mechanical/air brakes: 90%; Rules: 90%; Signals: 100%. If a trainee fails any of the components of mechanical or air brakes he is dismissed from the program. Students have a second chance to pass the operating rules and signals test.

At the completion of the classroom training, the students return to the location where they were hired for on-the-job training (OJT). The OJT portion lasts between 12 and 16 months. During this time students qualify on the physical characteristics of the territory, and are tested on the sections of track where they received their training. After passing the test, they then operate trains under the direction of an engineer instructor. They continue to operate with multiple instructors to learn different train types, operation of different equipment, and different operating styles. After completing the OJT phase, students are sent to 'block training' for another operating rules class and additional requirements (covering various train components, including air brakes, mechanical, equipment, ATC, cab signals, ACSES, emergency preparedness). At the completion of block training, students must perform a qualification or certification run to demonstrate proficiency on all routes. Students successfully completing this phase are promoted to engineer. The locomotive engineer training program was developed in conjunction with the



BLET and lasts up to 18 months.

*Transfer Engineers:* Amtrak locomotive engineers who have been qualified but wish to change operating locations (for example, moving from the West coast to the East coast) must first bid into a job based on seniority. They must learn the physical characteristics the same way as a student / trainee. They then go back to the operating department and must pass a physical characteristics examination. Afterwards they operate under the direction of an instructor until they become proficient and it is determined that they are qualified to operate independently. Because they are qualified engineers, the time frame for completing the training is quicker than that for a student with no previous qualifications.

An Amtrak official stated that the territory where the accident occurred is a “fairly easy piece of the railroad to learn...compared to Zoo or Penn Station or between New York and Dock, which is very complex. It’s pretty simple. You have a four-track main, very few interlockings there. But you have simple moves.”

*Amtrak’s new locomotives:* Amtrak received and began testing the new locomotives (Siemens ACS-64, which was the type involved in the accident) in the summer of 2013. They were put into service in February 2014. An Amtrak official stated that their engineers had provided very positive feedback for these types of locomotives.

Amtrak provides their engineers with 1 day of static training on the new ACS-64 Locomotive. This includes 4 hours of classroom followed by 4 hours of hands-on training. The purpose of this is for the engineers to become familiar with the equipment – components of the locomotive, various features, and cut-outs. Afterwards, under the direction of a road foreman, engineers will operate the new equipment on familiar territory to become qualified on that equipment. In most cases, engineers become proficient on their first trip. Amtrak allows for additional days for engineers who request additional trips.

The Amtrak engineer involved in the accident told investigators that he felt comfortable operating the newer style of locomotive (ACS-64), and estimated that he had operated this type of unit about two dozen times.

## **5. Other Amtrak Crewmembers**

### **a. Assistant Conductor #1.**

The Amtrak assistant conductor, 38, was hired by Amtrak on October 14, 2011. On the day of the accident, she awoke about 9:00 a.m., ate breakfast, and reported for duty at 11:50 a.m. in New York. She served as an assistant conductor on the Amtrak train #171 traveling from New York to Washington, D.C. She described her trip as uneventful, though they arrived in D.C. about 30 minutes late.

She recalled her train being delayed leaving D.C. because the train had not been pulled from the yard. She participated in the crew’s job briefing prior to departure, and also conducted other safety tests on the train equipment. She was assigned the third and fourth passenger cars,

and also assigned to make public address announcements to the passengers during the return trip. She made her first announcement (discussing stations stops, safety instructions, café car and other information) when they departed D.C., and a similar announcement when they departed the station in Philadelphia. She described the trip to Philadelphia as being uneventful. After departing the Philadelphia station, she overheard on her portable radio a conversation between an engineer (which she mistakenly believed was the engineer of the Amtrak train) and the dispatcher about someone either shooting or throwing rocks at the train. Moments later, she heard the horn sound which was followed by “something flash and the train is shaking violently...I don’t know if we flipped over or what, but we rolled and slid and the train was on its side.” As a result of the derailment she had fallen to the ground. Moments later, she made an emergency call to the train dispatcher on her radio indicating that the train had derailed.

She told investigators that she had previously worked with the Amtrak engineer. She stated,

[He] is great. He knows his job. He’s there on time for the briefing. He answers any questions we have...I’ve never seen him do anything that he wasn’t supposed to do... He was a very good engineer.”

b. Assistant Conductor #2.

The second assistant conductor, 34, was hired by Amtrak on May 7, 2014. On the day of the accident he went on duty at 1:20 p.m. in New York and served as the assistant conductor ON Amtrak train #2121 during the trip to Washington, D.C.

He participated in the job briefing prior to their trip from Washington, D.C. to New York. He was responsible for the sixth and seventh passenger cars. He described the trip to Philadelphia as being uneventful. At the time of the derailment he was in the seventh car. As a result of the derailment he had fallen to the ground. He had attempted to call the dispatcher to report an emergency, and overheard the other assistant conductor doing the same. He then assisted passengers in evacuating the train.

He had not worked with the Amtrak engineer prior to the day of the accident. He told investigators,

I was actually really happy with him (the engineer) because I found him to be involved in the briefing process...And plus, I thought he was really communicative on the radio. Like I could always understand what he was saying and I could – he always responded to everything that was said to him.

c. Conductor.<sup>8</sup>

The Amtrak conductor, 32, was hired by Amtrak on May 7, 2014. On the day of the

---

<sup>8</sup> Due to his injuries sustained in the accident, the Amtrak conductor was unable to be interviewed during the on-scene investigation. On September 9, 2015, NTSB investigators, along with FRA, Amtrak, and BLET investigators, interviewed the conductor in New Jersey.

accident he went on duty in New York at 1:20 p.m., and served as the conductor on Amtrak train #2121 during their trip to Washington, D.C. He had participated in the job briefing prior to their return trip. During his trip he tended to passengers in the first and second cars of the train. On some of the station stops he had a brief interaction with the engineer, who did not indicate any concerns he had about train operations. The conductor described the trip to Philadelphia as normal and routine. At the time of the derailment he was in the restroom when he felt the train jerk. He opened the restroom door and was thrown to the floor and reportedly unconscious for a period of time.

The conductor had worked intermittently with the engineer over the last three years. He told investigators that the engineer was:

On top of his game. Knowledgeable. Always knew the answers. Very knowledgeable of the territory.

Compiled by: /s/ \_\_\_\_\_

Date: October 20, 2015

Stephen M. Jenner, Ph.D.  
Human Performance Investigator