National Transportation Safety Board

Washington, D.C. 20594

Railroad Accident Brief

Accident No.:	DCA-06-FR-007
Location:	Abington, Pennsylvania
Date:	July 1, 2006
Time:	2:53 p.m., eastern daylight time[1]
Railroad:	Southeastern Pennsylvania Transportation Authority
Property Damage:	$179,700
Injuries:	38
Fatalities:	None
Type of Accident:	Collision

Synopsis

On Saturday, July 1, 2006, about 2:53 p.m., southbound Southeastern Pennsylvania Transportation Authority (SEPTA) passenger train 1143 collided head on with standing northbound SEPTA train 1134 near Abington, Pennsylvania. The southbound train was traveling about 11 mph when it struck the northbound train. As a result of the collision, the control cab car and two passenger cars on the southbound train and the control cab car on the northbound train were derailed. Thirty-eight passengers were injured and treated on scene. Of those, 29 were transported to local hospitals, and 8 were admitted. All six crewmembers from both trains were also taken to local hospitals; three of them were admitted. Total property damage was about $179,700.

The Accident

The accident[2] occurred on single, straight track at milepost 2.8 on the Warminster Line, just south of a 3°15' curve. (See figure 1.) The weather was partly sunny, and the temperature was 83° F. At the time of the accident, both trains consisted of four electrically driven passenger cars, and each train had a lead car that was equipped with a control cab for the engineer. Each train had an engineer, a conductor, and an assistant conductor on board.

[1] All times in this brief are eastern daylight time.

[2] The following sequence of events was determined from event recorder data, signal data, train dispatcher data, and postaccident testing and interviews.

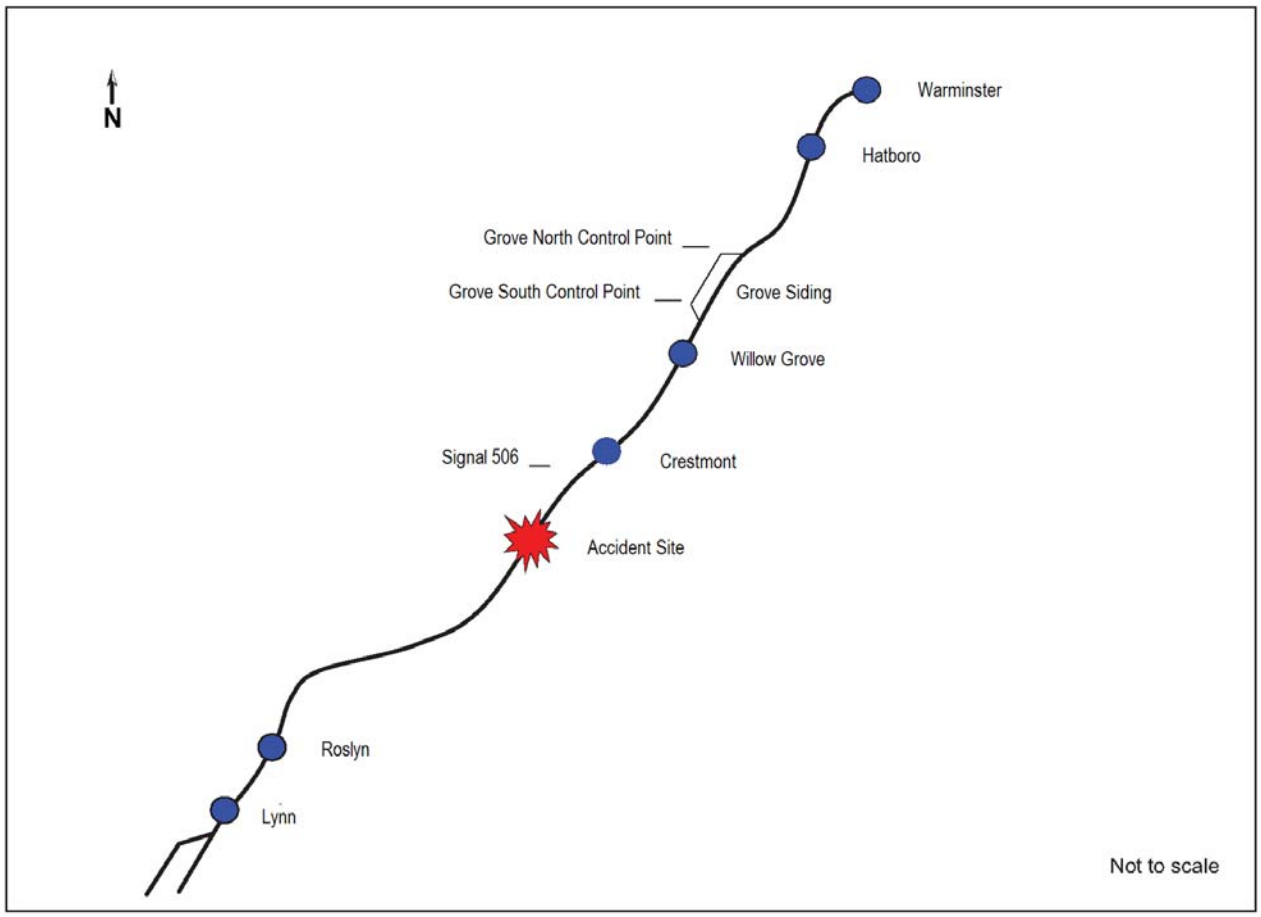

Figure 1. Map of a portion of the Warminster Line and the accident location.

The dispatching plan called for the two trains to meet at the Grove South Control Point, about 1.4 miles north of the collision site, with the southbound train stopping on the main track at Grove South and the northbound train entering the siding at Grove South. The southbound train did not stop on the main track at Grove South, and it did not meet any train at Grove siding prior to the collision. The southbound train engineer did not comply with a total of three wayside signal indications—*approach* (yellow over red over red), *stop* (red), and *stop and proceed* (red)—leading up to the collision. He also operated through and damaged the siding switch at Grove South, which was aligned for the northbound train to enter the siding. Yet, as the southbound train continued traveling between Grove South and the eventual accident site, the engineer passed three crossings and properly used the train horn at each, and he made two passenger station stops. When he saw the northbound train stopped on the track, he made an emergency brake application about 10 seconds before impact and warned passengers to brace themselves.

A few minutes prior to the collision, the engineer of the northbound train passed a sequence of two signals—a *clear* (green) followed by a *stop and proceed* (red)—that concerned her. She was concerned because she had not received an *approach* (yellow) signal indication before the *stop and proceed indication* and she was operating the train on single track. The engineer stopped the train and tried calling the train dispatcher three times to confirm that the

signal instructions were correct. After receiving confirmation via radio, the engineer again began to operate the train and proceed in compliance with the signal instructions. When she saw the headlights of the southbound train, the engineer of the northbound train reapplied the brakes, stopped the train just prior to the collision, and told passengers to brace themselves.

The train dispatcher acknowledged a system alarm for an overrun signal, via computer mouse click, shortly after the southbound train engineer operated through the siding switch at Grove South. However, he did not take any additional action in response to the alarm. The alarm sound and screen text type were not unique, and alarms were a common occurrence for routine matters during a dispatcher's shift. Also, although he was responsible for only one desk/dispatching area, the dispatcher was covering two desks/dispatching areas at the time of the accident because his counterpart was taking a break.

Investigation

The investigation determined that the wayside signal system and equipment were functioning properly at the time of the accident. Weather conditions did not limit visibility. No impairing substances were found during the required Federal Railroad Administration postaccident toxicological tests of all crewmembers on both trains and the dispatcher on duty when the accident occurred.

The engineer of the southbound train said that the train had operated normally. SEPTA records indicated that the cars of southbound train 1143 had been inspected and tested within the required intervals. The crew had performed an air test on the train before departing Warminster. The night before the accident the mechanical department completed an inspection of the equipment. No exceptions were noted.

The engineer of the southbound train was qualified to perform his duties. He had passed a physical examination that included a vision test. He had been properly trained and tested, and SEPTA had determined him to be knowledgeable of and in compliance with its operating rules. He had begun working for SEPTA as an assistant conductor in October 2004, and he had transferred to the engineer training program in 2005. The accident trip was his fifth solo trip as an engineer.

The train dispatcher was qualified to perform his job duties. He had passed SEPTA's operational tests and the recertification examination for his position. He had worked as a tower operator for 13 years, which was a position with duties similar to those of a train dispatcher. He had been in the bus service as a driver for 7 months in 2004. In July 2004, he had transferred to the dispatching center, and he had been working as a train dispatcher for about 2 years when the accident occurred.

The main track movements, including movements onto and off the main track and sidings, were governed by operating rules, a wayside traffic control signal system, and a SEPTA dispatcher at SEPTA's control center located in downtown Philadelphia, Pennsylvania.

Southbound Train 1143 Engineer's Actions

The southbound train engineer's descriptions of the signal aspects he had received at three locations prior to the collision did not match those recorded by the signal system or the results of postaccident testing. (See table 1 for a comparative summary of the accident signal data.) He misperceived and/or misinterpreted three different signal aspects, two of which were red, indicating the need for him to *stop* or *stop and proceed*. He also operated through and damaged the siding switch at Grove South, which had been lined for the northbound train.

During the same accident trip, the engineer made appropriate station stops. He used the throttle and brakes correctly. He also used the train horn at crossings. Further, when he did see the northbound train stopped on the track and recognized the inevitability of impact, he made an emergency brake application and warned passengers.

Table 1. Summary of accident signal data as described by the southbound train engineer and as collected by the National Transportation Safety Board.

	Southbound Train 1143 Engineer's Testimony	**National Transportation Safety Board's Collected Data**
Grove North Signal	*Approach Medium* (yellow over green over red)	*Approach* (yellow over red over red) Wayside signal equipment did not have a green lens in its middle signal unit
Grove South Signal	*Approach* (yellow over red over red) Saw three signal units 30 mph speed restriction implied post signal	*Stop* (red) Wayside signal only equipped with two signal units Was traveling 40 mph post signal
Signal 506	*Approach* (yellow)	*Stop and Proceed* (red)

On the day of the accident, the engineer of the southbound train fulfilled most of his job duties. Wayside traffic control signals authorize train operations; complying with them ensures safe train operations. The engineer was aware of passenger station stops and crossings. He capably applied the brakes and used the train horn when appropriate, but he did not respond correctly to three separate signal aspects. The engineer was actively operating the train, but he was not adjusting the speed of the train or stopping the train as required by the wayside signal indications.

Cab Signals

All of SEPTA's control cab cars, including those on the trains involved in this accident, were equipped with automatic cab signal and train control enforcement equipment that could display signal indications inside the cab and enforce them. However, on the Warminster Line, the wayside signal system was not capable of transmitting signal information to the cab signal

system installed in SEPTA's control cab cars.[3] Other lines of the SEPTA system had functional cab signals with automatic train control enforcement. On those lines, if an engineer failed to observe or misinterpreted a more restrictive signal (such as *approach* or *stop*) the cab signal system would alert the engineer, and if no action (such as a speed reduction) were taken, the air brakes would be activated. The engineer of the southbound train did not have such safety redundant technology backing up his actions. Without it, compliance with the wayside signals and the safe operation of the train rested solely on his attention and proper response to the wayside signal indications.

Train Dispatching Alarm

The alarm on the dispatcher's computer system was used to alert the dispatcher to many abnormal system conditions; the overrun signal was only one of them. The alarm sound (monotonous and low) and the computer screen text appearance (small, red, and stacked along the lower half of the monitor) were the same for all exceptions; none were distinguished by significance. The train dispatcher was accustomed to receiving several non-critical alarms during a shift. As a result, in this accident, he reflexively cancelled the audible alarm for the overrun signal about 30 seconds after it sounded. Nearly 4 minutes and 20 seconds elapsed between the time when the alarm initially sounded and the collision occurred. Had the train dispatcher recognized the importance of the overrun signal alarm, he would have had time to call and warn the southbound train and the northbound train of the pending collision.

Postaccident Actions

Since the July 1, 2006, Abington accident, SEPTA has improved the safety of its wayside signal system. SEPTA is implementing a capital budget funding project systemwide. As part of the project, SEPTA is upgrading the Warminster Line with functional cab signals and automatic train control enforcement. The work on the Warminster Line began in January 2008, and SEPTA expects it to be completed by the end of 2009.

SEPTA has also improved its train dispatching system since the Abington accident. The SEPTA train dispatching system was modified effective October 2007. Two features, "Signal Overrun" and "Catenary Power Loss," were enhanced on all of the dispatching desk consoles, the chief dispatching console, and the Superintendent of Train Operations (STO) console. The change to the Signal Overrun feature is a critical one. If a train in the field overruns a signal, a voice will announce continuously, "signal overrun." A pop-up message also will appear on both the dispatcher's computer screen and the STO's computer screen. Both the train dispatcher and the STO must acknowledge the message before it will turn off. With this system in place, it would require two individuals (the dispatcher and the dispatcher's supervisor) to ignore the alarm before a collision similar to the one at Abington could occur.

[3] At the time of the accident, SEPTA was upgrading the signal system on the Lansdale Line to make the cab signals functional. In January 2008, SEPTA began upgrading the signal system on the Warminster Line. SEPTA expects cab signals on the Warminster Line to be functional by the end of 2009.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the July 1, 2006, collision of two Southeastern Pennsylvania Transportation Authority passenger trains near Abington, Pennsylvania, was the failure of the engineer on southbound train 1143 to comply with the wayside signals and stop the train on the main track at the Grove South Control Point. Contributing to the accident was the lack of a functioning cab signal system with automatic train control enforcement. Also contributing to the accident was a dispatcher computer alarm system that did not adequately alert the train dispatcher to the overrun signal.

Adopted: June 17, 2008