

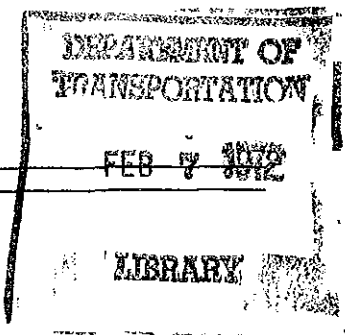
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RAILROAD ACCIDENT INVESTIGATION

REPORT NO. 4164



PENN CENTRAL COMPANY

NEW YORK, N. Y.

JANUARY 9, 1970



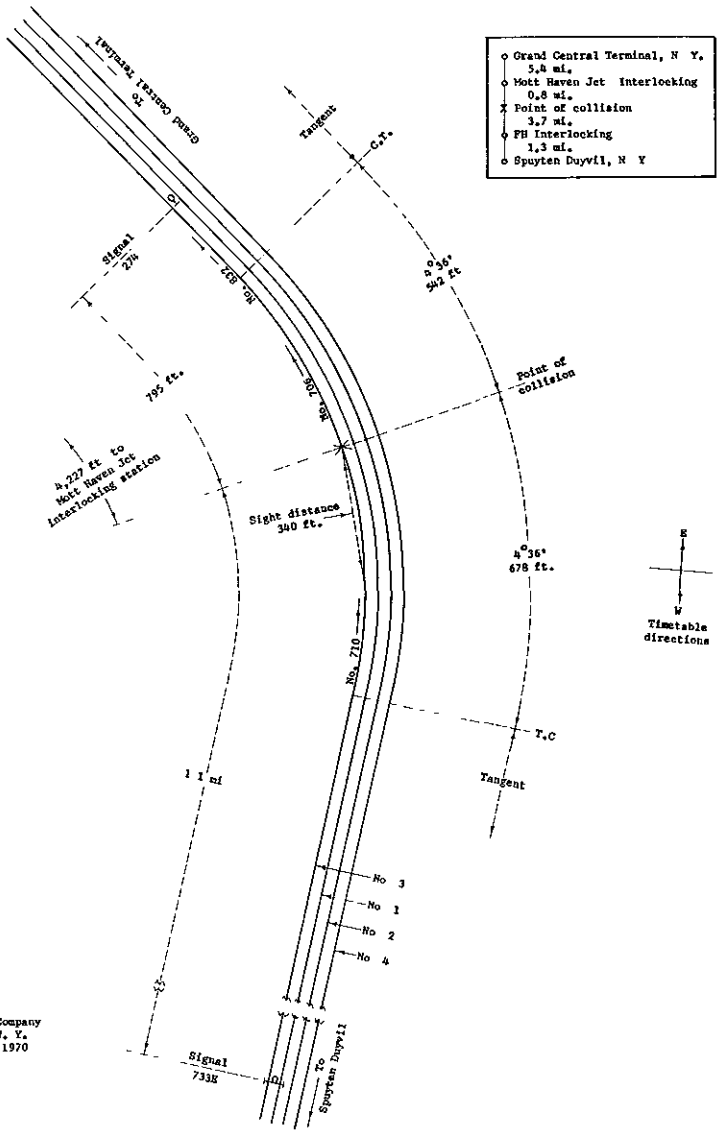
FEDERAL RAILROAD ADMINISTRATION

BUREAU OF RAILROAD SAFETY

Washington, D C. 20591

Summary

DATE:	January 9, 1970		
RAILROAD:	Penn Central		
LOCATION:	New York, N Y.		
ACCIDENT TYPE:	Rear-end collision		
TRAINS INVOLVED:	Passenger	Passen- ger	Passenger
TRAIN NUMBERS:	832	706	710
CONSISTS:	4 electrically-pro- pelled passenger units	3 electri- cally pro- pelled pa- ssenger units	5 electri- cally pro- pelled pa- ssenger units
SPEEDS:	Standing	Standing	Slow
OPERATION:	Signal indications		
TRACKS:	Four; 4 ^o 36' curve; level		
WEATHER:	Clear		
TIME:	8:15 a.m		
CASUALTIES:	259 injured		
CAUSE:	Failure of engineer to operate the sec- ond following train in accordance with a restrictive sig- nal indication		



Penn Central Company
 New York, N. Y.
 January 9, 1970

DEPARTMENT OF TRANSPORTATION
FEDERAL RAILROAD ADMINISTRATION
BUREAU OF RAILROAD SAFETY

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RAILROAD ACCIDENT INVESTIGATION,
REPORT NO. 4164,

PENN CENTRAL COMPANY
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Synopsis

On January 9, 1970, a rear-end collision occurred between three Penn Central passenger trains at New York, N. Y. It resulted in injury to 250 passengers and 9 train employees

The accident was caused by failure of the engineer to operate the second following train in accordance with a restrictive signal indication

Location and Method of Operation

The accident occurred on that part of the Penn Central extending eastward from Spuyten-Duyvil Interlocking to Grand Central Terminal, New York, N. Y., a distance of 11 2 miles. Trains move northward and southward in that territory by geographical directions. The timetable directions, however, are eastward and westward, and those directions are used in this report

FH and Mott Haven Jct. Interlockings are 1 3 and 5 8 miles east of Spuyten-Duyvil Interlocking, respectively. Between FH and Mott Haven Jct., the railroad is a four-track line. From the north, the main tracks are numbered 3, 1, 2 and 4. Trains operate in either direction on tracks No. 3 and No. 4 by signal indications of a traffic control system. A third-rail system is provided for the electric propulsion of trains

The collision occurred on track No. 3, 6.2 miles west of Grand Central Terminal and 4227 feet west of the interlocking station at Mott Haven Jct

Track No. 3

From the west on track No 3 there are, in succession, a long tangent, and a 4°36' curve to the left 678 feet to the collision point and 542 feet eastward. The grade in this area is practically level.

Signals

Automatic signal 733E and interlocking signal 274, governing eastbound movements on track No 3, are 1.1 miles west and 795 feet east of the collision point, respectively. Signal 274 is the home interlocking signal for eastbound movements approaching Mott Haven Jct. Interlocking on track No 3

The circuits are so arranged that when its block is occupied, signal 733E displays a Stop-and-Proceed aspect, which indicates Stop; Then Proceed at Restricted Speed.

Carrier's Operating Rules

DEFINITIONS

Restricted Speed - Proceed prepared to stop short of train, *** not exceeding 15 miles per hour.

Time and Weather

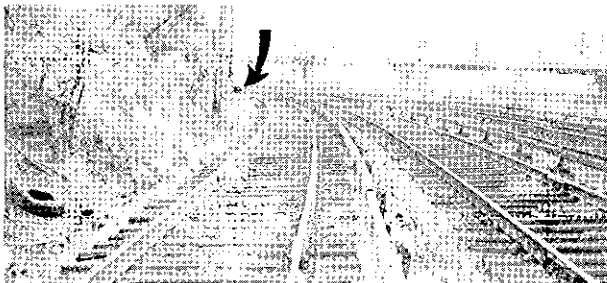
The collision took place at 8:15 a.m., under clear weather conditions. The ground was covered with snow and the temperature was about 4°F.

Authorized Train Speed

The maximum authorized speed for passenger trains in the collision area is 60 m.p.h.

Sight Distance

An embankment, 10 to 20 feet high, is adjacent to the north side of track No. 3 in the collision area. Because of the embankment and track curvature, the engineer of an eastbound train on track No. 3 cannot see a railroad car standing at the collision point at a distance greater than approximately 340 feet (see photo on the following page).



View eastward on track No. 3 (at left),
340 feet to collision point (arrow).

Circumstances Prior to Accident

On the morning of the accident, a gondola car moving in a freight train caused damage to the third rail of track No. 2 between the Spuyten-Duyvil and FH Interlockings, and also within limits of the Mott Haven Jct Interlocking. As a result, four eastbound passenger trains en route from Croton-Harmon, N. Y. to Grand Central Terminal, New York City, were held at the Spuyten-Duyvil Interlocking until they were routed from that interlocking to FH Interlocking via track No. 1, and from FH Interlocking to Mott Haven Jct. Interlocking via track No. 3.

At 7:52 a m., the four delayed passenger trains began to leave Spuyten-Duyvil Interlocking via track No. 1 at 3- or 4-minute intervals. The first train, No. 830, consisting of 4 electrically-propelled passenger units, entered track No. 3 at FH Interlocking. Soon afterward, it passed signal 274 and entered the Mott Haven Jct. Interlocking. While moving through crossovers within this interlocking, No. 830 struck a damaged portion of the third rail associated with track No. 2. Some of the third-rail contact shoes on the train were knocked off, disabling the train and causing it to stop foul of the main tracks within the interlocking. As a result, the interlocking operator caused signal 274 to display a Stop aspect, to hold eastbound trains on track No. 3 clear of the interlocking.

The Accident

Train No. 832

This was an eastbound first-class passenger train consisting of four electrically-propelled passenger units. It left Spuyten-Duyvil Interlocking via track No. 1 at 7:55 a m., three minutes after No. 830, and entered track No. 3 at FH Interlocking. Soon afterward, it stopped short of signal 733E, which displayed a Stop-and-Proceed aspect due to the operator at Mott Haven Jct. Interlocking having caused signal 274 to indicate Stop. The train then passed signal 733E and stopped on track No. 3 about 125 feet short of signal 274, where it waited for the signal to display a proceed aspect.

Train No. 706

This was an eastbound first-class passenger train consisting of three electrically-propelled passenger units. It left Spuyten-Duyvil Interlocking via track No 1 at 7:59 a m, four minutes after No 832, and also entered track No 3 at FH Interlocking. Soon afterward, it stopped short of signal 733E, which displayed a Stop-and-Proceed aspect due to No. 832 occupying its block. No 706 then entered the block of signal 733E and proceeded eastward on track No 3 at Restricted Speed. As the train neared the east end of a 4°36' curve to the left, the engineer saw No 832 standing on track No. 3 short of signal 274, and stopped his train about 100 feet to the rear of the preceding train. He then moved it forward and stopped it on the curve with the front end about eight feet behind No. 832. Approximately three to five minutes later, while it was standing on track No. 3, No 706 was struck from the rear by No. 710. No crew member of No 706 was providing flag protection against following trains at that time, as the carrier's rules do not require such protection in the signal territory involved.

Train No. 710

No. 710, an eastbound first-class passenger train consisting of five electrically-propelled passenger units, left Croton (near Croton-Harmon) at 6:46 a m, after having received a brake test by car inspectors. This train made station stops while en route eastward and stopped at Spuyten-Duyvil Interlocking shortly before 8:00 a.m. It departed from that point via track No 1 at 8:03 a.m., four minutes after No 706, and followed that preceding train onto track No 3 at FH Interlocking.

Soon after No 710 entered track No 3, the engineer used the electro-pneumatic brake valve to stop the train short of a wayside signal that displayed a Stop-and-Proceed aspect due to the next signal, 733E, displaying a Stop-and-Proceed aspect because of its block being occupied by No 832 and No 706. After stopping short of the wayside signal, No 710 entered its block, approached signal 733E while moving at Restricted Speed, and stopped short of signal 733E, as required, by use of the electro-pneumatic brake valve. A few moments later, the train passed signal 733E, which displayed a Stop-and-Proceed aspect, and proceeded eastward on track No 3 in the block of that signal. The engineer was at the controls in the vestibule at the front of the first passenger unit. The conductor and a brakeman were in the passenger compartment of the first unit. Other trainmen were at various locations in the third and fourth units.

Soon after passing signal 733E, No. 710 entered the 4°36' curve to the left where the view along track No 3 is materially restricted. The engineer stated that as the train moved on the curve at a speed of about 10 m p.h., he suddenly saw No 706 standing on the track ahead at a distance of about two car lengths (170 feet). At that time, according to his statements, the engineer initiated a service application

of the electro-pneumatic brake, but found this to be ineffective in reducing the speed and he therefore applied the train brakes in emergency. A few seconds later, however, No. 710 collided with the rear end of No. 706 while moving at slow speed. As a result of the impact, No. 706 was propelled about eight feet eastward to a collision with No. 832, which in turn was propelled about 10 feet forward.

Damages

No unit of the three trains was derailed. The last unit of No. 706, and the 1st, 2nd, 4th and 5th units of No. 710 were slightly damaged.

According to the carrier's estimate the cost of damages to the aforesaid units was \$2530.

Casualties

Eight crew members of the three trains sustained minor injuries, none of which required hospitalization. In addition, a brakeman of No. 706 suffered a broken nose and was hospitalized.

A total of 250 passengers on the three trains were either injured or claimed injury. Of these, 151 claimed minor injury to various portions of their bodies; 91 claimed injury of a shaken-up nature; 5 claimed injury to an unknown extent; 2 sustained fractured hips, and 1, a fractured wrist.

According to the carrier's estimate, 75 to 80% of the injured were passengers on No. 710.

Engineer of No. 710

This engineer, age 55, was first employed by the carrier as a fireman in 1943 and was promoted to engineer in 1954. In 1960, he qualified for service as a passenger train engineer between Croton and Grand Central Terminal. His service record was clear and showed no restriction because of a physical condition.

At the time of the accident, he had been on duty 2 hours 3 minutes after having been off duty for 10 hours 47 minutes.

Equipment of No. 710

No. 710 consisted of electrically-propelled passenger units 1182, 1126, 1103, 1035 and 1079, coupled in multiple-unit control. Each unit was about 85 feet long and was of all-steel construction with a seating capacity for 130 passengers. The first unit, 1182, had 26-CMUE electro-pneumatic brake equipment. None of the units was equipped with a speed-recording device or a device for applying sand to the rails.

Units 1126 and 1103, the second and third, were equipped with composition brake shoes.

Between 1:15 and 2:30 a m. the day of the accident, the train was given the prescribed brake test at Croton by employees of the carrier's mechanical department, and no exceptions were taken. A notice to this effect was left in the control compartment of unit 1182 for information of the engineer when he reported for duty.

Post-Accident Examinations

About three hours after the accident, examination and tests of the brake system of No. 710 disclosed the following unfavorable conditions:

- (a) The train brake pipe leakage was 7 pounds per minute, or 2 pounds per minute in excess of the maximum leakage rate authorized by the Power Brake Law of 1958.
- (b) The right No. 3 tread brake assembly of the first unit was inoperative.
- (c) The air brakes of the second unit were inoperative, due to the unit's air brake system being frozen.
- (d) The snow brake features of the second and third units (with composition brake shoes) were not cut in to maintain 8 pounds brake cylinder pressure and zero clearance between the brake shoes and wheels, as required by instructions of the carrier's mechanical department.

Single-car tests of the units comprising No. 710 revealed 15 to 18 pounds brake pipe leakage per minute in the brake system of the first unit. This condition apparently caused the excessive train brake pipe leakage disclosed by tests made about three hours after the accident. The excessive air leakage of the first unit was caused by a missing brake pipe port gasket at the H5E Relayair Valve. The condition was corrected by replacement of this valve.

The right No. 3 tread brake assembly of the first unit was found to be inoperative because of a broken slack adjuster screw. The fracture surfaces showed 100% old break, indicating that (a) the screw had been broken through and the tread brake assembly had been inoperative for a considerable period of time, and (b) the brake system of the first unit had not been inspected closely during train air brake tests, or proper corrective action was not taken when train air brake tests revealed the tread brake assembly was inoperative.

After applying heat to the main reservoir and control valves of the second unit, the brakes of this unit functioned properly. Six days after the accident, the air brakes of the unit again became inoperative due to the air brake system being frozen. After removal of air brake equipment from the unit, the J-1 Relay Valve double-seated rubber check valve was found frozen to the supply valve seat, preventing main

reservoir air from flowing to the brake cylinders. About eight ounces of condensation was removed from the valve after thawing. Apparently the same frozen condition caused the brakes of the second unit of No 710 to be inoperative on the day of the accident.

Stopping Distance Test

Approximately five weeks after the accident a test train composed of five electrically-propelled passenger units (similar to those of No 710) were assembled to determine stopping distances under various conditions. The second and third units of the test train had composition brake shoes. For two tests, the brakes of the second unit were rendered inoperative and the snow brake feature of the third unit was cut-out, to simulate the condition of the brake system of No 710 on the day of the accident. The right No 3 tread brake assembly of the first unit of the test train was not rendered inoperative for the test. This omission, however, had no significant bearing on the test results as it involved the application of only one brake shoe. In one test, an electro-pneumatic service application of the brakes was made while the test train was moving at a speed of about 10 m p.h., and the train stopped within a distance of 123 feet. In the other test, the brakes were applied in emergency while the test train was moving about 10 m p h., and the train stopped within a distance of 90 feet.

Conclusions

Before No 710 left Croton, its initial terminal, car inspectors tested its brake system without taking any exception. That the brake test was conducted inefficiently is evidenced by information indicating the train left Croton with (a) an excessive rate of brake pipe air leakage caused by a missing gasket at the H5E Relayair valve of the first unit (b) the right No 3 tread brake assembly of the first unit inoperative because of a broken slack adjuster screw, and (c) the snow brake features of the second and third units not cut in. In addition to the aforesaid deficiencies in the train brake system, the investigation revealed the air brakes of the second unit were inoperative due to a frozen condition. It is not known whether this frozen condition came into being before or after No. 710 left Croton. The train made several stops en route to the accident point and the engineer took no exception to the operation of the brakes on those occasions, indicating he was able to properly control the speed of the train despite the irregularities in the train brake system.

Shortly before the accident, No 710 stopped at signal 733E, which displayed a Stop-and-Proceed aspect because of its block being occupied by trains No 832 and No 706. Under the circumstances, the train was authorized to pass signal 733E and proceed in the block of that signal at a speed not exceeding 15 m p h., prepared to stop short of a train ahead.

No. 710 passed signal 733E, as authorized, and entered a 4°36' curve soon afterward. Although the rear end of No. 706 was standing in the block of signal 733E at a point in the curve where it could have been first observed at a distance of about 340 feet, the engineer of No. 710 stated he did not see No. 706 before reaching a point about two car lengths (170 feet) distant, indicating that he might not have been keeping a careful lookout ahead.

According to the engineer's statements, No. 710 was moving about 10 m.p.h. when he saw No. 706 stopped ahead and he immediately initiated an electro-pneumatic service application of the brakes. He further stated this brake application was ineffective and that he, therefore, applied the brakes in emergency a few moments before the collision occurred. Considering that tests revealed No. 710 could have been stopped within about 123 feet by a service brake application and in about 90 feet by an emergency brake application, it is difficult to reconcile what must have taken place as related to the engineer's statements. Consequently, it is surmised that No. 710 approached the collision point at a speed of about 10 m.p.h., as alleged, and the engineer failed to notice the train stopped ahead in sufficient time to stop short of a collision, or that he saw the train ahead when it first came within his range of vision but did not apply his train brakes soon enough, because of an error in judgment, to stop short of the train ahead.

Findings

1. No. 710 left its initial terminal with components of its brake system in defective or inoperative condition. Some time before or after the train departed from the initial terminal, the brakes of the second unit also became inoperative due to freezing of the brake system of that unit.

2. Despite irregularities in the brake system, the engineer experienced no difficulty with the brakes when it was necessary to stop No. 710 at points en route to the collision area, including a stop at signal 733E shortly before the collision. Because of this and the results of stopping-distance tests after the accident, the condition of the brake system of No. 710 does not appear to have been a contributing factor in this accident.

3. As No. 710 approached the collision area, No. 706 was stopped behind No. 832 in the block of signal 733E. The rear end of No. 706 was stopped on a restricted-view curve. Both No. 832 and No. 706 were standing in accordance with applicable rules of the carrier.

4. No. 710 stopped short of signal 733E as required, then passed the signal. It was authorized to proceed in the block of this signal at a speed not exceeding 15 m.p.h., prepared to stop short of a train ahead.

5. No. 710 apparently moved in the block of signal 733E and entered the restricted-view curve at a speed of 10 to 15 m.p.h.

6 Although the rear of No 706 was visible from a distance of about 340 feet, the engineer of No 710 did not take prompt action to reduce the speed of his train when No. 706 came into view

7 Apparently due to misjudgment or failure to notice the train stopped on the track ahead in sufficient time, the engineer of No 710 applied the brakes of his train too late to stop short of No 706, resulting in No 710 striking No. 706 with sufficient force to propel the latter train forward to a collision with No 832

Dated at Washington, D C , this 2nd
day of March 1971
By the Federal Railroad Administration

Mac E Rogers, Director
Bureau of Railroad Safety