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16. Abstract <p>On October 17, 1975, about 6:37 p.m., a northbound Penn Central Transportation Company (Penn Central) passenger train, No. 944, struck the rear of Penn Central passenger train No. 132, which had made an unscheduled stop near Wilmington, Delaware, because of an equipment malfunction. Train No. 939, a southbound Penn Central passenger train that was approaching on an adjacent track, struck the derailed equipment from No. 944. The collisions injured 25 persons and caused property damage of \$817,866.</p> <p>The National Transportation Safety Board determines that the probable cause of the rear end collision was the engineer's failure to operate his train according to established procedures. Contributing to the accident was the operational practice of the railroad industry which permits trains to enter occupied blocks. The second collision was caused by the absence of flagging.</p>					
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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D. C. 20594

RAILROAD ACCIDENT REPORT

Adopted: June 16, 1976

COLLISION OF PENN CENTRAL TRANSPORTATION COMPANY-
OPERATED PASSENGER TRAINS NUMBERS 132, 944, AND 939,
NEAR WILMINGTON, DELAWARE, OCTOBER 17, 1975

SYNOPSIS

On October 17, 1975, about 6:37 p.m., a northbound Penn Central Transportation Company (Penn Central) passenger train, No. 944, struck the rear of Penn Central passenger train No. 132, which had made an unscheduled stop near Wilmington, Delaware, because of an equipment malfunction. Train No. 939, a southbound Penn Central passenger train that was approaching on an adjacent track, struck the derailed equipment from No. 944. The collisions injured 25 persons and caused property damage of \$817,866.

The National Transportation Safety Board determines that the probable cause of the rear end collision was the engineer's failure to operate his train according to established procedures. Contributing to the accident was the operational practice of the railroad industry which permits trains to enter occupied blocks. The second collision was caused by the absence of flagging.

FACTS

The Accident

On October 17, 1975, an Amtrak passenger train, No. 132, operated by the Penn Central Transportation Company (Penn Central), ^{1/} departed Washington, D.C., with six cars in its consist. This train was a regularly scheduled Metroliner which operated over Penn Central's track between Washington, D.C., and New York, New York. Because of an equipment malfunction in Washington, northbound No. 132 departed Washington 12 minutes behind schedule and departed Wilmington, Delaware, 14 minutes behind schedule. The train experienced no further mechanical difficulty until after it departed Wilmington.

^{1/} Penn Central became part of the Consolidated Rail Corporation in April 1976.

As the train approached Milepost (MP) 25, about 1 mile east of Wilmington station, at about 60 mph, the train's brake applied and stopped the train. The locomotive engineer advised the operator at the nearest station that the train's brakes were in emergency and that the train was stopping. The operator attempted to notify No. 944, a five-car Penn Central Silverliner commuter train operated for Southeastern Pennsylvania Transportation Authority (SEPTA). No. 944 was following No. 132 on No. 2 track and had departed Wilmington station 8 minutes late -- 2 minutes behind No. 132. For unknown reasons, No. 944 did not receive the notification that No. 132 was stopped.

When No. 944 departed Wilmington, a thunderstorm was in progress. However, the engineer of No. 944 had turned off the windshield wiper on the cab window because its noise annoyed him. When his train approached signal No. 208L, the signal displayed a "stop and proceed" aspect, and he complied with the indication. His cab signals changed from "restricting" to "approach," and he increased his train's speed to 30 mph; as the train approached the home signal at Landlith Interlocking, No. 118L, he was prepared to stop, in accordance with the "approach" rule. At Landlith Interlocking, the home signal displayed a "stop and proceed" aspect and the cab signals displayed "restricting." The engineer operated his train in accordance with all block signal indications and with the restricted speed rule through Landlith Interlocking.

As No. 944 departed Landlith Interlocking, the cab signal momentarily indicated a false "approach" aspect. The engineer commented to the trainman who was riding with him that No. 132 was gone; he applied full power and accelerated the train to an estimated 25 mph. He then observed the cab signal return to "restricting" after he had called the "approach" signal to the trainman. He did not respond immediately to the "restricting" indication but instead he turned on the cab-window windshield wiper.

The flagman of No. 132, who was in his train's rear car, saw No. 944 as it approached the rear of his train; he ran to the cab and attempted to alert the engineer of No. 944 to the presence of No. 132 by flashing the headlight on the rear of his train. The engineer of No. 944 and the trainman riding in the cab saw the headlight after they already had seen the marker lights on the rear of No. 132, realized that the train was stopped, placed the train's brakes in emergency, and elected to escape from the cab. They entered the coach compartment of the car, shouted a warning to the passengers, and braced themselves. About 6:37 p.m., No. 944 struck the rear of No. 132.

The flagman of No. 132 remained in the cab of the rear car, which maintained its structural integrity during the collision. The cab of No. 944 collapsed inwardly and contacted the inner coach wall. As the trains collided, No. 132 was pushed forward, and standing passengers and crewmembers in both trains were knocked down. Cars from both trains derailed.

After the trains collided, the crewmembers of both trains attended to the passengers' needs and attempted to notify officials of the collision; however, the trains' radios were inoperative, and a crewmember was sent to telephone from a railroad shop near the accident site. The crewmembers intended to flag the adjacent tracks, but there was no flagging equipment on the lead unit of No. 132. Some crewmembers were injured, and crewmembers, who saw men with lights walking in the area north of the derailment, assumed that they would flag opposing trains; they did not.

About 12 minutes after the two trains collided, a southbound Fenn Central train (No. 939) which was operated for SEPTA approached on the adjacent track (No. 3), passed No. 132, and scraped a portion of the lead car of No. 944 as No. 939 stopped. After this collision, a crewmember of No. 944 provided flag protection for the rear of his train with a fusee.

As a result of the collisions, 25 persons were injured. Most of them were injured when they struck hard objects. The most seriously injured sustained contusions, broken ribs, and broken collar bones. Total damage to the three trains amounted to \$817,886.

Accident Site

The trains collided on No. 2 main track of Penn Central's Northeast Corridor Region, Chesapeake Division, 23 feet south of MP 25. The railroad consisted of three tracks -- "B" track, No. 2 main track, and No. 3 main track. (See Figure 1.) No. 2 was used predominantly for northbound traffic and No. 3 was used predominantly for southbound traffic. South of MP 25, No. 2 track was on a 0.37-percent descending grade and on a 0° 20' curve to the right.

The trains collided about 2,082 feet north of the interlocking limits of Landlith Interlocking, which was controlled remotely from Wilmington Station, and about 4,277 feet north of Signal 118L, which was the last signal passed by No. 944.

Rain was falling and light was fading rapidly when the trains collided.

Method of Operation

Through Landlith Interlocking, speed was restricted to 50 mph. At the accident site, the maximum authorized speeds were 105 mph for No. 132 and 60 mph for the other two trains.

The signals between Wilmington and the accident area consisted of Wilmington Interlocking, territory governed by automatic block signals and cab signals, and Landlith Interlocking. (See Figure 2.) Landlith Interlocking was an electropneumatic interlocking governed by home signal 118L, which controlled northbound traffic through the interlocking to the point of the accident. The interlocking functions were controlled by a 504C code system and the signals were position-light type.

Penn Central's automatic block signal system Rules 501 through 514 and cab signal Rules 550 through 562 applied. Interlocking Rules 605 through 670 were in effect through the Wilmington and the Landlith interlockings. Block operators were assigned at Bell, Delaware, and Wilmington. Automatic block signal and cab signal rules applied from the signal bridge, located 2,147 feet before the point of collision.

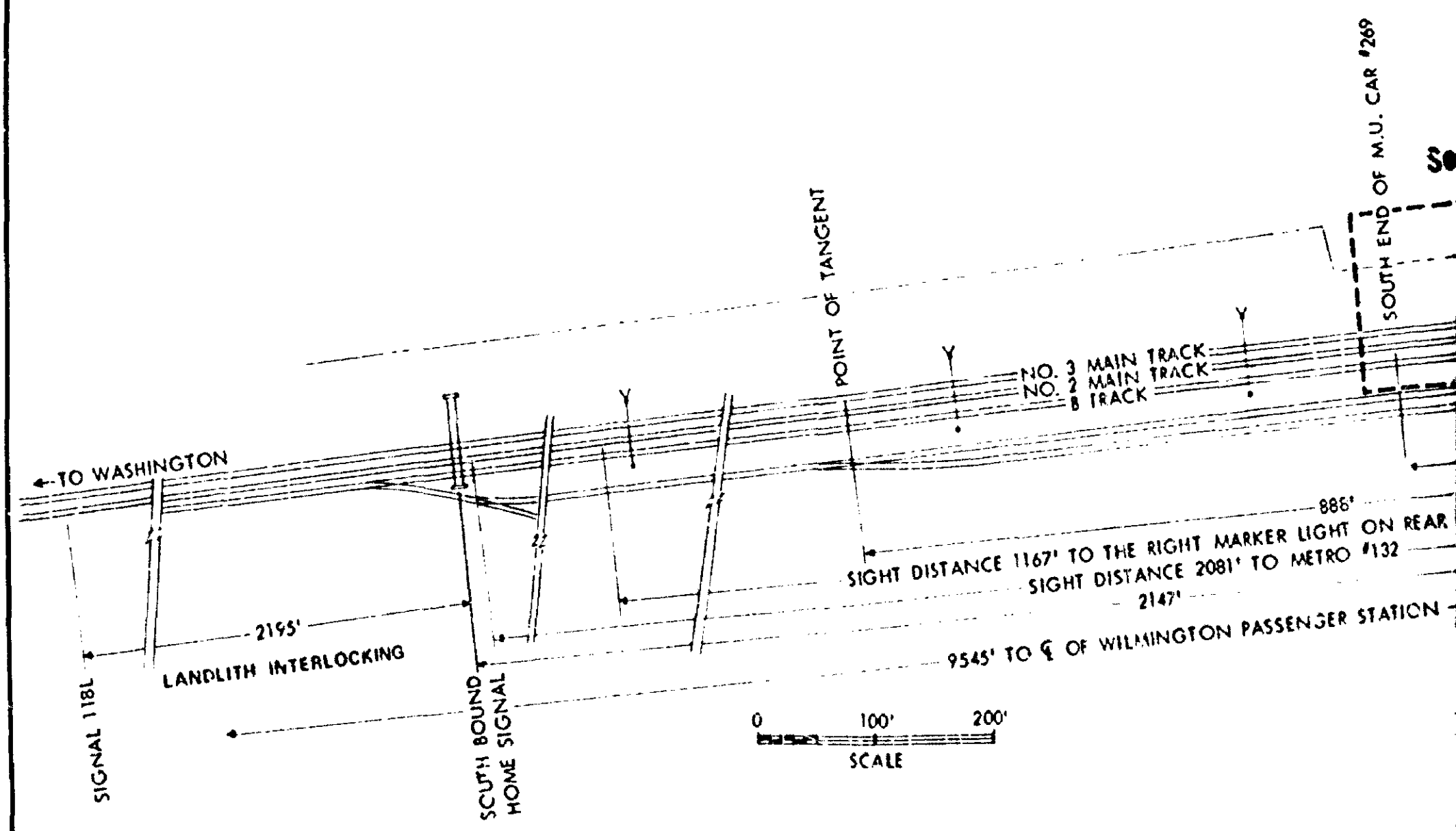
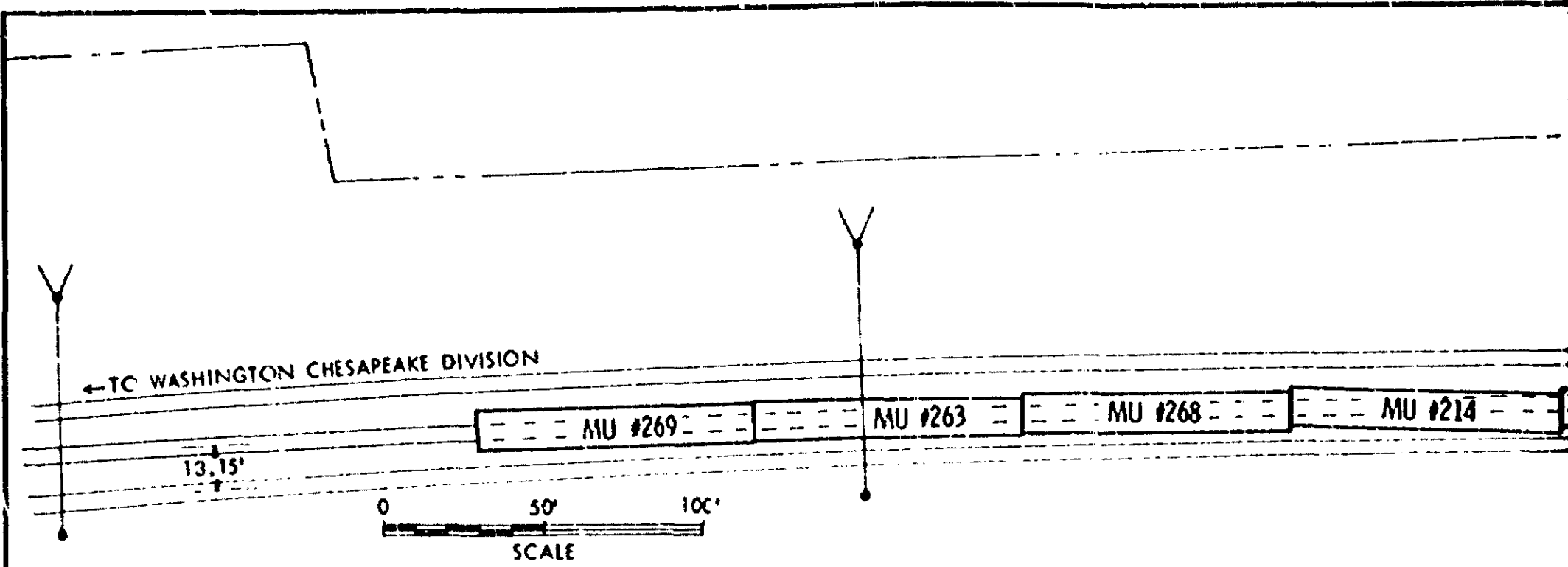
On the day of the accident, signal 118L displayed a "stop and proceed" aspect for No. 944. The "stop and proceed" aspect was defined in Rule 291 of the Penn Central Rules for Conducting Transportation as "stop; then proceed at restricted speed." Restricted speed was defined as "proceed prepared to stop short of train obstruction or switch not properly lined looking out for broken rail, not exceeding 15 mph. NOTE: Speed applies to entire movement."

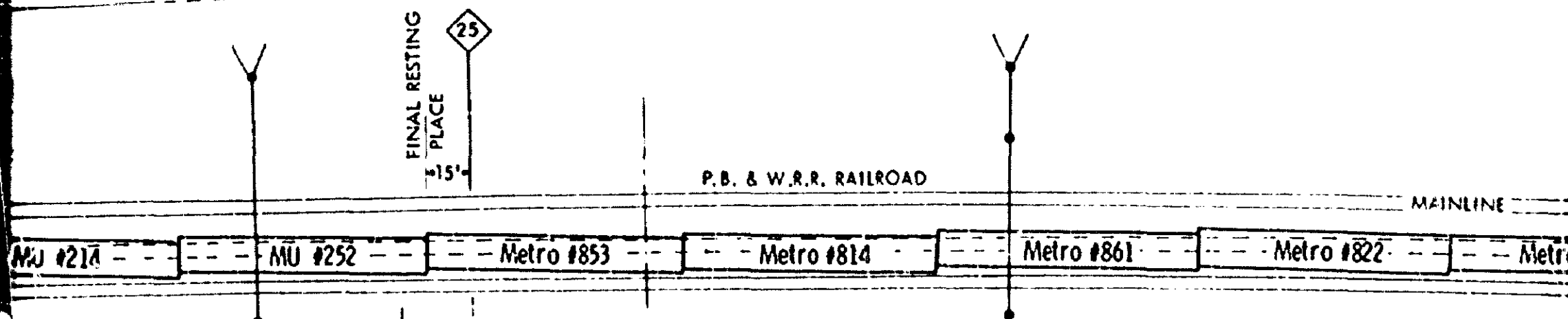
The engineer of No. 944 saw a "restricting" aspect on his cab signals after he passed 118L. Rule 551(d) stated that "When Cab Signal indication changes to Restricting, a train or engine must reduce speed at once not to exceed Restricted Speed."

The engineer and brakeman of No. 944 saw the cab signal indicate "approach" just north of Landlith Interlocking. The "approach" indication was defined as: "Proceed prepared to stop at next signal. Trains exceeding Medium speed must at once reduce to that speed." Rule 551(e) stated that "When Cab Signal indication changes from Restricting to a more favorable indication speed must not be increased until train has run its length."

Rule 99 stated that "When a train stops under circumstances in which it may be overtaken by another train, a member of the crew must go back immediately with flagging equipment a sufficient distance to insure full protection, placing two torpedoes, and when necessary, in addition, displaying lighted fusees...When a train is moving under circumstances in which it may be overtaken by another train, a member of the crew must take such action as may be necessary to insure full protection. By night or by day when the view is obscured, lighted fusees must be dropped off at proper intervals...Note -- When trains are operating under automatic block signal system rules or traffic control system rules, the requirements of Rule 99 do not apply for following movements on the same track."

Rule 102 stated that "When a train is disabled or stopped suddenly by an emergency application of the air brakes or other causes, adjacent tracks as well as tracks of other railroads that are liable to be obstructed must, while stopping and when stopped, be protected in both directions until it is ascertained they are safe and clear for the movement of trains."

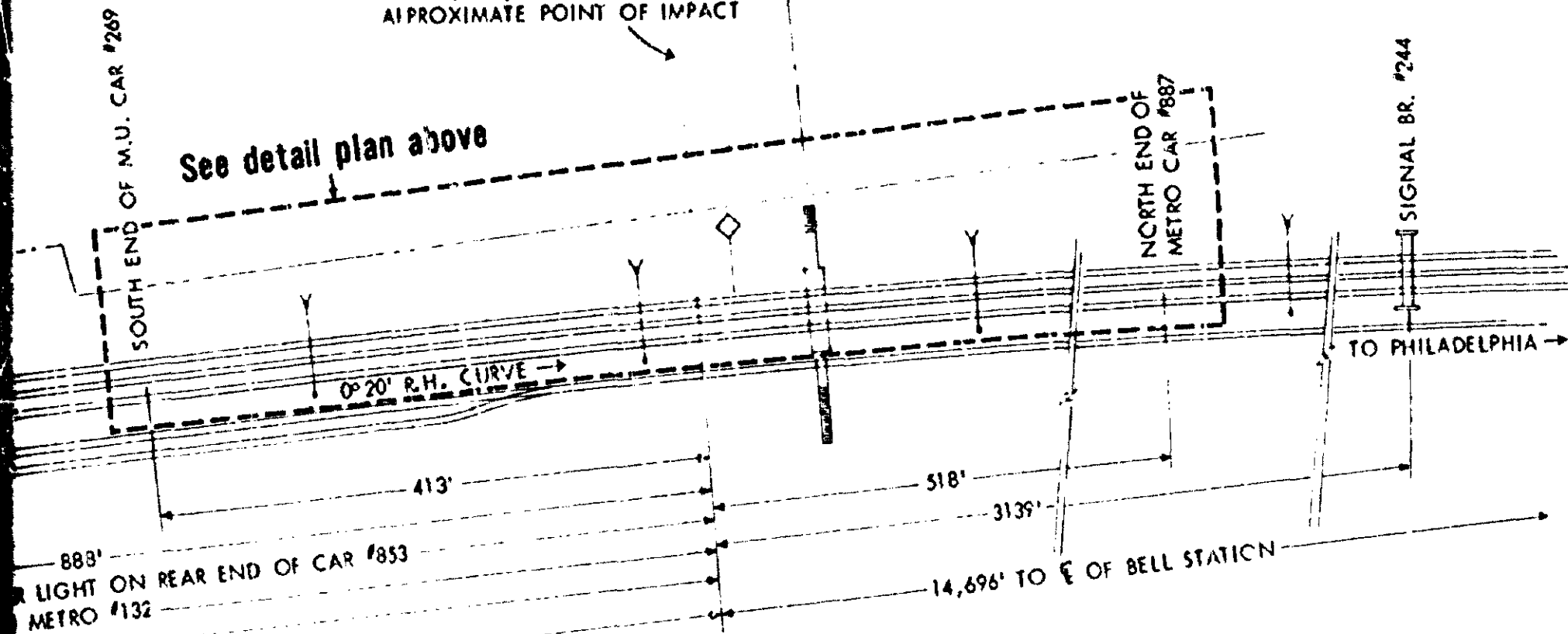




APPROXIMATE POINT OF IMPACT

6 FOOT RIDGE O.H. 24.96

See detail plan above



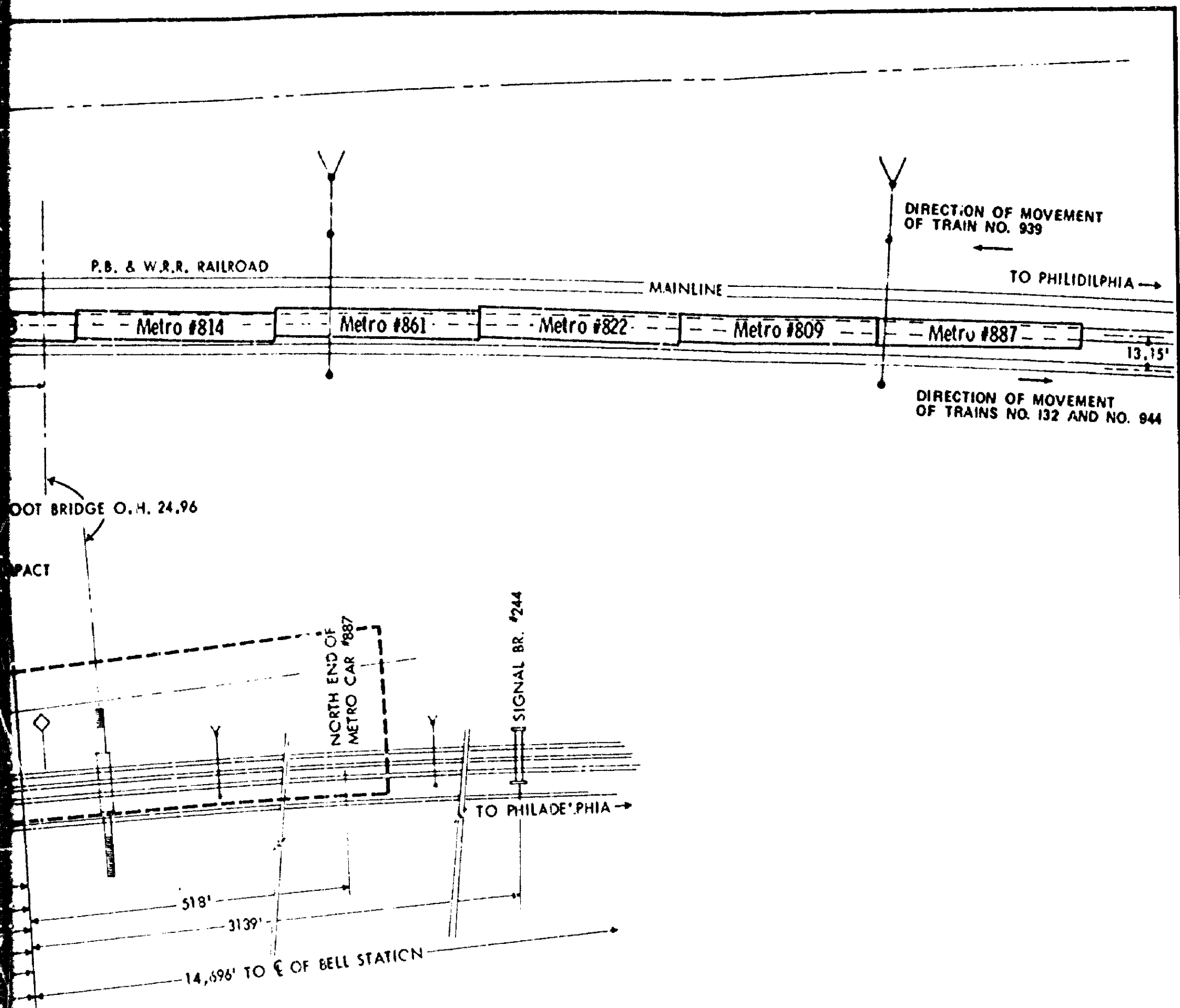
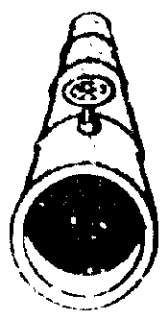
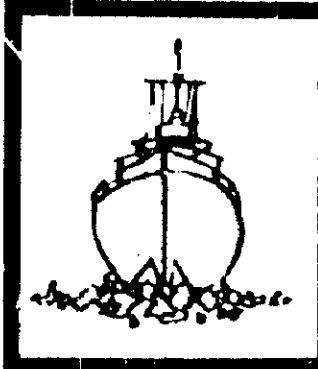
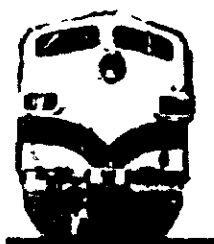


FIGURE 1
ACCIDENT SITE
METRO #132 AND MU #944

222135

PB 255 651



NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

RAILROAD ACCIDENT REPORT

**COLLISION OF
PENN CENTRAL
TRANSPORTATION COMPANY
OPERATED PASSENGER TRAINS
NUMBERS 132, 944, AND 939**

NEAR WILMINGTON, DELAWARE

OCTOBER 17, 1975

REPORT NUMBER: NTSB-RAR-76-7

UNITED STATES GOVERNMENT

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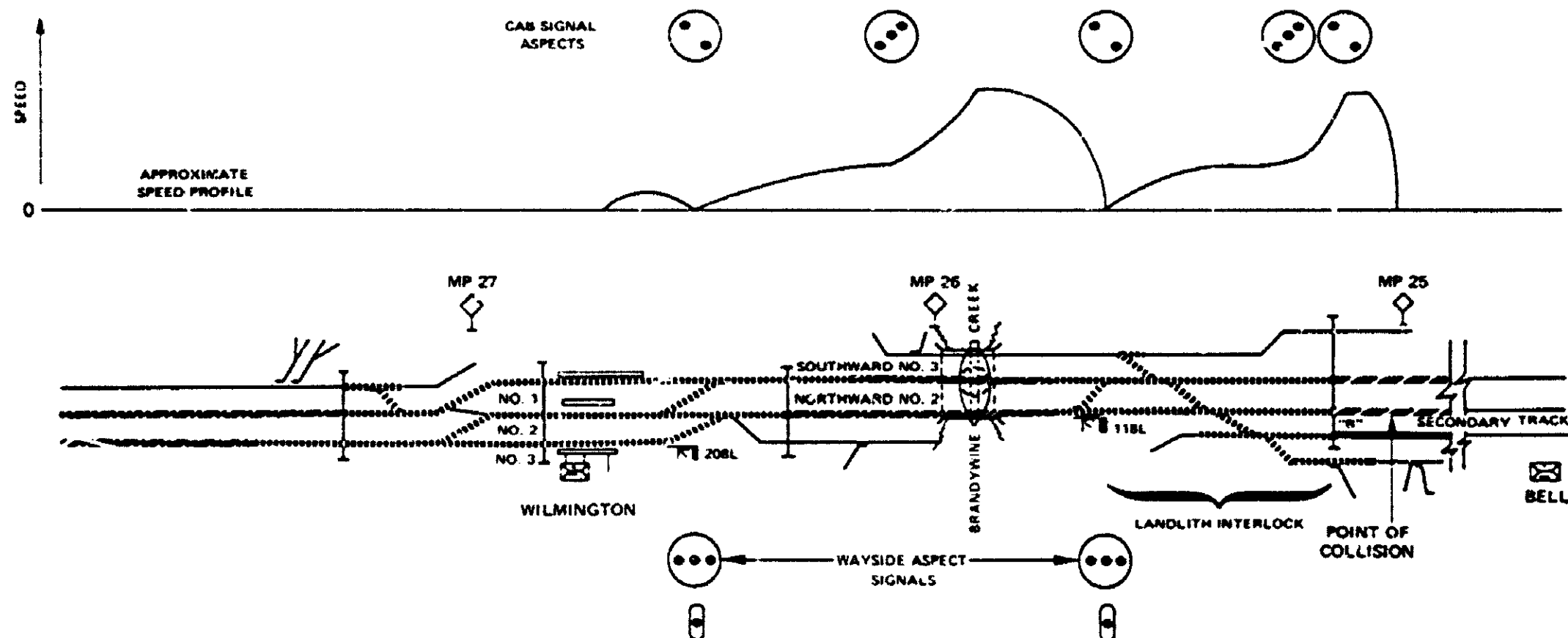


FIGURE 2

TRACK PLAN VIEW MP 27 TO MP 25
INDICATING INTERLOCKING LAYOUT,
SIGNAL LOCATIONS AND SPEED
PROFILE. LIMITS OF APPLICABLE
RULES ARE INDICATED.

- Interlocking Rules 605 to 670
 - Rules 261 to 264 Automatic Block
Signal System Rules 501 to 514
Cab Signal Rules 550 to 562
 - Automatic Block Signal System
Rules 501 to 514 Cab Signal
Rules 550 to 562 Rules 251-253-254
Manual Block Signal System Rules
305 to 342
 - Rule 110 - Spec. Instr. 1151-D1
- With the Current of Traffic
- Against the Current of Traffic

The Trains

Characteristic	Train No. 132	Train No. 944	Train No. 939
No. Cars	6	5	6
Manufacturer	Budd	Budd	NM
Weight	165,000 lbs	102,000 lbs	NM
Length	85 ft	85 ft	NM
Collision Post	800,000 lbs	800,000 lbs	NM
Static End Load			
Locomotive Controls			
. Speedometer	#	X	NM
. Radio Phone	#	#	X
. Intercom	#	X	NM
. Cab Signal Equipment	#	#	NM
Maximum Operating Speed	105 mph	75 mph	65 mph

present
X absent
NM not material

Damage to Trains and Track

Damage to train No. 132 amounted to \$317,061, damage to train No. 944 amounted to \$499,065, and damage to train No. 939 amounted to \$1,760.

The lead car of train No. 944, No. 252, was damaged heavily; the forward portion of this car collapsed through the vestibule. The center sill of No. 252 underrode the last car of train No. 132, and the end sill and buffer structure of that car contacted and sheared No. 252's collision post. The second, third, and fourth cars of train No. 944 were damaged slightly.

Train No. 132 was not damaged as extensively as No. 944; the lead car on No. 944 had not penetrated the control or coach compartments on the last car of No. 132. (See Figures 3 and 4.)

Penn Central examined the cars to determine why the trailing car of train No. 132 was damaged less severely than the lead car of train No. 944. Their report stated: "...couplers on the two types of equipment differ and are not compatible.

"On impact, the striking Silverliner cars deflected downwards as couplers passed permitting the draft sill of the Silverliner to enter the striker opening of the Metroliner. This in turn allowed the end sill and



Figure 3. Last car of No. 132.



Figure 4. Lead car of No. 944.

buffer structure of the Metroliner to contact and shear the Silverliner collision post, resulting in collapsing of the vestibule of the Silverliner. Since the buffer of the Metroliner was pushing the end structure of the Silverliner away from its own striker, the contact between the end sheets of the Silverliner and the Metroliner was minimized, resulting in minimal damage to the Metroliner end."

Train No. 939's lead car, No. 686, was slightly damaged as it scraped protruding equipment. The train did not derail.

About 950 feet of the east rail of track No. 2 were damaged and about 440 feet of the west rail were damaged.

The Traincrews

The crew of No. 132 consisted of an engineer, a brakeman, a flagman, and a conductor. The engineer, the brakeman, and the flagman were hired in 1941. The conductor was hired in 1972, and he did not recall having received training concerning the priorities in his responsibilities during emergencies.

The crew of No. 944 consisted of an engineer, a conductor, and a flagman. The conductor and flagman were hired in 1941 and 1973, respectively. The engineer was hired in 1942. He was promoted to a locomotive engineer in 1946 and had worked in all classes of service throughout his 34 years with the railroad. His record contained a few minor infractions relative to his performance as an engineer.

The engineer had received a head injury when struck by an object thrown at his train in June 1973. The engineer did not work again until September 11, 1973, when a medical examination indicated that he was fit for service. He passed additional annual physical examinations on May 28, 1974, and on May 16, 1975. However, the engineer said that he requested assignments that were less arduous than normal assignments when he first returned to work. He stated after the accident that the injury had impaired his ability to concentrate.

Tests and Research

After the collision, the rail was examined to determine the point where the emergency brakes of No. 944 were applied. Although the condition of No. 944's wheels suggested heavy braking, the point where the braking began could not be established.

The wayside signaling system was examined after the accident and was found to be functioning normally.

Air brake tests were conducted and the brake systems were found to be functioning on the undamaged brake components of No. 944.

The air brakes on No. 132 were examined to determine what caused the brakes to apply in emergency. The examination showed that the alerter circuit breaker had tripped and also showed that the alerter magnetic valve's suppression diode was missing. The diode was designed to protect the alerter system against voltage spikes in the battery circuit.

The radios on No. 132 did not function after the accident. Investigators determined that the batteries used to supply power to the radio system in emergencies were inadequate. These batteries also had caused the failure of the emergency lights on some cars. When current was applied, the marker lights on train No. 132's rear car, No. 887, were operable.

Sight distance tests were conducted using cars similar to the collision cars to determine when the rear end of train No. 132 would have been visible from car No. 252, the lead car on train No. 944.

The tests showed that although the rear lights of No. 132 could be seen for more than 1,000 feet, they were not conspicuous. The tests also showed that because of the color of No. 132, it was relatively inconspicuous in reduced light.

Stopping distance tests and braking tests also were conducted. During the brake tests, the engineer of No. 944 was asked to estimate certain speeds. In the first test he was asked to operate his train at 10 mph. He accelerated the train to what he considered to be 10 mph and the radar indicated that the speed was 14.5 mph, almost 50 percent greater than the intended speed. When the engineer of No. 944 was asked to simulate his run from Wilmington to the accident site, his train speed was measured by a wayside radar instrument. The instrument measured his maximum speed at 47 mph.

ANALYSIS

The Accident

The engineer of No. 944 had seen No. 132 depart Wilmington Station. He often followed this Metroliner on close headways and expected that its progress would not be interrupted. This expectation was reinforced as the block signals governing the movement of his train indicated that No. 132 was progressing. The operator's message to inform him of the stalled Metroliner was not heard.

The engineer of No. 944 operated his train in compliance with the rules until he departed Landlith Interlocking. However, when the cab signal improved to "approach," indicating that the track ahead was unoccupied, he immediately placed his throttle in the full-power position which did not comply with the delay requirement specified in Rule 551(e). He should have waited at least 18 seconds for his train to run its full length before he increased speed.

The "approach" indication was the indication that the engineer would have received if No. 132 already had cleared the block limits controlled by signal 118L and was the same indication that he had received in his approach to 118L when No. 132 had cleared the interlocking limits. At this point, the engineer assumed that No. 132 had cleared the block limits of 118L and that the track ahead was no longer occupied. The Safety Board could not determine why conflicting cab signals were displayed. However, the depositions taken by the Safety Board indicated that the cab signals are not always reliable. There was no indication that cab signals had failed in this area before or after the accident.

After the engineer applied power, the cab signal immediately returned to the "restricting" aspect. Although required by Rule 551(d) the engineer did not immediately reduce his throttle and return to restricted speed nor did he call the indication to the trainman in the cab. He did not respond immediately because its return to the "restricting" aspect was unexpected.

The engineer's ability to see No. 132 was impaired seriously by the rain and the lighting conditions which existed at dusk. The effectiveness of No. 132's marker lights was diminished because there was still some natural light, and at the same time No. 132's silver-colored rear car was being obscured by the fading light. The Safety Board could not determine whether the engineer's earlier injury contributed to his failure to respond immediately to Rules 551(d) and (e).

Based on speed tests, by the time the engineer detected the standing train, his train's speed was probably more than 30 mph. His train's speed should not have exceeded 15 mph at that time. However, the operator was not informed of the derailment or of the obstruction to the adjacent track in sufficient time to implement Rule 627.

The Safety Board pointed out the benefits of train radios in its accident report concerning a 1970 collision between a passenger train and derailed freight cars in Soundview, Connecticut. 2/

Operating Procedures

Almost every rear end collision investigated by the Safety Board that has not been caused by a signal failure or by the physical impairment of crewmembers has been related to incorrect action under the restricted speed rule. The Safety Board has questioned the appropriateness of the procedures which allow a train to move into occupied blocks and has called for a review of these procedures. 3/ This accident again demonstrates that no train should be authorized to move into an occupied block.

2/ "Penn Central Transportation Company, Freight Train Derailment-Passenger Train Collision With Hazardous Material Car, Sound View, Connecticut, October 8, 1970."

3/ "Collision of two Penn Central Commuter trains at Botanical Garden Station, New York City, January 2, 1975." NTSB-RAR-75-8.

Contributing to the violation of the restricted speed rule in this case was the lack of a speed indicator on train No. 944; the crew had to estimate the train's speed. During one test performed after the accident, the engineer underestimated his train's speed by almost 50 percent. The Safety Board previously has called for the installation of speed-indicating and -recording devices on trains. 4/

Rule 99 required that if a train stopped under circumstances in which it might be overtaken, the crew should provide flag protection. However, it did not apply if the movement of trains was governed by automatic block signal system rules or by traffic control system. This exception to Rule 99 should be eliminated.

The failure of the railroad's operating system to warn train No. 939 of obstructions as it approached the accident site 12 minutes after the collision illustrates that the control of trains on adjacent tracks is not insured by current procedures and that Penn Central's safety system should be reexamined. They flagging of the adjacent track was not performed in accordance with Rule 102, probably because of the confusion at the collision site. Employees that should have flagged were assisting passengers. The crewmembers who could have flagged were either injured or were unable to find the necessary equipment. The absence of flagging equipment indicates that the current practice of predeparture checks cannot be relied upon to assure that such vital equipment is available.

The crew of No. 944 evacuated the cab seconds before it collapsed inwardly because the engineer knew that the cab of this type of car would collapse in collisions. This action undoubtedly prevented serious injury or death. The postaccident examination of the cab compartment indicated that the area was probably not survivable. The crewmember of No. 132 who did not evacuate the cab was not injured because the metroliner cab did not collapse; crewmembers should be instructed to evacuate when a collision is imminent.

Conspicuity of No. 132

No. 132 lacked conspicuity under the lighting conditions encountered at the time of the collision. The Safety Board already has recommended that the conspicuity of the rear ends of trains be improved. 5/ In response to these recommendations, the Federal Railroad Administration (FRA) is studying colors and methods of illumination to determine which will most improve the conspicuity of trains. The FRA intensified this study

4/ Ibid.

5/ National Transportation Safety Board, "Collision of Illinois Central Gulf Railroad Commuter Trains, Chicago, Illinois, October 30, 1972." NTSB-RAR-73-1.

after an accident in Chicago, Illinois, which resulted in 45 fatalities and hundreds of injuries. 6/ The Safety Board believes that a Federal Standard for conspicuity of trains is warranted. 7/

Communication System

The trains' communication systems failed in accident. First, the engineer of No. 944 did not overhear the notification by the engineer of No. 132 to the operator that his train was stopping nor did he receive the notification from the operator that No. 132 had stopped. This information was important to the engineer of No. 944's evaluation of the track ahead. However, the system did not require that such information be conveyed to engineers entering occupied blocks. Had the engineer of No. 944 been notified before his train entered restricted block 118L, he probably would not have acted immediately on the false "approach" signal, and he probably would have reacted promptly when his cab signal indication changed to "restricting."

Second, the traincrews attempted to radio authorities after the first collision, but the radios on both trains were not operable. Had they been operable the crews could have insured that trains approaching the area were stopped; also, any traincrews on opposing tracks would have received more timely information about the collision had they been tuned to the same radio frequency.

Crashworthiness

Cars within the two trains did not override because the design of the couplers was adequate to withstand the forces of the collision. However, the contacting cars did override. When the trains collided the rear car of No. 132 withstood the impact forces, but the lead car of No. 944 did not.

Little is known about the crash dynamics of rail commuter cars, primarily because few of them have been involved in collisions. This collision illustrates what can be expected when commuter trains collide with Metroliners. Had the impact speed been greater, the couplers on No. 132 probably would have penetrated the coach compartment on the lead car of No. 944 and the injuries to persons in the coach compartment probably would have been more severe. The difference in the behavior of these cars in the crash environment indicates that rail commuter cars should be studied to determine how their crashworthiness can be improved.

6/ Ibid.

7/ FRA is considering the comments filed in response to a Notice of Proposed Rulemaking (NPRM) proposing issuance of a regulation to require highly conspicuous marking of the rear end of passenger trains and has devoted considerable effort in field testing of strobe lights and other devices under typical operating conditions. In the course of this field testing, deficiencies in the system proposed in the NPRM were uncovered. FRA is now engaged in developing a second NPRM, which will invite public comment on a modified system.

Maintenance Procedures

When No. 132 was examined to determine what had caused its brakes to apply in emergency, investigators discovered that the suppression diode in the alerter circuit breaker was missing. If the suppression diode had been in place, the train would not have stopped. Investigators also determined that the batteries which powered the radios and the emergency lights were run-down.

The Penn Central does have a program to replace all existing batteries on Metroliner cars; consequently the batteries on No. 132 would have been replaced eventually. However, the Safety Board believes that the lack of both a suppression diode and the inadequate power indicate that the maintenance procedures of the Penn Central should be reviewed.

Safety Management

This accident indicates that railroad management needs to:

- o Improve maintenance and quality control of its railroad system, e.g., the omission of a diode in the Metroliner alerter, the variable performance of the cab signals.
- o Assure that flagging equipment is available on all trains.
- o Improve personnel training in emergency procedures.
- o Assure the operational performance and readiness of communication channels and operational practices.
- o Provide clear and concise instructions which employees can use to determine the priorities of their duties in emergency situations.

CONCLUSIONS

1. Train No. 132 was stopped in emergency because the alerter circuit breaker tripped.
2. The absence of the suppression diode across the alerter magnet valve was responsible for the unplanned stop.
3. The engineer of No. 944 did not hear the message that No. 132 had stopped.
4. The cab signals of No. 944 provided unreliable information about the condition of the block in which No. 944 was operating when the cab signal displayed an "approach" aspect although the track ahead was occupied.

5. The engineer of No. 944 accelerated his train immediately in violation of Rule 551(e), and did not react immediately to the restricted signal aspect.
6. Speedometers are necessary to assure rule compliance.
7. The speed of train No. 944 probably reached 30 mph while operating with a restricted cab signal indication displayed instead of the 15 mph or less required by Rule 551(d).
8. Although the marker lights on the rear of No. 132 were lit the conspicuity of the train was poor under the existing environment conditions and the engineer of No. 944 did not see No. 132 in time to stop.
9. The failure of the communication and lighting systems after the accident was due to run-down batteries.
10. The crew of No. 132 should have provided flagging immediately after the collision.
11. Operating Rule 291 should be changed to prevent trains from entering occupied blocks and Rule 99 should have the exception concerning flagging in automatic block signal territory eliminated.
12. The crash damage indicated that trains No. 132 and No. 944 were incompatible in a crash environment.
13. Safety management practices of Penn Central were not adequate.

PROBABLE CAUSE

The National Transportation Safety Board determines that the probable cause of the rear end collision was the engineer's failure to operate his train according to established procedures. Contributing to the accident was the operational practice of the railroad industry which permits trains to enter occupied blocks. The second collision was caused by the absence of flagging.

RECOMMENDATIONS

As a result of this investigation, the National Transportation Safety Board made the following recommendations to the Federal Railroad Administration:

"Establish regulations on mainlines used by passenger trains that will require trains to stop if the block in front of them is occupied.
(R-76-24) (Class II, Priority Followup)

"Establish standards for rear end visibility of trains. (R-76-25)
(Class II, Priority Followup)

"Require that trains are equipped with emergency flagging equipment.
(R-76-26) (Class II, Priority Followup)

"Establish regulations for the protection by flagging of the rear
end of all stopped trains in passenger territory. (R-76-27)
(Class II, Priority Followup)

"Require carriers to provide emergency lighting and communication
systems on passenger cars and to provide for predeparture inspection
to assure their operability. (R-76-28) (Class II, Priority Followup)

"Require carriers to train employees in emergency procedures to
be used after an accident, to establish priorities for emergency
action, and to conduct accident simulations to test the effectiveness
of the program, inviting civic emergency personnel participation.
(R-76-29) (Class II, Priority Followup)

"Require railroads to include emergency procedures for cab evacuation
in its training program for operating employees. (R-76-30) (Class II,
Priority Followup)

"Observe a statistically adequate sample of trains equipped with cab
signals to establish the reliability of this system. Appropriate
remedial action should be taken based on these findings. (R-76-31)
(Class II, Priority Followup)

"Require that trains be equipped with reasonably accurate speed
indicators. (R-76-32) (Class II, Priority Followup)

The Safety Board made the following recommendations to the Consolidated
Rail Corporation:

"Study the recommendations made to the Federal Railroad Administration
in this report and take immediate appropriate action. (R-76-33)
(Class II, Priority Followup)

"Require that trains be equipped with reasonably accurate speed
indicators. (R-76-32) (Class II, Priority Followup)"

The Safety Board made the following recommendations to the Southeastern
Pennsylvania Transportation Authority and AMTRAK:

"Include in your agreements with Consolidated Rail Corporation (Con
Rail) requirements that will provide for the safe transportation of
passengers as well as for their protection and care in the event of
an accident. (R-76-34) (Class II, Priority Followup)

"Require that trains be equipped with reasonably accurate speed indicators. (R-76-32) (Class II, Priority Followup)"

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ WEBSTER B. TODD, JR.
Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ PHILIP A. HOGUE
Member

/s/ ISABEL A. BURGESS
Member

/s/ WILLIAM R. HALEY
Member

June 16, 1976