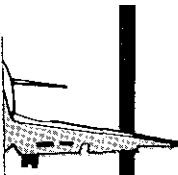


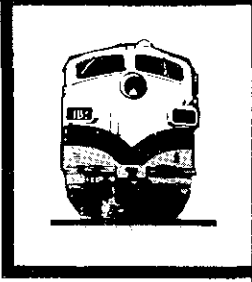
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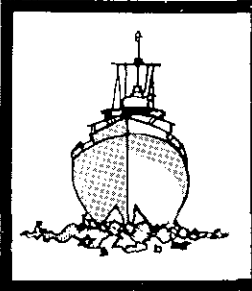


# NATIONAL TRANSPORTATION SAFETY BOARD

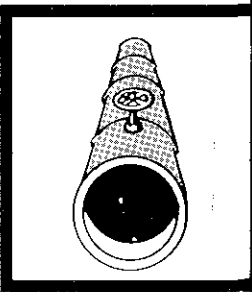


WASHINGTON, D.C. 20594

## RAILROAD ACCIDENT REPORT



HEAD-ON COLLISION OF TWO  
PENN CENTRAL TRANSPORTATION  
COMPANY FREIGHT TRAINS



NEAR PETTISVILLE, OHIO

FEBRUARY 4, 1976

REPORT NUMBER: NTSB-RAR-76-10



UNITED STATES GOVERNMENT

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16. Abstract					
<p>About 11:52 p.m. on February 4, 1976, Penn Central freight train NY-12 collided head-on with freight train BM-7 near Pettisville, Ohio. The 3 locomotive units and 21 cars of train NY-12, and the 4 locomotive units and 4 cars of train BM-7 were derailed. One locomotive unit of each train was destroyed and the derailed cars were heavily damaged. The two crewmembers in the lead locomotive of both trains were killed and one crewmember on each train was injured as a result of the collision. The estimated cost of damages was \$1,165,000.</p> <p>The National Transportation Safety Board determines that the probable cause of the accident was the failure of the engineer to stop train NY-12 west of signal 3272E as required by signal indication, and the inability of the crew in the caboose of train NY-12 to take preventive action.</p> <p>As a result of its investigation, the Safety Board submitted three recommendations to the Federal Railroad Administration.</p>					
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NATIONAL TRANSPORTATION SAFETY BOARD  
WASHINGTON, D. C. 20594

RAILROAD ACCIDENT REPORT

Adopted: September 10, 1976

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HEAD-ON COLLISION OF TWO  
PENN CENTRAL TRANSPORTATION COMPANY  
FREIGHT TRAINS NEAR  
PETTISVILLE, OHIO  
FEBRUARY 4, 1976

SYNOPSIS

About 11:52 p.m. on February 4, 1976, Penn Central Transportation Company freight train NY-12 collided head-on with freight train BM-7 near Pettisville, Ohio. The 3 locomotive units and 21 cars of train NY-12, and the 4 locomotive units and 4 cars of train BM-7 were derailed. One locomotive unit of each train was destroyed and the derailed cars were heavily damaged. The two crewmembers in the lead locomotive of both trains were killed and one crewmember on each train was injured as a result of the collision. The estimated cost of damages was \$1,165,000.

The National Transportation Safety Board determines that the probable cause of the accident was the failure of the engineer to stop train NY-12 west of signal 3272E as required by signal indication, and the inability of the crew in the caboose of train NY-12 to take preventive action.

FACTS

The Accident

About 9:15 p.m. on February 4, 1976, Penn Central Transportation Company's (Penn Central) <sup>1/</sup> freight train NY-12 departed Elkhart, Indiana, eastbound for Toledo, Ohio. The train consisted of 3 locomotive units and 73 cars. It had been given a mechanical inspection and an initial air brake test that disclosed no defective conditions before its departure. Crewmembers twice used the train radios during the air brake test.

Train NY-12 passed several westbound trains and was crossed over between track 1 and track 2 twice during the trip between Elkhart and the collision point. The train passed through several slow-order locations, which required that it vary its speed from 40 to 30 mph. The engineer last applied the automatic air brake at Bryan, about 16 miles west of the collision point, where the train was stretched to prevent a train separation. There were no radio transmissions between the crewmembers

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<sup>1/</sup> Penn Central became part of the Consolidated Rail Corporation in April 1976.

on the caboose and those on the locomotive. The conductor, who was riding on the caboose, stated that he noted no discrepancies in the train's operation between Elkhart and the collision point.

When NY-12 was near Stryker, about 4 miles west of control point (CP) 329, it was seen by the locomotive crewmembers of a westbound train on track 1. The crewmembers noticed that the headlight of NY-12 was on dim; they watched the headlight for about 4 miles until the trains passed at CP 329 and they stated that the headlight never changed to bright.

Penn Central freight train BM-7 originated in Selkirk, New York, and was last serviced before the accident at Cleveland, Ohio. The train consisted of 4 locomotive units and 113 cars when it departed Cleveland. Mechanical inspections and air brake tests disclosed no defective conditions. BM-7 stopped on the main track at Toledo to change crewmembers, after which it departed westward on track 2 for Elkhart at 10:30 p.m. on February 4, 1976. The conductor and flagman inspected the train and checked the radio by calling the engineer as the train departed. The engineer turned the train's headlight on bright in accordance with Operating Rule No. 17.

About 11:43 p.m., BM-7 was moving west on track 2 in the vicinity of CP 320 and NY-12 was moving east on track 2 in the vicinity of CP 329 near Archbold. The train dispatcher planned to have train BM-7 cross over from track 2 to track 1 at CP 327 so that NY-12 could proceed east on track 2. (See figure 1.)

When BM-7 entered the block between CP 320 and CP 327, it caused signal 3272E, which was governing the eastbound movement of NY-12, to display a "stop" aspect. As BM-7 moved toward CP 327, the switches were lined and the signals actuated for BM-7 to cross over to track 1. When train NY-12 reached signal 3272E, it should have stopped in accordance with the signal indication until BM-7 had crossed over. However, it passed the signal about 35 mph and continued east without reducing its speed. In fact, the train's speed did not change appreciably between Bryan and the collision point.

When the engineer of BM-7 saw NY-12 approaching on the same track, he called over the radio, "Archbold eastbound--stop your train," but he received no response from NY-12. The two trains collided about 11:52 p.m., 1 mile east of CP 327. The collision ruptured the fuel tanks of several locomotive units and the escaping fuel ignited and exploded. The two crewmembers on the lead locomotive of each train were killed and two others were injured.

#### Damages

The 3 locomotive units and 21 cars of NY-12 and the 4 locomotive units and 4 cars of BM-7 were derailed. The lead locomotive units from each train were destroyed and the derailed cars were heavily damaged.

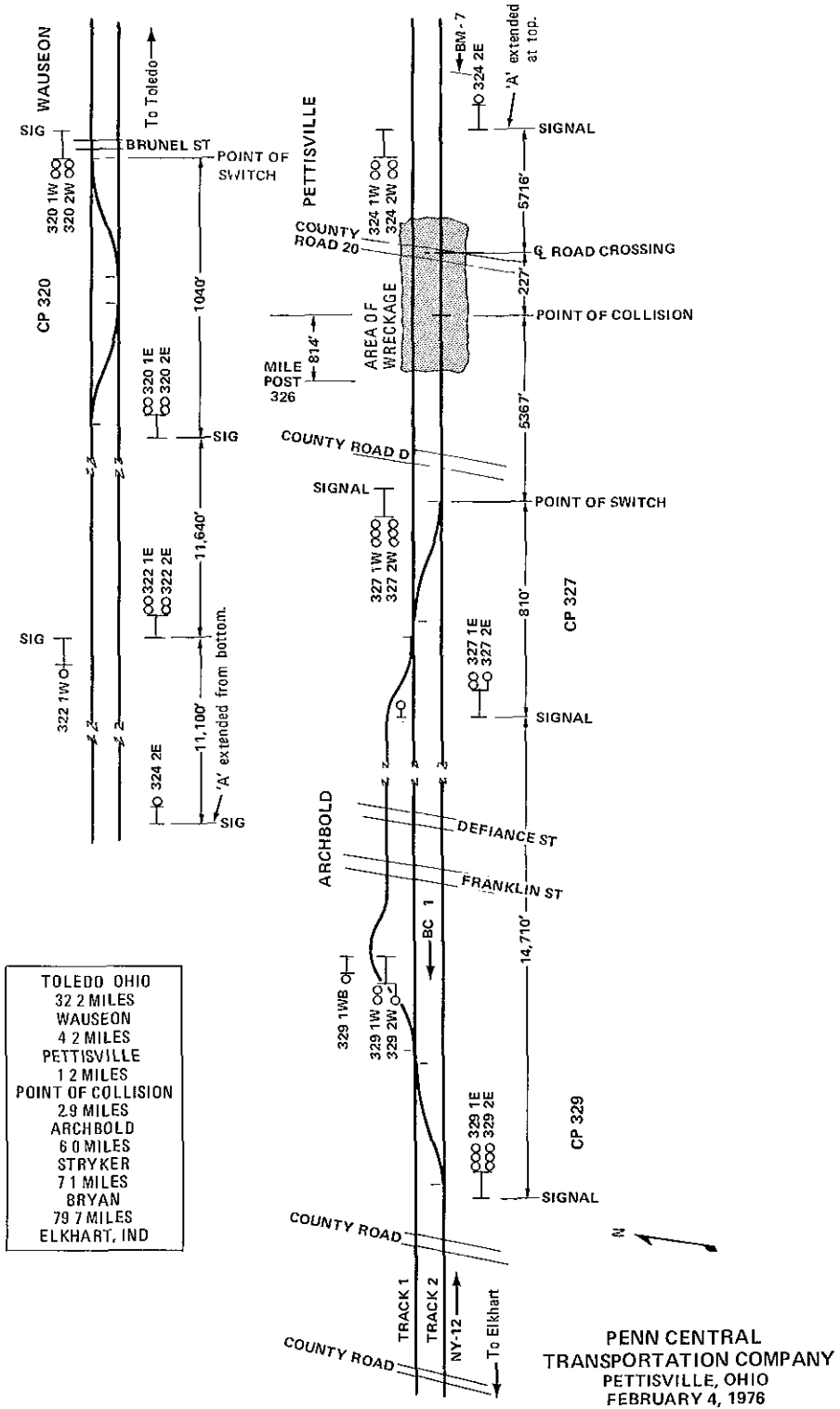


Figure 1. Track layouts at and near accident site.

About 400 feet of track 2 and 100 feet of track 1 were damaged. The switch of the crossover at CP 327 was damaged when train NY-12 ran through the switch after it was lined for the crossover movement. The operating rod was bent; this caused the far switch point <sup>2/</sup> to gap open about three-fourths of an inch. A portion of the head of the near switch point, opposite the point that had gapped open, was broken.

Cost of damages was estimated as follows:

Locomotives	\$928,041
Cars	64,600
Lading	36,000
Track and Signal	50,052
Removal of wreck	<u>86,086</u>
Total	\$1,164,779

### The Accident Site

The double main track is straight for more than 15 miles both east and west of the point of collision. A No. 20 crossover for westbound trains connects track 2 to track 1 at CP327. The grade for westbound trains averages 0.17 percent descending as they approach the accident point. There were five rail-highway grade crossings in the 5-mile area west of the accident site for which NY-12's headlights should have been on bright. It was dark when the trains collided; the weather was cloudy, visibility was about 15 miles, and the temperature was 22°F.

### Method of Operation

Trains are controlled in both directions between Toledo and Elkhart on the double-track line by signals of an automatic traffic control system. Interlocked crossovers, called control points, are provided at various locations to facilitate the handling of traffic on the main tracks. Crossovers and controlled signals are operated by the dispatcher, who is located in Toledo, Ohio. The dispatcher can radio train orders to traincrews; all radio communications for train operation are recorded.

The maximum authorized speed for freight trains is 50 mph. Limited and medium speeds cannot exceed 45 and 30 mph, respectively.

Penn Central Operating Rule No. 17 requires that the headlights on the front of every train be displayed brightly by day and by night. They must be dimmed when a train is approaching from the opposite direction.

2/ At CP 327 when the switch is lined for a crossover movement, the switch point, which is open, is called the near point and the opposite switch point, which is closed, is called the far point.

Signal System

The train dispatcher can cause the controlled signals to display a stop- or a proceed-type aspect. Once the dispatcher or the track occupancy causes the controlled signals at CP 327 and CP 329 to display a stop aspect, they will not display a proceed aspect until the dispatcher activates the circuit. Other intermediate signals function as automatic-block signals. The signals are approach lighted. (See figure 1.)

When a westbound train which is being operated on track 2 in the block between CP 320 and CP 327 is to be crossed over to track 1 at CP 327, and when the block between CP 327 and CP 329 on track 1 is unoccupied and signal 3291W displays an aspect other than "stop," the signals will display the following aspects to an approaching train:

<u>Signal Number</u>	<u>Aspect</u>	<u>Name</u>	<u>Indication</u>
3242W	green-over- red-over- red	Clear	Proceed
3272W	red-over- flashing green-over- red	Limited Clear	Proceed: Limited speed within inter- locking limits
3271W	red-over- red-over- red	Stop	Stop
3241W	yellow-over- red-over- red	Approach	Proceed prepared to stop at next signal. Train exceeding medium speed must at once reduce to that speed.
3272E	red	Stop	Stop
3292E	yellow-over- red-over- red	Approach	Proceed prepared to stop at next signal. Train ex- ceeding medium speed must at once reduce to that speed.



If signal 3291W displays a "stop" aspect and the block between CP 327 and CP 329 on track 1 is unoccupied, then the following signal aspects will be changed and all other signals will remain unchanged:

<u>Signal Number</u>	<u>Aspect</u>	<u>Name</u>	<u>Indication</u>
3272W	red-over- flashing yellow-over- red	Limited Approach	Proceed at limited speed preparing to stop at next signal.

If the block on track 1 is occupied between CP 327 and 329, then the following signals will display the aspects shown below and all other signals will remain unchanged:

3272W	red-over- red-over- red	Stop	Stop
3242W	yellow-over red	Approach	Proceed prepared to stop at next signal. Train exceeding medium speed must at once reduce to that speed.

The signal system is properly protected for time, route, and traffic direction.

A train graph in the dispatcher's office automatically records entering and leaving times at all control points. In addition, a control board has panel indication lights that show whether signals are displaying stop- or proceed-type aspects, whether a block is occupied, and whether a switch is lined for a straight or a crossover movement.

Each controlled switch is provided with a device which should detect a switch point that does not fit properly against the running rail. The device is designed to cause the signal which governs movements over the switch to display its most restrictive aspect when the switch points are gapped open more than one-fourth inch. A detector rod connects the device to one of the two switch points. At CP 327, the switch point to which the detector rod is connected is the near point. Switch protection is required by 49 CFR 326.205.

#### Train Equipment

The diesel-electric locomotive units of NY-12 and BM-7 were provided with air-actuated deadman safety controls, speedometers, and radios with which the crewmembers on the locomotive could converse with those on the

caboose, with other trains, and with the train dispatcher. The crewmembers on the caboose of each train were provided with portable radios. The locomotives were not equipped with speed-recording equipment.

#### Crewmembers of NY-12

The engineer was 60 years old and his last physical examination, in February 1975, disclosed no defective physical condition. He had been operating locomotives for 25 years.

The front brakeman was 41 years old and was required to have a physical examination each 6 months because of a heart condition. His last examination, in September 1975, indicated that he was fit for duty.

An investigation of the activities of the crewmembers during the 24-hour period preceding the accident did not disclose any condition which would have contributed to the accident. The engineer and brakeman had been off duty for 12 1/2 hours when they reported for this assignment. It was not possible to determine their physical condition, but other crewmembers reported that they appeared to be well rested and fit for duty.

It was not possible to determine whether the engineer or the front brakeman were incapacitated immediately before the accident nor was it possible to obtain alcohol or drug tests because of the crushing damage of their bodies and the complete loss of blood.

#### Tests

Tests by the carrier were observed by representatives of the FRA. Tests on the braking system of the undamaged cars and on the air brake components of the locomotive units were performed. The tests disclosed that the train braking systems of both trains were functioning properly before the accident.

Signal 3272W was observed following the accident to display a "limited approach" aspect when the crossover at CP 327 was lined for the crossover movement, even though the switch point was gapped open about three-fourths of an inch. Signal 3291W displayed a "stop" aspect after the train on track 1 had cleared the block but it could not be placed in proceed position by the train dispatcher because all of the control wires had been torn out by the derailment.

Tests also were performed on the signal system under the observation of an FRA representative. The tests disclosed that the signals were functioning as intended before the accident.

## ANALYSIS

### Accident

When BM-7 occupied CP 320 about 11:42 p.m., signal 3272E and 3292E, when lighted, displayed "stop" and "approach" aspects, respectively. At this time, NY-12 was west of signal 3292E and should have received the indication that it was required to stop short of signal 3272E. Nothing happened from the time BM-7 entered CP 320 until the accident occurred to change the "stop" aspect which was displayed by signal 3272E.

The crewmembers on the train which was westbound on track 1 watched NY-12 for about 4 miles and stated that the headlight of NY-12 never changed to bright, although the rules of the carrier require the headlights to be on bright except when a train is closely approaching or passing another train. Since there were no other trains between NY-12 and the westbound train on track 1, the engineer of NY-12 should have had the headlight on bright until his train was near the westbound train.

The last brake application of NY-12 was made near Bryan. Shortly after NY-12 passed signal 3292E, it entered a speed restriction zone where the speed was required to be reduced to 30 mph. The engineer apparently made no attempt to reduce the speed of the train as it continued eastward at 35 mph.

There was no reported radio communication between the crewmembers on the locomotive of NY-12 and anyone else after the train departed from Elkhart, and they did not answer the call which the engineer of BM-7 made just before the trains collided. Since the radio was operable when the train departed Elkhart, the lack of radio communications apparently was not caused by faulty equipment. However, the damaged condition of the radio prevented determination of its operable status after the accident.

These factors indicate that the engineer and the front brakeman were not responsive while train NY-12 passed the stop signal at CP 327, ran through the switch, and continued east to collide with BM-7. It is also questionable whether the crewmembers were responsive while the train traversed the 16 miles between Bryan and the collision point. The reason for their lack of response could not be determined.

### Operating Rules

At present, the Penn Central has no rule or procedure which requires that the activities of crewmembers on a locomotive be monitored by employees of passing trains or by employees along the track. In order to determine that engine crews are not incapacitated in the course of their duty, such a rule should be established. The rule should require locomotive crewmembers to acknowledge crewmembers of passing trains and to acknowledge employees along the track. If such acknowledgement is not received, employees should be required to notify the other train's

conductor, the dispatcher, or both. The conductor should be required to determine why the crewmembers on the locomotive failed to respond, and if he does not receive a satisfactory response, he should stop the train.

Had such a rule been in effect at the time of the accident, the engine crew of the westbound train on track 1 would have alerted the conductor of train NY-12. If the conductor of train NY-12 did not receive a proper acknowledgement from the engineer, he would have been able to stop the train short of CP 327.

#### Safety Controls on Locomotives

The locomotive units of NY-12 were provided with an air-actuated safety control device which required a floor pedal to be depressed while the unit was operating. Release of the pedal results in the actuation of a warning whistle and, if the engineer does not take corrective action within a specified time, the brakes of the train are applied. This device can be nullified by placing a weight on the pedal or by wedging the pedal into a depressed position with a bar or stick. Even if the engineer had become incapacitated or had fallen asleep, the position or weight of his body could have kept the pedal in the depressed position. Because of the extensive damage to the cab of NY-12's locomotive, it could not be determined if the safety control device had been made inoperative.

#### Responsibilities of Other Crewmembers

The front brakeman has no device in the locomotive cab to insure that he is alert. His major duty is to observe the engineer; the movement of the train is not dependent on his actions. Most of the time, the front brakeman is junior to the engineer both in age and experience and is always junior in position. It is not unusual for a front brakeman to be reluctant to take over the operation of the train or even criticize the engineer except as a last resort.

If the front brakeman were assigned radio duties, then each communication with the locomotive would check his alertness and would keep him in contact with the conductor for instructions.

The conductor is generally considered to be in charge of the train and he shares with the engineer responsibility for the train's safety. When the conductor is in the caboose of a long freight train, many times he is unable to observe the aspects displayed by signals before the locomotive passes them; he has no device in the caboose to indicate the speed of the train but must rely on his judgment; and he cannot monitor the engineer and the front brakeman. Since the conductor shares the responsibility for the safety of the train, he should be provided with sufficient information to carry out these duties.

## Signal System

The signal system on this section of main track incorporates signal circuits and concepts used throughout the railroad industry. If the engineer of NY-12 had operated his train in compliance with the signal indications, he would have stopped the train west of signal 3272E. The continuance of train NY-12 through CP 327 indicates that the engineer and front brakeman either misinterpreted signal 3272E or failed to see it.

Although the signals were operating properly, the system as presently designed does not provide any safeguards to prevent trains from passing the stop signals. At one time, this area was equipped with an automatic train stop feature. This feature, however, was eliminated when train speeds were reduced below 80 mph. Consequently, the signal system now depends upon the employees' compliance with operating rules. Because of the double-track, bidirectional method of operation in this territory, a train control system could be used effectively to provide compliance with operating rules. The lowering of train speeds to under 80 mph did not justify the elimination of the signal backup system.

The examination of the damage to the switch on track 2 at CP 327 disclosed that as the locomotive of NY-12 ran through the switch, which was lined for the crossover movement, the wheel sprung the closed far switch point and bent the operating rod. This permitted the far switch point to gap open. The wheels on the opposite side of the locomotive broke the head of the near switch point and went behind the point and onto the stock rail. This prevented the near switch point and the detector rod from moving toward the stock rail and actuating the detector device. Because of this, signal 3272W, which governed movements over the switch, was able to display a proceed aspect despite the defective switch resulting from the accident. This type of protection does not comply with the requirements of 49 CFR 236.205.

## CONCLUSIONS

1. The double main track was lined for westbound BM-7 to cross over to track 1 at CP 327 so that NY-12 could continue east on track 2.
2. NY-12 passed signal 3272E, which displayed a "stop" aspect, and continued east without stopping for about 1 mile, where it collided with BM-7.
3. There was no known activity of the locomotive crewmembers on NY-12 between Bryan and the collision point. The reason for their lack of activity could not be determined.

4. The conductor and flagman on NY-12 were not aware that the train was being operated in violation of signal 3272E and that the engineer and front brakeman were not responsive. Since the conductor was at the back of the train, he could not monitor the activities of the crewmembers on the lead unit except by radio. He also was not required to do so.
5. The front brakeman is not assigned sufficient duties which would insure that he remains alert.
6. If the Penn Central required the locomotive crewmembers of trains to acknowledge or signal the crewmembers of passing trains and to report any signals which are not acknowledged, the accident might have been avoided.
7. The arrangement of the detector device on the switch at CP 327 on track 2 did not comply with 49 CFR 236.205 because it permitted a proceed aspect to be displayed even though the switch point was gapped open.
8. If the signal system still had been provided with an automatic train stop system, the accident might have been prevented.

#### PROBABLE CAUSE

The National Transportation Safety Board determines that the probable cause of the accident was the failure of the engineer to stop train NY-12 west of signal 3272E as required by signal indication, and the inability of the crew in the caboose of train NY-12 to take preventive action.

#### RECOMMENDATIONS

As a result of this investigation, the National Transportation Safety Board, on April 28, 1976, submitted the following recommendation to the Federal Railroad Administration:

"Insure that switches in signal territory are so protected that related signals governing train movements will display their most restrictive aspects if the switch points do not close properly. (R-76-15) (Class I, Urgent Followup)"

The National Transportation Safety Board also submitted the following recommendations to the Federal Railroad Administration:

"Promulgate rules to require engine crews to communicate fixed signal aspects to conductors while trains are en route on signalized track. (R-76-50) (Class II, Priority Followup)"

"Promulgate rules to require the engine crew of a train to exchange signals with engine crews of passing trains and/or wayside employees. If passing crews do not acknowledge the signal, the responsive engine crew or wayside employee shall notify the dispatcher and/or conductor of the nonresponsive engine crew for corrective action. (R-76-51) (Class II, Priority Followup)"

In addition to these recommendations, the Safety Board reiterates the following recommendations which were made to the Federal Railroad Administration as a result of other train collisions:

"In cooperation with the Association of American Railroads, develop a fail-safe device to stop a train in the event that the engineer becomes incapacitated by sickness or death, or falls asleep. Regulations should be promulgated to require installations, use, and maintenance of such a device. (R-76-8)" (Issued 3/25/76)

"Include in its present investigation of the safety of locomotive-control compartments a study of environmental conditions that could distract crews from their duties or cause them to fall asleep at the controls. Regulations should be promulgated to correct any undesirable conditions disclosed. (R-73-9)" (Issued 5/3/73)

"In the promulgation of regulations governing railroad operating rules, where responsibility for safety operation of the train is assigned jointly to the engineer and the conductor, require that they be located and informed so that they can make quick effective decisions. (R-73-11)" (Issued 5/3/73)

"Promulgate regulations to require an adequate backup system for mainline freight trains that will insure that a train is controlled as required by the signal system in the event the engineer fails to do so. (R-76-3)" (Issued 1/25/76)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ WEBSTER B. TODD, JR.  
Chairman

/s/ KAY BAILEY  
Vice Chairman

/s/ FRANCIS H. McADAMS  
Member

/s/ PHILIP A. HOGUE  
Member

/s/ WILLIAM R. HALEY  
Member

September 10, 1976