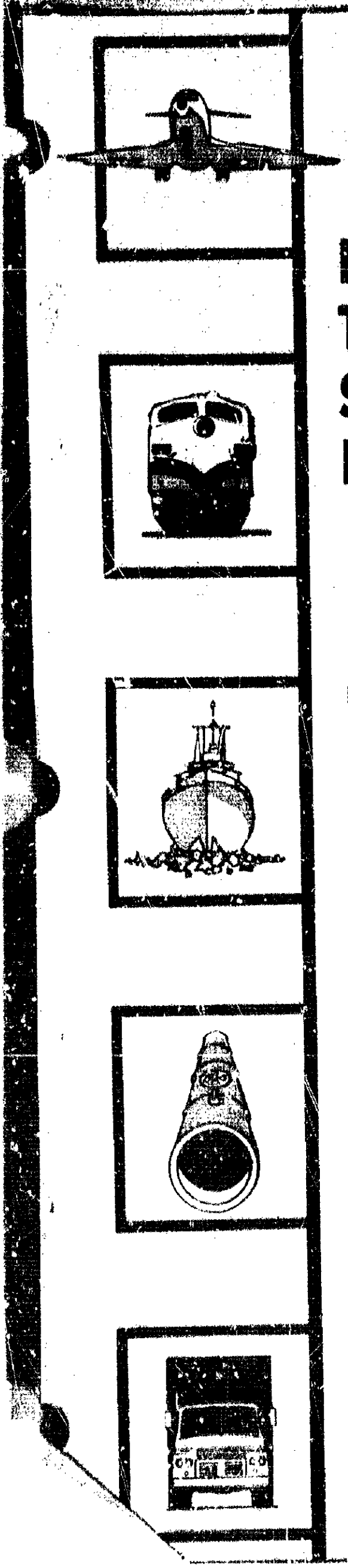
PB 277 990



NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

RAILROAD ACCIDENT REPORT

REAR END COLLISION OF TWO
CONRAIL FREIGHT TRAINS,
STEMMERS RUN,
BALTIMORE, MARYLAND

JUNE 12, 1977

REPORT NUMBER: NTSB-RAR-78-1

UNITED STATES GOVERNMENT

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. NTSB-RAR-78-1	2. Government Accession No.	3. Recipient's Catalog No. PB277990
4. Title and Subtitle Railroad Accident Report -- Rear End Collision of Two ConRail Freight Trains, Steinmers Run, Baltimore, Maryland, June 12, 1977		5. Report Date January 26, 1978 6. Performing Organization Code
7. Author(s)		8. Performing Organization Report No.
9. Performing Organization Name and Address National Transportation Safety Board Bureau of Accident Investigation Washington, D.C. 20594		10. Work Unit No. 2126B 11. Contract or Grant No. 13. Type of Report and Period Covered Railroad Accident Report June 12, 1977
12. Sponsoring Agency Name and Address NATIONAL TRANSPORTATION SAFETY BOARD Washington, D. C. 20594		14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

About 11:03 p.m., on June 12, 1977, ConRail freight train WA-4 collided with the rear of ConRail freight train WA-6. A fire began in the lead locomotive unit of train WA-4 and in the caboose of train WA-6. Damage was about $300,000. Two crewmembers on each train were injured.

The National Transportation Safety Board determines that the probable cause of the accident was the failure of the engineer of train WA-4 to fulfill his responsibility to properly control the speed of the train, as required by the signal indications, to insure that it could be stopped before passing signal 880. Contributing to the severity of the accident was the manner in which the engineer of train WA-4 applied and released the brakes approaching the accident point and the failure of the engineer of train WA-6 to communicate with the tower and train WA-4 when train WA-6 stopped.

17. Key Words	18. Distribution Statement
Rear end collision; stop and proceed signal; restricted speed; flagging; emergency braking.	This document is available to the public through the National Technical Information Service, Springfield, Virginia 22151

19. Security Classification (of this report)	20. Security Classification (of this page)	21. No. of Pages	22. Price
UNCLASSIFIED	UNCLASSIFIED	24	PC A02-A01

NTSB Form 1765.2 (Rev. 9/74)

CONTENTS

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C. 20594

RAILROAD ACCIDENT REPORT

Adopted: January 26, 1978

REAR END COLLISION OF TWO CONRAIL FREIGHT TRAINS, STEMMERS RUN, BALTIMORE, MARYLAND JUNE 12, 1977

SYNOPSIS

About 11:03 p.m., on June 12, 1977, ConRail freight train WA-4 collided with the rear of ConRail freight train WA-6. A fire began in the lead locomotive unit of train WA-4 and in the caboose of train WA-6. Damage was about $300,000. Two crewmembers on each train were injured.

The National Transportation Safety Board determines that the probable cause of the accident was the failure of the engineer of train WA-4 to fulfill his responsibility to properly control the speed of the train, as required by the signal indications, to insure that it could be stopped before passing signal 880. Contributing to the severity of the accident was the manner in which the engineer of train WA-4 applied and released the brakes approaching the accident point and the failure of the engineer of train WA-6 to communicate with the tower and train WA-4 when train WA-6 stopped.

INVESTIGATION

The Accident

On June 12, 1977, ConRail freight train WA-6, consisting of 2 GE Type L-33 electric locomotive units and 115 cars, was dispatched at 4:50 p.m. from Potomac Yard, near Washington, D.C., for Philadelphia, Pennsylvania. It later stopped at Bay Interlocking, Baltimore, Maryland, (Bay) to change locomotives because of mechanical problems which developed after departing Potomac Yard. Two EMD Type SD-35 diesel-electric locomotive units were substituted for the defective electric units. The train departed Bay at 10:50 p.m. with the engineer operating the locomotive from the right side of the lead unit. The front brakeman was seated on the left side of the lead unit and the conductor and the flagman were in the caboose.

Only the locomotive was equipped with an operable radio. The crewmembers in the caboose were not issued portable radios. Therefore, information could not be relayed between the two ends of the train.

Train WA-6 was being operated northward from Bay on track No. 2 when an emergency application of the train brakes occurred about 11:00 p.m. as the caboose passed signal 880 at Stemmers Run. The brake application was neither initiated by the engineer nor by the other crewmembers. The cause of the brake application was not determined and shortly after stopping, the conductor on the caboose and the engineer on the locomotive noticed on their separate gauges that the trainline air was being restored to normal pressure. This indicated that the brakes would release in a few moments and the train could proceed. Therefore, the crewmembers did not flag the rear of the train. The engineer did not notify the operator at Bay by radio or other means that his train was stopped.

The caboose of train WA-6 stopped about 283 feet north of signal 880. The engineer was attempting to restart the train after the brakes had released when train WA-4 collided with the caboose of train WA-6 at 11:03 p.m. As a result, the brakes on train WA-6 again were applied in emergency. The engineer of train WA-6 radioed the operator at Bay that his train was in emergency, but that he did not know the reason for the second brake application.

Train WA-4, consisting of 4 diesel-electric locomotive units, a GP-382, 2 GP-7's and a GP-35, and 71 cars had departed Potomac Yard at 8:02 p.m. en route to Philadelphia. The engineer was operating the train from the right side and the front brakeman was seated on the left side. The locomotive was headed north with its short end forward. The conductor and flagman were in the caboose. Only the locomotive was equipped with a radio; the crewmembers in the caboose did not have a portable radio.

Train WA-4 had proceeded north to Canton Junction, located just south of Bay without incident, where the operator at Bay informed the engineer, by radio, that WA-4 would follow train WA-6 northward on track No. 2. After this radio conversation the engineer of train WA-6 informed the engineer of train WA-4, by radio, that because the crew on train WA-6 was approaching the maximum number of duty hours, train WA-6 should stay in front of train WA-4. At this time train WA-6 had departed Bay and was moving northward on track No. 2 in the vicinity of North Point.

The engineer of train WA-4 applied the train brakes and reduced the throttle to the No. 5 position as the train approached the signal at Bay. The engineer saw the signal aspect change from "stop-and-proceed" to "approach." Before passing the signal, he released the brakes. After passing this signal, the engineer could see the next signal at North Point. He saw that signal also change from "stop-and-proceed" to "approach." Again, the engineer applied the brakes but released them before passing the signal. Almost immediately after passing the signal, the cab signals changed from "approach" to "clear." This permitted the

train's speed to be increased to about 40 mph. The signal aspect at River remained at "approach" as the train moved northward, so the engineer again applied the brakes to reduce the speed to about 30 mph as required by the aspect. As train WA-4 passed the signal at River, the signal aspect in the locomotive cab changed from "clear" to "approach," indicating that the engineer, if exceeding medium speed (30 mph), must reduce to medium speed at once and must be prepared to stop at the next wayside signal.

Train WA-4 went over a road crossing about 5,000 feet south of signal 880 and the engineer made a 12- to 15-pound application of the train brakes rather than a usual 6- to 8-pound reduction. He made a heavier reduction because he had just used the automatic brake. The train was about 1,300 feet from signal 880 when the engineer saw that the signal continued to display a "stop-and-proceed" aspect; he placed the automatic brake valve in the emergency position. He then saw the caboose of train WA-6 standing about 280 feet north of signal 880. When the engineer of train WA-4 initiated the emergency brake application, his locomotive was about 1,600 feet south of the caboose of train WA-6. The engineer of train WA-4 was not able to see the markers on the caboose of train WA-6 earlier because of the curvature of the track.

The front brakeman jumped from the locomotive of train WA-4 as it approached the caboose of train WA-6. The engineer remained on the locomotive, and lay on the floor behind the middle seat of the cab.

The conductor and flagman of train WA-6 were standing on the rear platform of the caboose as train WA-4 approached. When they realized that train WA-4 was on the same track, they jumped to the ground.

Train WA-4, was moving about 20 mph when it collided with train WA-6. The caboose and next five cars of train WA-6 were derailed. The caboose stopped on the east side of track No. 1 and the five cars stopped in various positions across tracks Nos. 3 and 4. (See figure 1.) The lead locomotive unit of train WA-4 stopped across track No. 1 on its right side. The other three locomotive units were derailed but stayed in line with the track. The first four freight cars were derailed. The caboose of train WA-6 and the lead locomotive unit of train WA-4 caught fire when diesel fuel from a ruptured tank on the locomotive unit ignited.

The four main tracks at the accident site are provided with an overhead catenary system, which supplies 11,000-volt a.c. electric power for the propulsion of trains. Approaching the point of impact, a northbound train operates around a 0°30' curve to the right for 0.3 mile, and then around a compound curve of 0°25' to 0°52' to the left for 0.9 mile. The track is then straight for 0.3 mile where it enters a compound curve to the right of 0°57' to 0°40'. The accident occurred 1,394 feet from the south end of this curve. (See figure 1.)

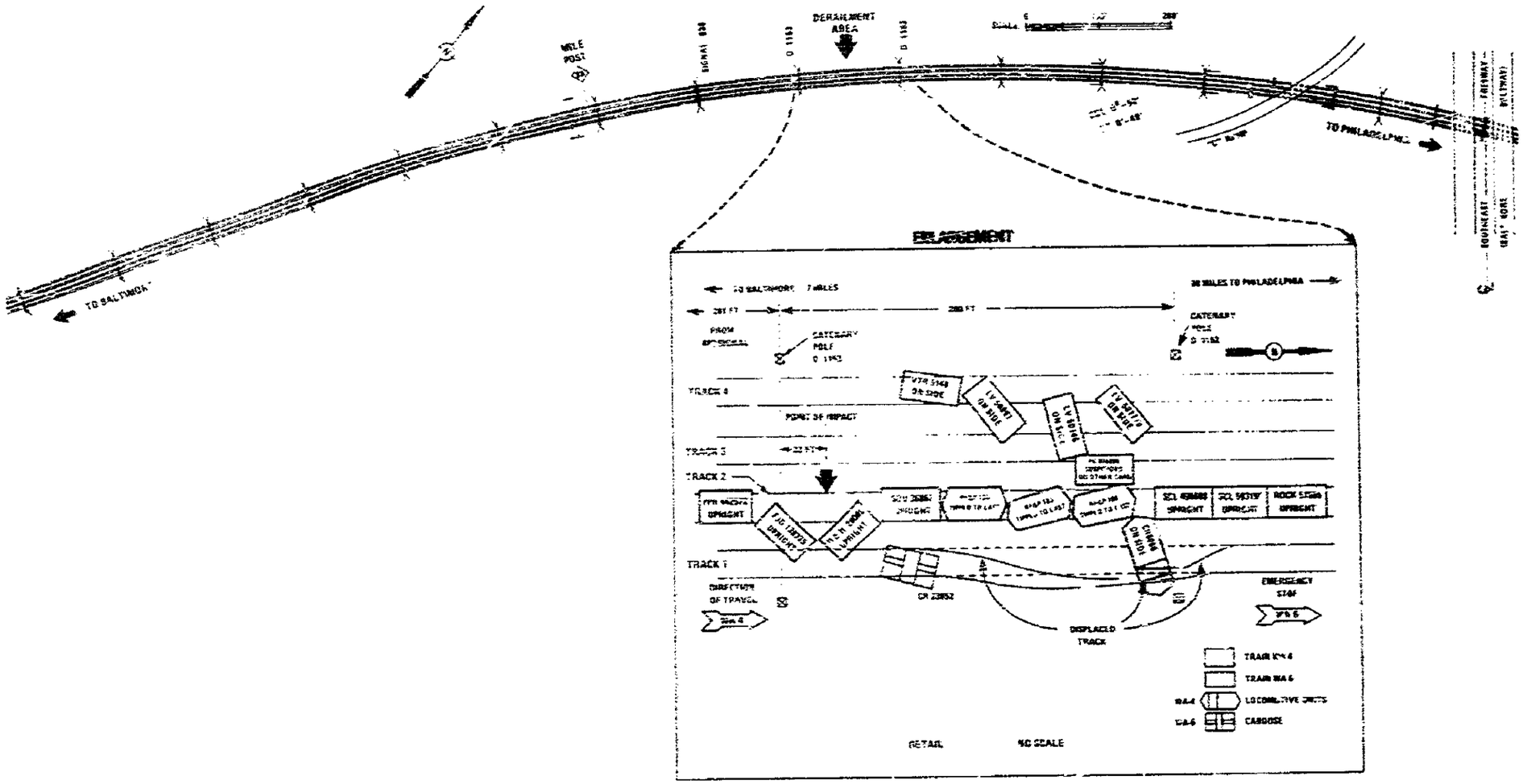


Figure 1. Plan of accident site.

Injuries to Persons

Injuries	Crewmembers	Passengers	Other
Fatal	0	0	0
Nonfatal	4	0	0
None	4	0	

Damage

The collision occurred on a right-hand curve and the locomotive and caboose were deflected toward the right side of the track. The lead locomotive unit of train WA-4 turned over on its right side and came to rest perpendicular to the track. Although there was no override, both the caboose and the locomotive unit were extensively damaged. The five derailed cars of train WA-6 were driven across tracks Nos. 3 and 4 and were extensively damaged. The other derailed locomotive units and cars of train WA-4 were not extensively damaged. (See figure 2.)

The catenary was slightly damaged. About 210 feet of track No. 1 and 190 feet of track No. 2 were damaged.

Total damage was estimated to be about $300,000.

Train Information

The engineer of train WA-6 made the required locomotive inspection and tests at Potomac Yard, including the required airbrake tests on the entire train. The engineer reported a power loss on the locomotive en route and the dispatcher sent a helper locomotive to assist the train from Bowie, Maryland, to Bay. When the original locomotive units of WA-6 and the helper locomotive were replaced with two diesel-electric units at Bay, the engineer applied and released the train brakes; the test was observed only at the head end of the train. Because of the lack of radio communication with crewmembers at the rear of the train, the engineer was not informed about whether the brakes had applied and released on the rear car nor whether the air pressure was restoring at the rear. Notification of the results of airbrake tests is required by ConRail operating rules and Federal regulations. (See appendix B and 49 CFR 232.13.)

The engineer of train WA-4 visually inspected the four diesel-electric units and performed a cab signal test at Potomac Yard. He also tested the locomotive brakes. However, during this test, the engineer did not leave the cab of the lead unit and did not observe the brake apply and release on all the locomotive units as required by ConRail rules. (See appendix B.) After the locomotive units were coupled to the train, an initial terminal airbrake test was performed. En route, the engineer used the automatic brake several times, including a stop at Baltimore. The engineer later stated that the brakes did not respond

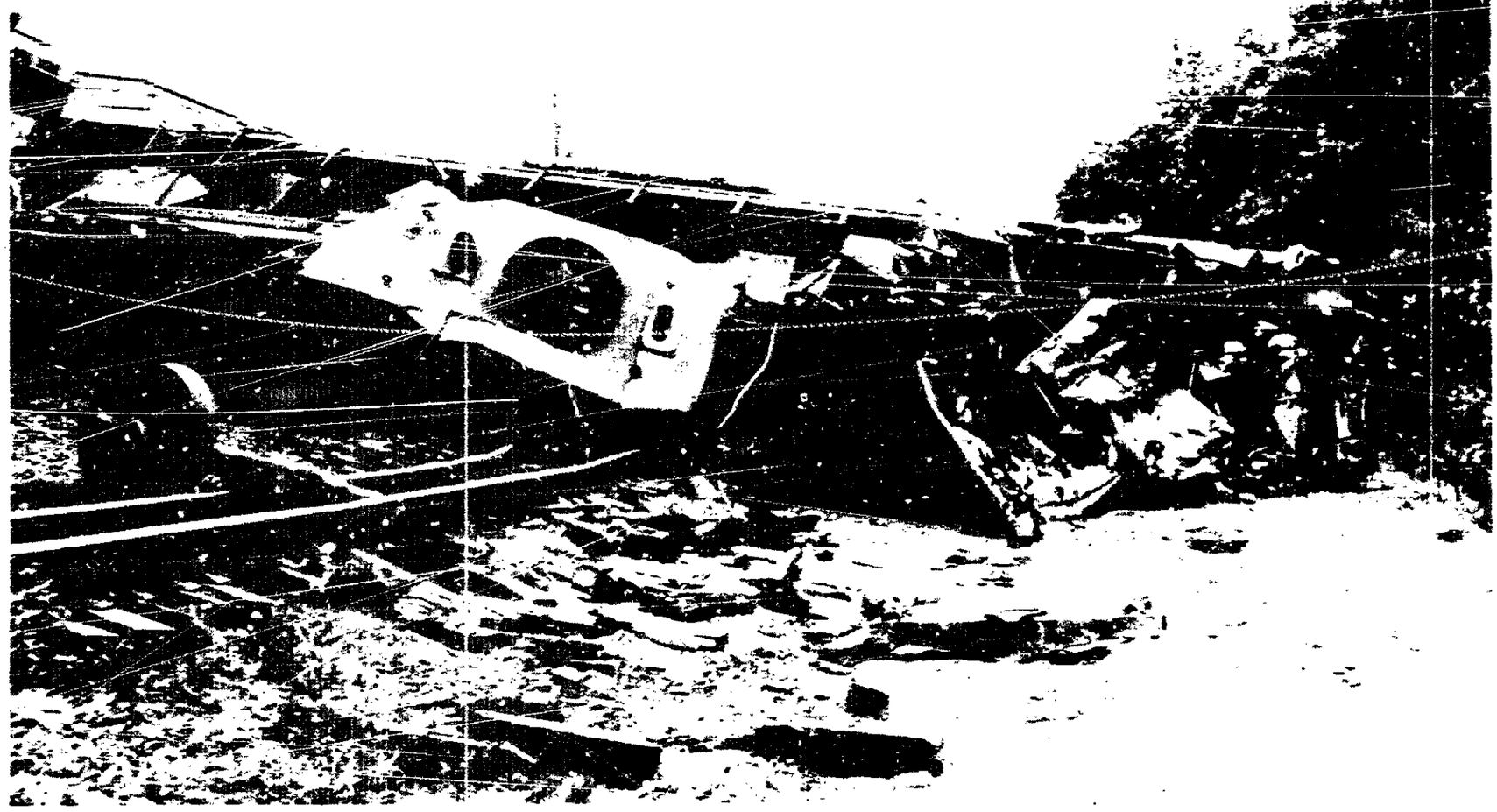


Figure 2. Damaged lead locomotive unit of train WA-4.

properly to his service application at the Baltimore stop, and he had to put the brake valve handle into "handle off" position to stop the train.

The caboose of train WA-6 was provided with battery-operated flashing red marker lights with 4-inch lenses. One such marker was mounted on each side of the rear platform just under the roof level.

Once the airbrake system is fully charged, the brake pipe, auxiliary reservoir, and emergency reservoir are at equal pressures. A service application initiated by the engineer reduces pressure in the brake pipe by means of the locomotive brake valve which, in turn, causes the brake valve on each car to allow air pressure from the auxiliary reservoir to enter the brake cylinder on each car and apply the brakes.

In order to accelerate release of the train's brake after a service application, air pressure from the emergency reservoir (which remains fully charged during a service brake application) is used to provide partial recharging of the auxiliary reservoir. While this action quickens the release of the train's brakes, it also reduces the air pressure available for subsequent service and emergency brake applications until the entire system is again fully charged. Since fully recharging the brake system after a brake application requires considerable time, it is possible for an engineer to make repeated brake applications before the system pressure is fully restored. Thus, the frequent applications and releases of the brake can result in reduced braking effect in both the service and emergency modes if sufficient recharging time is not permitted. The time required to fully recharge the brake system is dependent on the amount of depletion of the system.

Crewmember Information

The engineer of train WA-4 was hired by the railroad as a fireman in 1969, and entered the carrier's engineer training school in October 1974. His actual service as a fireman totalled about 10 months which was interrupted by 4 years of military service. His formal training spanned 4 1/2 months and consisted of classroom instruction, on-the-job training, and qualification on the Philadelphia-Potomac Yard territory. Included in the classroom instruction were courses on the design and operation of the airbrake systems. During the on-job-training portion of the course, trainees were instructed in train handling and methods of operating the air brake system. The engineer reentered actual service about 1 year before the accident. During this time he had a physical examination and attended a class on the operating rules.

The front brakeman of train WA-4 was hired in 1972 and had a total of about 10 months service as a trainman before the accident.

The engineer of train WA-6 graduated from the engineer training school in November 1973, and worked as a qualified engineer until the time of the accident. The conductor of WA-6 had 8 years service as a trainman and was promoted about 1973. The flagman had worked as a brakeman on the territory involved since February 1977.

All of these employees had received physical examinations and had received periodic formal instructions on the operating rules. None of the crewmembers had been restricted for service.

Method of Operation

Trains are controlled over the four-track line by an automatic signal system, by cab signals, and by interlocking signals remotely controlled by the operator at Bay. The main tracks are numbered 1 through 4, from east to west. Tracks Nos. 1 and 2 are used as northbound and Nos. 3 and 4 as southbound. Wayside signals are of the position-light type with the tracks signalled in the designated directions. Tracks Nos. 2 and 4 are nominally assigned to passenger trains but are used by freight trains.

Maximum authorized speed for freight trains is 50 mph on track No. 2. Limited speed and medium speed are defined as not exceeding 45 and 30 mph, respectively.

The operator at Bay controls the northbound semi-automatic signals for track No. 2 at Bay, North Point, and River. The distances separating the three signals are 6,267 feet and 7,143 feet, respectively. Automatic signal 880 at Stemmers Run is located 8,647 feet north of River.

The operator can display a "proceed" aspect on any of the controlled semi-automatic signals by moving a lever on his control panel. If the block beyond the signal is occupied by a train, the signal will display the following aspect:

Aspect	Name	Indication
3 horizontal yellow lights above a single yellow light	Stop and Proceed	Stop: Then proceed at restricted speed

If the block governed by the signal is clear and the block in advance of that block is occupied, the signal will display the following aspect:

Aspect	Name	Indication
3 diagonal yellow lights to the right	Approach	Proceed prepared to stop at next signal. Train exceeding medium speed must at once reduce to that speed.

If both blocks in advance of the signal are unoccupied, the signal will display the following aspect.

Aspect	Name	Indication
3 vertical yellow lighcs	Clear	Proceed

The semi-automatic signals do not automatically clear when a train leaves the block governed. The operator initiates the action by operating a signal lever.

Signal 880 at Stemmers Run is an automatic signal. If a train occupies the block governed by this signal, the signal will automatically display the following aspect:

Aspect	Name	Indication
3 horizontal yellow lights above a single yellow light	Stop and Proceed	Stop: Then proceed at restricted speed

If the block governed by signal 880 is clear and the block in advance of that block is occupied, signal 880 will automatically display the following aspect:

Aspect	Name	Indication
3 diagonal yellow lights to the right	Approach	Proceed prepared to stop at next signal. Train exceeding medium speed must at once reduce to that speed.

If both blocks in advance of signal 880 are clear, the signal will automatically display the following aspect:

Aspect	Name	Indication
3 vertical yellow lights	Clear	Proceed

The cab signal displays an aspect to the engineer which informs him of the condition of the signal block in which he is operating.

When a train is stopped by an emergency application of the brakes, crewmembers are required to protect 1/ the adjacent tracks at the front and rear of the train until it is determined that the adjacent tracks are not fouled. (See rule 102, appendix A.)

1/ To protect the tracks, crewmembers must detrain with the proper signals and go a sufficient distance so that other approaching trains can be signalled to stop before colliding with the standing train as per rule 99, appendix A.

Meteorological Information

At the time of the accident it was partly cloudy with good visibility. The temperature was about 70°F and winds were northeasterly at 5 mph.

Survival Aspects

The two trainmen in the caboose of train WA-6 were able to escape by the rear platform steps before the collision. The operating cab of the lead locomotive unit of train WA-4 was demolished by the collision, overturning of the unit, and the subsequent fire. Before the collision, the front brakeman had jumped to the ground from the cab. The engineer survived by lying on the floor of the cab before the collision; he was able to climb from the cab after the accident.

Tests and Research

No defects were found in the undamaged components of the cab signal apparatus of the lead locomotive unit of train WA-4.

The signals at 880 were observed shortly after the accident and were found to display "stop-and-proceed" aspects for both Nos. 1 and 2 tracks. Tests performed on the signal system indicated the signals were functioning as intended before the accident.

Postaccident airbrake tests were performed on the caboose and 64 of the 71 cars in train WA-4. Trainline leakage was within permissible limits. Excessive piston travel was noted on 13 cars.

Maximum sight distances approaching the signals preceding the accident location were Bay, 1,980 feet; North Point, 3,829 feet; River, 4,041 feet; and 880, 1,929 feet.

ANALYSIS

The engineer of train WA-4 was operating his train while keeping only one unoccupied signal block between his train and train WA-6 ahead, as the trains moved northward from Bay. He evidently assumed that the signals he encountered would improve to "proceed" aspects before he reached them. As train WA-4 approached the block signal, it would change from a "stop-and-proceed" aspect to an "approach" aspect, indicating that train WA-6 had cleared the block ahead. This permitted train WA-4 to continue without stopping. Also, because the wayside signals changed to "approach" as the train approached them, the locomotive cab signals changed to "clear," which permitted the engineer to increase the train's speed to more than the medium speed. This situation had occurred successively at Bay, North Point, and River. However, as WA-4 approached signal 880 the situation changed. Train WA-6 had stopped in the signal block with its caboose just north of signal 880 due to the emergency application of the brakes. As WA-4 approached signal 880 the engineer testified that he assumed that this signal would react as the previous three had. When he realized that the signal continued to display the

"stop-and-proceed" aspect and would not change, the 30 mph speed of the train was too great to permit stopping short of the signal and the rear of train WA-4.

ConRail operating rules require that a train moving under an "approach" aspect be operated in such a manner that it can be stopped short of the next signal and must not exceed 30 mph. The engineer of WA-4 stated that in his opinion he was complying with the rules at Bay, North Point, and River. Approaching signal 880, although the engineer had less than half the sight distance he had had on approaching the signal at River, and slightly more than half that available to him approaching North Point, he knew the location and aspect of signal 880. It is obvious that the engineer did not comply with ConRail's rules because he approached signal 880 at a speed too great to stop short of the signal when it did not change from "stop-and-proceed."

On the basis of the engineer's description of the method he employed in braking train WA-4, it is obvious that the train's brakes were being used improperly. Several brake applications had been made approaching Baltimore and it is possible that there was insufficient time between the brake actuations and the stop at Baltimore for the brake pipe to have been fully recharged. This is confirmed by the necessity to place the brake valve handle in "handle off" position to stop the train. Similarly, the train brakes were applied and released several times as train WA-4 proceeded from Bay to River and approached signal 880. Again, there was probably insufficient time for full restoration of brake pipe pressure and emergency reservoir pressure. As a result, the brake system was not fully effective when it became necessary to make an emergency stop approaching signal 880. The stopping distance required may have been substantially increased.

The engineer of train WA-4 apparently did not take into account the consequences of making repeated brake applications without allowing adequate time for recharging the brake pipe. The method by which air is taken from the emergency reservoirs to help promote quick release of the brakes was discussed and demonstrated during the air brake classes of his formal training as an engineer. The training also acquainted him with the results of too frequent brake actuations without sufficient time to recharge the brake system. However, he apparently did not relate it to this situation. ConRail rules do not describe what occurs when the train brakes are used improperly nor do they detail the quick-release action of the control valves. The braking capability of train WA-4 was further reduced by the 13 cars which were found to have long piston travel.

When the engineer of train WA-4 saw the signal at Bay improve from "stop-and-proceed" to "approach," he should have released the brakes and then reduced the power to the point where the train was not accelerating so that repeated brake applications would not be required.

The engineer is assigned the primary responsibility for operating the train within the speed requirements. However, by Rule 34 (See appendix A) other crewmembers are required to take the necessary action if the engineer fails to respond to conditions properly. The front brakeman of WA-4 had little experience as an operating employee, and stated that in his opinion the engineer was competent and that the train was moving at a speed which would permit it to stop short of the signal. Therefore, he had no reason to use the emergency brake valve. This and previous cases investigated by the Safety Board suggests that Rule 34, which depends upon an employee of another craft who generally has less experience and training, to overrule the judgment of an engineer, was ineffective.

Neither caboose was equipped with radios, so the crewmembers were unable to communicate between the locomotive and the caboose. They were unable to ascertain conditions pertinent to the safe operation of their trains. The conductors on both trains could not effectively carry out their assigned responsibilities for the general operation of their trains. Had each caboose been equipped with a radio, and had the engineer of WA-6 informed his conductor by radio of the emergency stop, the crew of WA-4 may have heard the radio transmission and been aware of the stopped train. Communication between the engineer and conductor is necessary if the joint responsibility for safe movement of the train is to be carried out. Because of the ineffectiveness of Rule 34 as a safety backup to the engineer, it becomes even more important to enforce the requirement that the conductor exercise his responsibility for the safety of the train.

The Safety Board has made recommendations to the FRA 2/ in the past regarding this issue; however, the FRA declined to make regulations which would require:

> "Where responsibility for safe operation of the train is assigned jointly to the engineer and conductor, see that they are located and informed so they can make quick effective decisions."

FRA's rationale for not regulating this facet of rail operations is contained in their response to the Safety Board's recommendation R-73-11 as follows:

> "Having the conductor in closer proximity to the engineer to effectively monitor his actions in relation to signal indications...would be an unnecessary redundancy as most carrier's operating rules already require one other train

2/ National Transportation Safety Board Railroad Accident Reports:
"Collision of Two Penn Central Freight Trains at Herndon, Pennsylvania, March 12, 1972" (NTSB-RAR-73-3);
"Collision of Two Texas and Pacific Freight Trains at Meeker, Louisiana May 30, 1975" (NTSB-RAR-75-9).

> crewmember to be in the control cab of the engine with the engineer. Operation of the train's movement is enhanced in other respects by having the conductor in his position on the rear of the train where he can readily observe the moving train for unsafe conditions and take immediate timely action when required. As carriers continue to modernize by increasing their use of radio, the line of communication between the two ends of the train will improve to better enable the conductor to fulfill his responsibilities from his position on the rear of the train."

It would have been easy for the engineer of train WA-6, who had talked to the engineer of train WA-4 only 5 minutes earlier, to have notified train WA-4 immediately that WA-6's train was in emergency and was stopping. Alternatively he could have notified the dispatcher or the operator at Bay and the transmission probably would have been heard by the crew on the locomotive of train WA-4. This would have provided additional warning to train WA-4 that signal 880 would not change from the "stop-and-proceed" aspect. If the operator at Bay had known in sufficient time, he could have notified train WA-4.

A requirement to have the operator or dispatcher notify a following train when the preceding train makes an unscheduled stop, may have alerted the engineer of train WA-4 of the conditions ahead soon enough for him to take action. The method of combining the use of radio with automatic signals would produce the optimum level of safety. Whatever procedure is developed, due regard must be given to 49 CFR 220 and particularly to 49 CFR 220.51, Signal Indications.

In summary, this accident happened because the engineer of train WA-4 operated the train in violation of the requirements of ConRail rule 285 which required him to approach each "stop-and-proceed" signal at such a speed that would enable him to stop the train short of the signal. Further he persisted in handling his airbrakes in a manner that degraded the capability of the system even after the stop at Baltimore which should have warned him that his procedure was faulty.

Although the evidence indicates that the engineer of train WA-4 was subjected to a reasonably thorough training course for engineers, his performance on the day of the accident suggests a serious deficiency in the application of what he should have learned. This means that the instruction was faulty or the followup in the on-the-job phase and subsequent supervision was deficient.

CONCLUSIONS

Findings

1. The engineer of WA-4 assumed that signal 880 would change to a "proceed" aspect as the train approached as had the three previous signals.

2. The engineer of train WA-4 operated his train too fast to stop south of the "stop-and-proceed" signal, as required by the operating rules.

3. The numerous applications and releases of the train brakes between Bay and the accident point reduced the braking capability of train WA-4.

4. The front brakeman of train WA-4 did not act to apply the train's brakes, which he was authorized to do by operating rules.

5. The conductors of each train could not properly discharge their duties from the rear ends of the trains because they had no method of communication.

6. The front brakeman lacked the training and experience to overrule the judgment of the engineer on train WA-4, therefore Rule 34 was ineffective.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the accident was the failure of the engineer of train WA-4 to fulfill his responsibility to properly control the speed of the train, as required by the signal indications, to insure that it could be stopped before passing signal 880. Contributing to the severity of the accident was the manner in which the engineer of train WA-4 applied and released the brakes approaching the accident point and the failure of the engineer of train WA-6 to communicate with the tower and train WA-4 when train WA-6 stopped.

RECOMMENDATIONS

As a result of this investigation, the National Transportation Safety Board recommended that the Consolidated Rail Corporation:

> "Insure that ConRail freight trains and locomotives receive proper airbrake tests. (Class II, Priority Action) (R-78-1)

"Equip all mainline freight trains with radio capable of communicating between trains, between trains and base stations, and between both ends of the same train. (Class II, Priority Action)(R-78-2)

"Supplement Rule 102 by requiring the crewmembers of all trains to notify by radio the appropriate authority (dispatcher, etc.) immediately when a train stops under unpredicted circumstances and require that authority to inform all trains that are approaching the stopped train. (Class II, Priority Action) (R-78-3)

"Determine whether engineers on ConRail freight trains fully understand and use train brakes properly. (Class II, Priority Action) (R-78-4)"

to the Federal Railroad Administration:

"Analyze the data relating to the role of radio in train accidents and report its findings. (Class II, Priority Action) (R-78-5)

"Unless refuted by the above analysis, require railroads to install radios where appropriate on trains and to maintain them in operating condition, unless all personnel involved are notified to the contrary by appropriate railroad procedures. (Class II, Priority Action) (R-78-6)"

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ KAY BAILEY
Acting Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ PHILIP A. HOGUE
Member

/s/ JAMES B. KING
Member

January 26, 1978

APPENDIX A

Excerpts from Penn Central
"Rules for Conducting Transportation"

*****

DEFINITIONS

*****

Block Signal Systems

Automatic Block Signal System (ABS)--A block signal system wherein the use of each block is governed by an automatic block signal, cab signal, or both.

*****

Interlocking

Interlocking--An arrangement of signals and signal appliances so interconnected that their movements must succeed each other in proper sequence and for which interlocking rules are in effect. It may be operated manually or automatically.

Interlocking Limits--The tracks between the extreme opposing home signals of an interlocking.

*****

Signals

Fixed Signal--A signal of fixed location indicating a condition affecting the movement of a train or engine.

NOTE--The definition of a "Fixed Signal" covers such signals as switch target, train order, block, approach block limit, block limit, interlocking, speed signs, stop signs, yard limit signs, or other means for indicating a condition affecting the movement of a train or engine.

Aspect--The appearance of a fixed signal conveying an indication as viewed from the direction of an approaching train; the appearance of a cab signal conveying an indication as viewed by an observer in the cab.

Indication--The information conveyed by the aspect of a signal.

Block Signal--A fixed signal, or hand signal in the absence of a fixed signal, at the entrance of a block to govern trains and engines in entering and using that block.

Block Limit Signal--A fixed signal indicating the limit of a block the use of which by trains or engines is prescribed by manual block signal system rules.

Cab Signal--A signal located in the engine control compartment or cab indicating a condition affecting the movement of a train and used in conjunction with interlocking signals and in conjunction with or in lieu of block signals.

Approach Signal--A fixed signal used in connection with one or more signals to govern the approach thereto.

Home Signal--A fixed signal at the entrance to a route or block to govern trains or engines entering and using that route or block.

Interlocking Signals--The fixed signals of an interlocking.

*****

Speeds

Normal Speed--The maximum authorized speed.

Limited Speed--Not exceeding 45 miles per hour.

Medium Speed--Not exceeding 30 miles per hour.

Reduced Speed--Prepared to stop short of train or obstruction.

Slow Speed--Not exceeding 15 miles per hour.

Restricted Speed--Proceed prepared to stop short of train, obstruction, or switch not properly lined looking out for broken rail, not exceeding 15 miles per hour.

NOTE--Speed applies to entire movement.

*****

OPERATING RULES

*****

34. Employes located in the operating compartment of an engine must communicate to each other in an audible and clear manner the indication by name of each signal affecting movement of their train or engine, as soon as the signal is clearly visible or audible. It is the responsibility of the engineman to have each employee comply with these requirements, including himself.

It is the engineman's responsibility to have each employee located in the operating compartment maintain a vigilant lookout for signals and conditions along the track which affect the movement of the engine or train.

APPENDIX A

If a crew member becomes aware that the engineman has become incapacitated or should the engineman fail to operate or control the engine or train in accordance with the signal indications or other conditions requiring speed to be reduced, other members of the crew must communicate with the crew member controlling the movement at once, and if he fails to properly control the speed of the train or engine, other members of the crew must take action necessary to ensure safety including operating the emergency valve.

An employee controlling the movement of a train from a location other than the operating cab of an engine must, when practicable, communicate to other employes involved the indication by name of each signal affecting the movement.

After the name of a signal has been communicated to other employes involved, it must continue to be observed until passed and any change of indication communicated in the required manner. (Revised 7-1-78)

*****

102. 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.

103a. When a train is stopped or delayed from any cause including "Stop Signal" (Rule 292), the conductor, engineman, or member of their crew, when authorized by the conductor or engineman must, as soon as the safety of their train will permit, ascertain the cause and, when practicable, communicate with the Train Dispatcher or operator.

*****

106. The conductor, engineman, and pilot are responsible for the safety of the train and the observance of the rules, and under conditions not provided for by the rules, must take every precaution for protection.

This does not relieve other employes of their responsibility under the rules.

*****

FIXED SIGNALS

*****

Rule 285

FIG. A

FIG. A-1

FIG. B

FIG. B-1

FIG. B-2

FIG. C

FIG. C-1

MI CAB SIGNAL TERRITORY
CAB SIGNAL WILL DISPLAY

INDICATION—Proceed prepared to stop at next signal. Train exceeding Medium speed must at once reduce to that speed.

NAME: Approach.

Rule 291

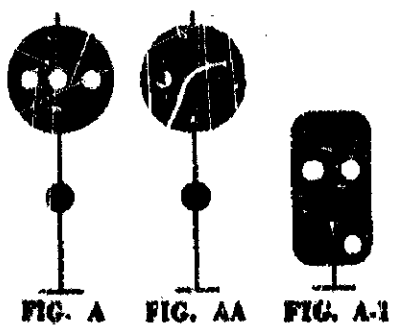


FIG. A FIG. AA FIG. A-1

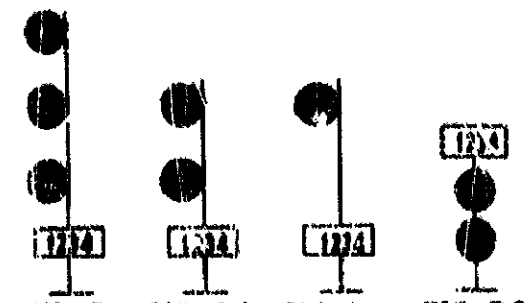


FIG. B FIG. B-1 FIG. B-2 FIG. B-3

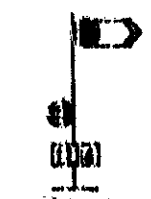


FIG. C

IN CAB SIGNAL TERRITORY
CAB SIGNAL WILL DISPLAY

AND FIXED SIGNAL INDICATION WILL GOVERN

INDICATION---Stop; then proceed at Restricted speed.

NAME: Stop and proceed.

NOTE---Where, in addition to the number plate, a letter C, grade marker, is displayed as part of these aspects, Rule 290 applies.

MISCELLANEOUS RULES

*****

Conductors

400N-1. Report to and receive their instructions from the Superintendent or other designated officer. They must obey the instructions of train master, station masters, station agents, yard masters, and operators within their jurisdiction, and from officers of other departments on matters pertaining to those departments.

Conductors have general charge of the train to which assigned and all persons employed thereon are subject to their instructions. They are responsible for the prompt movement, safety and care of their respective trains and the passengers and commodities carried, for the vigilance and conduct of the men employed thereon and for the prompt reporting to the Superintendent of conditions that interfere with the prompt and safe movement of trains.

They must know that members of crew providing protection as required by Rule 99 are familiar with their duties and that their trains are properly equipped and inspected; also that Air Brake Rules have been complied with and that the prescribed signals are displayed.

*****

Trainmen and Brakemen

400N-2. Report to and receive their instructions from the Superintendent or other designated officer. They must obey the instructions of their conductor and of officers of other departments on matters pertaining to those departments.

They are responsible for the display of train signals, the proper protection of trains, the handling of switches, the coupling and uncoupling of cars and engines, the manipulation of brakes and for assisting the conductor or engineman in all things requisite for the prompt and safe movement of their train.

*****

APPENDIX A

ENGINEMEN

400N-1. Report to and receive instructions from the Superintendent or other designated officer. They will be governed by current mechanical, electrical and air brake instructions pertaining to the safety, inspection, preparation, and operation of trains and engines. They must comply with the orders of the Road Foreman of Engines, Trainmaster or other designated officer within their jurisdiction.

They must obey the instructions of Station Masters, Station Agents, Yard Masters, and Operators within their jurisdiction; and the conductor in charge of their train as to general management of their train, unless by so doing they endanger its safety or commit a violation of the rules.

They must be qualified on type of engine to which assigned including any devices or auxiliaries attached thereto. At a point where no mechanical forces are on duty and except on through trains, they will check the prescribed form in the cab to be sure that the unit or units of the engine consist have been inspected within the previous 24 hour period for road service or within one calendar day in yard service.

If the engine unit or units are not within date they will make an inspection. After making inspection, they will then record date, time and location on the prescribed form in the cab and prepare and sign regular work report.

At points where mechanical forces are employed and on duty, they will accept the inspection of the mechanical forces, except air brake test, as to the condition of the engine.

They will at the end of the trip make written report on the prescribed forms.

They will be responsible for the observance of all signals controlling movements accordingly and the regularity of speed between stations, exercise discretion, care, and vigilance in moving the engine with or without cars to prevent injury to persons, damage to property, and lading, avoiding collisions and derailments. While acting as pilot they will operate the engine unless otherwise instructed and when in charge of the engine to which no qualified conductor is assigned or is disabled they must perform the duties of and conform to the rules relating to conductors. They will require the assistance of crew members in any duties relative to the prompt and safe movement of their trains, engine and cars, promptly reporting irregularities or failures.

They must not allow any member of the crew to operate the engine except under their personal supervision. They will be responsible for the proper operation of the engine and must not leave it while on duty except in case of necessity in which case the engine must be secured.

They must, if anything withdraws attention from constant lookout ahead, or weather conditions make observation of signals or warnings in any way doubtful, at once so regulate speed as to make train progress entirely safe.

When a train has more than one engine the rules apply alike to the engineman of each engine, but the use of the engine bell, whistle and air brake except in emergency must be limited to the leading engine.

The engineman is responsible for the vigilance and conduct of other employes on the engine. He will see that they are familiar with their duties and instruct them if necessary.

*****

APPENDIX B

APPENDIX B

Excerpts from Penn Central
"Brake and Train Air Signal Instructions"
(EC-99)

*****

ENGINEMAN'S RESPONIBILITY

*****

3-b. Brake Tests

After the above inspection has been made, the brakes must be tested from the operating station to be used, and it must be determined that the brakes on each unit of the locomotive consist respond properly to the following:

(1) Application and Release—Independent Brake Valve.

(2) Ten (10) pound Service Brake Pipe Reduction—Brake pipe leakage not to exceed three (3) pounds per minute. Pressure maintaining must be cut out during this test.

(3) Release of service application—Dynamic brake interlock.

(4) Nullify dynamic brake interlock—Automatic brake valve emergency.

(5) Brake valve cutout cock will not allow brake pipe pressure to increase—Brake valve cutout cock closed, automatic brake valve in running. (Duration one (1) minute.)

(6) Deadman application—Deadman foot valve, Alertor or other device for initiating deadman brake application.

(7) Quick release of service application—Independent brake valve.

(8) Emergency application—Emergency brake valve.

(9) To determine the brakes are applied or released on units, it must be observed that the brake shoes are either against or away from the wheels.

(10) Power Knockout should occur during tests Nos. 4, 6, 11, 12 and 13.

(11) Speed Control—See instruction 5e.

(12) Automatic Train Stop—MU Cars—See instruction 6e.

(13) Automatic Train Stop—Intermittent Inductive—See instruction 7c.

*****

TRAIN BRAKE TESTS AT OTHER THAN INITIAL TERMINAL

*****

13-a. Freight Train—Road Train Brake Tests

Before locomotive is detached on a freight train, automatic air brake must be applied in service followed with emergency 30 seconds later. At location where cut is to be made, after signal is received that brake application is completed, the angle cock on the side of cut closest to the locomotive should be closed. (With proper understanding between crew members the emergency application can be used as a signal.) Angle cock on end of cars left standing detached from locomotive must remain open. After recoupling and making certain that angle cocks are open and before proceeding it must be known that brake pipe air pressure is being properly restored as indicated by the cabin car air gauge and that brakes on the rear car are released. In the absence of a cabin car gauge, air brake test must be made as prescribed in Instruction 13.

*****