

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

RAILROAD ACCIDENT REPORT

**DERAILMENT OF AMTRAK TRAIN NO. 97
ON SEABOARD COAST LINE RAILROAD TRACK
LOCHLOOSA, FLORIDA
MAY 26, 1981**

NTSB-RAR-81-9

UNITED STATES GOVERNMENT

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16. Abstract At 12:30 p.m. on May 26, 1981, southbound Amtrak train No. 97, operating over Seaboard Coast Line Railroad track, derailed in Lochloosa, Florida. The locomotive and nine-car train derailed at a previously damaged switch leading to a siding that paralleled the main track. Nine passengers and nine Amtrak employees were injured; damage was estimated at \$241,258. The National Transportation Safety Board determines that the probable cause of this accident was the movement of train No. 97 through a damaged and improperly positioned track switch that was not properly signalled because of an inverted relay that interfered with the normal functioning of the signal circuitry. Contributing to the accident were the Seaboard Coast Line's (SCL) conflicting Signal and Operating Department instructions and policies influencing the signal maintainer, the SCL's lack of specific written instructions to prevent the practice of inverting a signal relay to avoid train delay during signal maintenance, and the SCL's lack of adequate quality control or supervision to ensure compliance with existing Federal safety regulations applicable to the railroad signal system.					
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Adopted: September 29, 1981

DERAILMENT OF AMTRAK TRAIN NO. 97 ON
SEABOARD COAST LINE RAILROAD TRACK
LOCHLOOSA, FLORIDA
MAY 26, 1981

SYNOPSIS

At 12:30 p.m. on May 26, 1981, southbound Amtrak train No. 97, operating over Seaboard Coast Line Railroad track, derailed in Lochloosa, Florida. The locomotive and nine-car train derailed at a previously damaged switch leading to a siding that paralleled the main track. Nine passengers and nine Amtrak employees were injured; damage was estimated at \$241,258.

The National Transportation Safety Board determines that the probable cause of this accident was the movement of train No. 97 through a damaged and improperly positioned track switch that was not properly signalled because of an inverted relay that interfered with the normal functioning of the signal circuitry. Contributing to the accident were the Seaboard Coast Line's (SCL) conflicting Signal and Operating Department instructions and policies influencing the signal maintainer, the SCL's lack of specific written instructions to prevent the practice of inverting a signal relay to avoid train delay during signal maintenance, and the SCL's lack of adequate quality control or supervision to ensure compliance with existing Federal safety regulations applicable to the railroad signal system.

INVESTIGATION

The Accident

At 10:50 a.m., e.d.t., ^{1/} on May 26, 1981, southbound Amtrak train No. 97, consisting of one locomotive unit and nine cars, departed Jacksonville, Florida, on the tracks of the Seaboard Coast Line Railroad (SCL) en route to Miami, Florida. A crew change and satisfactory air brake test were made in Jacksonville.

As train No. 97 approached Lochloosa, Florida, it was being operated on authority of a "proceed" signal indication and was in compliance with a 75-mph speed restriction for a curve in the area. As the train moved out of the curve, the enginecrew observed a "clear" aspect being displayed by home signal No. 7113 at the north switch for the siding at Lochloosa about one-half mile ahead. They acknowledged the signal as required by the rules, and the engineer advanced the locomotive's throttle to maximum power.

1/ All times herein are Eastern daylight time.

As the train accelerated, the home signal for the north switch of the Lochloosa siding continued to display a "clear" aspect. When the train was about 250 feet from the right-hand facing point switch, the engineer observed that the west switch point was not properly closed against the rail as needed for the main track route indicated by the signal aspect. He immediately instructed the fireman to brace himself and initiated an emergency application of the train's air brakes with the automatic brake valve. The train was moving at a recorded 76 mph. (See appendix C.) When the locomotive passed through the improperly aligned switch, it derailed to the right between two tracks and remained upright. The cars in the train followed the locomotive and derailed, but they also remained upright, coupled, and approximately in line with the track structure. There was no fire. (See figure 1.)

The flagman derailed and used the wayside telephone to notify the train dispatcher of the derailment. He requested emergency equipment to handle possible injuries. The train dispatcher called the operator at Hawthorne, Florida; the operator notified the Alachua County Emergency Response Center. About 30 minutes later, several ambulances and rescue squad personnel arrived at the derailment site.

Upon learning of the circumstances of the derailment, the SCL Signal and Communications Supervisor of the Jacksonville Division immediately issued instructions to seal all signal cases and the relay house associated with the signal system at the north end of the Lochloosa siding. About 1 p.m., the seals were applied by an Assistant Signal Supervisor. About 2:30 p.m. on the same day, the Division Signal Supervisor, accompanied by the Division Superintendent, the Assistant Signal Supervisor, the signal maintainer for the territory, and a representative of SCL's Police and Special Services Department, broke the seals that were applied earlier and unlocked the relay house. When they entered the house, the normal switch repeater relay (NWPR) was found in an inverted position. With the NWPR relay in this position, the signal system reacts as to a normal switch position, i.e., lined for main track movement, regardless of actual switch position. There was no evidence to suggest that the relay house had been entered previously by unauthorized persons using tools to force entry. Other than the NWPR relay, all other signal equipment in the relay house was properly in place and operating normally.

Events Preceding the Accident

On May 15, 1981, the signal maintainer whose territory included the Lochloosa siding was advised by a train dispatcher that the switch-position indicating light for the north-end switch of the Lochloosa siding was illuminated properly on the traffic control console in the dispatcher's office but was reacting abnormally upon the passage of a train. The maintainer determined upon inspection that a worn circuit controller mechanism at the switch was malfunctioning. He immediately arranged to obtain a replacement circuit controller, which was received during the following week.

On May 20, shortly after 1 p.m., the signal maintainer arrived at the north switch of the Lochloosa siding to replace the circuit controller. He contacted the train dispatcher by telephone, advised the dispatcher of his presence at the siding and his intention to work on the switch circuit controller, and asked when trains were expected to pass his location. The train dispatcher informed him that a southbound freight train was due by Lochloosa at 1:30 p.m., and that northbound Amtrak train No. 98 was running late and would be at Lochloosa shortly after 3 p.m.

After the southbound freight train passed Lochloosa, the signal maintainer began to replace the circuit controller. He stated that during the preparation he inverted the NWPR relay. About 3 p.m., he informed the dispatcher that he had finished exchanging and adjusting the circuit controller. The maintainer asked the dispatcher to check on the

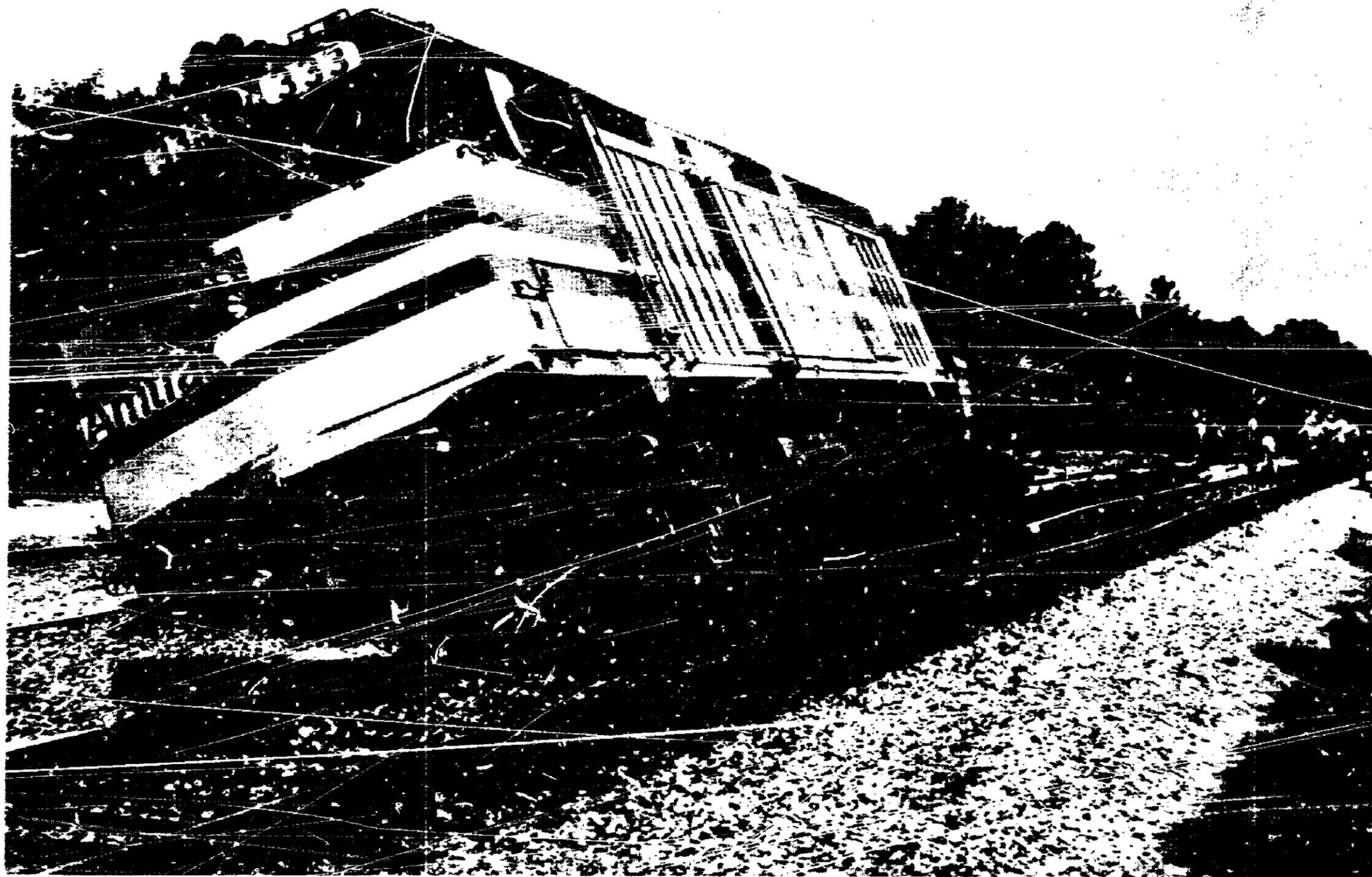


Figure 1.—Derailed locomotive and cars of train No. 97.

location of train No. 98 because he wanted the dispatcher to test the remote operation of the switch and new circuit controller. The maintainer stated that the dispatcher discussed with him the possible delay to train No. 98 if the test was made. The maintainer asked the dispatcher to operate the switch anyway. The maintainer said he told the dispatcher, "if you don't have a signal lined up, I'll catch time for it." 2/ The maintainer stated that after observing the activation of the switch to both the normal and reverse positions by the dispatcher, 3/ he returned to the relay house and placed the NWPR relay in its proper operating position and waited for the arrival of train No. 98. He said that, as train No. 98 passed, he "sat on the step outside and watched the NWPR relay the whole time [the train] went over the switch; it [the relay contacts] never went down." 4/ After completing his work on May 20, the signal maintainer did not return to the north end of the Lochloosa siding until about one-half hour after the derailment on May 26.

An examination of the train graph produced by the traffic control equipment in the train dispatcher's office in Jacksonville indicated that the Lochloosa siding had not been used for train traffic between May 19 and early on May 26, 1981. About 4:10 a.m. on May 26, in a planned passing maneuver, northbound freight train No. 174 entered the siding via the south switch and exited via the north switch after southbound freight train No. 173 had passed on the main track. When questioned afterward, the train dispatcher could not recall the exact procedure he used to "normal" the north switch and clear the signal following this move. 5/ Reportedly, the wayside and the dispatcher's console signal indications and indicator lights were observed to be correct for the passing maneuver. At 6:10 a.m., a second northbound train, No. 178, passed Lochloosa siding while operating on the main track. The locomotive crewmembers of train No. 178 indicated that they received "clear" signal aspects throughout the Lochloosa area and did not observe the switch point position at the north end of the siding. The next train movement indications on the train graph were made by train No. 97. The graph showed that southbound train No. 97 arrived at the north end of the Lochloosa siding about 12:30 p.m.--the time of the derailment.

Injuries to Persons

<u>Injuries</u>	<u>Passengers</u>	<u>SCL Traincrew</u>	<u>Amtrak Employees</u>		<u>Total</u>
			<u>On-Duty</u>	<u>Off-Duty</u>	
Fatal	0	0	0	0	0
Nonfatal	9	0	6	3	18
None	118	5	9	0	132
Total	127	5	15	3	150

2/ Refers to disciplinary action against the maintainer for delaying a train.

3/ Normal switch position is lined for straight movement. Reverse switch position is lined for another track.

4/ At a later demonstration of how he observed the relay, the signal maintainer found it necessary to stand with his head in the doorway of the relay house to make the observation.

5/ The traffic control console can be set by the dispatcher to send single codes for switch and signal operation or a composite code to cause first the switch to operate and then the signal to operate.

Damage

The entire consist of train No. 97 derailed except for the wheels on the trailing truck of the last car, but the train remained upright. (See figure 2.) The locomotive sustained damage to the trucks, fuel tank, and snowplow pilot. The locomotive's trailing truck became disengaged from the car body during the derailment. Damage incurred by the cars was limited to trucks and equipment under the car bodies, except for the fourth and fifth cars which sustained cornerpost damage when they began to jackknife before stopping.

There was extensive damage to the trackage of the siding and the stub-end track that paralleled the siding on the west.

Inspection of the switch at the north end of the Lochloosa siding disclosed that the operating rod was bent in a northerly direction and that the operating bar of the power switch machine was fractured and lying on the ballast near its original point of attachment. (See figure 3.) The east switch point indicated evidence of wheel contact due to being run through, and wheel abrasions were observed on the north end of the heel block of the east switch point. Damage was estimated as follows:

Locomotive	\$ 40,000
Equipment	152,000
Track	33,335
Signal	5,000
Clearing	10,923
Total	\$241,258

Employee Information

The crewmembers of train No. 97 reported for duty at 10:20 a.m. at Jacksonville. The engineer and fireman were to operate to Wildwood, Florida; the traincrew was assigned to work through to Miami, Florida. Each crewmember was qualified for his position under SCL standards. (See appendix B.)

The signal maintainer was employed by the SCL in October 1969 as a signal helper and assistant signalman. He had worked almost continuously in the territory that included the Lochloosa siding since his promotion to signalman on November 30, 1970. He learned his duties as a signal maintainer through on-the-job training; no classroom training was provided at the time. He said that, during his on-the-job training, he had seen senior signal maintainers and their immediate supervisors invert relays.

The signal maintainer's headquarters was located in Waldo, Florida, at milepost (MP) 690. He was assigned a territory which extended from the south end of Hampton, MP 685.6, to the north end of Sparr, MP 718.5. This territory involved 36 miles of a traffic control signalized system and associated signal apparatus. The apparatus included an automatic interlocking at a railroad crossing, hot box and dragging equipment detectors, and highway warning systems. On May 20, 1981, the maintainer was in compliance with 49 CFR 228.19 regarding hours-of-service.

The signal maintainer had attended an operating rules examination class on April 22, 1980, and acknowledged receipt of SCL's Signal Instruction Letters No. 5 and 6 prior to May 20, 1981. Signal Instruction Letter No. 5 (see appendix D) listed several Federal

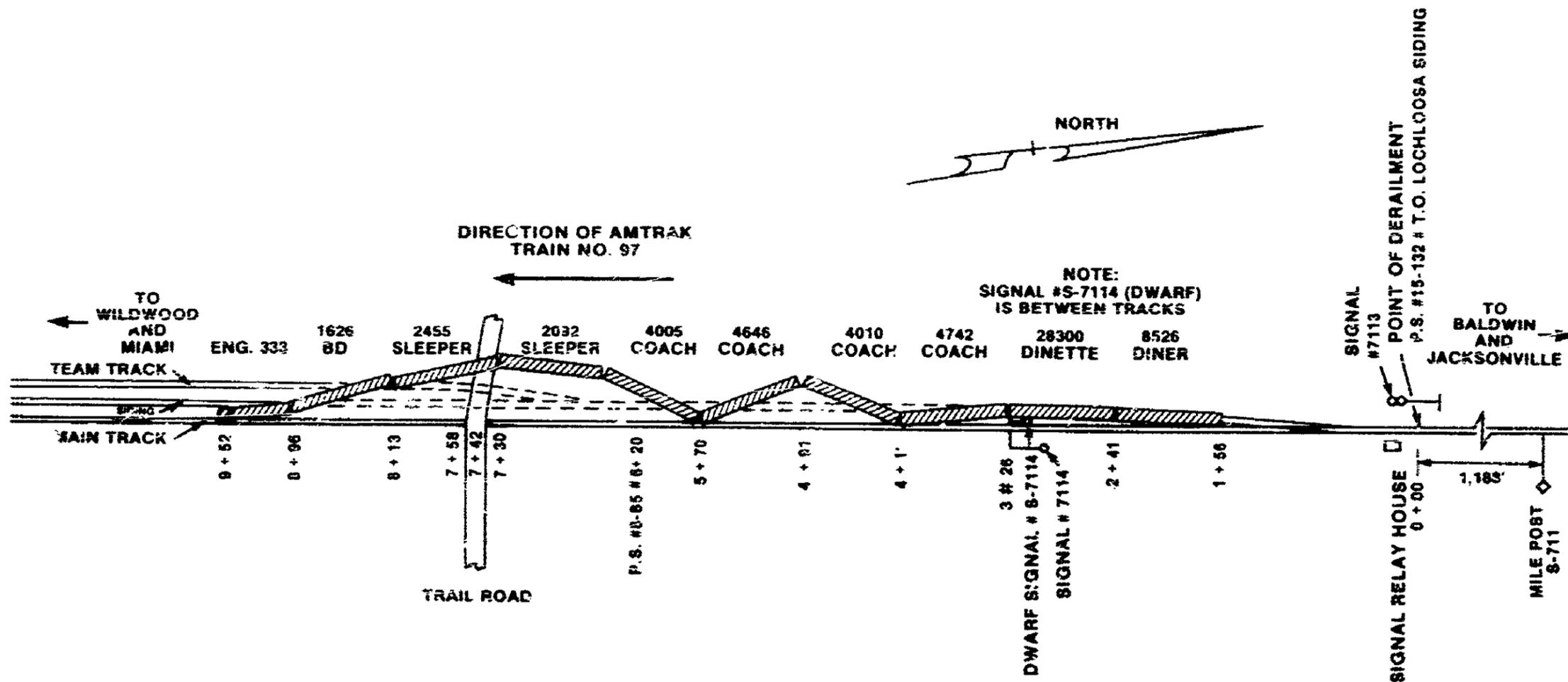


Figure 2.--Plan view of accident site.

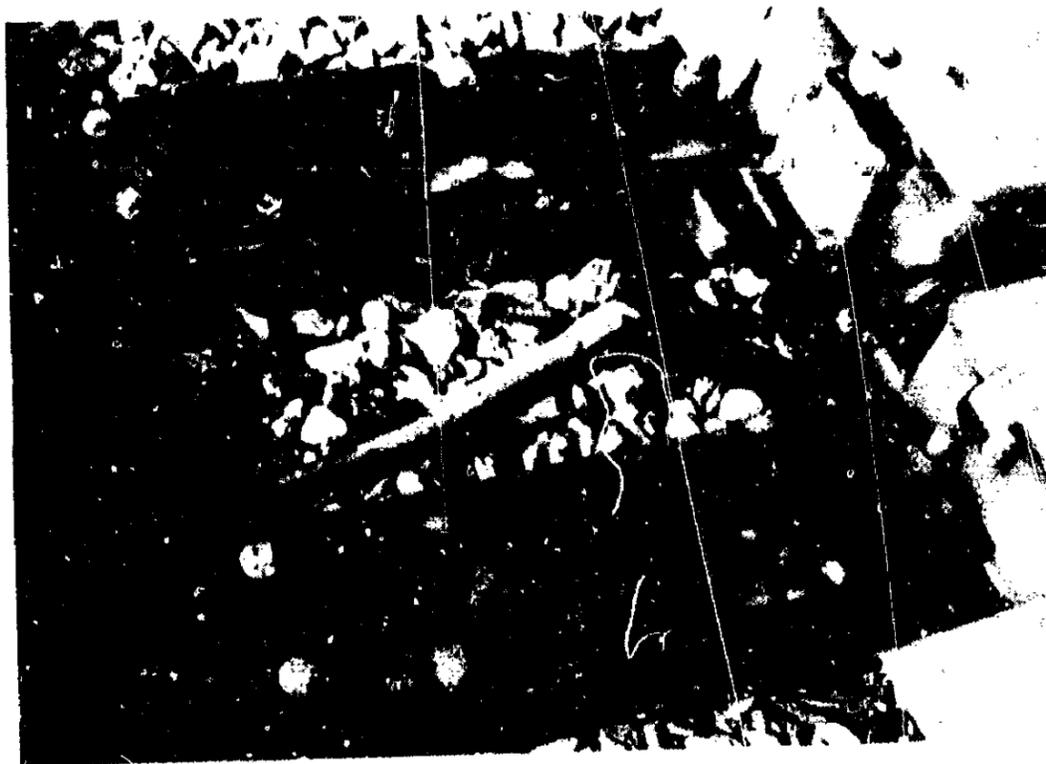


Figure 3.—Switch machine and bent operating rod.

Railroad Administration (FRA) Rules, Standards and Instructions for Railroad Signal Systems including the following:

[49 CFR] 236.4 Interference with normal functioning of device.

The normal functioning of any device shall not be interfered with in testing or otherwise without first taking measures for insuring safety of train operation which depends on normal functioning of such device.

Signal Instruction Letter No. 6 (see appendix E) stated:

Operating Rule 1181 states, [Signal maintainers] shall be responsible for the proper maintenance and operation of all equipment in their charge and shall do no work thereon that will delay or interfere with the safe passage of trains. Their work must be programmed so that it does not cause delay to trains. They shall conform to prescribed standards and plans in the execution of work in their charge. They shall not make or permit any changes without authority.

Train Information

The train consisted of, from front to rear, a General Motors Corporation Electro-Motive Division (EMD) Model F-40 PH diesel-electric locomotive unit, a baggage car, two sleeping cars, four coaches, a dinette car, and a dining car. The locomotive was equipped with a 26L air brake system, a speed indicator, and a speed recorder.

Track Information

The single main track in the vicinity of the accident site consisted of 132-pound R E continuous welded rail (CWR) on 8-inch by 14-inch, double-shouldered tie plates

supported by mixed hardwood crossties and granite ballast. A siding paralleled the main track on the west for 10,908 feet between the north and south end switches at Lochloosa. A stub end team track was parallel to the siding on the west and extended southward 500 feet from the point-of-switch, which was 620 feet south of the switch at the north end of the Lochloosa siding. All the tracks were tangent and level throughout the derailment area. The main track was maintained to FRA Class 4 standards or better.

The No. 15 right-hand turnout at the north end of Lochloosa leading from the main track to the siding used two 26-foot-long switch points and a railbound manganese frog. The switch was operated by a direct-current, electric switch machine. A connecting rod between the switch points and circuit controller was arranged so switch point position was determined by an electrical circuit which was part of the signal system.

Method of Operation

Train movements were governed by signal indications of a traffic control system operated by a train dispatcher in Jacksonville. The train dispatcher, through use of a control console, could control the switches and interlocking home signals. Maximum train speed for passenger trains was 79 mph. The single main track in the vicinity of the derailment was provided with a siding used for passing or meeting trains. Trains departed the siding upon receipt of a proceed signal.

The traffic control and automatic block signal system used continuously lighted signals of the color-light type. The southbound home signal for the switch at the north end of the Lochloosa siding was mounted on a mast west of the track. The mast was equipped with two signal heads, each having three lights vertically arranged to display signal aspects in accordance with the SCL Operating Rules.

The traffic control system used an electronic sending and receiving code unit and a pole line to transmit the code from Jacksonville to the field locations. By use of this system, power switch positions and controlled signal indications controlling train movements, with the exception of conditions of track occupancy, are operated by the train dispatcher. Each power switch and home signal had a relay house for the protection and maintenance of the electrical relays associated with the system. According to some signal maintainers, other SCL personnel may have keys that allow them unauthorized access to signal relay houses and to signal equipment.

The NWPR relay used at Lochloosa relies on gravity to hold the relay in its deenergized position. If the relay is inverted manually, the contacts will complete circuits that normally would be open when the relay's operating coil is not energized with electrical current. A circuit controller that is designed and adjusted to indicate the position of the track switch by supplying a circuit to appropriate relays for indicating and controlling the switch and signal can be made ineffective by inverting the NWPR relay. Because of the circuit design, inverting the NWPR relay would have caused the signal to indicate "proceed" regardless of the switch position. The same relay was used to provide a normal switch position indication on the dispatcher's traffic control console.

In more recently designed signal circuits, an inverted relay would not have allowed the home signal to display a clear aspect because circuit cross-checks would have been performed differently and a circuit anomaly would have been detected. As a result of the inverted relay found at the north end of the Lochloosa siding, the SCL's signal department management immediately took steps to prevent a recurrence of this action. On June 1, 1981, a written instruction prohibiting the inverting of relays was sent to appropriate signal department personnel. (See appendix F.)

After formation of the National Railroad Passenger Corporation (Amtrak) and the beginning of its operation on contract railroads, Amtrak found that its trains were being delayed at times to allow passage of freight trains. To eliminate this problem, Amtrak management installed an on-time monetary incentive program with its contractor railroads, which has succeeded in expediting Amtrak train movements.

The contract concerning on-time operation incentive between Amtrak and the SCL for train No. 97 at the time of the derailment was about \$5,000 per day for each trip of on-time performance after an 80-percent threshold per month had been reached, i.e., SCL would realize about \$32,000 for 30 days of on-time operation during a month for this one train. The SCL train dispatcher, chief train dispatcher, and chief of the Signal and Communications Department each alluded to the SCL's effort to run Amtrak trains on time.

Meteorological Information

At the time of the accident, the temperature was 82° F with a cloudy sky. It was daylight and there was no atmospheric condition to restrict visibility.

Medical and Pathological Information

Most of the injuries during the derailment resulted from persons falling or being ejected from their seats. One passenger and a food service attendant were admitted to a local hospital for observation. Another food service attendant suffered a fractured finger. The other injuries were sprains, contusions, and abrasions.

Survival Aspects

At 12:32 p.m. following the accident, a telephone notification was received by the Emergency Medical Service (EMS) for Alachua County, which is headquartered in Gainesville, Florida. The EMS is responsible for monitoring incoming telephone calls on the dial emergency number 911. Within 1 minute of notification, a firetruck and an ambulance manned by a paramedic team were dispatched from Gainesville, about 25 miles from the accident site; they arrived onscene at 12:41 p.m. At 12:35 p.m. an ambulance and firetruck were dispatched from a station at Hawthorne, Florida, approximately 8 miles from the accident site; they arrived onscene at 1:03 p.m. The EMS Director and Assistant Civil Defense Director for Alachua County arrived shortly afterward and set up a command post at the Civil Defense vehicle. The injured were triaged by paramedics and those requiring hospital examination and/or treatment were transported to local hospitals in the Gainesville area.

The EMS Director indicated that he believed that the time consumed in getting the injured to the triage point may have been too long and could have been better organized by Amtrak or railroad employees. However, the triage point was not readily identified in a manner recognized by railroad employees.

Other Information

The Safety Board's investigation revealed that on March 18, 1981, two SCL signal maintainers working on a switch machine at MP 847 did not follow SCL Signal Instruction Letter No. 6, by not putting signals at stop, and Amtrak train No. 87 made a high-speed trailing move through a switch on a false "clear" signal aspect. (See appendix G.) The FRA has informed the Safety Board that it is examining the circumstances concerning this incident and the accident on May 26, 1981.

ANALYSIS

The absence of train movement through the Lochloosa siding between May 19 and May 26, the day of the accident, allowed the condition created by the inverted relay to remain undetected since the switch was always in its normal main track position. The passing of the two opposing trains at Lochloosa siding on May 26 did not reveal the improper condition because the train in the siding left through the north switch and the switch machine was able to move the switch points to the reverse position. Reportedly, the wayside and the dispatcher's console signal indications and indicator lights were observed to be correct for the passing maneuver. Therefore, there was no reason for the traincrews or the train dispatcher to suspect that a problem existed in the signal system and that the switch had not functioned properly by not returning to its normal main track position after the train left the siding. If the train dispatcher, during the passing of the opposing trains, coded a single command to move the switch to its normal position after the train left the siding, and waited for a normal switch indication to be received on his console, and then coded a signal command, the switch would have gone to the normal position. However, if he positioned the switch lever and the signal lever at the same time to obtain the desired routing, and sent a composite command code to the signal equipment at the north end of the Lochloosa siding, power would have been applied only momentarily to the switch machine motor due to the inverted NWPR relay. This action would have left the switch either lined for the siding or only partially moved toward a full normal position. Because of the inverted relay, a clear signal aspect for both northbound and southbound trains was possible.

The second northbound train, No. 178, to pass the north switch in a trailing position at Lochloosa on May 26 received a clear signal aspect even though the switch was not lined for the main track over which it was operating. The damage to the switch components indicates that the switch had been run through while it was set against the train movement. The wheel marks on the back of the east switch point and the absence of similar marks on the west point indicate that train No. 178 ran through the switch.

Engineers usually look at the position of switch points before passing over a switch. If the crewmembers on the locomotive of train No. 178 had noted the reversed position of the switch and reported it to the dispatcher, the derailment of train No. 97 might have been prevented. However, the primary causal factor was the inversion of the NWPR relay. With the NWPR relay inverted, it was possible for the switch points, even if not damaged, to have been left gapped open and a clear signal displayed.

SCL Signal Instruction Letter No. 6 explicitly detailed the procedures to be used by the signal maintainer for an equipment change such as the circuit controller exchange at Lochloosa. The written instruction clearly indicated that when signal circuits or apparatus were being changed, signals were to be set to "stop" train movements until the work was completed. On the other hand, the wording of SCL Operating Department Rule 1181 quoted in Signal Instruction Letter No. 6 and the discussion between the train dispatcher and the maintainer indicated that trains were not to be delayed. Since the inverting of a relay was frequently observed by the maintainer during his on-the-job training, and accepted as a practice by supervisors of the Signal Department, the "no train delay" admonition of the Operating Department apparently prevailed within the Signal Department as well. As a result, the signal maintainer was faced with a dilemma--either follow the unwritten but accepted practice of inverting the relay to avoid train delay, or follow the written instructions of a departmental officer to place signals at stop. The circumstances suggest that the threat of possible disciplinary action if trains were delayed as a result of his maintenance work may have been the major factor in his decision to invert the relay. He knew that if he followed the written instruction to set the signal to "stop," train No. 98 would be delayed. The signal maintainer stated that

fearing a delay to a passenger train could lead to a suspension and/or a reprimand, he chose to invert the relay. This action may have been contrary to 49 CFR 236.4 since the investigation did not disclose any actions taken by the maintainer to first ensure the safety of train operations which depended on the normal functioning of the relay.

There was no evidence found to indicate that the accident resulted from an act of vandalism. Additionally, if a person other than the signal maintainer had entered the signal relay house to sabotage the equipment, more than one vital relay probably would have been inverted or disturbed. The signal maintainer stated that he returned the inverted NWPR relay to its normal position after completing the circuit controller exchange on May 20, 1981. Then, as train No. 97 passed over the north switch of the Lochloosa siding, he watched the relay operate while he sat on the step outside the relay house. At a later demonstration as to how he observed the pertinent relay, he found it necessary to stand with his head in the doorway of the relay house to make the observation. The signal maintainer's statement regarding the relay observation and the lack of evidence of vandalism or sabotage leads the Safety Board to conclude that the signal maintainer was the only person to have handled the NWPR relay between May 20 and May 26 and that he forgot to return the NWPR relay to its proper operating position on May 20, 1981.

The previous Amtrak incident on March 18, 1981, and the circumstances disclosed in this accident investigation indicate that the practice of allowing trains to continue operation while work is being performed on the signal system, regardless of written instructions to set signals at "stop," apparently occurs because of the SCL's lack of specific written instructions to prevent the practice of inverting the relay. Because of the significant monetary incentive for on-time Amtrak train operation, the practice may be particularly pronounced when Amtrak trains are involved.

The FRA has the responsibility to enforce Federal regulations governing railway signal systems for interstate rail carriers. However, because of the number of miles of signalized track and the limited number of Federal signal inspectors, effective Federal surveillance of the systems on a continuing basis has not been practicable. Consequently, the quality control of maintenance methods and standards has been left largely to the judgment of individual signal maintainers with occasional oversight by their supervisors. Most signal maintainers spend their workdays alone and unobserved; many of their work decisions are discretionary.

At the SCL, those discretionary judgments on occasion are undoubtedly compromised by the pressures brought about by the rule and practice not to delay trains, particularly Amtrak trains. Safety and the effective use of safety measures may be diminished as a result of this practice. This practice suggests that the SCL Operating and Signal Departments have conflicting or incompatible rules and instructions pertaining to train delays. The ability to invert the NWPR relays and the tacit condoning of this practice demonstrated that the SCL did not have either effective procedures to ensure that signal maintainers comply with signal instructions or a signal system in the Lochloosa area that functioned in a manner to detect an improper switch position and noncorresponding signal indication as possible in newer circuit designs. The SCL's written instructions of June 1, 1981, prohibiting the inverting of relays hopefully will eliminate this practice.

CONCLUSIONS

Findings

1. During maintenance on the north switch of the Lochloosa siding on May 20, 1981, the signal maintainer inverted the NWPR relay to avoid delaying Amtrak

train No. 97 and forgot to replace the relay in the correct position when he had finished his maintenance work.

2. The train dispatcher apparently used a composite code to align the switch and condition the signal at the north end of the Lochloosa siding after train No. 174 left the siding on May 26, 1981. This and the inverted relay prevented the switch from returning to its normal position.
3. On May 26, 1981, northbound train No. 178 damaged the switch when the train trailed through the north switch of the Lochloosa siding while it was aligned for the siding and while the train was operating on a false "clear" signal aspect.
4. On May 26, 1981, southbound Amtrak train No. 97 derailed at the damaged north switch of the Lochloosa siding while operating on a false "clear" signal aspect.
5. The signal system at Lochloosa did not have crosscheck circuitry to detect the position of the NWPR relay, which would have disclosed the signal and switch position anomaly.
6. The inverting of the NWPR relay without first taking other measures to ensure the safety of train operations was contrary to Federal safety regulations (49 CFR 236.4).
7. The inverting of relays apparently occurs because of the absence of specific written instructions to prevent the practice and to ensure Federal safety signal regulation and carrier rule compliance.
8. The signal maintainer's perception of proper job performance in this case was dominated by avoiding train delay rather than by complying with signal instruction letters Nos. 5 and 6.

Probable Cause

The National Transportation Safety Board determines that the probable cause of this accident was the movement of train No. 97 through a damaged and improperly positioned track switch that was not properly signalled because of an inverted relay that interfered with the normal functioning of the signal circuitry. Contributing to the accident were the Seaboard Coast Line's (SCL) conflicting Signal and Operating Department instructions and policies influencing the signal maintainer, the SCL's lack of specific written instructions to prevent the practice of inverting a signal relay to avoid train delay during signal maintenance, and the SCL's lack of adequate quality control or supervision to ensure compliance with existing Federal safety regulations applicable to the railroad signal system.

RECOMMENDATIONS

As a result of its investigation of this accident, the National Transportation Safety Board made the following recommendations:

—to the Seaboard Coast Line Railroad Company:

Establish procedures for signal maintainers that promote compliance with Federal railway signal regulations. (Class II, Priority Action) (R-81-99)

Establish a test procedure which confirms that a signal system is completely operative after equipment or circuitry has been changed. (Class II, Priority Action) (R-81-100)

Review and resolve operating department policies and written instructions to signal maintainers that may be in conflict and result in unsafe acts to avoid train delays. (Class II, Priority Action) (R-81-101)

--to the Association of American Railroads:

Inform its membership of the circumstances of this accident, and recommend that member railroads check their signal systems and pertinent maintenance procedures and take necessary action to prevent similar occurrences. (Class II, Priority Action) (R-81-102)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JAMES B. KING
Chairman

/s/ ELWOOD T. DRIVER
Vice Chairman

/s/ G. H. PATRICK BURSLEY
Member

FRANCIS H. McADAMS and PATRICIA A. GOLDMAN, Members, did not participate.

September 29, 1981

APPENDIXES

APPENDIX A

INVESTIGATION

The National Transportation Safety Board was notified of the accident about 1:05 p.m., e.d.t., on May 26, 1981. The Safety Board immediately dispatched an investigator from its Atlanta Field Office to the scene at Lochloosa, Florida. Subsequently, the investigator was joined by a signal system specialist from the Railroad Accident Division in Washington, D.C. The Brotherhood of Locomotive Engineers, Brotherhood of Railroad Signalmen, Seaboard Coast Line Railroad, and Federal Railroad Administration cooperated in the investigation.

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APPENDIX B

PERSONNEL INFORMATION

Conductor

Ernest C. Carter, 58, was employed as a brakeman by the Atlantic Coast Line Railroad on November 10, 1946. He passed a company physical examination on April 22, 1981, and he was last examined on the SCL operating rules on May 20, 1981. He had been a promoted conductor since May 25, 1958.

Baggage Master

Joseph Lee Boone, 38, was employed by the Atlantic Coast Line Railroad as a brakeman on December 20, 1963. His last company physical examination was April 19, 1965, upon returning to work from an illness. He was last examined on SCL operating rules on May 20, 1981.

Flagman

Melvin Lee Smith, 57, was employed by the Atlantic Coast Line Railroad as a trainman on February 24, 1948, and passed an SCL physical examination on September 30, 1980. He was last examined on SCL operating rules on May 25, 1980.

Engineer

George P. Wadsworth, 58, was employed as a yard fireman on July 1, 1942, by the Atlantic Coast Line Railroad. He was promoted to engineer on September 14, 1950. His last company physical examination was on November 18, 1980, and his last SCL operating rules examination was on March 6, 1981. He was required to wear corrective lenses, which he was wearing at the time of the derailment.

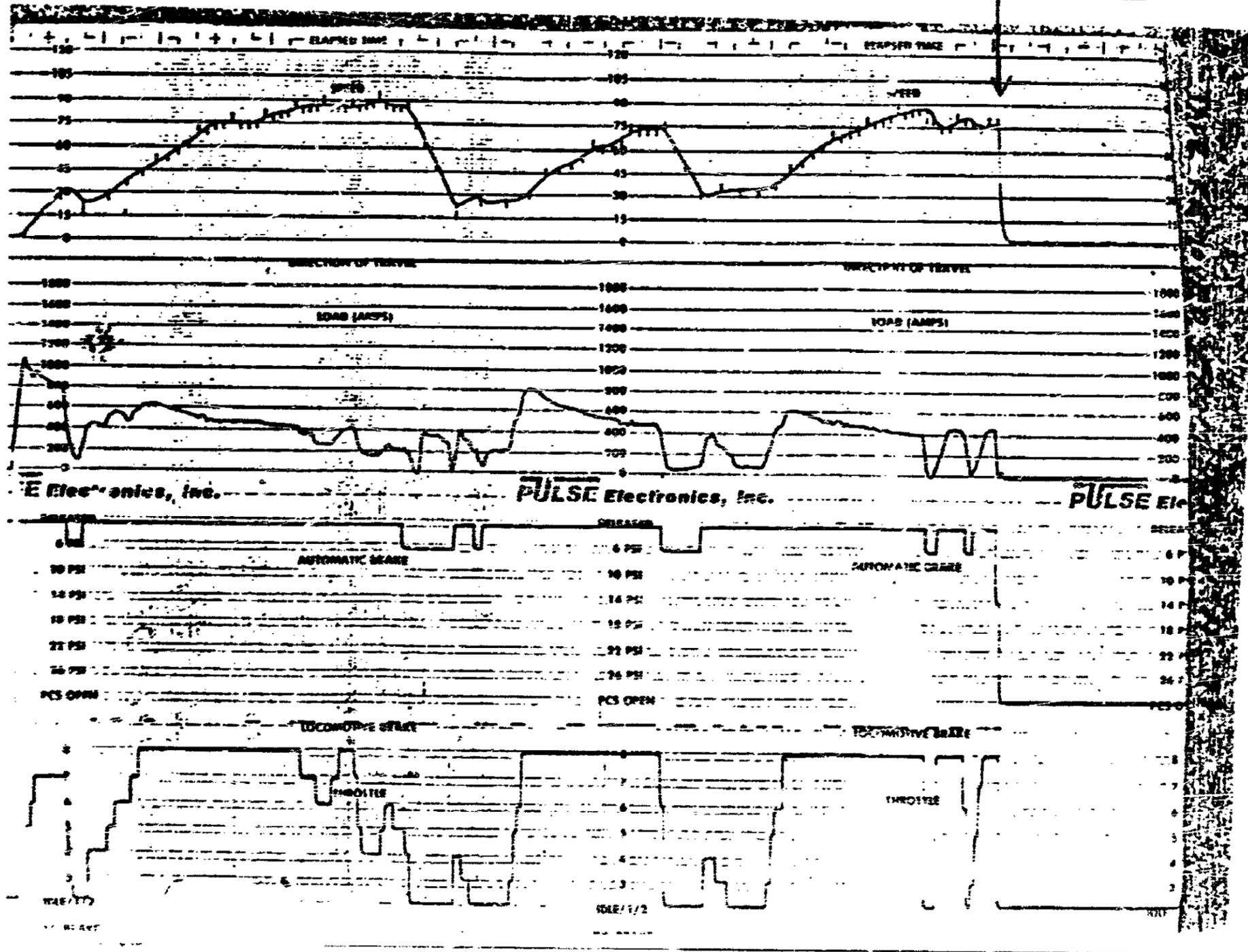
Fireman

Robert Ronald Chambers, 28, was employed as a fireman by the SCL on November 18, 1972. His last company physical examination was on November 13, 1972, and his last SCL operating rules examination was on November 13, 1980.

Signal Maintainer

Michael P. Williams, 29, was employed by the SCL on October 6, 1969, as an assistant signalman in Jacksonville, Florida. His last company operating rules exam was on April 22, 1980. As a signal department employee, he was not required to take a periodic physical examination.

POINT OF DERAILMENT



EVENT RECORDER TAPE FROM TRAIN NO. 87

APPENDIX C

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APPENDIX D

SEABOARD COAST LINE RAILROAD COMPANY
SIGNAL INSTRUCTION LETTER NO. 5

SEABOARD COAST LINE RAILROAD COMPANY

SIGNAL INSTRUCTION LETTER

NO. 5

Issued: November 24, 1970
Jacksonville, Florida
192

SUBJECT: Department of Transportation, Federal Railroad Administration,
Bureau of Railroad Safety, Rules, Standards, and Instructions
for Railroad Signal Systems.

ALL CONCERNED:

The attached Rules, Standards, and Instructions for Installation, Inspection, Maintenance, and Repair of Automatic Block Signal Systems, Interlocking, Traffic Control Systems, Automatic Train Stop, Train Control and Cab Signal Systems, and other Similar Appliances, Methods, and Systems, published November, 1969, by the Department of Transportation, Federal Railroad Administration, covering the Federal Regulations relating to railroad signal systems are hereby made a part of Signal Instruction Letter No. 5. They have the status of Federal Law and apply to all railroads in the United States.

These Rules, Standards, and Instructions must be studied, understood, and complied with by all Signal employees. They are of equal importance with the Operating Rules and Safety Rules.

Be governed accordingly.

J. R. DePriest
Superintendent Communications and Signals

* * *

§ 236.4 Interference with normal functioning of device.

The normal functioning of any device shall not be interfered with in testing or otherwise without first taking measures for insuring safety of train operation which depends on normal functioning of such device.

APPENDIX E

SEABOARD COAST LINE RAILROAD COMPANY
SIGNAL INSTRUCTION LETTER NO. 6

SEABOARD COAST LINE RAILROAD COMPANY

SIGNAL INSTRUCTION LETTER

NO. 6

Issued: February 1, 1971
Jacksonville, Florida

190

SUBJECT: Signal Tests.

ALL CONCERNED:

Operating Rule 1181 states, "They shall be responsible for the proper maintenance and operation of all equipment in their charge and shall do no work thereon that will delay or interfere with the safe passage of trains. Their work must be programmed so that it does not cause delay to trains. They shall conform to prescribed standards and plans in the execution of work in their charge. They shall not make or permit any changes without authority." Department of Transportation, Federal Railway Administration Rule 230.4, states, "The normal functioning of any device shall not be interfered with in testing or otherwise without first taking measures for insuring safety of train operation which depends on normal functioning of such device." (See Signal Instruction Letter No. 5).

The following instructions are intended to make clear to all Communications and Signals Department employees what must be done immediately following a replacement of a device or a change of a circuit in our signaling systems so as to comply with the above rules.

A. General Instructions.

1. Obtain permission from the Dispatcher to temporarily cause signals protecting the location involved to display "Stop."
2. Take action to assure that protecting signals remain at "Stop" until changes are completed.
3. Do not display signal indication except "Stop" to any train until checks outlined below are made to your satisfaction.

B. Circuit Changes.

1. All circuit changes must be made from authorized marked plans or under the direct supervision of a Supervisory Officer.
2. A physical breakdown check must be made of the wiring in the circuit(s) involved to see that the wiring is in accord with the circuit plans.

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3. A final operating check must be made to determine that the apparatus or system operates as intended, and meets the requirements of Signal Instruction Letter No. 5 for the type system or apparatus involved.

In addition, when signals are involved, all aspects must be checked to determine that they are in accordance with the plans and operate as intended.

4. Where highway crossing signals are involved, operating checks must be made to determine that the signals operate properly on approach and passage of trains. Lights, bell and gates must function as intended.

C. Apparatus Replacement.

1. Plug Coupled Apparatus:

Determine that the device functions properly. For example, for a neutral relay, see that it picks up and drops out properly; for a polar relay, see that the neutral AND polar contacts function properly in all positions; for a rectifier, see that it charges properly; for a code unit, see that it responds to coding properly; etc.

2. Non-Plug Coupled Apparatus:

Make all checks prescribed in C-1 above and, in addition, determine that all circuits wired through the device being changed are functioning properly according to the plans and as intended and that all nomenclature tagging on the devices is in accordance with plans.

Be governed accordingly.

J. R. DePriest

Superintendent Communications and Signals

APPENDIX F

SEABOARD COAST LINE RAILROAD COMPANY
SIGNAL INSTRUCTION LETTER NO. 11

Seaboard Coast Line Railroad Company
Signal Instruction Letter
No. 11

Issued June 1, 1981
Jacksonville, Florida

Subject: Interference with normal functioning
of an signal device.

Maintenance and repair work, which may interfere with safe movement of trains must not be started until train movements have been fully protected. Relays must not be tilted or turned over to close contacts. Contacts of relays or other controlling devices shall not be bridged without first taking proper measures to insure safe operation of trains. Under no circumstances will bumpers be left without authority of Supervisor C&S.

R. D. Liggett
Chief Communications and Signals Officer

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U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL RAILROAD ADMINISTRATION

SIGNAL AND TRAIN CONTROL INSPECTION REPORT

PAGE 1 OF 1

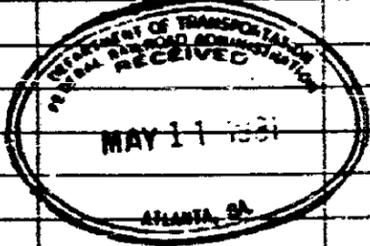
1 INSPECTOR: *Shady V. Holtman* 2 RPT NO: *33* 3 REGION: *7* 4 RAILROAD REPRESENTATIVE (PRINT NAME AND TITLE): *B.R. HIGHTOWER, ASST. SUPV. SIGNALS*

5 RAILROAD: *SEABOARD* 6 RAILROAD DIVISION CODE: *TAMPA* 7 RAILROAD SUBDIVISION: 8 REPORT DATE: YEAR *81* MONTH *03* DAY *25* 9 SYSTEM INSPECTED: *TCS*

10 INSPECTION LOCATION FROM: STATE *FLORIDA* CODE *12* CITY *POLK* 11 INSPECTION LOCATION TO: STATE CODE CITY CODE *FLORIDA* *12* CITY *POLK* 12 VIOLATION RPT FILED: YES NO 13 SOURCE CODE: *1* 14 FILE NO: *2*

INSPECTION SUMMARY											
A	B	C	D	E	F	G	H	I	J	K	L
CODE	UNITS	CODE	UNITS	CODE	UNITS	CODE	UNITS	CODE	UNITS	CODE	UNITS
SIGNALS		SWITCHES	<i>1</i>	RECORDS		PROHIBIT GRADE CROSSING OR SIGNALING SYSTEMS		LOCOMOTIVES			

16 UNITS INSPECTED								17 DEFECTS				18 RAILROAD FOLLOWUP	
A	B	C	D	A	B	C	D	E	DESCRIPTION			A	B
1	2	3	4	5	6	7	8	9				10	11
MP	SR	SW	LN	TYPE	NO. OF PARTS	RULE	SUB-RULE	OPERATING SPEED				ACTION	DATE
<i>1</i>	<i>M</i>	<i>W</i>	<i>236</i>	<i>009</i>	<i>01</i>	<i>79</i>		<i>79</i>	<i>INTERFERENCE WITH NORMAL FUNCTIONING OF DEVICE WITHOUT TAKING MEASURES TO INSURE SAFETY OF TRAIN OPERATION.</i>			<i>Corrected</i>	<i>3-27-81</i>



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SIGNAL AND TRAIN CONTROL INSPECTION REPORT

APPENDIX G