

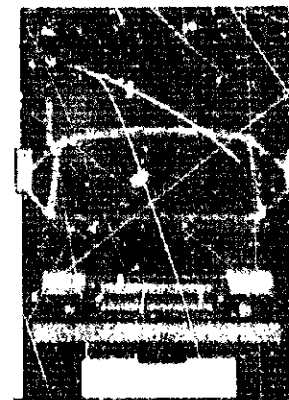
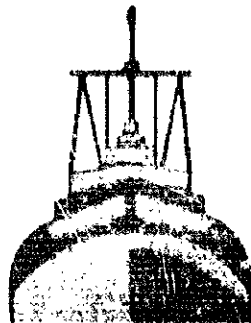
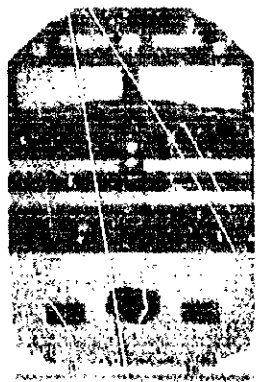
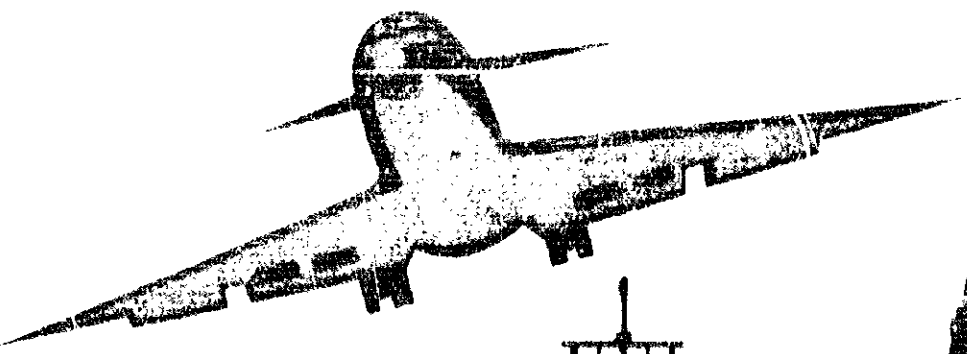
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NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

RAILROAD ACCIDENT/INCIDENT SUMMARY REPORT

CHASE, MARYLAND--APRIL 12, 1991



REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL INFORMATION SERVICE
SPRINGFIELD, VA 22161

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Abstract: This publication contains one summary report of an accident investigated by the National Transportation Safety Board in Chase, Maryland, on April 12, 1991. The safety issues discussed in the report are airbrake maintenance and testing, training, management oversight, and event recorder inspection. A recommendation was made to the National Railroad Passenger Corporation (Amtrak) concerning airbrake system procedures.

The National Transportation Safety Board is an independent Federal agency dedicated to promoting aviation, railroad, highway, marine, pipeline, and hazardous materials safety. Established in 1967, the agency is mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The Safety Board makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

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National
Transportation
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Washington, D. C. 20594

RAILROAD ACCIDENT/INCIDENT SUMMARY

Accident Number:	DCA-91-MR-005
Location:	Chase, Maryland
Date and Time:	April 12, 1991, 0309 eastern daylight time
Railroad:	National Railroad Passenger Corporation (Amtrak)
Type of Trains:	Amtrak Extra 390 North light locomotive with three locomotives in tow and Conrail freight train UMP-22B
Persons on Board:	Amtrak, two crewmembers; Conrail, five crewmembers
Injuries:	One serious and one minor
Damage:	\$800,000
Type of Occurrence:	Collision and derailment
Phase of Operation:	Amtrak--en route northbound on number 2 main track; Conrail--southbound crossing over from number 3 main track to "A" main track

About 0309 eastern daylight time on April 12, 1991, National Railroad Passenger Corporation (Amtrak) Extra 390 North struck southbound Conrail mineral train UMP-22B on Amtrak's Northeast Corridor (NEC) at Chase, Maryland, (mile post 79.3) about 16.4 miles north of Baltimore. The accident occurred at a turnout within "Gunpow" interlocking.¹ (See figure 1.) Four cars of UMP-22B and three units of Extra 390 North derailed; two crewmembers of Extra 390 North were injured.

As a result of its investigation of this accident, the National Transportation Safety Board identified two major safety issues:

- procedures for making up light engine consists and for inspecting and testing airbrake systems on light engine movements.
- locomotive event recorder inspection.

Following a brief narrative of the accident, this summary report will discuss these issues, as well as Amtrak's response to the Safety Board's concerns.

I. THE ACCIDENT

Amtrak train Extra 390 North, consisting of one diesel electric unit and three electric units in tow, with a crew of two, was northbound en route from Washington, D.C., to Philadelphia, Pennsylvania, on track 2. The weather was clear, visibility was 20 miles, and the temperature was 46 degrees F.

¹An "interlocking" is an arrangement of signals and signal appliances (a switch, derail, lock, control mechanism, movable point frog, or movable bridge) so interconnected that their movements must succeed each other in a prearranged sequence and for which interlocking rules are in effect.

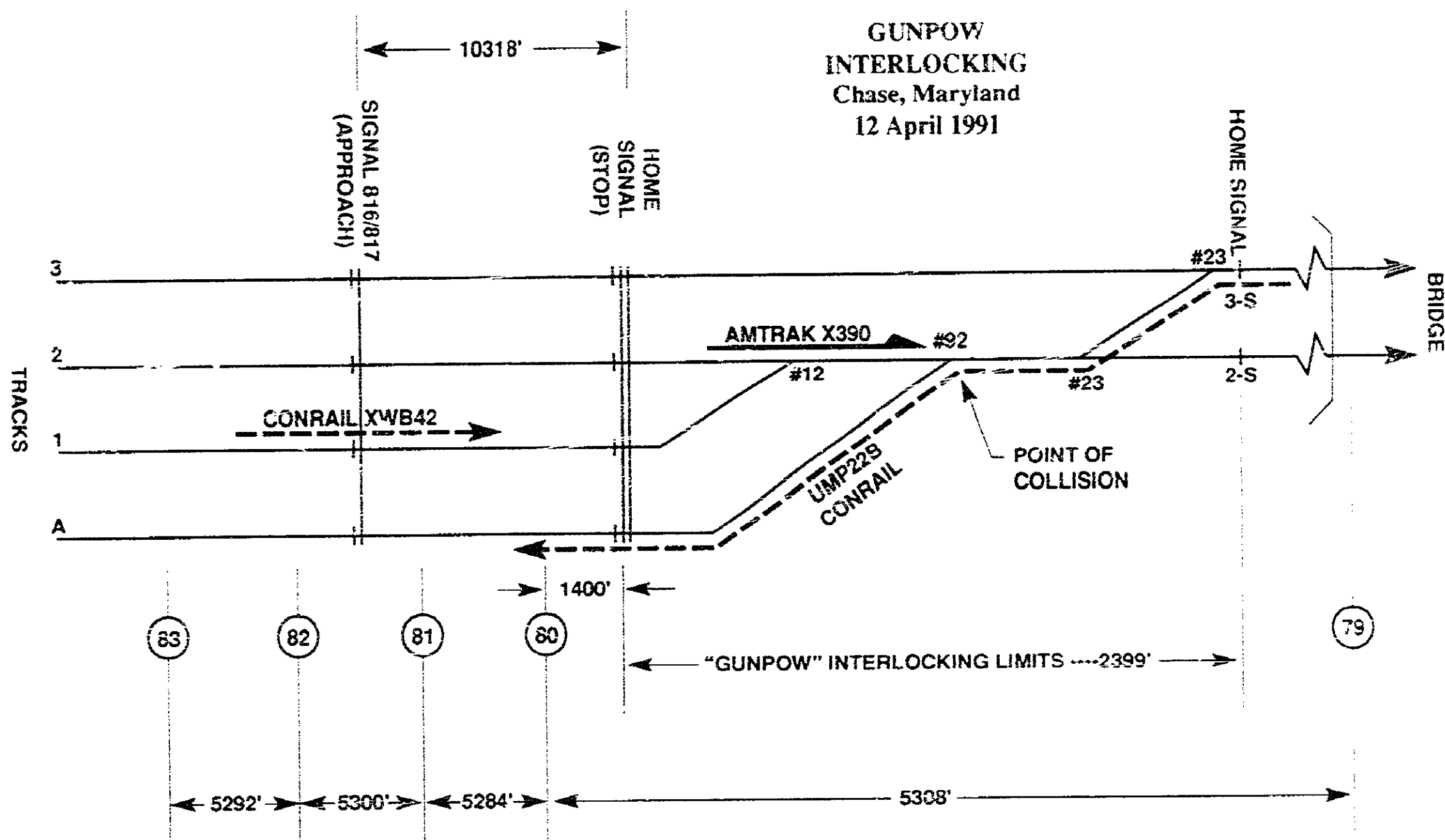


Figure 1.--Gunpow interlocking, Chase, Maryland.

Extra 390 North was considered a "light" locomotive move, that is, a move involving a lead locomotive and other locomotive units but no cars. It comprised one F40PH diesel electric unit and three E-60 electric units; the latter were being moved "dead-in-tow" (without power). Amtrak informed investigators that the E-60s had to be moved dead-in-tow--an infrequent occurrence over the NEC--because work was being done on the overhead electric conductor system (catenary) between Washington and Philadelphia. Therefore, the pantographs--jointed-frame devices used to collect current from the catenary--on the E-60s had been lowered for the move.

Train movements on this segment of the NEC are controlled by dispatcher through a centralized electric traffic control system at Philadelphia. Amtrak's Timetable and Special Instructions listed the maximum authorized speed for light locomotive moves, such as Extra 390 North, as 80 mph. The maximum authorized speed for mineral trains, such as the UMP-22B train, was 30 mph.

The engineer stated that the maximum speed of Extra 390 North during the trip was 80 mph. As the train neared the approach signal, which indicated that Extra 390 North should reduce speed and prepare to stop before reaching Gunpow interlocking, the engineer experienced train braking problems. About 0307 he radioed the dispatcher that his train was in a slide and that he would not be able to stop at the interlocking "STOP" signal. He announced "emergency" three times. The engineer stated that he had placed the train into emergency braking.

Southbound Conrail freight train UMP-22B, consisting of four diesel electric units and 121 loaded cars of coal and coke, had been given the proper signal by the dispatcher and, according to the engineer, was crossing over at 30 mph from track 3 to track 2 to track "A," in front of Extra 390 North. The locomotive of UMP-22B was about 1/2 mile south of Gunpow interlocking when the crew heard the communication from Extra 390 North to the dispatcher and saw the locomotive units go by. When the engineer of UMP-22B realized that the accident was inevitable, he made an emergency brake application.

A northbound Conrail freight train, XWB-42, was slowing on track 1 about this time, waiting for signal authority to enter onto track 2 and continue northbound. The crew of train XWB-42 stated that when they were about 1/2 mile south of their "STOP" signal at the Gunpow interlocking, they heard the emergency communication of Extra 390 North, observed the Amtrak locomotives go by, and saw the collision.

According to the signal event recorder at Gunpow interlocking, signal 3S had been cleared for a southbound Conrail coal train (UMP-22B) at 0303. Amtrak Extra 390 North entered the northbound approach circuit on track 2 at 0306. The coal train entered the interlocking at 0307 with a route aligned from track 3 southbound through crossover 23 and switch 92 reversed to track A. Switch 12 was aligned against a northbound move. Extra 390 North proceeded north on track 2 through switch 12, striking the coal train. (See figure 1.) Amtrak Extra 390 North struck the moving southbound train UMP-22B beginning at the 65th car, derailling 4 cars and damaging 2 others. (See figure 2.) At the time of the collision, train UMP-22B occupied all three tracks, and about 30 of its cars remained on track 3. The collision derailed the lead unit and the second and third trailing units of Extra 390 North; the locomotive cab compartment of the lead unit sustained extensive damage.

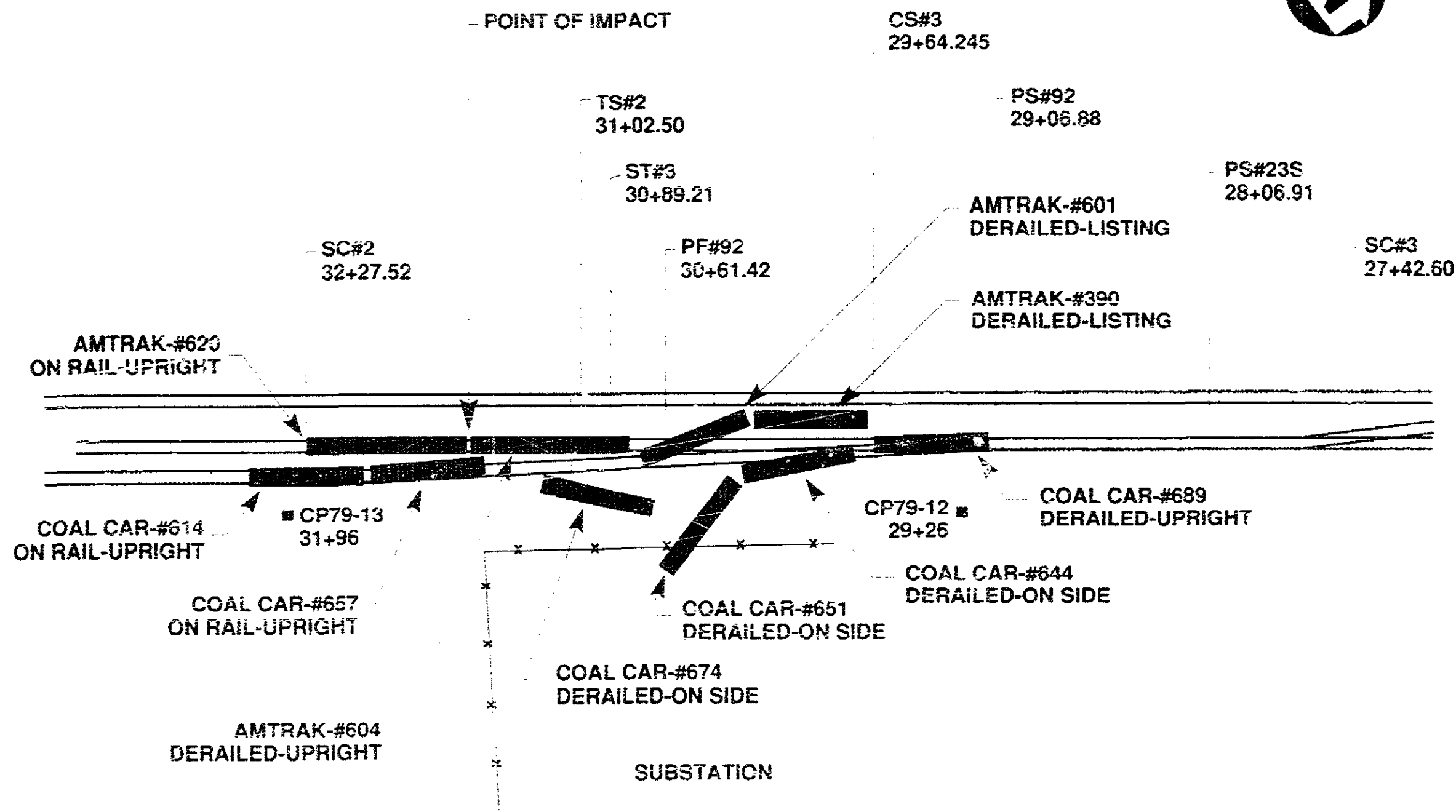


Figure 2.--Identification of derailed equipment.

The two crewmembers of Extra 390 North were injured when they jumped before the collision. The conductor sustained serious injuries and was admitted to the University of Maryland Shock Trauma Center; he was released on April 19, 1991. The engineer, who suffered minor injuries, was also taken to the shock trauma center; he was released on April 13, 1991. Conrail and Amtrak estimated damage to the two trains and property at \$800,000.

All crewmembers from UMP-228 and Extra 390 North were toxicologically tested in accordance with Federal Railroad Administration (FRA) regulations. All results were negative for drugs and alcohol.

Tests performed on the signal system after the accident showed that it was operating as designed.

Following the accident, Safety Board investigators examined Amtrak Extra 390 North. They found that the main reservoir hose connection between the lead unit and the second unit had not been made and that both cutout cocks,² which control the flow of compressed air to the main reservoir system, were closed. As a result, the airbrake system was not providing full braking capability to the locomotive consist, and Extra 390 North was unable to reduce speed and stop at the "STOP" signal.

Investigators found that the main reservoir hoses between the three trailing E-60 electric units were connected and the cutout cocks were open. The angle cocks on the trainline (brake pipe) connections between these units were also open. The valve for the dead-in-tow engine feature (dead-engine feature)³ was in line, that is, in the closed or "normal" position.

The airbrake connections on Extra 390 North failed to comply with Amtrak's Air Brake and Train Handling Rule 9.4, which applies to engines in a multiple consist that are dead-in-tow. The rule allows such a consist to be handled in two ways:

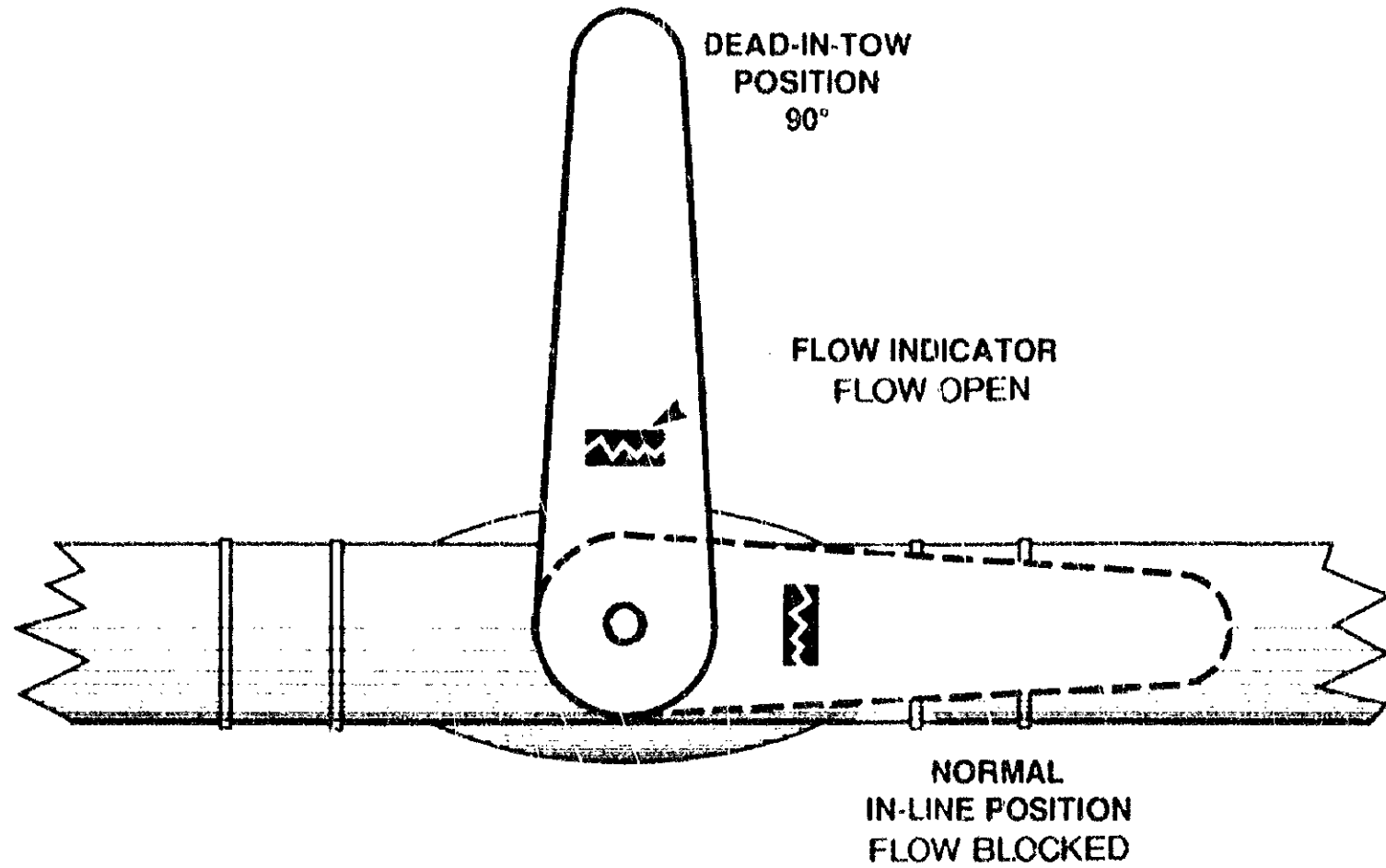
- (1) Brake pipe hose (trainline) connected: the dead-engine feature must be placed in the dead-in-tow (handle perpendicular to the pipe) position.
- (2) Main reservoir hose connected (cutout cock open): the units may be operated normally, with the dead-engine feature in the normal in-line position. (See figure 3.)

In accordance with this rule, the dead-engine feature on the E-60 units of Extra 390 North should have been in the dead-in-tow position. In other words, because the main reservoir hose connection between the lead and second units had not been made, the dead-engine feature should not have been in line.

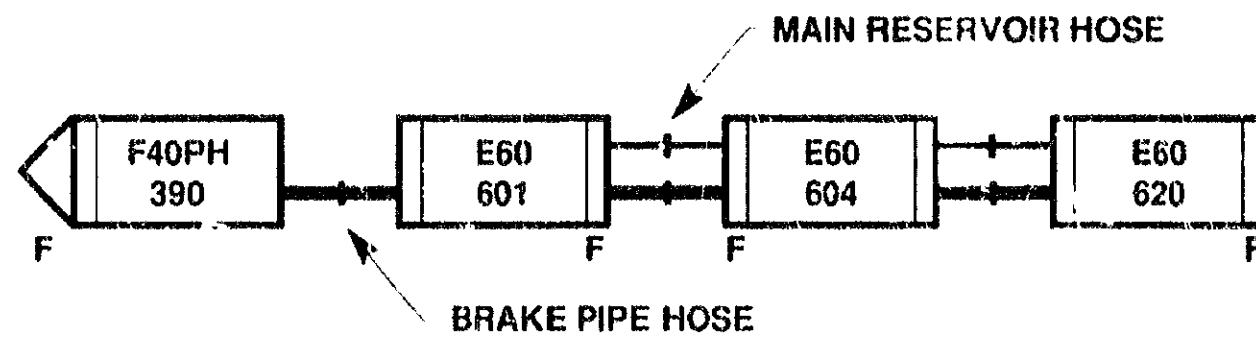
²Cutout cocks are used to initiate and cut off air flow to the main reservoir lines. Angle cocks are used to control air flow on the brake pipe.

³The dead-engine feature on a locomotive unit provides compressed air from the trainline for braking when the engine and compressor are "dead," that is, not running. When in the "dead-in-tow" position, the handle is at a right angle to the pipe and air is supplied from the trainline. Otherwise, the handle is aligned with the pipe.

DEAD-IN-TOW ENGINE FEATURE



AMTRAK X390 CONFIGURATION



AIR BRAKE HOSE ARRANGEMENT

End of an Amtrak Locomotive

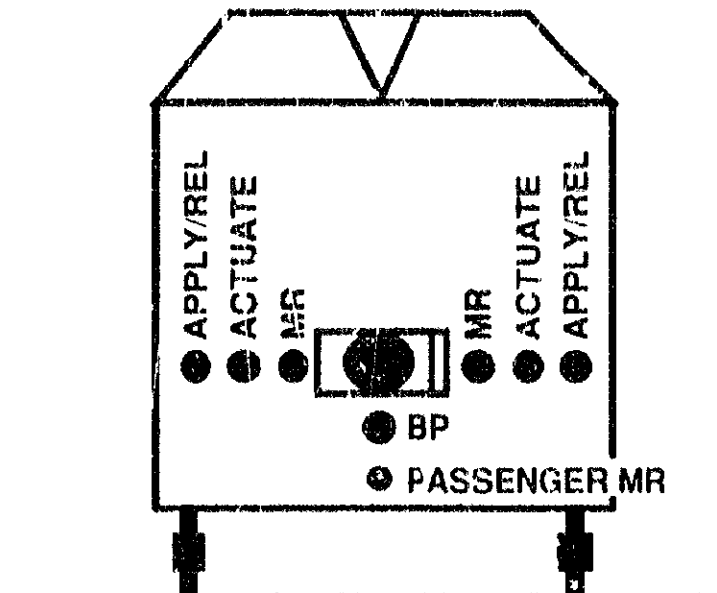


Figure 3.--Dead-in-tow engine feature and brake hose arrangement, Extra 390 North.

To adjust the handle on the dead-engine feature, Amtrak personnel have to gain access to it. On E-60 electric units, the feature is located underneath the cab compartment floor and is accessible only by laying face down over an opening in the floor, bending at the waist, and reaching under and to the rear. This maneuver is difficult at best and so, according to Amtrak mechanical personnel, is only done when a locomotive unit is damaged and mechanical department employees are prevented from connecting the main reservoirs.

When locomotive units are dead-in-tow, as were the three E-60s on Extra 390 North, they cannot power the air compressor for the airbrake system. Without a source of compressed air, the reservoirs are eventually depleted as the air supply is used for braking and as system leakage occurs. To maintain airbrakes when locomotive units are dead-in-tow, either the main reservoirs must be connected to a working compressor, which in this accident was the lead unit, or the dead-engine feature must be engaged to allow the dead units to draw air from the brake pipe, which is also supplied from the lead unit. Interviews with Amtrak shop personnel revealed that they had failed to connect the main reservoir hose between the lead locomotive unit and the second unit and to place the cutout cocks in the proper position for a dead-in-tow movement of a multiple-unit consist.

II. AIRBRAKE CONNECTION AND TESTING PROCEDURES

Extra 390 North had been made up at Amtrak's Ivy City shop, about 1 mile north of Union Station, Washington, D.C., and moved to Union Station by shop personnel. The move itself, as well as the makeup of the consist for the move, was marked by a number of unusual circumstances; collectively, they created conditions that led to the accident.

Personnel responsible for completing the train consist at Ivy City were aware that Extra 390 North would be a "shop move," that is, a move from one Amtrak shop to another, possibly in Wilmington, Delaware, or Philadelphia, Pennsylvania. They testified that diesel light moves headed north were infrequent. According to the diesel shop foreman, "Very seldom do we send diesels light in a consist north; very, very seldom. Everything north goes electric. Everything south goes diesel."

The diesel shop foreman was responsible for ensuring that personnel under his supervision properly prepared the train for the trip. However, the employee who usually would have been assigned to connect the airbrake hoses after the four locomotive units had been coupled together was engaged in other activities, and the diesel shop foreman made the airbrake hose connection himself. He was doing so for a shop move for the first time. The diesel shop foreman noted that "almost always shop moves are motors only [that is, electric rather than diesel units]"; thus, as he testified, he usually had no function in preparing consists for shop moves.

The diesel shop foreman told Safety Board investigators that the general foreman had only instructed him to "trainline" Extra 390 North, that is, to connect the brake pipe hoses. The usual practice when moving engines in the shop area is to do so with a minimum of trainline and airbrake connections because the engines will be traveling a short distance at low speed. The diesel shop foreman stated that although he had started to hook up the main reservoir hoses, he decided not to after noting that those hoses on nearby units were not connected and after remembering that the general foreman had told him to "trainline."

Although the Safety Board agrees that the general foreman should also have instructed the shop foreman to connect the main reservoir lines between all units, the general foreman's failure to do so did not relieve his subordinate of responsibility for ensuring that Extra 390 North was properly prepared for the trip. The Safety Board concludes that both foremen failed to exercise adequate oversight of the train makeup.

Extra 390 North was on track 19 at the Ivy City facility; the diesel unit had been coupled to the three electric units there about 2130 on April 11. Track 19 is elevated several feet on an embankment, making reaching between locomotives difficult; the track at that location receives only indirect lighting from the pit area. Amtrak mechanical personnel indicated that determining which airbrake hoses are connected at night or in reduced visibility on track 19 is almost impossible without physically feeling the connections.

The diesel shop foreman stated that even though he was not responsible for performing airbrake tests on the train brake system, he performed one application and release test while at Ivy City, and he said another was performed after the train had been moved to the station. However, the Safety Board believes that the application and release tests were not in compliance with Federal regulations for an initial terminal brake test⁴ because they did not include leakage tests carried out under anticipated train operating conditions.

The first application and release test was performed while the E-60 locomotive units were still under power (pantographs up); the second was made while the pantographs were being lowered at the station and therefore no power was being supplied to the units and the compressors were not working. When E-60 electric units are under power, the air compressor in each unit maintains the required air pressure in the main reservoir of the unit's airbrake system. However, the E-60 units in Extra 390 North would not be under power during the accident trip that began in Washington, and a proper initial terminal airbrake test would therefore have to have been performed with no power to the E-60 units.

When the operating train crew arrived at Union Station to begin the trip with Extra 390 North, they received neither written nor oral acknowledgment that an airbrake test had been performed. The crew stated that they therefore made an initial terminal brake test, as they were required to do under FRA regulations. The crewmembers told Safety Board investigators that they performed the test three times before they achieved a passing test.

The conductor provided the following account of the three brake tests. When the first brake application was attempted, the pistons did not come out on all the locomotive units. The conductor stated that he then checked the airhose connections between the units and observed that the brake pipe hoses were

⁴Title 49 CFR, Part 232, sets forth the rules that govern initial terminal airbrake tests. Part 232.12, "Initial Terminal Road Train Airbrake Tests," requires that qualified personnel inspect each train at the place where it is originally made, that is, at the initial terminal. It states, in part: "A qualified person participating in the test and inspection or who has knowledge that it was made shall notify the engineer that the initial terminal road train air brake test has been satisfactorily performed. The qualified person shall provide the notification in writing if the road crew will report for duty after the qualified person goes off duty."

coupled, the angle cocks were properly positioned between all units, and the main reservoir hoses were connected between the first and second locomotive units. He also said that the cutout cocks for the main reservoir hoses were closed between the first and second locomotive units. After opening the main reservoir cutout cocks between the first and second locomotive units, he called for another brake application.

When this second attempt also failed to generate the required piston travel, the conductor said he positioned the main reservoir cutout cocks as they had been during the first attempt (closed). With the cutout cocks between the first and second locomotive units closed, the conductor called for the third brake application, which, he said, resulted in the appropriate piston travel on all locomotive units. The conductor stated that after walking the entire locomotive consist to make sure the brakes applied on each unit, he informed the engineer that the brakes had set. Extra 390 North then departed Washington.

The locomotive engineer stated that after departure, he made a running airbrake test as required by Amtrak rules. He also said that he subsequently used the airbrakes several times en route to slow the train (for stations, a tunnel, curves, and speed restrictions) and to stop it when a dragging equipment detector was activated at Bowie, Maryland. The engineer reported that he took no exception to how the train responded when the airbrakes were used.

The rules governing an initial terminal airbrake test state: "Train airbrake system must be charged to required air pressure, angle cocks and cutout cocks must be properly positioned, air hose must be properly coupled and must be in condition for service."⁵ However, the crew achieved the passing test with the main reservoir hose uncoupled and with the main reservoir cutout cocks closed between the lead locomotive and the three trailing units. The crew did not, but should have, checked the brake hoses and cutout cocks. The Safety Board concludes that the crew improperly performed the initial terminal airbrake test.

The Safety Board is aware that the FRA is drafting an advanced notice of proposed rulemaking (ANPRM) concerning airbrake procedures. That ANPRM is expected to include regulations governing initial terminal airbrake testing, cold weather operations, two-way telemetry devices, and intervals between intermediate terminal airbrake testing. The Safety Board will comment on the draft ANPRM when it becomes available and encourages participation in the ANPRM development process by rail carriers, labor organizations, manufacturers, and academia.

The mechanical group of the Safety Board's investigation team met on May 7, 1991, at Amtrak's Race Street engine facility in Philadelphia to simulate the operation of the airbrake system on Extra 390 North. Unit 310, the lead unit in the test, was an F40PH, and the three E60 electric locomotive units were numbers 610, 602, and 620, respectively. Unit 620 was the same trailing unit that had been in the accident consist; all other units were similar to those of the accident train.

A pretest inspection of the locomotives revealed that unit 620 had an obvious and significant leak in a copper air pipe above the fuel tank. The copper pipe, which is a line from the main reservoir to the brake valve, had developed the leak as a

⁵Title 49 CFR, Part 232.12.(2)(c).

result of rubbing against the metal hex nut of an adjacent rubber hose coupling. The investigators agreed that the leak had developed over a period of time and probably existed at the time of the accident. The defective air pipe was not evident to Safety Board investigators at the scene because Extra 390 North's air reserve was depleted following the accident.

During the postaccident test, the pantographs on the electric units were dropped and the hoses were set up in the same configuration as on the accident consist. All units were connected by brake pipe hoses, and main reservoir hoses were connected between electric units only; the dead-engine feature was in line, that is, in the normal position.

Following the initial terminal leakage test, brake pipe leakage was found to be 3 psi per minute, which is within the acceptable limit of 5 psi per minute prescribed in 49 CFR 232.12(e). This leakage was almost entirely the result of the main reservoir line leak on unit 620.⁶ Brake piston travel on all units was found to be within acceptable limits.

Following 17 brake applications of 26 psi each over a period of 1 hour 19 minutes, the main reservoir air pressure was depleted. Effective brake cylinder pressure of 60 psi was no longer available after only 32 minutes and four brake applications. Upon subsequent applications, brake cylinder pressure trailed main reservoir pressure by 2 psi, a grossly inadequate differential for proper functioning of the airbrake system.

The failure of shop personnel and the operating crew to walk and inspect the consist before the accident allowed locomotive 620 to depart the terminal with a serious air leak. Although the leak probably would not have been sufficient to prevent Extra 390 North from passing the initial terminal brake test, it was significant.

The crew's description of the cutout cock positions for the third test on the day of the accident agrees with what Safety Board investigators found after the collision and derailment. Regardless of whether the crew achieved a passing airbrake test, however, air to the braking system in the three trailing units was being depleted from the main reservoirs at each application of the train brakes, and the main reservoirs were not being replenished from the lead locomotive air compressor because of the improper connection. The loss of air pressure on the main reservoirs meant that after several brake applications, insufficient air was available to apply the train brakes.

If the operating crew had conducted a proper initial terminal brake test before departure, they should have detected the problem with the airbrake system. During their walkarounds to inspect brake and piston travel, they should have observed that proper air line connections had not been made, and they should have noted the obvious air leak in unit 620. Therefore, the Safety Board concludes that the operating crew of Extra 390 North had not verified that the airbrake system was properly connected and did not conduct an adequate initial terminal airbrake test.

⁶Brake pipe hose pressure was set at 110 psi, and main reservoir pressure was set at 140 psi. Readings were taken from unit 620, the trailing unit, where the results of the leakage would be readily apparent.

III. EVENT RECORDER INSPECTION

Each unit of Conrail train UMP-22B was equipped with a PULSE multievent recorder. The data packs were removed and sent to the Safety Board's laboratory for a printout. Nothing on the printout indicated train mishandling or problems with the locomotives.

The lead unit of Extra 390 North was equipped with a PULSE multievent recorder; the three E-60s had paper tape speed recorders, which were not operating because the units were not under electrical power. The PULSE recorder and data pack were removed after the accident and sent to the Safety Board's laboratory for readout and evaluation. The data pack, which had been installed on April 6, 1991, in San Antonio, Texas, was read the day of the accident but did not show a recording for the accident trip.

The 48 hours of data recovered from the data pack indicate that the recorder stopped operating on April 10, 1991, about 0130, while locomotive unit 390 was in Washington, D.C. The PULSE recorder, which was tested at the PULSE facility in Rockville, Maryland, on April 18, 1991, was found to have an inoperative capstan drive motor. The Safety Board believes that Amtrak should have had a policy in place requiring inspection of the PULSE recorder on the F40PH before Extra 390 North left Washington to confirm that the event recorder was operational. Amtrak now requires such inspections.

IV. AMTRAK'S RESPONSE TO ISSUES IDENTIFIED

During the investigation, Safety Board investigators expressed concern to Amtrak about the procedures used in connecting and testing airbrake systems on light engine movements. In response, Amtrak took corrective action to address some issues.

On April 12, 1991, the day that the accident occurred, Amtrak's Chief Mechanical Officer (CMO) issued the following instructions:

An airbrake slip must be completed for all airbrake tests performed by the mechanical forces on trains or locomotives dispatched as a light engine move. The airbrake slip is to be placed in the cab of the controlling unit and a copy retained at the maintenance facility.

This instruction does not relieve the engineer of the responsibility for knowing that the locomotive brakes are in operative condition.

In instructions issued to Amtrak's general superintendents, mechanical superintendents, and maintenance facilities on April 14, 1991, the CMO set the following policy regarding setup of airbrakes on locomotives moved light or added en route:

1. All MU (multiple unit) main reservoir and brake pipe hoses will be properly coupled.

2. All angle cocks, cutout cocks and end cocks will be properly positioned.
3. The handle position of brake valves, brake valve cutout cocks and other brake devices must be properly positioned as indicated in AMT-3 [Amtrak's Airbrake and Train Handling Rules], Rule 20 and charts on pages AMT 3-30 to AMT 3-34.

The instructions further state, "Mechanical forces [employees] must perform inspection and departure tests as outlined in AMT-3, Rule No. 2." In addition, according to the instructions, "Enginemen must know that locomotive brakes are in operative condition as stated in AMT-3, Rule No. 3."

On April 24, 1991, Amtrak's System General Road Foreman-Engines issued instructions concerning "Light and Multiple Light Locomotive Movements" to engine service personnel. The instructions restrict the maximum speed for light engine moves to 50 mph and describe the setup of the brake hose, as well as the angle cock positions. They modify and elaborate on previous instructions for such moves. Following reformatting, they were printed, made effective July 31, 1991, as GRF [General Road Foremen] Notice 3-8, and incorporated in Instruction Number 29.

Amtrak also took steps to ensure that maintenance-of-equipment employees who are responsible for making up light trains with dead engines in tow receive training in those procedures. On April 15, 1991, the CMO issued the following instructions to all mechanical superintendents: "Please notify me by April 24, 1991, of each employee who has not completed an airbrake training course in the last 12 months." The instructions applied to all employees whose duties required that they supervise or perform airbrake departure tests.

Amtrak's Transportation Department, working with its Human Resources Department, reviewed new training courses to ensure proper instruction on connecting and testing airbrake systems for light engine movements. Plastic pocket cards have been designed that will be a guide to proper air connections on trains; Amtrak issued these cards to employees in March 1992. An Amtrak airbrake committee is assembling informational drawings and procedures for approval and inclusion in the corporation's Air Brake and Train Handling Rules and Instructions.

Following this accident, according to Amtrak officials, Amtrak implemented a standard method throughout the system for training employees in airbrake inspection and testing. According to a November 13, 1991, memorandum to the CMO from Amtrak's Director of Technical Training, 667 employees had attended "Locomotive Departure Inspection and Testing" classes as of November 12, 1991; 576 passed and 91 students failed. Employees in the Boston area received training in December 1991, and New Haven and Springfield employees attended classes in January 1992. All employees who either perform or supervise airbrake departure tests will now attend training courses annually.

In addition, Amtrak now requires that mechanical department employees pass comprehensive airbrake training and testing before they are allowed to conduct mandatory FRA train brake inspections. According to Amtrak, employees who fail the airbrake training have the opportunity to retake the course; if they decline to retake the course or if they fail a second time, they are relieved of responsibilities in

this area. The Technical Training Department is evaluating the training to determine why some employees are not able to pass the course the first time.

Although the Safety Board recognizes that Amtrak has taken steps to address the problems identified as a result of this accident involving a light locomotive move, it also encourages Amtrak to review and, as necessary, revise airbrake training and oversight procedures for personnel involved in the makeup of passenger trains. The Safety Board has identified passenger train airbrake issues and plans to address them in its forthcoming report on an Amtrak accident that occurred in Palatka, Florida, on December 17, 1991.

On April 16, 1991, Amtrak's mechanical department issued instructions that all recording devices are to be inspected at an Amtrak locomotive service facility after a train completes its trip.

V. CONCLUSIONS

1. Amtrak shop personnel failed to connect the main reservoir hose between the lead locomotive unit and the second unit and to place the cutout cocks in the proper position for a dead-in-tow movement of a multiple-unit consist.
2. The general foreman and diesel shop foreman failed to oversee the train makeup to ensure that all airbrake lines were correctly connected.
3. The operating crew of Extra 390 North did not verify that the airbrake system was properly connected and did not conduct an adequate initial terminal airbrake test.
4. Amtrak did not have a policy requiring predeparture inspection of event recorders, and Amtrak personnel did not inspect the event recorder on the F40PH to confirm that it was operational before Extra 390 North left Washington.
5. As a result of concerns the Safety Board expressed to Amtrak during the on-scene investigation, Amtrak identified procedural deficiencies relating to the connection and testing of airbrake systems for light engine moves and initiated corrective action.

VI. PROBABLE CAUSE

The National Transportation Safety Board determines that the probable cause of this accident was the failure of Amtrak mechanical department employees at the initial terminal to correctly connect the airbrake system between the lead locomotive and the three units in tow, the failure of Amtrak Extra 390 North's operating crew to verify that the airbrake system was properly connected to provide full braking capability to the train, and Amtrak's failure to provide adequate training and oversight.

VII. RECOMMENDATIONS

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

--to the National Railroad Passenger Corporation:

Develop and implement a plan to monitor and evaluate the effectiveness of the new procedures relating to airbrake systems that were initiated following the accident at Chase, Maryland, on April 12, 1991. (Class II, Priority Action) (R-92-08)

The National Transportation Safety Board is pleased to acknowledge that Amtrak took prompt action to address the safety issues identified during this investigation and commends Amtrak for doing so.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

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May 12, 1992