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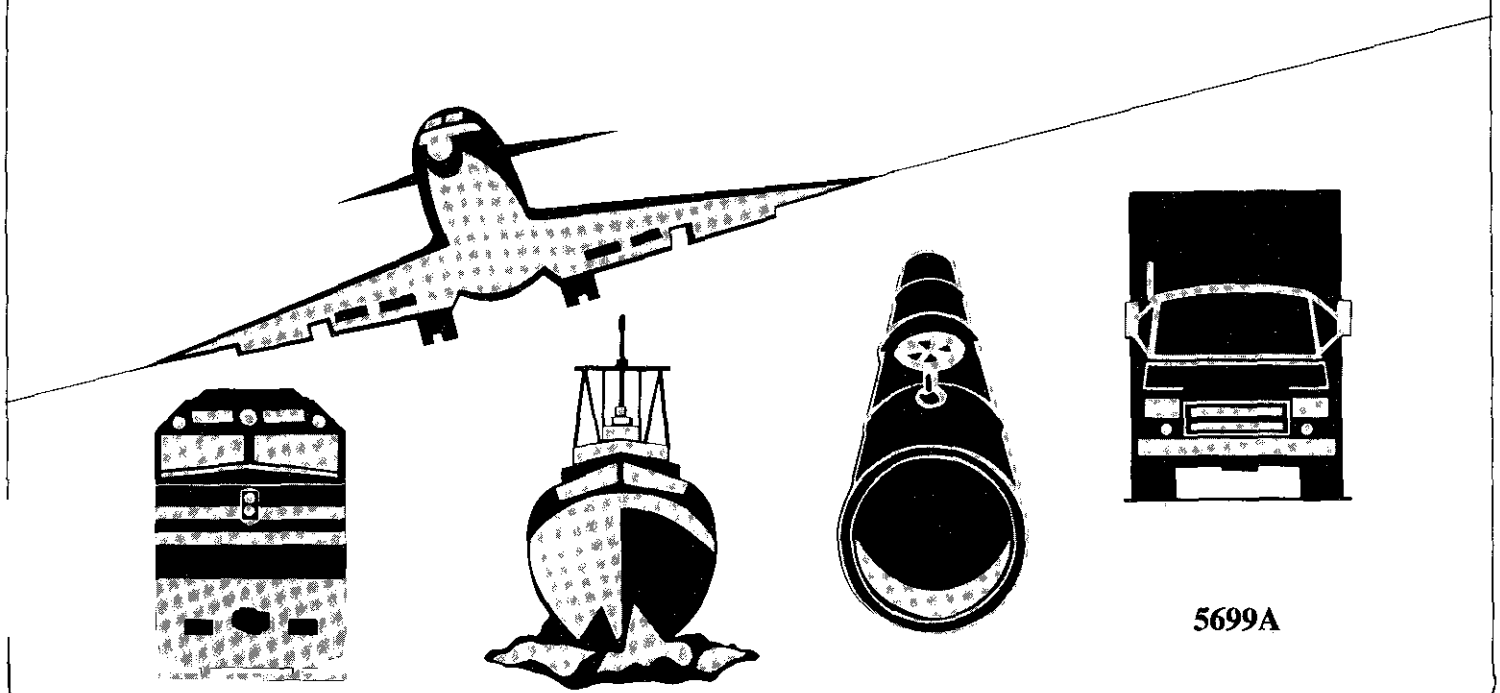
TIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

RAILROAD ACCIDENT/INCIDENT SUMMARY REPORT

DERAILMENT OF AMTRAK TRAIN 87, SILVER METEOR, IN PALATKA, FLORIDA, ON DECEMBER 17, 1991



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Abstract: This publication contains the report of an accident in Palatka, Florida, on December 17, 1991, investigated by the National Transportation Safety Board. The safety issues discussed in this report are the inattentiveness of the engineer and fireman, the use of prescription and over-the-counter drugs by operating crewmembers, and the adequacy of Federal Railroad Administration regulations for inspecting modern passenger car brakes.

National Transportation Safety Board

Washington, D.C. 20594

RAILROAD ACCIDENT/INCIDENT SUMMARY REPORT

Accident Number:	DCA-92-MR-001
Location:	Palatka, Florida
Date and Time:	December 17, 1991, at 11:25 a.m.
Railroad:	National Railroad Passenger Corporation (Amtrak) on CSX Transportation Inc. track
Train:	Amtrak train 87 (Silver Meteor)
People on Board:	5 operating crewmembers, 5 on-board service personnel, and 172 passengers
Injuries:	61 (crew and passengers)
Damage:	$1.4 million
Type of Occurrence:	Derailment
Phase of Operation:	En route to Tampa, Florida, from New York, New York

At 11:25 a.m. on December 17, 1991, National Railroad Passenger Corporation (Amtrak) train 87, operating on CSX Transportation Inc. (CSXT) track, derailed at milepost (MP) A697.6 in Palatka, Florida. Train 87 consisted of a locomotive and eight cars; the locomotive and first six cars derailed. The derailment occurred while train 87 was negotiating a 6^0 6' curve to the right (west). The derailed equipment struck two homes and blocked the street north of the Palatka station. (See figure 1.) Eleven passengers sustained serious injuries and 41 received minor injuries. Five operating crewmembers and four on-board service personnel had minor injuries.

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

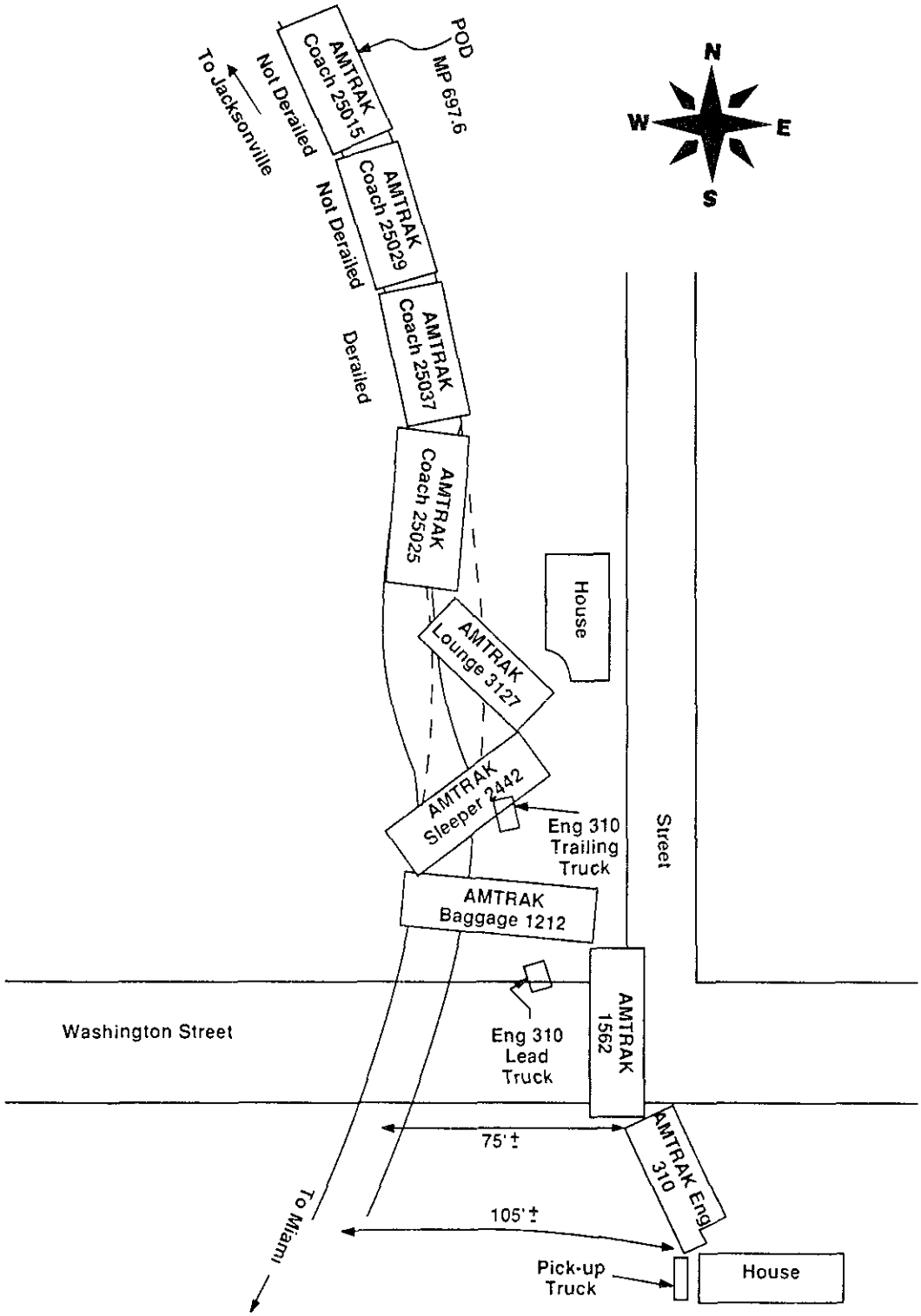

Figure 1.--Car positions after train derailment.

- o inattentiveness of the engineer and fireman.
- o use of prescription and over-the-counter drugs by operating crewmembers.
- o adequacy of Federal Railroad Administration (FRA) regulations for inspecting modern passenger car brakes.

Following a brief accident narrative, this report discusses these issues, as well as the effectiveness of Amtrak's equipment inspection and maintenance programs and the securement of food service appliances and seats in passenger cars.

THE ACCIDENT

Amtrak train 87 was a scheduled passenger train, operating daily between New York, New York, and Tampa, Florida. At 10:18 a.m., train 87 left Jacksonville, Florida, destined for Tampa, a trip of 239 miles. It had a scheduled 11:24 a.m. stop at the Palatka station. The train consisted of a locomotive, two baggage cars, a sleeping car, a lounge car, and four coaches.

The operating crew reported for duty in Jacksonville at 9:28 a.m. on December 17. Although the engineer and fireman knew each other, they had never worked together. Train 87 was not their regular work assignment, and they had been assigned this trip from their position on the extra list.[1] A conductor and two assistant conductors completed the operating crew. Five on-board service personnel were assigned to the passenger cars.

The engineer asked that the fireman operate the train[2] for the first half of the trip. He stated that between 20 and 30 percent of the time when he is the engineer, he allows the fireman to operate the train. For the 58 miles between Jacksonville and the accident site, the engineer and fireman indicated that the trip, including the handling and operation of the train, had been uneventful. They had stopped and flagged a road crossing, as required by train order. Before crossing the Rice Creek bridge, they were required to stop and request permission to proceed from a bridge maintenance foreman. They received authority from the foreman by radio transmission to cross the bridge at 10 miles per hour (mph) without stopping, which was in accordance with CSXT operating rules. Train 87 slowed to the required speed and crossed the bridge.

Because Amtrak was operating in a passenger service over CSXT track, its operating crews were governed by CSXT operating rules. The maximum authorized speed for passenger trains was 79 mph, unless a lower speed was posted in the timetable, designated by wayside signs, or listed in train bulletins. The CSXT timetable specified a 75-mph speed restriction between the Rice Creek bridge and Palatka. In the accident area, the single main track was listed in the timetable with a 30-mph permanent speed restriction, as required by a Palatka city

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[1]A listing of unassigned operating employees who can substitute for absent assigned employees.

[2]Amtrak allows firemen who have held the position of engineer to operate trains under the supervision of the assigned engineer.

ordinance. A sign adjacent to the track marked the point at which this restriction began at MP A697.5 (3.3 miles south of the Rice Creek bridge); the restriction ended at MP A697.8. The track curved to the right through a 6° 6' curve with a 2 1/2-inch elevation between these points. The FRA track safety standards list a maximum allowable operating speed of 35 mph on curved track with this geometry.

About 300 feet into the 30-mph curve, train 87 derailed at MP A697.6 about 0.5 mile north of the Palatka station. The locomotive crossed a street, rolled over onto its left side, and came to rest about 100 feet from the track. (See figure 2.) The first six cars derailed but remained upright; the last two cars did not derail. The train struck two houses, and the derailed equipment blocked the street. (See figure 3.)

At 11:28 a.m., the assistant train master was in his vehicle at the nearby Pecan railroad yard when he heard the train 87 conductor call over the radio, "Emergency, we need help!" A CSXT bridge tender had also heard the radio transmission and called the CSXT dispatcher in Jacksonville to advise that train 87 had overturned. At 11:32 a.m., the CSXT notified the Palatka Police Department; the Palatka police dispatcher had received a 911 call at 11:25 a.m. and had already sent police officers to the scene. By 11:40 a.m., 10 units were on scene. The Palatka police also requested assistance from the Putnam County Sheriff's Department, whose deputies began arriving on scene at 11:32 a.m. Meanwhile, the Palatka Fire Department chief had been notified at 11:28 a.m., and while en route, he requested assistance from the Putnam County Fire and Rescue stations. The Palatka fire chief had established an on-scene command post by 11:30 a.m., and he served as the incident commander.

A triage area was established to treat the injured. Within 1 hour 30 minutes, all injured passengers and crewmembers had been transported to a trauma center and two nearby hospitals. Forty-one passengers and the 9 Amtrak personnel were treated and released; 11 passengers were admitted to hospitals. Injuries consisted of multiple contusions, lacerations, abrasions, strains, fractures, and blunt trauma. According to passenger statements and medical records, the injuries resulted from the passengers striking seatbacks, tables, interior surfaces, and luggage, or being thrown to the floor. No luggage fell from the overhead storage, and no seatlock disengaged.

The emergency response agencies, which had participated in 1990 training exercises that involved a mock train derailment, coordinated their actions effectively. In addition, firefighters were able to direct their efforts to the rescue operations because no fire was involved. The Safety Board concludes that emergency response activities were timely and effective.

LOCOMOTIVE CREW INATTENTIVENESS TO DUTY

During initial interviews after the derailment, the engineer and fireman reported that the train brakes had failed; they stated that several brake applications had been made, but the train failed to slow. In a later interview on January 24, 1992, the engineer said that his unfamiliarity with the territory might have affected his judgment in giving the fireman a braking point too close to the curve, thereby preventing the fireman from slowing in time. Because of these

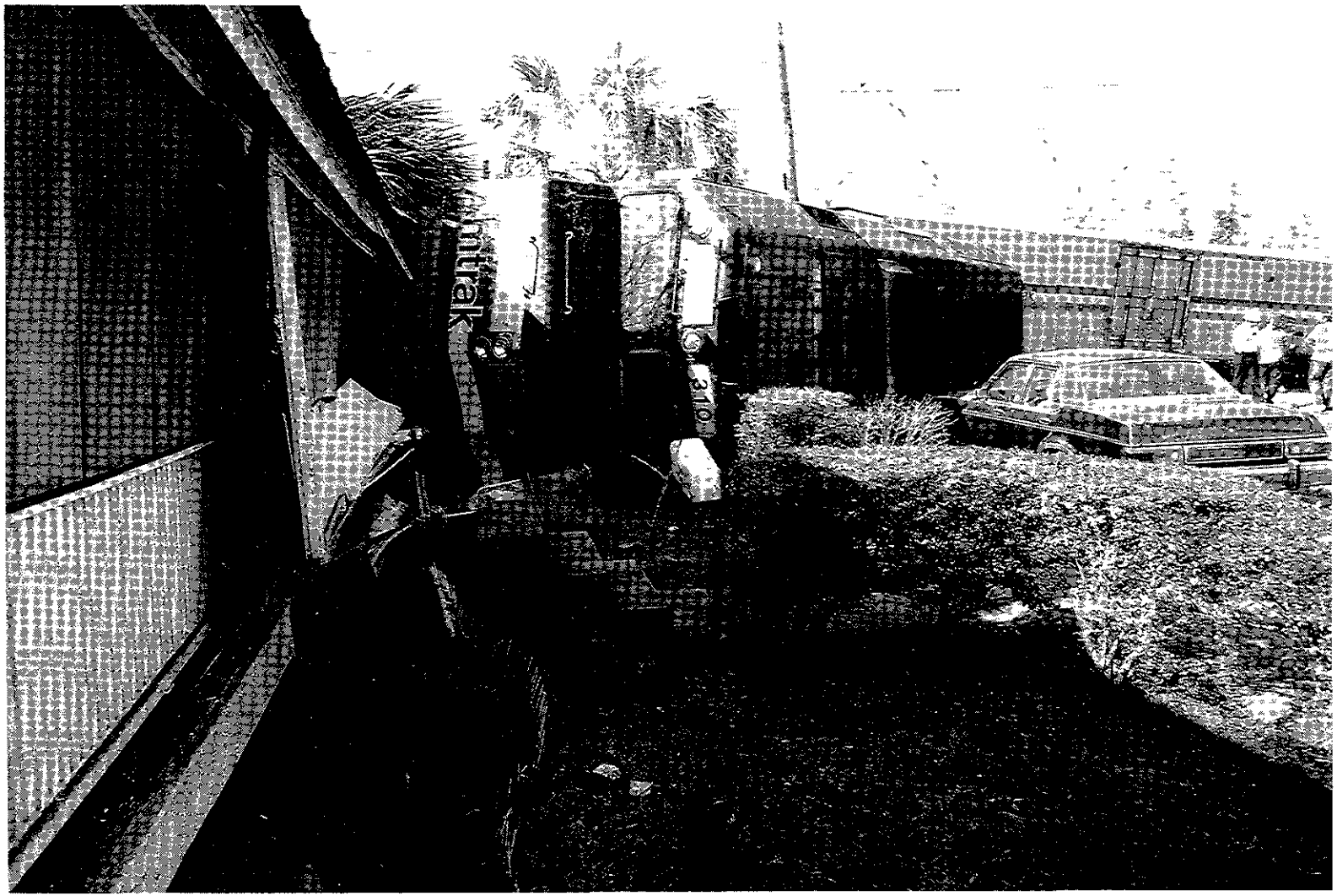

Figure 2. --Locomotive after derailment.

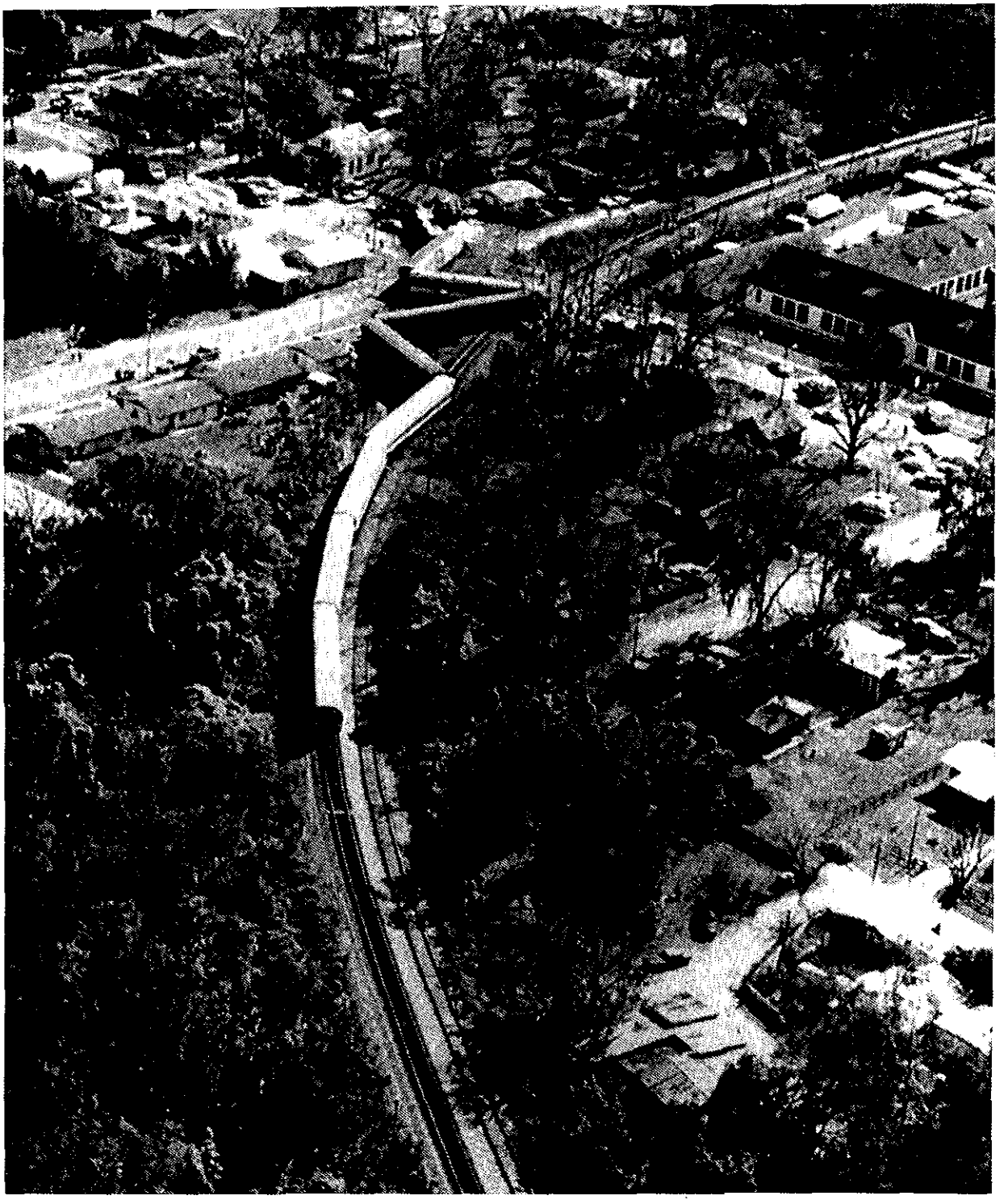

Figure 3.--Aerial view of accident scene.
Photo courtesy of *Palatka Daily News*.

statements, the Safety Board explored both the possibility that the train's braking system failed and the possibility that the locomotive crew's familiarity with the physical characteristics of the territory was insufficient. The Safety Board also examined the possibility that the locomotive crew was inattentive to duty immediately before the accident.

The locomotive speed tape shows that train 87 had slowed to about 9 mph as it crossed the Rice Creek bridge and then steadily accelerated to 72 mph after passing Rice Creek headed toward the accident site. The speed tape then shows a rapid deceleration, indicating that the train was placed in emergency braking. The Safety Board on-site investigation determined that the emergency brake was applied about 300 feet into the curve and beyond the 30-mph speed sign. No reduction in speed is indicated on the speed tape to show that braking had occurred before the curve. Thus, the train entered the curve about 42 mph faster than permitted.

On December 17, 1991, the fireman stated that he applied the automatic brake valve in a service brake application and made an 8- to 10-pound per square inch (psi) brake pipe reduction about 0.5 mile north of the south end of a siding track. The south end of that siding track is about 800 feet north of MP A697.5, where the 30-mph curve began; thus, his reported initial braking would have begun about 3,450 feet before the curve. The fireman stated that because the brakes did not seem to be applying as usual, he then made a full-service or 20-psi brake pipe reduction. This full-service application was not very effective, according to the fireman, and consequently, he applied the brake in emergency.

In an interview on January 24, 1992, the fireman gave basically the same account of the trip up to the Rice Creek bridge that he had given on December 17, 1991; however, he added and altered information about the brake and throttle applications. He stated that after the 10-mph speed restriction over the Rice Creek bridge, he increased the throttle position to maximum power "8 position" and began to accelerate, noting that he asked the engineer about the curve and the Palatka station stop. At "0.9 mile more or less" (about 4,750 feet) before the 30-mph speed restriction, according to the fireman, he applied the brakes with a 12-psi brake pipe reduction and kept the throttle in the "8 position." He stated that he began a second brake application, but the engineer said, "Don't brake yet. Brake closer to the curve. Brake for the 75 [mph][3] and continue braking on around the curve to your station." The fireman stated that the engineer's instructions confused him. He said he did not make the second brake application or reduce the throttle until the train was at or near the 30-mph speed restriction sign. When he realized the engineer had given him the wrong instructions, he made a full-service brake application and placed the train brakes in emergency. The train entered the curve and derailed. After the accident, according to the fireman, he asked the engineer, "What are we going to tell them what happened?" The engineer then replied, "I am going to tell the brakes. . .because that is what it was."

The engineer's December 19, 1991, statement generally agreed with the fireman's

[3]The allowable timetable speed between the Rice Creek bridge and Palatka.

account of the trip up to the Rice Creek bridge. At 0.9 mile before the 30-mph speed restriction, according to the engineer, he told the fireman to set the brakes and within a few seconds of this application to "take more"; however, the fireman had already done so. The train's speed seemed too fast to him, and he told the fireman to put the brakes in emergency. He stated that the train was in emergency before it reached the south end of the siding track at 0.15 mile (about 800 feet) before the 30-mph speed restriction.

Safety Board investigators examined and tested the locomotive's air-brake components. Not all brake components met the test procedure requirements; however, the defects would have resulted in more, not less, braking power than applied. The air-brake equipment operated as designed, and the defects would not have prevented the brakes from applying on command. Results of the air-brake tests contradict the statements concerning the ineffectiveness of the air brakes. The Safety Board concludes that while abnormalities existed, the condition of the brakes was not a factor in this accident. Additionally, in the January 24, 1992, interviews, the locomotive crew retracted their previous statements that the train brakes had failed.

After investigators determined the air brakes functioned properly, they conducted a test to determine whether the fireman's actions, if carried out as he described them, would have been sufficient to slow the train and prevent the derailment. On March 8, 1992, the acceleration and braking actions were re-created over the same territory. An Amtrak passenger train that comprised a locomotive and seven cars served as the test train. After the test train cleared the 10-mph speed restriction at the Rice Creek bridge (3.3 miles before the accident site), it was accelerated at full throttle (power). At 0.9 mile from the 30-mph speed restriction at MP A697.5, a 12-psi brake pipe reduction was made at a speed of 67 mph, and the train continued with the throttle in the full power position. About 800 feet from where the speed restriction begins, the train's speed had been reduced to 20 mph with the throttle in the full power position and the 12-psi brake pipe reduction. At that point, the test was stopped.

From the results of the two tests, the Safety Board concludes that the brakes of train 87 could not have been applied as initially reported by the fireman and the engineer. If the brakes had been applied in that manner, the train would have slowed before entering the curve, and the derailment probably would not have occurred. In addition, the speed tape of the locomotive shows that no reduction in speed had taken place after the train passed Rice Creek and, thus, supports the evidence indicating that the reported braking action did not occur. Also, the evidence leaves unsupported the conversation reported by the fireman in which the engineer had instructed him when to brake and the fireman claimed the instructions had confused him.

The fireman had not been tested to be qualified on the physical characteristics of the territory by Amtrak, nor was he required to be qualified. The fireman reported that he had made 20 round trips over the territory since he began working for Amtrak on April 26, 1991. Five of those trips took place in the 2 weeks before the accident. In addition, during his employment as an engineer on the Seaboard Coast Line (SCL), a predecessor of the CSXT, he had been qualified on the territory between Jacksonville and Sanford, Florida, which includes the Palatka area. He was also familiar with the territory in the accident area because he had

worked at the Pecan railroad yard while he was an engineer for the SCL. The fireman, who left the SCL in 1985, stated that he was "pretty familiar, fairly familiar" with the curve at Palatka and that "[t]here was nothing new, nothing I wasn't familiar with. I probably knew that area -- I know that area better than I know anything."

Amtrak considered the engineer to be qualified on the territory. The engineer told Safety Board investigators that he did not consider himself to be so; however, he had not informed Amtrak of this. He had originally qualified on the territory about 3 years before the accident occurred. Other assignments and an extended period of sick leave kept him from operating over the territory until October 16, 1991. Between October 16 and December 17, 1991, he made nine trips, including seven round trips, over the territory. During his December 19, 1991, interview, he accurately described the area between the Rice Creek bridge and the accident site. He also described in detail, without using notes, charts, or a timetable, the physical characteristics of the track approaching the curve, which indicated that he had a thorough working knowledge of the area.

The information drawn from their backgrounds and statements indicates that both the fireman and the engineer were familiar with the territory and knew what action was required to operate a train over that territory, as well as where such action should be taken. Therefore, the Safety Board concludes that their qualifications on the physical characteristics of the territory were not a factor in the accident.

The engineer knew that the fireman had been promoted to the position of engineer while employed by the SCL. He said that the fireman "was experienced in operating trains because he is an ex-CSX [SCL] employee" and that he realized that the fireman knew what he was doing as soon as the fireman started running the train. As the train passed the Pecan railroad yard about 1.5 miles from the accident site, the fireman told the engineer about his familiarity with the territory as a result of having worked at the yard when employed by the SCL. He told the engineer, "I've made a many a night right here." Thus, the engineer may have become overconfident of the fireman's abilities because of the fireman's operating background, train handling skills on the trip, and stated familiarity with the territory. This overconfidence may have caused the engineer to relax his oversight responsibility.

In addition, the fireman may have become inattentive to the train's location, since he did not brake the train in sufficient time to prevent the accident. Immediately after the accident, a CSXT road foreman overheard the fireman tell someone at the scene that the train was in the curve before he realized it. The fireman later denied making this statement. Nonetheless, his conversation with the engineer about the Pecan railroad yard area may have diverted his attention. Given the speed of the train, it would take about 75 seconds to travel the 1.5 miles from the yard to the accident site. Although the extent of the conversation is unknown, it could have distracted the fireman during that short, critical period of time. Therefore, the Safety Board concludes that the engineer and the fireman failed to maintain their full attention to the train's location and to realize their proximity to the curve in sufficient time to safely negotiate it.

PHYSICAL IMPAIRMENT

In compliance with FRA regulations, postaccident blood and urine specimens were collected from the engineer, the fireman, and the three other operating crewmembers at 4:10 p.m. on December 17 (4 hours 45 minutes after the accident). A U.S. Department of Transportation-authorized laboratory analyzed the specimens for the FRA. The laboratory found no drugs in the blood and urine specimens of the fireman and three operating crewmembers. The engineer's blood specimen was negative, but codeine was reported in his urine specimen.

Following the FRA tests, the Safety Board requested that the Center for Human Toxicology (CHT) also analyze portions of the specimens. Results of the CHT analysis agreed with those of the FRA analysis; the CHT also tested for additional substances in the engineer's specimen based on his reported use of various medications. The CHT analysis of the engineer's urine specimen showed the presence of codeine and its metabolite, morphine, as well as the antihistamines doxylamine, chlorpheniramine, and diphenhydramine. None of these drugs were found in the blood specimen at instrumental detection limits.[4] However, the drugs have a relatively short half-life, that is, they are eliminated rapidly from the system. The urine and blood specimens were collected about 4 hours 45 minutes after the accident, and that delay in specimen collection provided adequate time for them to fall below their measurement sensitivities.

The engineer reported that in the 4 days before the accident, he took medications for bronchitis, a chronic back condition, and sleep inducement. Each medication had the potential to cause drowsiness. The night before the accident, he took three prescribed medications: an antibiotic, an inhalant for bronchitis, and Tussi-Organidin[5] (codeine) for his cough. He also took Unisom (doxylamine), an over-the-counter nighttime sleep aid. On the morning of the accident, the engineer reported taking Tussi-Organidin and ibuprofen, as well as the antibiotic and the inhalant. He did not provide any information about the sources of the chlorpheniramine and the diphenhydramine, which are frequently found in over-the-counter cold medications.

The engineer stated in his Amtrak medical records that he had been prescribed Halcion (triazolam), a hypnotic drug used for treating insomnia. According to his medical forms, it was prescribed for a chronic back condition, and the engineer stated that he took the drug to be able to sleep when his back bothered him. He could not remember whether he had used this medication the night before the accident; if he had, he would have taken half a tablet, which is 0.125 milligram (mg). Because triazolam was not found in his blood or urine specimen,

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[4]The codeine and morphine detection limits were 20 nanograms/milliliters (ng/ml); the antihistamine detection limits were 50 ng/ml.

[5]A liquid prescribed for the symptomatic relief of cough associated with conditions such as chronic bronchitis or the common cold.

pharmacokinetic[6] calculations were done to compare the calculated values with the toxicology laboratory cut-off values, based on triazolam's instrumental detection limit of 20 nanograms/milliliters (ng/ml). Assuming the engineer took 0.125 mg of triazolam the night before the accident, his blood concentration at the accident would have been 0.057 ng/ml, and the concentration when the blood was sampled would have been 0.017 ng/ml. These values are well below the detection limit of 20 ng/ml. Similar calculations were not done for the chlorpheniramine and the diphenhydramine, since their source, dosage, and ingestion time is unknown. The presence of these drugs in the engineer's urine suggests that he was also taking over-the-counter cold medications.

For the drugs reported in the toxicology tests, pharmacokinetic data were used to calculate the concentrations expected at the time of the accident and at the time of the specimen collection. These calculations assumed that the engineer metabolized the drugs at the average rate stated in the drug literature. The prescription strength, the engineer's weight, and the standard dosage were used to calculate the drug amount. Because the exact time of drug ingestion was not reported, the time was estimated. The calculations indicate that at the time of the accident, the blood concentration for codeine and for doxylamine would have been 30 and 35 ng/ml, respectively, and that at the time of the blood collection, the concentration for codeine and for doxylamine would have been 10 and 26 ng/ml, respectively. These calculated postaccident specimen concentrations for codeine and for doxylamine were below the instrumental detection limits of 20 and 50 ng/ml, respectively, which explains why they were not found in the blood specimen. The calculations suggest that if the specimen had been collected immediately after the accident, the codeine would have been detectable in the blood. In addition, the codeine concentration would have been higher when he reported for work about 9:30 a.m.

The antihistamine doxylamine reportedly has hypnotic properties and is more effective than the barbiturate secobarbital,[7] a common sedative. This hypnotic property is apparently the reason that doxylamine is used as a sleep-inducing medication. The effects of doxylamine in combination with the narcotic codeine and the antihistamines chlorpheniramine and diphenhydramine, which can also cause drowsiness, as well as the engineer's acute bronchitis, raise questions about his fitness for duty on the day of the accident. This combination of multiple drugs, although admittedly at a low level, may result in decreased alertness. While the degree is difficult to quantify, some impairment may have occurred from his drug usage and his medical condition.

The engineer may have tried to compensate for the effects of his illness and his medications by drinking coffee. Between 7:30 and 11:25 a.m. on the day of the accident, he

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[6]Pharmacokinetics is the branch of pharmacology that relates to the body's absorption, distribution, and elimination of drugs

[7]Seth K Sharpless, "Hypnotics and Sedatives," *The Pharmacological Basis of Therapeutics*, eds Louis S. Goodman and Alfred Gilman, 4th ed. (New York: Macmillan, 1970), p. 132

drank four of the five to eight cups of coffee that he routinely drank each day. From his interviews and his medication usage, the engineer appears to have had a sleep disorder, which he attributed to his years of irregular work schedules. He used sedatives at night to sleep and then used caffeine during the day to remain alert. As a result of this routine, the engineer may have suffered from a lack of quality sleep that may also have adversely affected his level of alertness and attentiveness. The Safety Board concludes that a combination of prescription and over-the-counter medications, illness, and poor quality sleep perhaps reduced the engineer's attention level.

Before leaving Jacksonville on December 17, the engineer had reported to Amtrak that exhaust fumes were leaking into the locomotive cab. To determine whether fumes could have affected the engineer or the fireman, their postaccident blood specimens were analyzed for carboxyhemoglobin, the substance formed in the blood when carbon monoxide is inhaled. The CHT test results indicated that the saturation level of both blood specimens was below the level at which any effects occur.

The Safety Board is concerned about the effects of medications, used for long-term ailments or acute illnesses, on safe operating practices. Amtrak has addressed the use of medications under its personnel order 19 and operating rule G. Both rules require that an employee not report for duty under the influence of any substance, including a prescribed medication, that will adversely affect alertness, coordination, reaction, response, or safety. On December 16, 1991, the engineer had been placed on a medication that contained codeine. After the accident, the prescribing physician was asked whether she had given him instructions about his activities when he took the codeine medication. In a December 23, 1991, letter to the Amtrak medical director, the physician reported that she told the engineer not to operate any heavy machinery while taking this medication. The engineer reported that he was never given such an instruction and that the medication container, which was lost in the accident, had no warnings on it. In addition, he had not informed the medical director about his use of the prescribed codeine medication. After reviewing the FRA drug test results and consulting with the prescribing physician, the medical director stated that the engineer had used the medication in a manner not directed by his physician. The engineer's use of medications indicates that not all employees understand the potential dangers of many medications and may use them inappropriately.

Since this accident, Amtrak has provided all service personnel with a plastic wallet-sized card. A notice of employee responsibility is on one side; a notice to physicians about the use of medications that may affect employees is on the reverse side. When the card is issued, Amtrak supervisors brief employees on the importance of following its instructions. To prevent a violation of rule G, employees are to verify any questionable use of a prescription or over-the-counter medication with their personal physicians. The employees' physicians may also contact the Amtrak medical director, whose telephone number is on the card, for additional guidance. An employee is to notify his supervisor if a potentially impairing medication is taken; the medical director is then notified to determine the employee's work status. If temporarily disqualified for medical reasons due to the use of an impairing medication, the employee is not

paid. Title 49 Code of Federal Regulations (CFR) 219.103 states that the medical director or physician must be informed and make a good faith judgment that the substance used by the employee is at the prescribed or authorized dosage levels.

This card directs employees to contact their physicians about any questionable use of prescription or over-the-counter medications; however, to follow this direction requires a clear understanding of what is questionable. The Safety Board concludes that Amtrak's reliance on its employees to contact a physician about questionable medication use may be beyond its employees' knowledge of what questionable means. Therefore, the Safety Board believes that Amtrak should develop and implement an educational program for employees that describes and illustrates potential consequences of medication use to enable employees to make an informed decision about the relationship between their use of prescribed and over-the-counter medications and their fitness for duty.

FRA REGULATIONS FOR INSPECTING MODERN PASSENGER CAR BRAKES

The four coach cars of train 87 were Amfleet cars, which are newer model passenger cars. These cars are equipped with a dual-braking system that consists of two disc brakes[8] and two tread brakes[9] on each car axle. Disc brakes provide 60 percent and tread brakes provide 40 percent of the required braking effort.

Whether equipped with disc, tread, or dual brakes, Amtrak equipment must be maintained and inspected in accordance with FRA regulations. These regulations state that an initial terminal air-brake test must be performed when a locomotive is first coupled to its consist or when that consist is significantly changed. Title 49 CFR 232.12 requires that:

1) The train air-brake system is charged to required air pressure, the angle cocks and the cutout cocks are properly positioned, and the air hoses are properly coupled and in condition for service.

2) An examination is made for leaks, and necessary repairs are made to reduce leakage to a minimum.

3) A 15-psi brake pipe service reduction is made with the automatic brake valve; after which, note brake pipe leakage per minute by brake pipe gage, increase to full service, and inspect train brakes to determine that angle cocks are properly positioned, that brakes are applied on each car, that piston travel is correct, that the brake rigging does not bind or foul, and that all parts of the brake equipment are properly secured.

4) The brakes must be released, and each brake inspected to see that they have released.

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[8]Flat steel discs used as the braking surface instead of wheel tread

[9]Friction is created by the brake shoe rubbing on wheel tread during a brake application

5) The brake pipe leakage must not exceed 5 psi per minute.

Amtrak mechanical personnel testified that before train 87 left Jacksonville, they completed an initial terminal air-brake test that met the requirements of 49 CFR 232.12.

During the postaccident inspection, investigators discovered four defective tread-brake units on three dual-brake Amfleet cars. The brake shoe was not tight against the wheel tread when fully applied; therefore, the four defective units were not effectively braking. These units were probably defective when the initial terminal air-brake test was conducted because the observed failure usually results from long-term wear, vibration, and internal component contamination. The detection of failed brake system components is a primary objective of the initial terminal air-brake test; however, the test procedure for train 87 on the day of the accident did not detect that the tread brakes were not applying properly.

Title 49 CFR 232.11(c) requires that brakes be in effective operating condition but does not define the term "effective" braking for a passenger car. This regulation describes the typical freight car arrangement in which one brake cylinder controls all brakes on the car. The FRA regulation states:

> Each train must have the airbrakes in effective operating condition . . . . When piston travel is in excess of 10 1/2 inches, the airbrake cannot be considered in effective operating condition.

The Amfleet passenger car has 16 separate brake cylinders: eight on the tread-brake units and eight on the disc-brake units. Piston travel is 1/2 to 1 inch, maximum, on the Amfleet equipment, and 10 1/2 inches is not physically possible for this passenger car.

An FRA inspector stated:

> Historically with the tread-brake unit, they have an automatic slack adjuster system which keeps the brakes within the proper piston travel, you might say, on them, and they have a tendency to break in there and become inoperative or out of adjustment. And that's typical of all tread-brake units on all passenger equipment. . . . We with FRA and Amtrak both understand that from time to time brakes become inoperative or fail on a certain car, and we allow them to run to the next follow-up point. . . . if the percentage is not exceeded by 15 percent.

The FRA regulations do not reflect this particular understanding. Amtrak mechanical personnel performed the initial terminal air-brake test but detected no defective tread-brake units. However, even if they had discovered the four failed tread-brake units, the regulations contain no guidance on how many of the 16 brake cylinders must function to provide effective braking. The Safety Board concludes that the initial terminal air-brake test procedures contained in the

FRA regulations are inadequate for inspecting brake equipment on modern passenger cars.

The tread-brake units on the train 87 passenger cars are designed as self-adjusting. The automatic slack adjuster mechanism adjusts the clearance between the bake shoe and the wheel at each brake application. The purpose of the "adjustment" nut on the tread brake is to retract the automatic slack adjuster mechanism when replacing a worn brake shoe with a new brake shoe. The manufacturer's maintenance manual contains no procedure to adjust an inoperative tread brake. In addition, the manufacturer recommends that the tread-brake unit be overhauled when it ceases to apply force to the wheel. To manually adjust the tread-brake units would therefore be inappropriate.

The slack adjuster mechanism compensates for brake shoe and wheel wear. When Amtrak personnel "adjust" a tread-brake unit that is not applying force to the wheel, they restore braking force temporarily to the tread brake. Because the slack adjuster mechanism has failed, the braking force will deteriorate as the brake shoe and wheel wear, and the defect within the tread-brake unit will not be apparent until the brake shoe again does not apply force to the wheel.

When a tread-brake unit ceases to apply force to the wheel, Amtrak mechanical personnel normally adjust the tread brake. The carman who inspected train 87 said that he considers an adjustment of the tread-brake unit to be a satisfactory repair procedure. However, Amtrak management stated that an adjustment may or may not be a satisfactory repair. Although the failure of the tread-brake units did not contribute to this accident, the Safety Board is concerned that Amtrak mechanical personnel may not understand the operation of the equipment that they inspect sufficiently to ensure that defective equipment is detected and properly repaired.

AMTRAK EQUIPMENT INSPECTION AND MAINTENANCE PROGRAMS

The engineer reported to the Amtrak 800 trouble line that exhaust fumes were leaking into the locomotive cab compartment. According to Amtrak records, other employees had previously reported the leaking exhaust fumes on November 21 and December 4, 1991. The Amtrak maintenance records indicated that no repairs were made following the latter two reports; the shop reports showed either "no defects found" or "no parts in house." The daily Amtrak inspection reports also indicated fumes in the cab compartment on three occasions within a 9-month period and no action taken.

On February 24, 1992, the FRA inspected the locomotive and found no sign of leakage in the engine exhaust manifold; however, soot and residue had accumulated on the turbocharger, indicating previous leakage. The engineroom door had a seal gasket missing from the top right corner. A 1/2-inch-wide, 18-inch-long gap between the door and the car body sill contained residue. During an Amtrak 3-year periodic inspection on August 18, 1991, the door latch had been replaced, and on the October 24th 60-day inspection report, the door seal had been written up. After the FRA postaccident inspection of the locomotive, the FRA filed a violation of 49 CFR 229.45 (locomotive shall be free of conditions that endanger the safety of the crew) against

Amtrak.

On April 2, 1992, Safety Board investigators inspected the locomotive at an Amtrak repair facility and confirmed the findings from the FRA inspection. The repairs were inadequate: a homemade latch had been installed, and a foam gasket had been taped in place. The door gap was evident to investigators and should have been evident to Amtrak maintenance personnel.

Although the accident investigation did not reveal whether negligible or inadequate locomotive repair is widespread, the Safety Board is concerned that exhaust fumes leaked into the locomotive's cab for 9 months, despite repeated notifications during periodic inspections. Amtrak needs to examine its defect reporting and repair procedures to determine whether a more effective follow-up system should be developed.

SEATLOCKS AND RESTRAINTS ON FOOD SERVICE APPLIANCES

During postaccident inspection, investigators found 34 seatlocks in the unlocked position. A microwave oven had fallen onto the floor in the lounge car, and a coffeemaker had tilted out of its brackets. The Safety Board has previously made safety recommendations to Amtrak to minimize injuries that are caused by dislodged passenger seats and food service appliances.

After the Batavia, Iowa, Amtrak train accident[10] in which dislodged passenger seats were involved, the Safety Board recommended on December 10, 1991, that Amtrak implement procedures for on-board service personnel to periodically check passenger seats en route for unlocked antirotational devices and take action to ensure seats are functional (R-91-71). Amtrak responded on February 12, 1992, that instructions would be issued to its personnel to check and to ensure that seatlocks are functional and engaged. On April 3, 1992, Amtrak issued a letter that contained these instructions to on-board service personnel and transportation crews. Based on the Amtrak response, Safety Recommendation R-91-71 was classified "Closed--Acceptable Action" on May 22, 1992.

After a December 1989 Amtrak train derailment in Stockton, California,[11] the Safety Board recommended that Amtrak establish systemwide rules to ensure that only properly secured appliances are used in revenue service and establish procedures for enforcing those rules (R-90-48). Amtrak responded in June 1991 that it had met the provisions of this recommendation and all restraints were to be installed by October 1, 1991. Safety Recommendation R-90-48 was classified "Closed--Acceptable Action" on August 21, 1991.

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[10]Railroad Accident Report--*Derailment of Amtrak Train No. 6 on the Burlington Northern Railroad, Batavia, Iowa, April 23, 1990* (NTSB/RAR-91/05).

[11]Railroad/Highway Accident Report--*Collision of Amtrak Passenger Train No. 708 on Atchison, Topeka and Santa Fe Railway with TAB Warehouse and Distribution Co. Tractor-Semitrailer, Stockton, California, December 19, 1989* (NTSB/RHR-90/01).

In this accident, the microwave oven restraint failed, and Amtrak has determined that more secure mounting brackets with an overhead latching device need to be installed. Maintenance personnel found this necessary because as microwave ovens are removed for repair or replacement, the succeeding ovens often do not fit the existing brackets. In June 1990, Amtrak had issued instructions on how to properly secure coffeemaker pedestal legs in their pipe brackets.

The Safety Board will continue to monitor Amtrak regarding secured seatlocks and restraints on food service appliances.

CONCLUSIONS

1. While abnormalities existed, the condition of the brakes was not a factor in this accident.

2. The speed tape, accident dynamics, and other physical evidence do not corroborate that the brakes were applied as initially reported by the fireman and the engineer.

3. The engineer and the fireman were familiar with the territory, and their qualifications on the physical characteristics of the territory were not a factor in the accident.

4. The engineer and the fireman failed to maintain their full attention to the train location and therefore failed to notice their proximity to the curve in sufficient time to safely negotiate it.

5. A combination of prescription and over-the-counter medications, illness, and poor quality sleep may have contributed to the engineer's deficient attention level.

6. Carrier reliance on its employees to contact a physician about "questionable medication use" requires the employees to interpret the term "questionable," which may be beyond the capability of employees.

7. The initial terminal air-brake test procedures contained in the Federal Railroad Administration regulations are inadequate for inspecting brake equipment on modern passenger cars.

8. Emergency response activities were timely and effective.

PROBABLE CAUSE

The National Transportation Safety Board determines that the probable cause of this accident was the failure of the engineer and the fireman to maintain full attention to the train location and to slow for the speed restriction in sufficient time to safely negotiate the curve.

RECOMMENDATIONS

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

--to the Federal Railroad Administration:

> Amend the power brake regulations, 49 Code of Federal Regulations 232.12, to provide appropriate guidelines for inspecting brake equipment on modern passenger cars. (Class II, Priority Action) (R-93-16)

--to the National Railroad Passenger Corporation:

> Develop and implement an educational program for employees that describes and illustrates potential consequences of medication use to enable employees to make an informed decision about the relationship between their use of prescribed and over-the-counter medications and their fitness for duty. (Class II, Priority Action) (R-93-17)

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