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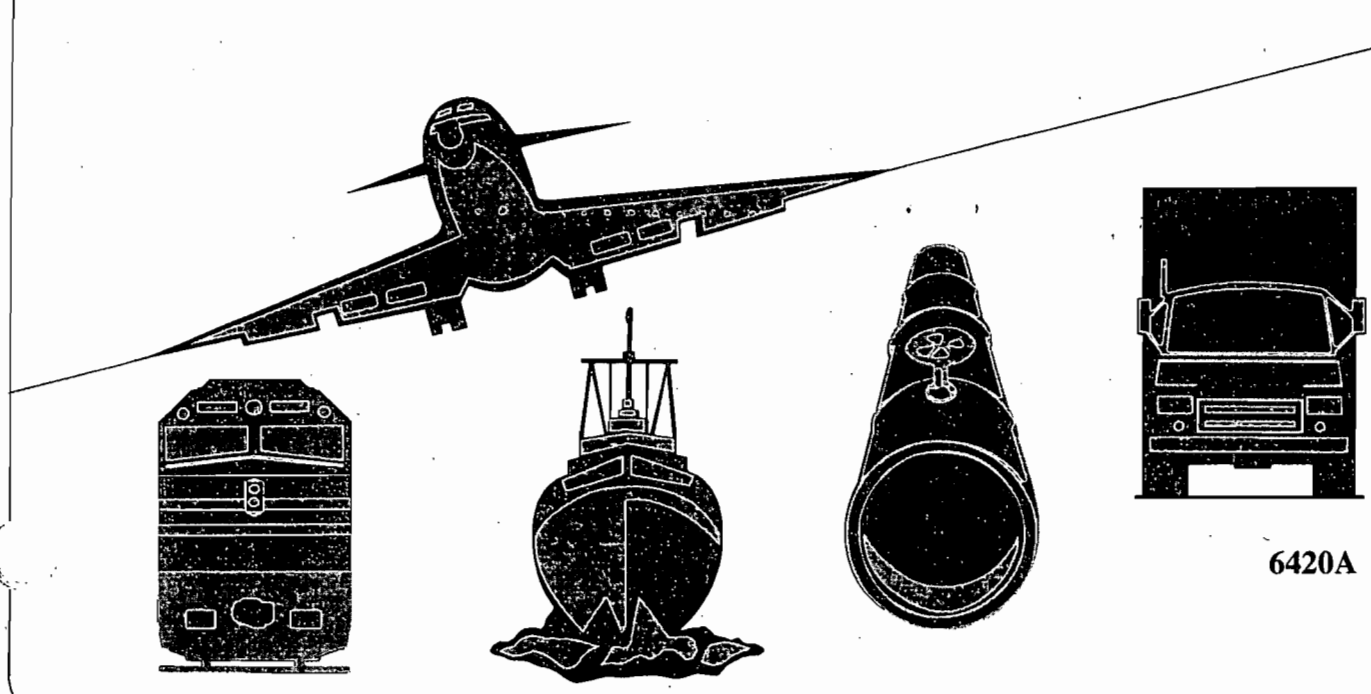
NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

RAILROAD ACCIDENT REPORT

**AMTRAK TRAIN 87 DERAILMENT
AFTER COLLIDING WITH INTERMODAL TRAILER
FROM CSXT TRAIN 176
SELMA, NORTH CAROLINA
MAY 16, 1994**



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Abstract: On May 16, 1994, the southbound National Railroad Passenger Corporation (Amtrak) train 87 collided with an intermodal trailer that had either fallen or was falling from a flat car on the passing northbound CSX Transportation Inc. freight train R176-15 (CSXT 176) near Selma, North Carolina. On Amtrak train 87, the assistant engineer was killed, the engineer sustained serious injuries, and 1 on-board service crewmember and 119 passengers received minor injuries. The operating crew on CSXT 176 sustained no injuries.

The major safety issues discussed in this report are the loading, securement, and inspection of intermodal trailers onto railroad flat cars and the crashworthiness of both the locomotive operating compartment and the fuel tank.

As a result of its investigation, the National Transportation Safety Board issued safety recommendations to the Federal Railroad Administration and the Association of American Railroads.

AMTRAK TRAIN 87 DERAILMENT AFTER COLLIDING WITH INTERMODAL TRAILER FROM CSXT TRAIN 176 SELMA, NORTH CAROLINA MAY 16, 1994

RAILROAD ACCIDENT REPORT

Adopted: March 21, 1995
Notation 6420A

NATIONAL TRANSPORTATION SAFETY BOARD

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ANALYSIS

EXECUTIVE SUMMARY

At 4:36 a.m. on May 16, 1994, the southbound National Railroad Passenger Corporation (Amtrak) train 87, Silver Meteor, collided with an intermodal trailer that had either fallen or was falling from a flat car on the passing northbound CSX Transportation Inc. freight train R176-15 (CSXT 176) at Selma, North Carolina. Amtrak train 87 consisted of a two-unit locomotive and 18 cars; CSXT 176 consisted of a three-unit locomotive and 52 cars. All but the last car of Amtrak train 87 derailed, and the next to the last car on CSXT 176 also derailed. On Amtrak train 87, the assistant engineer was killed, the engineer sustained serious injuries, and 1 on-board service crewmember and 119 passengers received minor injuries. The operating crew on CSXT 176 sustained no injuries.

The National Transportation Safety Board determines that the probable cause of the derailment of Amtrak train 87 was the failure of the CSX Intermodal Corporation loading crew to properly secure the intermodal trailer to the flat car on CSXT 176 and the failure of the CSX Intermodal Corporation to have in place a comprehensive inspection program.

The major safety issues discussed in this report are the loading, securement, and inspection of intermodal trailers onto railroad flat cars and the crashworthiness of both the locomotive operating compartment and the fuel tank.

As a result of its investigation of this accident, the Safety Board makes recommendations to the Federal Railroad Administration and the Association of American Railroads.

INVESTIGATION

Accident

At 4:36 a.m. on Monday, May 16, 1994, the southbound National Railroad Passenger Corporation (Amtrak) train 87, Silver Meteor, struck the intermodal trailer REAZ 232980 on the northbound CSX Transportation Inc. (CSXT) freight train R176-15 (CSXT 176), which was at milepost (MP) A162.5 on the CSXT Florence Division at Selma, North Carolina. Amtrak train 87 consisted of a two-unit locomotive and 18 cars traveling from New York City, New York, to Jacksonville, Florida. CSXT 176, consisting of a three-unit locomotive and 52 cars, was a trailer-on-flat-car/container-on-flat-car (TOFC/COFC) train en route to Kearny, New Jersey, from Tampa, Florida. (See figure 1.)

CSXT 176 left Tampa at 12:40 a.m. on May 15, 1994, and arrived at 2:28 a.m. at the Orlando, Florida, Taft Yard where the crew coupled 28 cars[1] to the train. After the crew made the coupling, the conductor inspected the train,[2] which then departed at 3:32 a.m. CSXT 176, according to CSXT records, met opposing trains at Satsuma and Winter Park, Florida, and no anomalies were reported. At 9:50 a.m., CSXT 176 arrived at the Jacksonville, Florida, Moncrief Yard; departed at 3:55 p.m. with a new crew, a three-unit locomotive, and 74 cars; and at 7:30 p.m., reached Savannah, Georgia, where the first 22 cars were uncoupled and left at the terminal. Another crew took over CSXT 176 at 9:09 p.m., and the train departed Savannah for Florence, South Carolina, arriving at 2:05 a.m. on May 16, 1994.

Another crew, consisting of an engineer and a conductor, took charge of CSXT 176 at Florence, and the train departed with 50 loaded and 2 empty cars at 2:10 a.m. Both crewmembers had gone on duty at 1:45 a.m. at Florence, their away-from-home terminal. Both were well rested, and according to CSXT records, both were qualified to operate in the territory and were in compliance with the Hours of Service Act. They stated[3] that at the Cromartie siding (MP A233), the crew of a stopped coal train observed CSXT 176 as it passed on the main track, east of the standing coal train. The CSXT 176 conductor said that as his train passed the stopped coal train, he saw someone on the ground whom he presumed to be the conductor of the coal train. After CSXT 176 passed the Cromartie siding, the coal train radioed CSXT 176 to acknowledge that everything looked fine on the freight train. The CSXT 176 conductor noted

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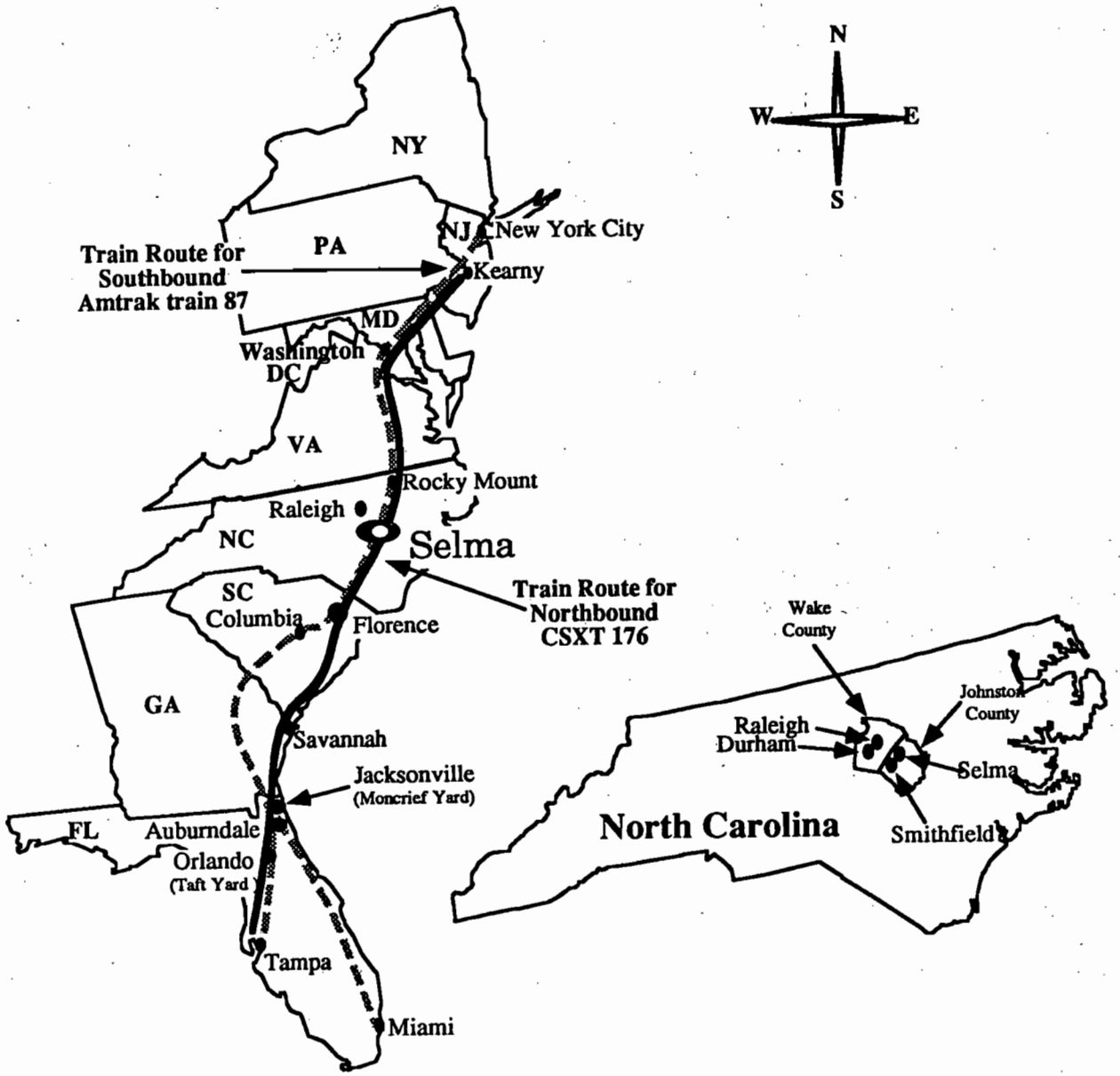
[1]These cars included car KTTX 251988 on which intermodal trailer REAZ 232980 was loaded.

[2]See the *CSXT Operations* section of this report for inspection procedures for operating crews.

[3]National Transportation Safety Board investigators took sworn statements on May 17, 1994, from the CSXT 176 crew and from the conductor, two assistant conductors, and a baggage handler on Amtrak 87.



Mileage		
Orlando	to Jacksonville	158 miles
Jacksonville	to Savannah	144 miles
Savannah	to Florence	204 miles
Florence	to Selma	132 miles
Total		638 miles

Drawing Not to Scale
Source: NTSB

Figure 1. -- Maps of North Carolina and of railroad routes.

that as his train passed the defect detector[4] at MP A165.9, it indicated no defects in the train.

The CSXT 176 engineer stated that the wayside signal at North Smithfield, North Carolina, where the track splits from single to double, had indicated that the freight train would be routed onto track 1. CSXT 176 proceeded northward from the main track onto track 1 between North Smithfield and Selma. (See figure 2.) The CSXT 176 crew received a clear signal indication[5] at the MP A164.4 signal as they saw Amtrak train 87 approach their location. Both the engineer and the conductor on CSXT 176 said they inspected southbound Amtrak train 87 passing on track 2. Once the passenger train had passed the lead unit on CSXT 176, the conductor radioed Amtrak train 87 and said the passenger train "looked good." Seconds later CSXT 176 went into unplanned emergency braking.

According to the Amtrak records, the operating crew of Amtrak train 87, consisting of an engineer, an assistant engineer, a conductor, and two assistant conductors, were qualified to operate in the territory and had sufficient off-duty time to be in compliance with the Hours of Service Act. The crewmembers went on duty at 10:20 p.m. on May 15, 1994, in Washington, D.C., and waited for the inbound train 87 from New York City, which was 20 minutes behind schedule when it arrived. According to the conductor, Amtrak train 87 departed Washington at 11:45 p.m., and made its regularly scheduled station stops.[6] The engineer stated that the assistant engineer operated the train from Washington to Rocky Mount, where the engineer took charge of the train. Amtrak train 87 departed Rocky Mount about 4 a.m. (10 minutes behind schedule). The conductor noted that he heard the engine crew call the "clear signals" as they approached Smithfield, North Carolina.

Amtrak train 87 was routed onto track 2 at Selma, and its engineer stated that about 4:36 a.m. as it was passing CSXT 176 on the adjacent track, he "saw this thing coming, I saw it hanging off. I hollered for [the assistant engineer] to hit the deck. I recognized something hanging off of one of the flat cars." Amtrak train 87 then collided with intermodal trailer REAZ 232980 that had been on the 51st car of CSXT 176.

After the collision, both Amtrak units and the next 17 cars derailed. (The second unit and all cars remained upright.) The lead unit broke free from the second unit, rolled 270 degrees over east of the tracks, and came to rest on the assistant engineer's side (see figure 3). (The assistant engineer's seat was on the left side of the lead engine control compartment.) The

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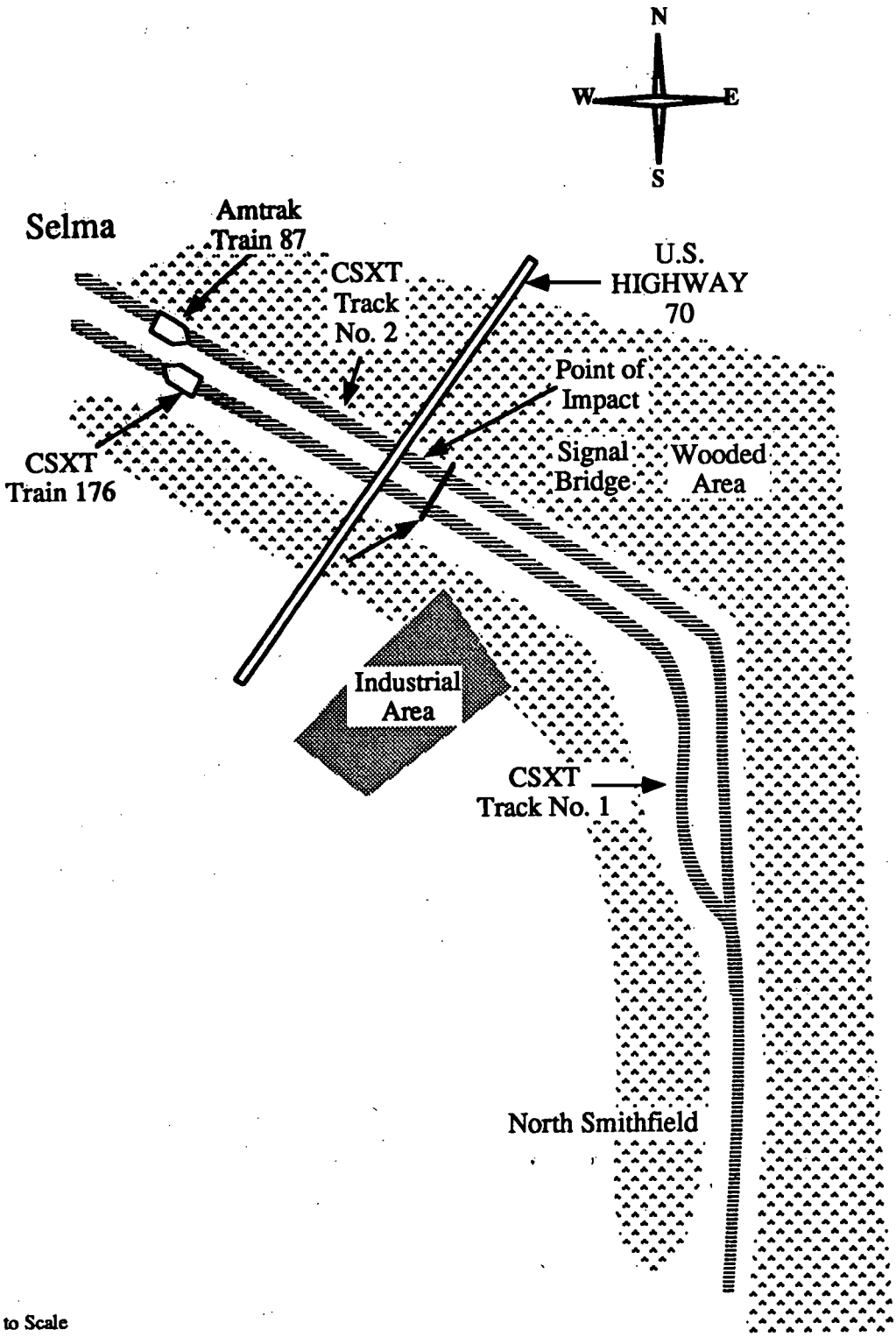
[4]A wayside infra-red device that scans a train as it passes over the detector measuring the temperature of the bearings on each axle. A detector also surveys any equipment dragging from a train. After a train passes over a defect detector, a synthesized voice announces the status of a train to its crew.

[5]Authorizes a train to proceed at the maximum authorized speed and indicates that no traffic is in the block and that all switches are lined for movement over the track.

[6]The last stop before the collision was Rocky Mount, North Carolina.



Drawing Not to Scale
Source: NTSB

Figure 2. -- Track split from single (main track) to double (tracks 1 and 2).

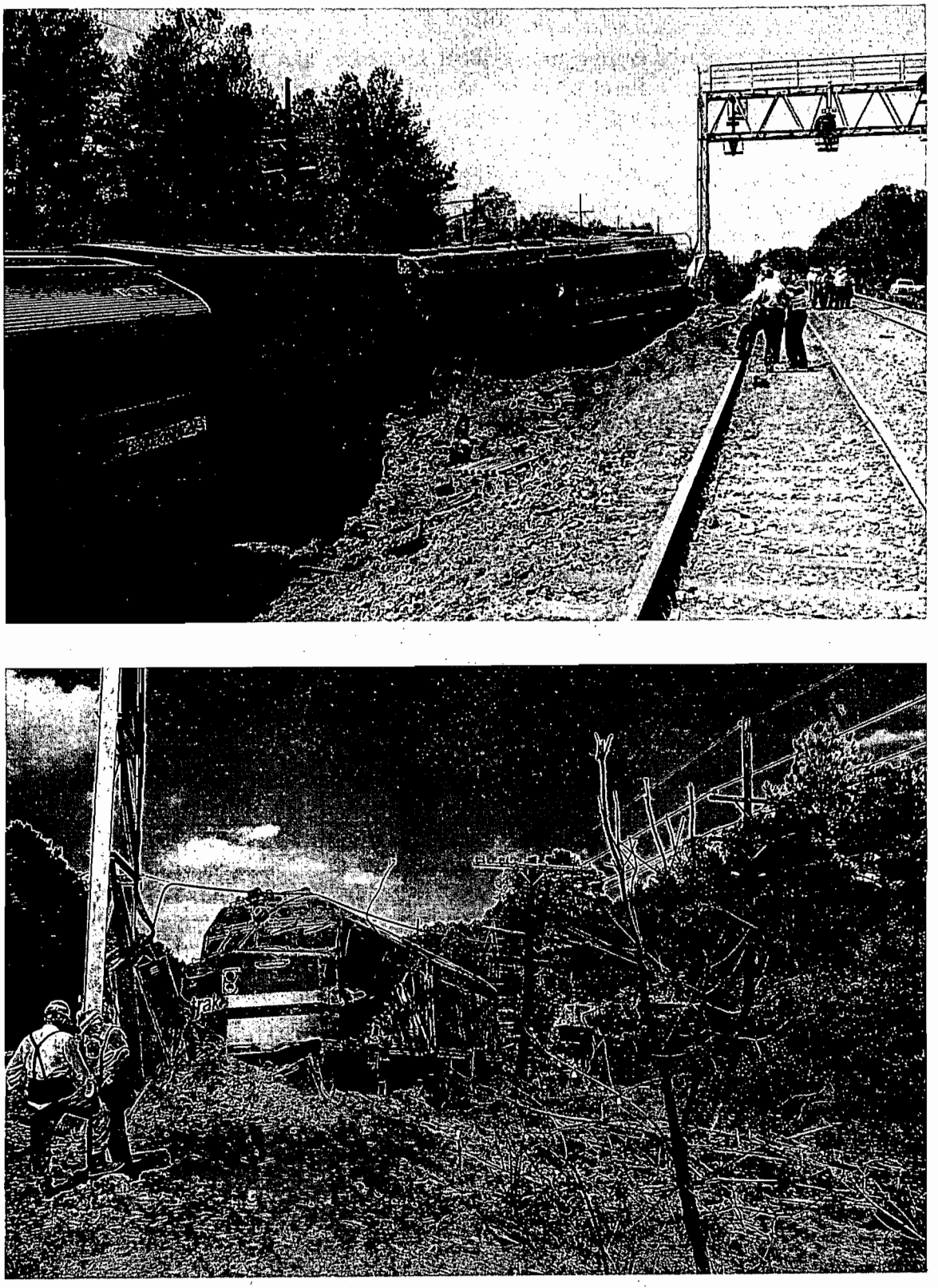


Figure 3. -- View of accident scene.

locomotive fuel tank ruptured during the accident sequence, and fire ignited outside the cab compartment from the spilled diesel fuel. The second unit came to rest east of track 2 against the signal cabinet at the base of a signal bridge. The derailed train had followed the second unit, and most of the derailed cars came to rest in a bog-like area east of track 2. The conductor attempted to call the engineer, received no response, and then contacted the CSXT 176 crew, using a hand-held radio, to summon help. At the same time, an assistant conductor exited the train and used a cellular telephone to contact emergency services.

On Amtrak train 87, the assistant engineer was killed, the engineer sustained serious injuries, and 1 on-board service crewmember and 119 passengers received minor injuries. The operating crew on CSXT 176 sustained no injuries.

Injuries[7]

Injury Type	Amtrak Train 87 Operating Crew	CSXT Train 176 Operating Crew	Amtrak 87 On-Board Service Crew	Passengers	Total
Fatal	1	0	0	0	1
Serious	1	0	0	0	1
Minor	0	0	1	119	120
None	3	2	17	296	318
Total	5	2	18	415	440

This table is based on the injury criteria of the International Civil Aviation Organization.

[7]Title 49 *Code of Federal Regulations* (CFR) 830.2 defines fatal and serious injuries, respectively, as follows: "any injury which results in death within 30 days of the accident" and "(l) Requires hospitalization for more than 48 hours, commencing within 7 days from the date the injury was received; (2) results in a fracture of any bone (except simple fractures of fingers, toes, or nose); (3) causes severe hemorrhages, nerve, muscle, or tendon damage; (4) involves any internal organ; or (5) involves second or third degree burns, or any burn affecting more than 5 percent of the body surface."

Damages

Amtrak and CSXT provided the following damage estimates:

Track	$ 60,000.00
Signal	75,000.00
Equipment	3,595,000.00
Total	$3,730,000.00

Track and Signal -- CSXT reported that 819 feet of track 2 and 234 feet of track 1 had to be replaced. Signal damage included seven poles of the CSXT communications pole line and one signal equipment case.

Amtrak Train 87 -- The two-unit locomotive received extensive damage. The lead unit had rolled over onto its left side and incurred massive damage to its frontal area. The second unit had severe impact damage to the left side of the operating compartment, where it was crushed inward 2 1/2 feet from the sliding window. The right side engine access door was heavily damaged. Both trucks were displaced.

All but the last car incurred damage from the derailment. The material handling car (ATK 1501) had scrape marks on its right side both front and rear. The baggage car (ATK 1229) had a 3-foot slash through the outer roof skin above the right rear door. The B-end collision post on the baggage/dormitory car (ATK 1611) was slightly bent on the left side. The other cars had damage at their ends and some slightly bent collision posts. The derailment and track structure damaged the running gear of most cars.

CSXT Train 176 -- Damage was limited to the last two cars on CSXT train 176. The 51st car (KTTX 251988) incurred damage to its decking, hitch mechanism, and B-end (hand brake location) safety appliances. The 52d car also had damage to its B-end safety appliances.

Personnel Information

Amtrak Train 87 Crew -- The 51-year-old engineer was hired by Amtrak as a locomotive engineer in 1986. He was recertified as an engineer on April 6, 1993, and had his last operating rules examination on October 15, 1993. (The successful completion of the rules examination qualified him to operate on the CSXT between Washington and Florence.) His last physical was in August 1993, and no problems were noted. On May 15, 1994, he ended his last tour of duty at 6:30 a.m.

The 41-year-old assistant engineer was hired by Amtrak in August 1986. He was recertified as an engineer on July 28, 1993, and had his last operating rules examination on March 30, 1994. (The successful completion of the rules examination qualified him to operate on the CSXT between Washington and Florence.) His last physical was in December 1993, and

no problems were noted. On May 15, 1994, he ended his last tour of duty at 6:30 a.m.

CSXT Train 176 Crew -- The 58-year-old engineer began as a fireman in 1953 and was promoted to engineer in 1960. He had operated trains for over 10 years on the Florence Division. His last physical was in December 1992, and no problems were noted.

The 49-year-old conductor began working with the railroad in 1963 and was promoted to conductor in 1965. His last physical was in February 1993, and no problems were noted.

CSXI[8] Loaders -- Employees, who work loading and unloading trailers at the CSXI terminal, receive on-the-job training (OJT) for the three ramp[9] positions: groundman, tractor driver, and packer.

The groundman stands on the ground and gives the packer hand signal directions for aligning and loading the trailer. He examines the indicator pin, locking jaws on the hitch, and the positioning of the trailer to determine whether the trailer has been properly secured. During unloading, he moves the hitch unlocking lever to the unlock position for the packer to remove the trailer.

The yard tractor driver operates a small, modified, specially equipped, truck tractor, which is used to position the trailers beside the railroad flat cars for loading and to move the unloaded trailers to designated parking areas for further disposition.

The packer operates a large, modified, hydraulic forklift, which is used to side-load trailers onto or off the railroad flat cars; he follows the hand signal directions of a groundman. The rubber-tired hydraulic loader has a special attaching device for intermodal trailers. It has two fixed and two folding legs that hang down on either side of a trailer, and the protruding feet at the end of each leg extend under the bottom side of the trailer for lifting. (See figure 4.)

The 52-year-old supervisor was employed as a part-time lift operator on July 10, 1993, and became the leadman of the second lift shift, a full-time position, on August 2, 1993. He supervises five employees and works with the loading crew on the weekday night shifts. His responsibilities include ensuring that the loading crew is properly trained to perform their duties. He trained most members of the loading crew, including the packer who serves as leadman during the weekend shifts. He had previously worked as a lift operator between 1964 and 1989 and as a terminal manager between 1989 and 1990 for the Seacoast Transportation Company, which merged with the CSXT in 1992.

The 28-year-old crew foreman, who worked under the direction of the supervisor, had

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[8]CSX Intermodal Corporation operates separately from CSX Transportation Inc. See the Operations Information section of this report.

[9]The area in which the trailers are loaded and unloaded is called the ramp.

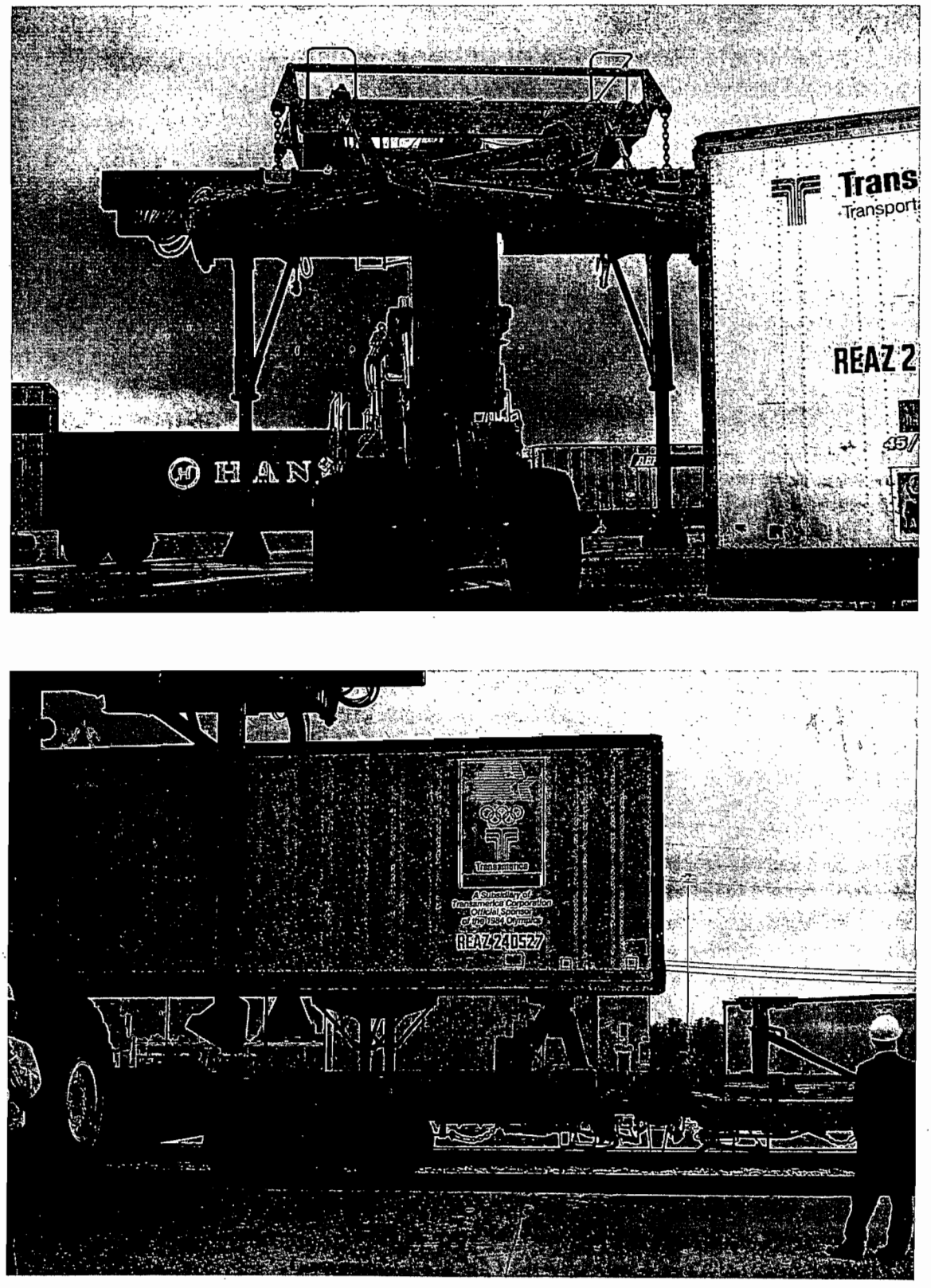

Figure 4. -- Trailer being loaded on flat car.

been employed as a lift operator on the weekend crew for the 5 months before August 2, 1993, when he changed his position. He then worked 9 months as an equipment operator "B,"[10] serving as the leadman for the weekend crew. He had received a course certificate of achievement on October 21, 1993, for truck operator training. His last performance evaluation was on May 2, 1994, in which his supervisor rated him average in each performance category. The evaluation written comments included: "very attentive to his job, safety conscious, and does a good job as leadman on the weekends. He needs to improve his tolerance of others and learn patience. In the future, it will be to his advantage to be exposed to supervisor training." He was approved on May 6, 1994, to advance to equipment operator "A"[11] and worked the entire shift on Saturday, May 14, 1994, as a packer.

The 22-year-old groundman was hired as a part-time equipment operator "T"[12] on November 11, 1993, and became a full-time employee on February 7, 1994, working the off days of the crew and the weekends. His last performance evaluation on February 10, 1994, described him as working in an "alert, if not over-cautious manner." He worked on Saturday, May 14, 1994, as a groundman and a packer.

The 49-year-old truckdriver had been with the CSXI for about 3 years. He had worked on the weekend lift crew as an equipment operator for over 5 months before being laid off (a decline in business lessened the need for drivers) on July 1, 1993, and reportedly had a good safety record during that time according to CSXI. He was rehired on August 2, 1993, as an equipment operator "B" and worked as a truckdriver, parking and lining up trailers. He had not completed training as a packer, but had received about 2 weeks of training as a groundman under the guidance of the supervisor and the crew foreman and had been approved to serve in that capacity. He had worked as a groundman toward the end of the shift on the night intermodal trailer REAZ 232980 was loaded at the Orlando Taft Yard.

The 36-year-old tractor driver was hired as a part-time equipment operator on February 1, 1994, and worked primarily as a driver. He had been trained as a packer and had received 1 week of training as a groundman from the weekend foreman. His last performance evaluation on February 15, 1994, concluded that he operated in a safe and alert manner. He drove a yard tractor on Saturday, May 14, 1994, and also worked as a groundman at the end of the shift.

Amtrak Train 87 Information

The train consisted of a two-unit locomotive (both F-40PH), a material handling car, 2 baggage cars, 10 coach cars, 2 lounge cars, a buffet car, a sleeper car, and a dining car. Lead

[10]The "B" designates a qualified groundman and tractor driver.

[11]The "A" designates a qualified groundman, tractor driver, and packer.

[12]The "T" designates a qualified groundman.

unit 357 and the trailing unit 325 were equipped with a Pulse MTR 48H8C-5 event recorder and a Bach-Simpson SIS paper tape speed recorder, respectively. The event recorder data and the paper tape were removed under National Transportation Safety Board supervision for review and analysis by its Vehicle Performance Division (VPD).

CSXT Train 176 Information

The train consisted of a three-unit locomotive and 52 cars (50 loaded and 2 empty) with a total of 4,449 trailing tons and a length of 6,188 feet. Lead unit 6231, the second unit 5936, and the third unit 5854 were equipped with Pulse MTR 48HO speed-only, Pulse MTR 48H8C-6, and Pulse TrainTrax F7 solid state event recorders, respectively. All event recorder data and recording media were removed under Safety Board supervision for its VPD review and analysis.

Car KTTX 251988 -- The fifty-first car on CSXT train 176, an 89-foot flat car designed to accommodate two 45-foot intermodal trailers, was owned by the TTX Company (TTX) of Chicago, Illinois. The intermodal trailers were loaded back-to-back with their end doors facing each other. Car KTTX 251988 was loaded with trailer REAZ 232980 on its north end and trailer CSXZ 238848 on its south end. The trailer hitches were on each end of car KTTX 251988. According to TTX, this car was equipped with:

> permanently erected hitches, not retractable hitches, positioned at opposite ends of the cars...the car could accommodate two trailers up to 45 feet in length...by allowing additional striker length and some overhang at the ends of the cars, therefore handling 90 feet of trailer on an 89-foot car.

Intermodal Trailer REAZ 232980 -- The trailer was built in 1983 by VanCo of Florence, New Jersey, and owned by TransAmerica Corporation. The shipper was Mid-Florida-Mining Company, in Lowell, Florida. It was loaded with 43,400 pounds of kitty litter, which was distributed, according to the shipper data, with about 32 percent of the lading over the fifth-wheel area of the trailer.

The 45-foot-long by 8.17-foot-wide by 13.34-foot-high trailer weighed 13,300 pounds empty. The underframe was corrosion-resistant high-strength low-alloy steel; the superstructure and side sheets were aluminum and galvanized steel; and the trailer box inside had a plywood lining.

The trailer landing gear[13] was a Homan vertical two-speed model AAR-50 with low profile, heavy duty sand shoes. Centered transversely about 7.5 feet from the kingpin axis and spaced to give an overall width not to exceed 7.34 feet, the landing gear was crossed braced

[13]The retractable support underneath the front portion of the trailer designed to keep the trailer level when it is not connected to a tractor or a hitch.

forward and aft with structural steel, and the braces were bolted to the legs and frame.

Hitch and Kingpin -- The model 6-L hitch that attached intermodal trailer REAZ 232980 to car KTTX 251988 was a cushion-fixed hitch with a semiautomatic locking head or top plate[14] designated "type III." This hitch was manufactured by the Amcar Division of ACF Industries, Inc. (ACF).[15] All model 6-L trailer hitches mounted on railroad flat cars are suitable for overhead trailer lift-on/lift-off. About 30,000 model 6-L hitches have been installed on railroad flat cars during the last 12 years, according to the ACF representatives.

Three basic hitch designs,[16] which includes type III, are found in intermodal trailer service. Type II and type III hitch heads have the same basic major parts that include a slotted top plate, a one-way gate at the entrance to the slot, a locking device within the slot, and operating or unlocking handles on each side. (See figure 5.)

The kingpin, which is attached to the trailer, is centered on the trailer bottom about 4 feet horizontally from the bulkhead end of the trailer. It is a short post-like device about 3 inches long and resembles a dumbbell with several stacked cylinders of which the center cylinder is smaller in diameter than the outer cylinders. The cylinder closest to intermodal trailer REAZ 232980 was 2.875 inches in diameter, the center cylinder was about 2 inches in diameter, and the bottom "knob" was 2.812 inches in diameter. The locking jaws of the type III model 6-L trailer hitch had an inside retaining ring that fit around the smaller center cylinder of the kingpin to prevent vertical and horizontal movement with the trailer loaded after the jaws were locked.[17]

Hitch Operation -- The proper operation of the hitch depends on the movement of the kingpin through the locking jaws, which presupposes the locking jaws to be in the correct sequenced position before any movement of the kingpin into or out of the hitch and the locking jaws. For example, when loading, the locking jaws of the hitch should already be in the open position ready to accept the next kingpin. The passage of the kingpin from the last trailer unloaded should open the locking jaws into a ready-to-load position. Should this sequence be interrupted, the operating handle and locking jaws must be manually reset by moving the operating handle to the unlock position and prying the locking jaws open with a pry bar.

To position a kingpin into the slot of the trailer hitch, the kingpin must first depress a spring-loaded hinged one-way gate at the entrance to the slot. The one-way gate, which allows

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[14]All hitch heads are designed similarly to the trailer locking plates found on semitrailer truck tractors.

[15]Previously known as American Car and Foundry.

[16]Type I is an ACF design with a manual lock head that folds into the flat car deck by using a screw mechanism; Type II is a Pullman Standard design that employs a rotating cam in the locking device.

[17]Design gap of 3/8 inch between jaws in locked position.

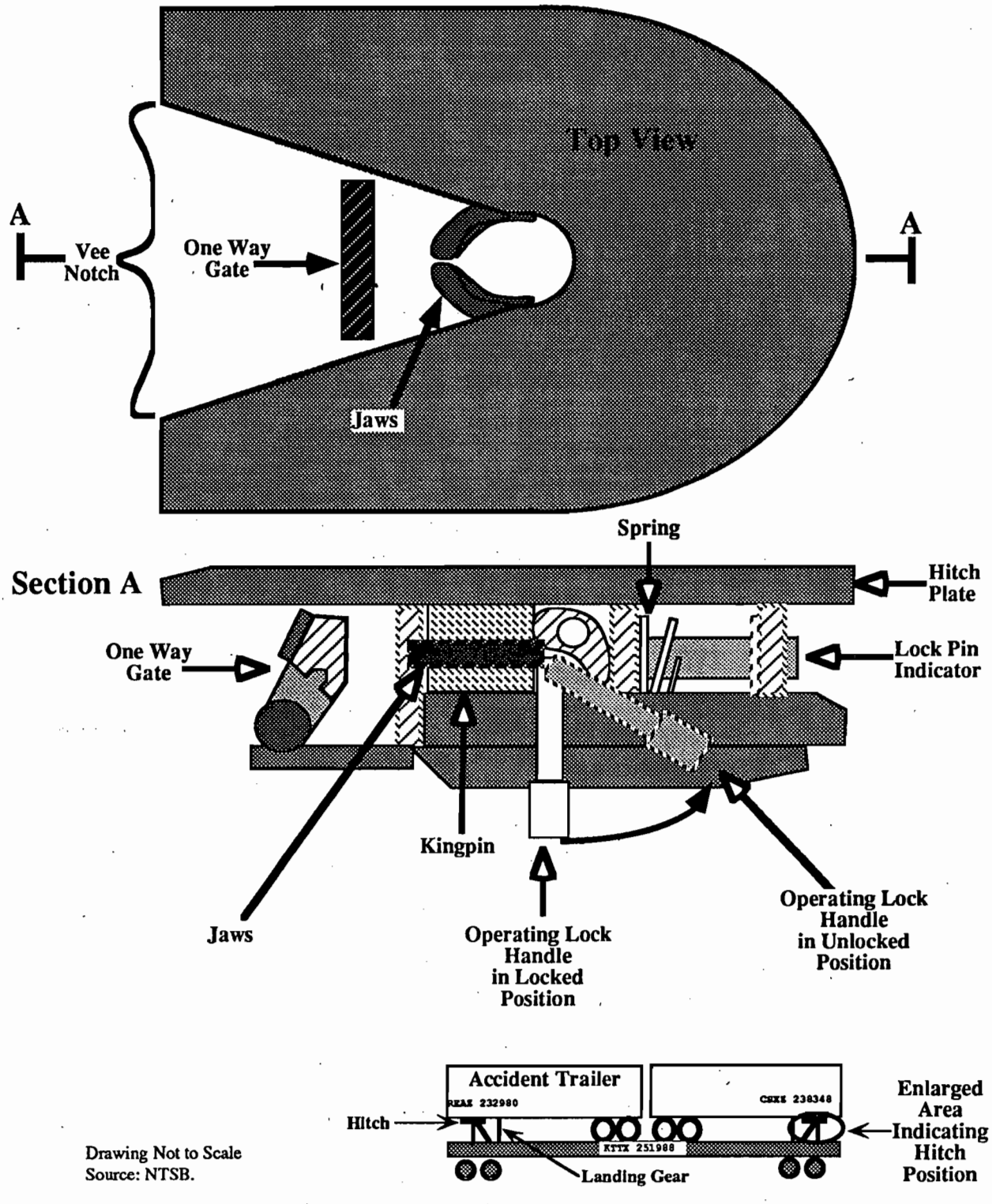

Figure 5. -- Intermodal trailer type III hitch and kingpin.

movement of the kingpin horizontally into but not out of the slot, is a redundant safety feature to ensure a kingpin does not slide forward beyond the hitch should the locking mechanism fail. The hitch is designed that should a kingpin not be moved completely rearward into the locking jaws during loading, the one-way gate will remain depressed and, thus, not prevent the kingpin from moving out of the hitch.

To remove a kingpin from the trailer hitch when unloading a trailer, the operating handle is manually rotated rearward until it stops, which unlocks the locking jaws. The kingpin is then moved forward, which opens and resets the locking jaws, and the kingpin rests against the one-way gate. The trailer with its kingpin free from the locking jaws is then lifted vertically for removal to complete the unloading.

Hitch Safety Features -- An indicator pin on the back of the hitch head is an integral part of the locking mechanism. It is sometimes painted a color that contrasts with the hitch mechanism as an additional safety precaution, which enables a loader to see it better. (The pin as well as the area around the opening for the pin on flat car KTTX 251988 was painted yellow.) When the pin is flush or slightly recessed to the head, the jaws and the handle are locked. When the pin protrudes (between 5/8 and 3/4 inch), the jaws are unlocked. The pin position indicates the status of the jaws (locked or unlocked) but does not indicate that the kingpin is locked into the jaws.

According to an ACF design drawing, one-way gates had a small metal flag attached to indicate whether the gate was depressed or up. The one-way gate flag was, according to the ACF representative, "used on a very few of the very early model 6 heads." Car KTTX 251988 did not have such a flag.

Hitch and Loading Inspection -- According to the testimonies of the CSXI loading personnel and of an ACF representative, several hitch areas can be inspected to ensure a trailer is properly locked into the hitch. The indicator pin would show that the jaws are locked or unlocked, and the one-way gate would remain depressed should the kingpin be out of position. In addition, the rotational position of the locking jaws under the hitch could be observed. Finally, looking between the top plate of the hitch and the bottom of the trailer, would reveal whether the trailer was fully resting on the top plate and that no "mislock" had occurred. (A mislock occurs when the kingpin enters the hitch slot about 1 1/2 inches too high, placing the bottom "knob" where the top cylinder should be. Upon contact with the kingpin, the locking jaws would close around only the lower cylinder; therefore, the kingpin is not vertically restrained because the locking jaws have not closed around the middle section of the kingpin.)

A mislock would be obvious because of the space between the trailer and the hitch top plate according to the CSXI loading crew. They stated that mislocks occur on occasion, but that the mislock is easily seen and corrected. None of the loaders remembered a mislock on the night of May 14, 1994, when intermodal trailer REAZ 232980 was loaded, and all four testified that they had sufficient lighting while working on the ramp.

Track and Signal Information

Track -- The accident occurred on the double-track line segment between MP A157.9 and MP A164.3,[18] which is owned, inspected, and maintained by the CSXT. The tracks were in a north and south direction, both geographically and by timetable, and were designated as number 1 main and number 2 main for the westernmost track and the easternmost track, respectively. The distance between tracks (center-to-center) was 13.35 feet. The minimum clearance between KTTX 251988 and ATK 357 would have been 3.42 feet. Approximately 40 million gross tons of traffic were hauled over the two tracks annually.

The maximum authorized speed on number 1 main track, according to the CSXT timetable, was 70 miles per hour (mph) for passenger trains and 45 mph for freight trains. The jointed rail track was maintained to meet or exceed the Federal Railroad Administration (FRA) class 4 track safety standards. The maximum allowable speed on number 2 main track, according to the CSXT timetable, was 79 mph for passenger trains, 70 mph for intermodal freight trains, and 60 mph for other freight trains. The continuous welded rail track was maintained to meet or exceed FRA class 5 track safety standards.

Track Maintenance and Inspections -- The maintenance was conducted to meet FRA track safety standards and to comply with CSXT maintenance practices. Spot maintenance was conducted as defects in the track structure were observed or reported. The inspection records between January 31 and May 13, 1994, indicated that the tracks were inspected twice weekly and the noted defects were repaired the same day.

Signal System -- Train movements in this area were governed by a Traffic Control Signal System in the Jacksonville CSXT dispatching center. The Selma signal at MP A160.0 was the last governing signal that Amtrak train 87 encountered; the Smithfield signal at MP A164.4 was the last control point signal that CSXT 176 encountered. The last defect detector that CSXT 176 would have passed was at MP A165.9, and it detected no anomalies on the train. No high/wide detectors[19] were on the CSXT 176 route between Orlando and Selma. During the signal tests performed after the accident, the signal system functioned as designed, and no anomalies were found.

Operations Information

CSXI Operations -- Both the CSXI and the CSXT are subsidiaries of the CSX Corporation of Richmond, Virginia, which reorganized the CSXI in January 1988 to operate separately from the transportation company. CSXI operates 33 intermodal terminals, 19 of

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[18]The mileposts descend in number from south to north.

[19]An electronic measuring device designed to detect cars or loads of excessive height or width or loads that have shifted.

which are referred to as core network terminals and are on CSXT tracks. (Taft Yard was a core network terminal.) The other 14 terminals are referred to as off-core terminals and are served by other railroads.

As part of their initial training as new employees, the groundmen, tractor drivers, and packers receive the CSXI manual *General Safe Operating Procedures for Loading and Unloading Trailers on Railcars*, which was developed after an employee fatality occurred in Philadelphia, Pennsylvania, on May 20, 1993. The Safety Board investigated the accident in which a railroad employee and a contractor crane operator were loading a trailer onto a flat car, and the trailer slipped and crushed the employee.[20]

The procedures manual discusses safety measures that can be taken by loading personnel, such as reducing the need to mount and dismount railroad equipment, ensuring that no employee is in a danger zone while lift equipment is operating, and standardizing practices throughout terminals. The manual addresses inspection after loading a trailer onto a flat car and advises:

> With the crane still attached to the trailer, but arm tension released and motion stopped, the trailer can be checked for proper positioning of the trailer and to verify that the jaws are locked around the kingpin.

The CSXI manual was distributed to the Orlando Taft Yard employees in November 1993. All four CSXI employees involved in the accident, who worked at Taft Yard, testified[21] that they were given a copy of this manual and were knowledgeable of the procedures.

A newly hired employee is designated as an equipment operator "T" during the first-level groundman training. The trainee works as a groundman under the direct supervision of the foreman for 3 to 4 weeks. As his confidence and ability increase, the trainee then works with less supervision, until both management and the trainee are satisfied with his performance. The trainee is considered qualified after 6 months and moves to the next position of responsibility and difficulty, which is the tractor driver. The employee is initially supervised while training for the tractor driver position, which is considered an equipment operator "B.". An equipment operator "B" can also serve as a groundman when needed. After becoming fully competent as a tractor driver, the employee is eligible for the equipment operator "A" position, which includes the packer position.

The OJT for the packer position is similar to the procedures for the other ramp positions; however, the size and sophistication of the loading machine requires more training time. The trainee spends time observing a qualified packer operator to learn the controls and then operates

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[20]For more information, refer to National Transportation Safety Board Regional Report NYC-93-FR-016.

[21]Safety Board investigators took sworn statements during deposition proceedings in Orlando on September 1, 1994.

the packer under the foreman's supervision. Less direct supervision is needed as the trainee acquires skill. The trainee is considered fully qualified as an equipment operator "A" (competent to perform all three ramp positions) when both management and the trainee are satisfied with his ability.

Four CSXI personnel worked the night shift at the Taft Yard on May 14, 1994, but no record documented who loaded which trailers onto what flat cars. The loading crew loaded and secured dozens of trailers on the night that REAZ 232980 was loaded at the terminal. All four CSXI personnel testified that they did not remember anything distinguishing about REAZ 232980 that would enable them to recall who had loaded it. As a result, neither management nor the loading crewmembers were able to determine who had loaded that trailer.

Each loading crewmember works three 8-hour night shifts (8 p.m. to 4 a.m.) during the week. On Saturdays and Sundays, they begin work at 4 p.m. and finish their tour of duty when the loading and unloading operations have been completed. (The crew supervisor works only the weekday shifts between 8 p.m. and 4 a.m.) On the Wednesday and Thursday before the Saturday, May 14, 1994, when REAZ 232980 was loaded, the packer and truckdriver worked their normal shifts, and the groundman and the truckdriver had those days off. All of the loading crewmembers worked on Friday night and reported having similar sleep routines. After their shift ended at 4 a.m., each immediately returned home, retired about 5:30 a.m., and slept between 7 and 8 hours. All reported to be well-rested before the Saturday shift, which began at 4 p.m. and finished about 9:45 p.m. None reported consuming alcohol in the 24 hours before the Saturday shift.

The loading crew supervisor was not on duty May 14, 1994, when the crew loaded the trailers for CSXT 176. During his regular weekday shifts before the accident, he reportedly made himself available for questions from the crew; however, he did not routinely check after them and only checked when they had a question about a hitch being properly locked. Only the loading crew foreman is available for on-site supervision on the Saturday and Sunday shifts.

CSXT Operations -- The accident site was governed by the CSXT timetable, effective May 1, 1994, and by superintendents' and train bulletins. At the time of the accident, no restrictions had been issued for the accident area. The CSXT timetable outlines the inspection procedures for operating crews to perform when adding cars to their train en route to its final destination. The operating rule 573 notes:

> Before leaving their initial station and at intermediate points where cars are picked up, unless instructed otherwise by the train dispatcher, conductors must ascertain that the cars in their train have been inspected, that brakes are in proper operating condition and that the necessary waybills and documents are on their train.
>
> Before permitting the train to proceed, the conductor must inform the train dispatcher, the engineer and other crew members concerning equipment or cars

in the train that restrict the train's movement or that require special handling.

When car KTTX 251988 was coupled to CSXT 176 at the Taft Yard, according to the CSXT 176 conductor, he inspected the braking systems of the car. The CSXT chief mechanical officer for equipment (CMOE) told Safety Board investigators that the train crew inspected the "running gear" of the train. The CSXT CMOE added that the policy is to observe only safety appliances and brakes. No anomalies were found to the train at the Taft Yard.

The CMOE also stated, "there is not a certification per se, but the bill of lading would specify that the shipper would be responsible to see that the lading was properly secured in the car or in the trailer." He said that CSXT views a trailer on a flat car as lading, and the "bill lading would specify that the shipper would be responsible to see that the lading was properly secured in the car or in the trailer. . . . We [CSXT] were responsible for inspecting the flat car and the components." According to the FRA, "Trailer/containers on flat cars are considered to be lading and damage to these is not to be included in on-track equipment damage."[22] Nothing specifically requires railroad employees to ensure a trailer and its contents are secured.

CSXT 176 was recoupled at Moncrief Yard and inspected by a CSXT car inspector who found no anomalies. According to the CMOE, the inspection at Moncrief Yard "includes. . .a walk-by inspection to see that the lading is in proper place. It's not a detailed inspection of the lading. . . ." When asked whether the inspector checked the securement of the trailer on a flat car, he responded, "Today they are. At the time of this incident, they were not." Once the train left Moncrief Yard, it had no further inspections.

Meteorological Information

The Raleigh-Durham (North Carolina) airport reported the weather conditions at 4:50 a.m. on May 16, 1994, as mostly cloudy skies, visibility of 7 miles, and a temperature of 65 degrees Fahrenheit. In addition, the CSXT 176 crew reported that the weather was clear.

Medical, Pathological, and Toxicological Information

The Amtrak train 87 assistant engineer, according to the North Carolina chief medical examiner's autopsy report, died of blunt force head trauma with massive basilar skull fracture and a subarachnoid hemorrhage. The Amtrak train 87 engineer was admitted in serious condition to the Duke University Medical Center in Durham, North Carolina, with a skull fracture, right ankle fracture, and facial lacerations. One Amtrak on-board service crewmember who had minor injuries was admitted to the Johnston County Memorial Hospital in Smithfield. Of the 119 passengers who sustained bruises and abrasions, 11 passengers were admitted to

[22] *FRA Guide for Preparing Accidents/Incidents Reports*, effective January 1, 1993, (DOT/FRA/RRS-22).

local hospitals for observation, and 108 passengers were treated in an emergency room and released.

In compliance with 49 CFR Part 219, Subpart C, blood and urine specimens were collected from crewmembers of the trains for postaccident toxicological testing. The CSXI loaders had no testing performed because as nonrailroad employees, they are not governed by the Hours of Service Act and, therefore, not subject to either random or postaccident toxicological testing. The CSXT 176 operating crew and the Amtrak train 87 crewmembers, except for the engineer, were taken to Johnston County Memorial Hospital, where blood and urine specimens were collected between 11:10 a.m. and 1:45 p.m.

The time (in hours) for the collection of specimens after the accident is:

CSXT 176 Crew	Blood	Urine
Engineer	6.5	6.5
Conductor	6.5	7.0
Amtrak 87 Crew		
Assistant Conductor	8.0	8.5
Assistant Conductor	8.75	8.75
Conductor	9.0	9.0
Assistant Engineer	9.5	9.5

The specimens were tested by Compu Chem Laboratories, Inc., a Department of Health and Human Services-approved laboratory in North Carolina. The laboratory reported negative drugs and alcohol test results for each crewmember, with the exception of the Amtrak train 87 engineer. The engineer had been seriously injured and transported to Duke University Medical Center where blood and urine specimens were taken 10 hours after the accident. The Compu Chem laboratory results on the engineer were positive for valium (diazepam) in his blood and morphine and temazepam (diazapam metabolite) in his urine. The alcohol and drug manager for the FRA contacted the University of North Carolina Hospital and reported that hospital records indicate that the engineer received valium during ambulance transport and morphine during emergency room treatment. As a result, the FRA has approved the Amtrak documented conclusion that these blood and urine tests were positive as a result of the legal administration of drugs during the emergency medical care the engineer received.

Postaccident Examination

Track -- The area between the point of impact (MP A162.59) and the south switch (MP A164.3), where the double main track began, was inspected and measured for cross level, alignment, and gage. The measurements taken on track 1 were within the allowable parameters of the FRA track safety standards. Investigators noted two FRA defects: a chipped switch point at MP A164.3 and a center cracked joint bar near MP A163.5. An inspection of the accident

site concluded that from the location of the derailment marks, the debris, and the derailed flat car, the impact point was at MP A162.59. No indication was found of any derailed or dragging equipment between the point of impact and the south switch.

Signals -- The signal supporting structures between the accident site and the south switch were inspected for any unusual marks as a result of being struck by protruding equipment or lading. No unusual marks were found to indicate that equipment or lading had been protruding beyond the confines of the railcars.

CSXT 176 Equipment -- The CSXT did not have any recent incidents of sabotage or equipment vandalism in the Moncrief Yard according to the CMOE. None of the trailers or containers on CSXT 176 were found unlocked or unsecured.

Representatives of the Safety Board, the CSXT, the FRA, and Amtrak examined CSXT 176 and found no significant defects. The three-unit locomotive and 50 cars of CSXT 176 that had not derailed were examined where they stopped on track 1. The end-of-train device with air gage was removed from the last car and placed at the end of the 50th car (TTWX 972882) for an initial terminal air brake test and inspection. Leakage was measured at 1.0 psi/min (pounds per square inch per minute), which was within the limits of the FRA regulations of 5.0 psi/min.

Flat car KTTX 251988 was found 40 feet north of the point of impact on its side and angled to the west side of track 1. (See figure 6.) Its A- and B-end were 4 and 24 feet, respectively, from the track. The flat car was righted and examined on-scene. The A-end hitch locking indicator pin was in the open position, and the remains of the second trailer, CSXZ 238848, was still attached to the B-end hitch. On May 17, 1994, Safety Board investigators examined the A-end hitch of KTTX 251988, on which the intermodal trailer REAZ 232980 had been mounted. Shiny marks were found on the front of the "vee notch" of the hitch throat; no other unusual signs of wear were noted. The jaws were closed, and the handle was in the full unlocked position (indicator pin extended about 1 1\4 inches). The hitch, which was laying in the road bed, was completely packed with rock, mud, and debris. The jaws were found in the locked position after the debris and mud were removed, and the hitch handle indicator pin was in the full unlocked position.

Marks were found on the platform of the derailed car KTTX 251988 where the foot plates of the REAZ 232980 landing gear contacted the deck, moved to the right side of the car, and marked a shallow indentation several inches in diameter into the metal on the car side "rub rail." The entire length of this rub rail had been painted yellow; however, paint was missing from the area containing the indentation mark. The bare metal was exposed about 7 1\4 feet along the rub rail of the car from the center of the hitch locking position. The Safety Board metallurgist noted that the exposed metal surface contained no corrosion. Smaller indentation marks, exposing bare metal surface, were noted near this indentation mark. Scrape marks were also noted on the floor of the railroad car. (See figure 7.)

Figure 6. -- Fifty-first car KTTX 251988 of CSXT 176.

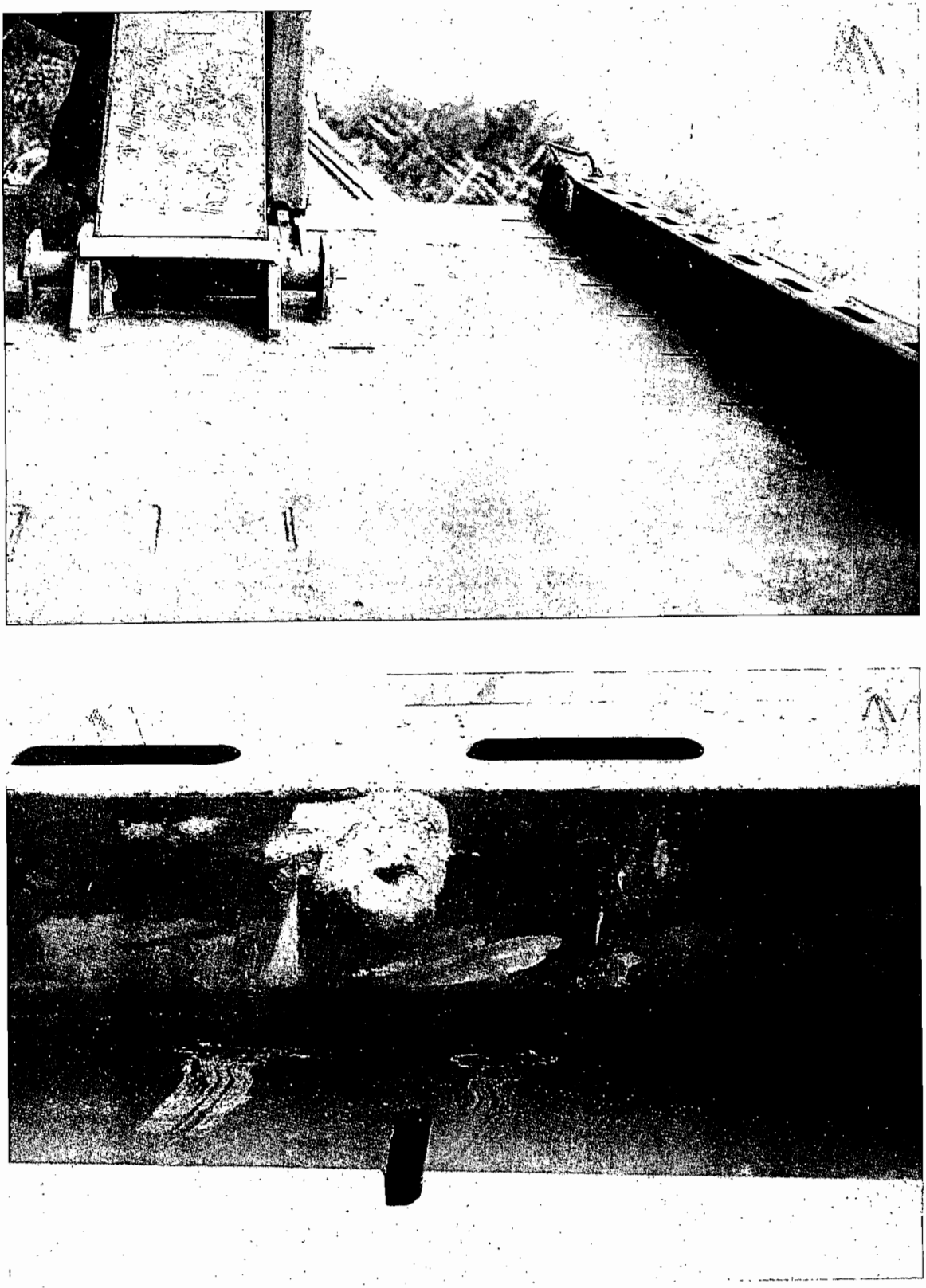

Figure 7. -- Photographs of marks found on rub rail.

Flat car KTTX 251988 and hitch were shipped intact to the TTX workshop in Hamburg, South Carolina, for disassembly and further mechanical inspection. Intermodal trailer REAZ 232980 had been destroyed with its contents spread over the point-of-impact area. The foot plates of the trailer landing gear could not be found. The kingpin and remains of the upper coupler plate of the trailer were found about 400 feet from the B-end of flat car KTTX 251988.

Flat car TTAX 653920 (last car on CSXT 176) had little damage to its running gear. Debris from trailer REAZ 232980 was imbedded in the sides of the intermodal trailers on the articulated car. Marks were found at the B-end of the car on the draft gear area and on the platform.

Amtrak Train 87 -- The lead unit had rolled 270 degrees over onto its left side, facing northeast and positioned opposite its original direction of travel. It came to rest 650 feet from the point of impact and about 145 feet east of track 2 and was covered with dirt and debris on all sides. The fuel tank was breached on its right side and ruptured. The spilled diesel fuel ignited, and a fire ensued. Amtrak crewmembers reported that they discharged fire extinguishers to curtail the fire.

The lead unit front hood showed contact damage from the right front corner extending inward toward the center line for 9 inches. The sheet metal that covered the right side of the front hood and the control compartment was torn and collapsed inward 1.5 feet. All windows, except on the left side of the control compartment, and both windshields were missing. The seats for the engineer and the assistant engineer had separated from their attachment points. The automatic brake and the emergency valve levers were found in the emergency position.

The second unit came to rest 767 feet from the point of impact and about 11 feet east of track 2. It showed damage on the left side from the forward control compartment wall extending rearward for the length of the control compartment, which included the engine access door. The damage extended from the roof line downward to the left side sill. The left side windows and the sheet metal below the windows were missing.

In several passenger cars, the emergency windows, the fire extinguishers, and the first aid kits had been removed. No intrusions occurred in the passenger cars. The fixed emergency lighting systems were not operating inside several passenger cars. Batteries and the wiring connecting the batteries to the lights were damaged as a result of the derailment.

Three of the injured passengers, interviewed after the accident, reported difficulty exiting the passenger cars because they could not see the emergency exit windows in the darkness. When they were finally able to escape through the doors leading outside, they said that they were not sure how far they were above a surface, which may not have been solid ground, because they could not see below the steps of the car.

Survival Factors

Emergency Response -- On May 16, 1994, at 4:42 a.m., the Johnston County Emergency Communications Center received a 911 call from an unidentified person reporting the train accident. The Johnston County dispatcher immediately notified fire, rescue, police, and emergency medical services (EMS) units. The Smithfield Fire Department was the first unit to arrive on scene at 4:48 a.m. and immediately commenced evacuating passengers from Amtrak train 87. A staging area was established at 4:55 a.m. in a parking lot adjacent to the accident site, and a command post was established at 5 a.m. An incident command system was implemented to coordinate all fire and rescue activities at the accident site, and the chief of the Smithfield Fire Department assumed the duties of incident commander. At that time, the Johnston County disaster plan[23] was put into effect. The CSXT dispatcher in Jacksonville, Florida, had been notified by the CSXT 176 crew and then contacted the Johnston County authorities about the accident at 4:46 and 4:47 a.m., respectively.

The Johnston County Memorial Hospital was advised immediately of the accident when the Johnston County disaster plan was implemented and made preparations to treat the incoming injured people. Sixty firefighters, 50 EMS personnel, and 30 police officers responded to and assisted in this accident. In addition, 5 fire engines, 1 tanker, 3 equipment trucks, 18 EMS vehicles, 2 brush trucks, and 25 police cars were on scene.

Disaster Preparedness -- The Johnston County Office of Emergency Management conducted a disaster preparedness exercise in January 1994, which simulated the evacuation of residents during a woodlands fire that spread into an urban area.

Norfolk Southern (NS) provided training for Johnston County emergency response agencies in February 1994. The 2-hour training session covered what commodities are shipped and where the NS routes are throughout the county.

Amtrak also provided training to Johnston County fire and rescue agencies in January 1995. The 3-hour training session included familiarization with Amtrak equipment, location of emergency gear, avoidance of high voltage electrical equipment after an accident, and evacuation of passengers from Amtrak trains.

The CSXT has not provided any hazardous materials or familiarization training to Johnston County emergency response agencies in the last 15 years, according to the Johnston County Office of Emergency Management director.

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[23]Provides a coordinated response by fire, police, and medical services to emergencies and disasters that occur in Johnston County.

Tests and Research

The Safety Board performed trailer overhang tests at the Orlando Taft Yard on May 19, 1994, to determine whether intermodal trailer REAZ 232980 may have fouled the width clearance limits of the passing Amtrak train 87 on the adjacent track. During the test, an identical intermodal truck trailer was placed on a TTX flat car, and a crane was used to turn the trailer askew. The test revealed that the trailer could overhang the car about 18 inches.

Flat car KTTX 251988 was taken to the TTX facility in Augusta, Georgia, where the A-end hitch was completely disassembled. Tests indicated that when the kingpin found at the accident site was placed in the hitch, the jaws locked around the kingpin. After disassembly, the Safety Board found that all mechanisms functioned as designed.

CSXT 176 Event Recorders -- The data packs from locomotive units CSXT 6231 and CSXT 5936 were in good condition when removed. The data from unit CSXT 5854 was extracted successfully using a laptop computer at the scene. The initial readouts of the data from CSXT 6231 and CSXT 5854 were under Safety Board direction and observation at the CSXT facility in Florence, South Carolina, on May 16, 1994; the subsequent Safety Board readouts were performed at the Safety Board VPD laboratory in Washington, D.C., on May 17, 1994.

CSXT 176 was traveling about 35 mph with the throttle in position 7 and the brakes released when it experienced an emergency brake application. The head, nonderailed section of CSXT 176 traveled about 955 feet in 40 seconds after it went into emergency braking.

Amtrak Train 87 Event Recorders -- No event recorder[24] data was available because locomotive units ATK 357 and ATK 325 were equipped with event recording devices that were inoperable at the time of the accident. The locomotives were not required to have event recorders.

The data pack from lead unit ATK 357 was found to have a break in its magnetic tape near the pinch roller. Further examination and subsequent disassembly of the data pack at the Safety Board VPD laboratory revealed that the magnetic tape recording media had become bound up internally so tape movement was prohibited, which in turn resulted in the capstan rotation wearing through the magnetic tape at the pinch roller. Such a failure would not be detectable by observing for rotation of the capstan, which is according to Amtrak its practice for determining whether the MTR-style event recorder functions before train make up.

The paper strip chart from trailing unit ATK 325 was found to have between one and two wraps around the recorder take-up spool and about 1.4 inches of atypical stylus-transferred data. Initial tests of the paper tape speed recorder and its components did not reveal any

[24]Federal regulations, effective January 16, 1995, require all trains that operate above 30 mph to have event recorders.

anomalies.

Federal TOFC/COFC Train Safety Study

After the accident in Selma, North Carolina, the Secretary of Transportation directed the FRA to assess TOFC/COFC safety. The FRA study[25] researched accidents/incidents and reviewed 63 TOFC/COFC loading sites across the United States. The FRA study found that 108 accidents/incidents were caused by TOFC/COFC loading problems between 1983-93. Sixty percent of those occurrences were attributable to improper loading; 30 percent were lading- or cargo-caused accidents; and 10 percent resulted from other causes. The study further noted that of the 7.2 million intermodal cars loaded in 1993, seven incidents were reported. Predeparture inspection procedures at the loading sites varied. Some companies reported a strongly enforced written policy of inspections to ensure proper loading and securement of the TOFC/COFC by an individual not in the loading crew.

The FRA study states:

FRA, in partnership with the industry, will promote the following actions to strengthen or eliminate safety weaknesses identified in TOFC/COFC loading operations:

1. require post-loading, pre-departure inspections of all loaded TOFC/COFC equipment by personnel other than the loading crew such as loading crew supervisors or carmen;

2. establish a uniform minimum set of training requirements to qualify TOFC/COFC loading crews throughout the industry;

3. establish required preventative maintenance intervals for TOFC/COFC securement systems that include cleaning and re-lubrication of critical moving parts;

4. develop standard operating procedures for safely loading TOFC/COFC equipment at each loading site;

5. discontinue the practice of collapsing defective hitches into the floor of the car and loading the car with containers without providing a means of positively preventing the defective hitch from being raised and used after it is unloaded;

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[25] *Trailer-on-Flat Car (TOFC) and Container-on-Flat Car (COFC) Loading and Securement Safety Report* to the Secretary of Transportation from the FRA Office of Safety, September 1994.

6. review design standards of trailers and containers to be loaded on TOFC/COFC equipment to ensure they are compatible with the various lifting modes while loaded to capacity; and

7. provide railroad oversight of the work of contractors performing TOFC/COFC loading work to ensure the contractors follow all the established safety procedures.

Intermodal Equipment Loading and Inspection

Federal Regulations -- The CFR does not address the loading and inspection of intermodal equipment. Title 49 CFR 215 Part D addresses the inspection to be done in the absence of a car inspector:

> At each location where a freight car is placed in a train and a person designated under regulation 215.11 is not on duty for the purpose of inspecting freight cars, the freight car shall as a minimum, be inspected for the imminently hazardous conditions listed below that are likely to cause an accident or casualty before the train arrives at its designation. These conditions are readily discoverable by a train crew member in the course of a customary inspection:
>
> 1. Car Body:
>   a. Leaning or listing to side.
>   b. Sagging downward.
>   c. Positioned improperly on truck.
>   d. Object dragging below.
>   e. Object extending from side.
>   f. Door insecurely attached.
>   g. Broken or missing safety appliance.
>   h. Lading leaking from a placarded hazardous material car.
> 2. Insecure coupling.
> 3. Overheated wheel or journal.
> 4. Broken or extensively cracked wheel.
> 5. Brake that fails to release.
> 6. Any other apparent safety hazard likely to cause an accident or casualty before the train arrives at its destination.

Industry Standards -- The Association of American Railroads (AAR) represents the major Class I railroads in North America, including Amtrak and the National Railways of Mexico as special members.

The AAR sets industry standards for certain equipment and components. The Safety

Board reviewed the open top loading rules that govern the loading of commodities on open top cars. Seven manuals contain the rules that cover over 600 loading practices specifying proper securement, bracing, and loading methods for open top loads. Other subjects include lumber and forest products, machinery, U.S. Department of Defense material, miscellaneous commodities, general rules, steel and steel pipe, and TOFC/COFC loading.

Manual seven, *Loading of Commodities on Open Top Trailers and Containers to be Handled in Trailer-On-Flat-Car (TOFC) Service and Container-On-Flat-Car (COFC) Service*, discusses intermodal shipments. This manual lists recommended practices for the loading of lading into trailers/containers for intermodal service transport. Manual seven, according to an AAR official during testimony, deals with flat bed type trailers rather than highway box type trailers. One reference in the manual addresses the placement of a highway type trailer on the flat car but does not address securement of a unit. The placement reference is to which end of the car a single trailer is positioned. The AAR official added that on May 14, 1994, the manual contained "nothing as far as securement of the trailer to the flat car." The AAR manual six, *Open Top Loading Manual for Military Equipment*, did address the loading and securing of military trailers onto railroad flat cars.

The February 21, 1995, AAR letter (see appendix C) detailed for the Safety Board the industry progress on intermodal securement handling issues outlined in the September 1994 FRA TOFC/COFC safety report. The letter specified that the AAR, in conjunction with the Intermodal Equipment Handling Task Force, has completed the following or plans to:

> Develop and implement an intermodal trailer and container securement manual (to be issued by March 1995).
>
> Develop and implement an inspection for locked position poster (to be issued by March 1995).
>
> Develop and distribute TOFC/COFC securement videos (to be issued by May 1995).
>
> Enhance the AAR recommended practices to include the addendum items regarding the loading, securing, and inspection of trailers onto flat cars (to be issued by June 1995).

Intermodal Operations Information

Safety Board Accident Investigations -- In the last 8 years, the Safety Board has investigated nine other accidents in which a shifted load or unsecured lading was involved. One involved an unsecured trailer that fell from a flat car, and two entailed a fatal injury to an operating crewmember.

On February 15, 1995, near Boarh, Idaho,[26] an Amtrak engineer and an assistant engineer sustained injuries when their passenger train struck a steel beam protruding from the side of a standing Union Pacific freight train. The accident is under Safety Board investigation.

On October 1, 1992, a Burlington Northern Railroad (BN) freight train derailed near Perham, Minnesota,[27] when a trailer fell and knocked the track out of alignment under the moving train. Two track gang employees witnessed the trailer fall from the flat car. The locking device on the fifth wheel hitch was found unlocked, allowing the trailer to come loose from the car. The trailer was loaded on the car by employees of a loading company under contract to the BN.

On September 2, 1991, near Silver Creek, New York,[28] a brakeman riding in the second unit on a Consolidated Rail Corporation freight train was fatally injured when two units were sideswiped by an empty steel cable spool projecting from the side of a gondola car. The car loading did not comply with the AAR open top loading rules. The steel bands used to secure the spools had been installed at a private shipper's facility, and the crimps on the bands were improperly executed and came loose.

On May 19, 1989, near Rochester, New York,[29] the fireman operating Amtrak train 49 was fatally injured when wooden boards protruding from a lumber car on a passing freight train crashed through the windshield and into the operating compartment of the lead unit. The seals used to clamp steel bands to secure the load were improperly crimped, and the defective crimp allowed the steel bands to slip through the seals. The shipper of the lumber found a defective tool had been used to crimp the seals.

Other Intermodal Incidents -- The Safety Board found that not all incidents of trailers falling off flat cars were included in the September 1994 FRA study. Accumulated information regarding incidents that involved TOFC/COFC shipments was not available in any data base. Although the CSXT had recorded 12 incidents that met the reporting criteria of the FRA or the CSXT property damage threshold of $6,300, the CSXT had other incidents of intermodal shipments falling from trains. One such incident, which did not meet the dollar damage reporting criterion, was in February 1994 when a trailer, loaded in Baltimore, Maryland, fell off a flat car near Micro, North Carolina, about 30 miles north of the Selma accident site. The cause of that incident, according to the CSXT, was an improperly secured trailer. The CSXI noted that on July 6, 1994, a trailer left the Orlando facility and had an unlocked hitch when it reached Jacksonville. A mechanical inspection determined the hitch to be mechanically sound,

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[26]National Transportation Safety Board Regional Report LAX-95-FR-007.

[27]National Transportation Safety Board Regional Report CHI-93-FR-001.

[28]National Transportation Safety Board Regional Report NYC-91-FR-024.

[29]National Transportation Safety Board Regional Report NYC-89-FR-008.

and the flat car was then released for service. At Mobile, Alabama, the same flat car was found to have the other hitch unlocked. The CSXI suggested "possible tampering en route."

Intermodal Operations Growth -- According to the AAR, intermodal traffic carloads have increased 186 percent over the last 10 years. The following table compares the other leading commodities hauled by the railroads during the same time period.[30]

Rail Traffic Growth
1983 Through 1993

Railroad Hauled Commodities	Increase in Revenue	Increase in Tonnage	Increase in Carloads
Intermodal	111%	148%	186%
Coal	3%	2%	-7%
Grain	18%	15%	13%
Chemicals	45%	47%	44%
All Commodities	15%	10%	17%

The intermodal figures pertain to essentially all U.S. rail industry traffic, whereas the other traffic data is based upon Class 1 railroads only. (These measurement differences are unlikely to be material.)

Computer-Generated Digitized Picture -- The CSXT uses a computer-generated digitized picture of all trains that go through the Savannah, Georgia, and Florence, South Carolina, terminals. The system has wayside digital cameras that take digitized pictures of the train as it passes. The digitized picture is used, according to the CSXT CMOE, "to verify the cars in the train, the car initial number and the placement of the cars in the train so that advanced consist [list] can be printed out and the terminals that are upstream from the train will know what to do with the cars." CSXT 176 was recorded at each location. (The Safety Board used the digital information in its analysis of this accident.)

[30]The AAR provided the information contained in this table.

Postaccident Developments

After the investigation of the Selma accident, the CSXI, the CSXT, and the AAR implemented several changes that involved the loading, securing, and inspecting of intermodal equipment by employees.

CSXI -- According to CSXI officials, they have implemented a new inspection procedure at all terminals requiring a sign-off inspection sheet for all loaders. Follow-up inspections are conducted by a loading crew worker other than the individual who served as groundman. The supervisors also do a follow-up inspection for all outbound shipments and now have an additional task of conducting inspections following the loading operation. The loading crew supervisor now inspects the hitches after all trailers have been loaded onto the flat cars. The CSXI also requires the follow-up inspector to sign a statement confirming the inspection has been conducted. According to the CSXI supervisor, he now carries a high-powered hand-carried light to better observe the securement of the hitches and trailers.

CSXT -- Car inspectors have been instructed, according to the CMOE, to look for improperly secured intermodal equipment when they perform the initial terminal air tests of the train.

AAR -- Manual seven, *Loading of Commodities on Open Top Trailers and Containers to be Handled in Trailer-On-Flat-Car (TOFC) Service and Container-On-Flat-Car (COFC) Service*, has been modified to address the securement of trailers onto flat cars as well as specifying the inspection of intermodal equipment at interchange points.

In response to the Selma accident, the AAR is developing a pocket manual on the loading and securing of trailers and containers onto flat cars. It is also producing a 20-minute videotape, designed for safety meetings, that presents the recommended procedures for loading and securing trailers and containers onto flat cars. The association is preparing wall posters that also illustrate these recommended procedures. All these AAR materials recommend that a separate inspection be made before the loaded flat cars are released to the railroads.

ANALYSIS

General

No unusual weather conditions were reported at the time of the accident. A review of the event recorder data from the CSXT 176 and the engineers' testimony indicated no deviation from accepted train handling practices. Neither operating crew reported any mechanical

problems while the trains were en route. The track inspections and measurements at MP A162.59 before and after the accident showed no defects or deviations from the FRA track safety standards. The signal system tests and inspections indicated the system functioned, as designed, before and after the accident. Therefore, the Safety Board concludes that the weather, train handling, train equipment, track, and signal system did not cause or contribute to this accident.

The CSXT 176 engineer and conductor were rested, were qualified to operate in the territory, and were in compliance with the Hours of Service Act. The Amtrak train 87 engineer and assistant engineer had recently passed the required rules examination to operate trains on the CSXT between Washington, D.C., and Florence, South Carolina. The medical records of both train operating crews showed no history of medical problems. The postaccident emergency medical care that the Amtrak engineer received accounted for the drugs found in his system. Toxicological test results for all other operating crewmembers were negative for drugs or alcohol. Therefore, the Safety Board concludes that the engineer and conductor of CSXT 176 as well as the engineer and assistant engineer of Amtrak train 87 were qualified for their duties and not medically impaired and that neither illicit drugs nor alcohol were factors in the accident.

Each member of the loading crew reported that he was well rested before his shift on the night REAZ 232980 was loaded. The crewmembers' work-rest cycle on the days before May 14, 1994, had not fluctuated from their normal schedules. Although the weekend shifts began at 4 p.m.and weekday shifts began at 8 p.m., the difference in time did not preclude the crew from obtaining sufficient rest before the Saturday shift. Because no postaccident toxicological testing had been required, none had been performed on the CSXI loaders, and it could not be determined whether the loading crew's performance was influenced by alcohol or drugs. Therefore, the Safety Board concludes that the CSXI loading crewmembers were not influenced by fatigue. In addition, the lack of a postaccident toxicological testing requirement precluded determining whether the loading crew's performance was influenced by alcohol or drugs.

Accident Sequence

On May 14, 1994, trailer REAZ 232980 was loaded at the Orlando Taft Yard onto flat car KTTX 251988 that departed the following morning on CSXT 176. While en route to Jacksonville, CSXT 176 encountered two opposing trains, and neither crew on the opposing trains observed any anomalies as CSXT 176 passed. At the Jacksonville terminal, CSXT 176 remained idle for about 6 hours. The train was reassembled with a new consist, inspected, and departed with a new crew. Proceeding north, CSXT 176 changed crews at Savannah, Georgia, and Florence, South Carolina. After Florence, CSXT 176 encountered an opposing train and a defect detector; no anomalies were noted. As CSXT 176 approached Selma, it was routed onto track 1 from the single main track. At this location, CSXT 176 met Amtrak train 87, and the north trailer REAZ 232980 that was on the 51st flat car KTTX 251988 of CSXT 176 either

fell or was falling from that flat car as the Amtrak lead locomotive unit passed it. The trailer had remained on the flat car for 636 miles from the loading location to the point of collision. KTTX 251988 and all but the last car of Amtrak train 87 derailed. The Amtrak engineer and assistant engineer in the lead locomotive unit were thrown about the interior of the control compartment once the collision occurred. The engineer sustained serious injuries and the assistant engineer died.

The clearance distance between the passing locomotive unit and the flat car at the collision point (MP A162.59) was about 3 feet.[31] Secured, the trailer would not extend beyond the sides of the flat car. Safety Board investigators found that the trailer could extend only 18 inches. If the trailer extended less than 18 inches over the side of the flat car, it would still be clear of the adjacent track at the point of collision. No indications of anything dragging beside or behind CSXT 176 south of the point of collision were found. In addition, the Amtrak engineer stated that when he first observed trailer REAZ 232980, he could not distinguish whether it had fallen or was falling off flat car KTTX 251988. Therefore, the Safety Board can only conclude that REAZ 232980 had either fallen or was falling from KTTX 251988 when the Amtrak locomotive unit struck it.

The major safety issues discussed in this report are the loading, securement, and inspection of intermodal trailers onto railroad flat cars and the crashworthiness of both the locomotive operating compartment and the fuel tank. The Safety Board also again addresses the issue of emergency lighting for passenger cars.

Trailer Securement

The Safety Board reviewed whether a trailer loaded and properly locked in the ACF type III intermodal hitch would not disengage until being unlocked. This situation is evidenced by the remains of the second trailer, CSXZ 238848, on flat car KTTX 251988 found at the accident site. After KTTX 251988 had uncoupled from the train, rotated 180 degrees horizontally, and dragged about 60 feet in the ballast, the kingpin of CSXZ 238848 remained in the locked jaws of the south end hitch on KTTX 251988. Even under these catastrophic circumstances, the hitch and its locking mechanism worked as designed.

In considering how trailer REAZ 232980 could have dislodged from and come off flat car KTTX 251988, investigators focused on the kingpin and hitch condition, the position of the hitch mechanism, the rub rail mark on the flat car, the digitized pictures from the wayside cameras, and vandalism.

Kingpin and Hitch Condition -- Upon postaccident testing, the REAZ 232980 kingpin performed as engineered. Examination and measurement of the kingpin found no design or

[31]The distance between tracks (center-to-center) was 13.35 feet. The width of ATK 357, including hand rails, was 10.66 feet. The extreme outside width of KTTX 251988 was 10.08 feet.

specification defects. The hitch also functioned as designed, and the individual hitch parts had little, if any, wear. The kingpin and hitch were found to be mechanically sound.

Position of Hitch Mechanism -- The hitch was found with its locking jaws in the closed position and the operating handle in the open or unlocked position. The pin locking indicator was extended in the unlocked position. Shiny marks were found on the front of the "vee notch" of the hitch throat where none should be because under normal operation, this area is not subject to striking or rubbing by a kingpin. By design, the locking jaws can only be opened by the passage of the kingpin or by prying the jaws open if the operating handle is in the unlocked position. Likewise, the locking jaws can only be closed by the passage of the kingpin rearward into the jaws or by striking the jaws with sufficient force.

Flat car KTTX 251988 overturned away from Amtrak train 87 in a reaction to the sudden unloading of trailer REAZ 232980. With this occurrence, the hitch operating handle was dragged through the railroad ballast and rotated to the unlocked position, moving the indicator pin to the unlocked or cocked (ready-to-load) position. The force necessary to rotate the handle to the unlocked position was about 50 foot pounds, well within the expected force of the moving derailed flat car.

Unlike the operating handle, it is improbable that the locking jaws could have been moved to a closed position by the derailment dynamics or the hitch being dragged in the ballast. The locking jaws are recessed in a protected position and must be struck sharply and forcefully to close. The shiny marks found on the front of the "vee notch" of the hitch throat indicate that a kingpin had recently struck or rubbed in an area not usually in contact with a kingpin while in transit. After considering the shiny marks, the final position of the derailed flat car, the derailment forces derailing only KTTX 251988, and the impact force needed to close the recessed locking jaws, the Safety Board determined that the locking jaws were closed at the time of the derailment and not as a result of the derailment. The Safety Board, therefore, concludes that trailer REAZ 232980 was out of position for satisfactory securement in the hitch and the kingpin was not within the locking jaws of the hitch mechanism.

Rub Rail Mark on Flat Car -- The landing gear of a properly loaded trailer or its foot plate should not contact the rub rail of a flat car. The rub rail should have contact only with the tandem rubber tires of the trailer. The landing gear and its foot plate could contact the rub rail only if a trailer is displaced to one side. For a trailer to be so displaced, the kingpin must also be displaced from the hitch and its locking jaws. The shallow, shiny, freshly made depression mark found worn into the rub rail of KTTX 251998 could have been made by the landing gear foot plate of the displaced REAZ 232980. Further, since no other trailer part or equipment could have made the mark, it must have been made by the displaced trailer REAZ 232980. Because no signs of corrosion were on the exposed area of the rub rail and the location corresponded to the area where the landing gear would be if a trailer was out of the hitch, the Safety Board, therefore, concludes that the rub rail mark had to be made by the displaced trailer REAZ 232980.

Digitized Pictures from Wayside Cameras -- Investigators explored the feasibility of using the wayside camera digital technology to detect unsecured trailers and prevent potential accidents. (See figure 8.) They determined this technology would not be adequate for detecting an unsecured trailer as some flat cars in intermodal service are designed for the trailer to extend over the couplers of the car. (The representative for TTX noted that KTTX 251988 was designed for "some overhang at the ends of the cars.") Because some flat cars are of this overhang design, it would not be reasonable to expect an individual to view computer-generated digitized pictures and note whether a trailer is dislodged from the hitch.

The crew on the stopped coal train at Cromatie siding (MP A233) on May 16, 1994, had observed CSXT 176 as it passed and radioed CSXT 176 to acknowledge that everything looked well on the freight train. The railroad personnel on the ground observing CSXT 176 were at a better vantage point than the wayside cameras at the Savannah and Florence terminals. The railroad personnel were closer to the moving CSXT 176 than were the cameras, and the coal train crew noted no anomalies. That situation only enforces the premise that the computer-generated digitized pictures would likely not be useful in detecting a trailer improperly secured in the hitch because the digitized pictures lack sharply distinct definition.

Vandalism -- During the Safety Board deposition proceedings, a CSXI representative noted that vandalism may have been incidental in this accident. No other CSXT 176 trailers/containers were found during the postaccident investigation to have been tampered with. Also, two points make vandalism less likely to have been contributory to the accident: the position of the locking jaws and the hitch design.

First, the locking jaws being found in the closed position contradicts the trailer being properly secured when the kingpin came out of unlocked jaws, as this condition would have left the jaws in the open not closed position. The handle may already have been in the unlocked position from vandalism at the time of the accident; however, the jaws would have been found in the open position. The only extended period of time that the flat car was idle was for 6 hours in Jacksonville on May 15, 1994. (The CMOE testified that CSXT had no record of vandalism in the Jacksonville area at the time of the accident.) At all other times on the trip from Orlando to Selma, the flat car was only idle for minutes during crew changes or train switching movements.

Second, the hitch design discounts vandalism. The hitch design limits the possibility of the trailer coming free from the confines of the hitch itself. Had the trailer been properly loaded, the one-way gate would have prevented the kingpin from horizontal movement off the hitch. Therefore, the Safety Board concludes that no evidence of vandalism was present.

To determine why the kingpin was not locked and properly secured within the locking jaws and its retaining ring when the trailer was loaded, the Safety Board considered three possibilities: first, the locking jaws were already closed when the trailer was loaded; second, a mislock could have occurred; and finally, a combination of the previous two possibilities. (See figure 9.)

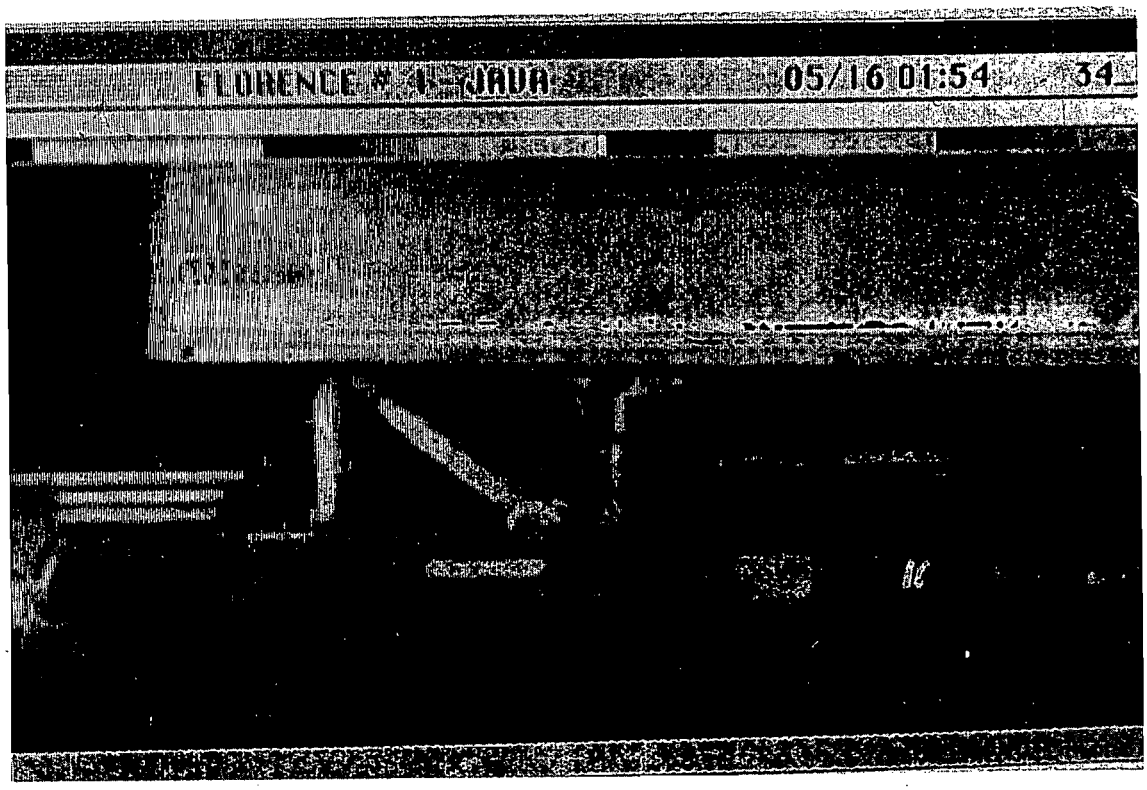
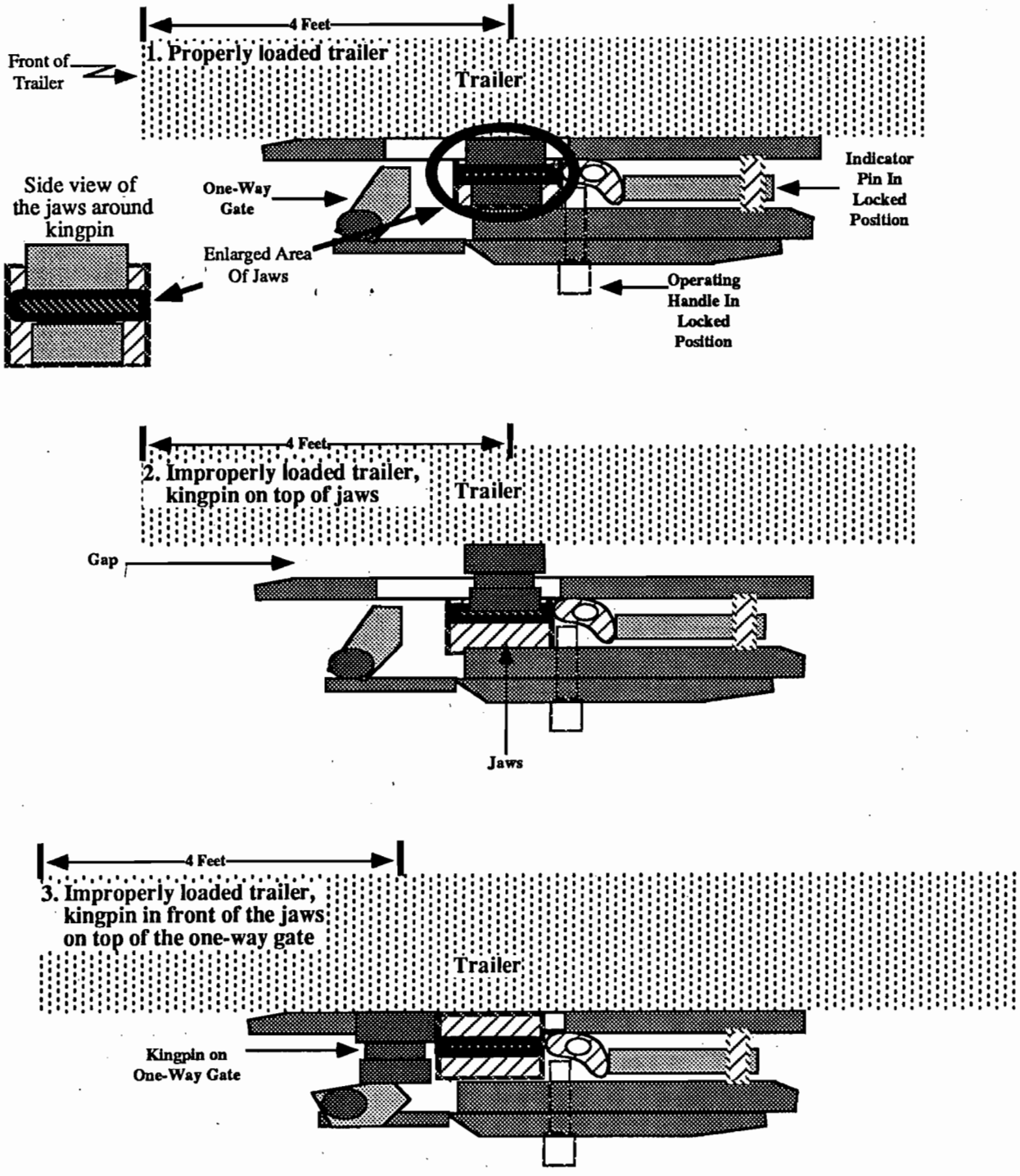


Figure 8. -- Digitized picture showing trailer position, as opposed to secured position.



Drawing Not to Scale
Source: NTSB

Figure 9. -- Side views of trailer locked and mislocked on an intermodal hitch.

Locking Jaws Closed -- If the locking jaws of the hitch were already closed when the trailer was loaded, the kingpin would rest in contact against the front of the closed locking jaws, where the shiny marks were found. The kingpin would still depress the one-way gate, and the locking indicator pin would be flush with the hitch head in a proper locked position. Unless a loader looked carefully, it would appear, according to the locking indicator pin, that the trailer was locked in place. The trailer would have been unrestrained in this position and could move forward over the depressed one-way gate and out of the hitch slot. The displacement between a properly secured locked trailer and this unsecured position would be about 6 inches horizontally, not much distance compared with the 45-foot trailer on the loaded 89-foot flat car. Initially, the handle would be down in the locked position, which should have been noticed. After loading, the handle would have appeared to be in the proper position.

This misload would be difficult to detect by the groundman who is usually on the ground to the rear of the hitch, observing the locking indicator pin and the positioning of the trailer bottom to the hitch plate. If the locking jaws were closed, the indicator pin would be in the locked position. If the trailer was positioned so that the kingpin was forward of the hitch, the trailer bottom would rest flush on top of the hitch plate. Thus, the trailer would appear secured into the hitch to the groundman.

Mislock of Trailer on Hitch -- A mislock would occur when the kingpin enters the locking jaws of the hitch about 1 1\2 inches too high, triggering the locking jaws to close around the kingpin but not engaging the vertical retaining ring. The one-way gate would be in the up position, and no vertical restraint would be provided. The kingpin would lift up and over the one-way gate beyond the hitch if the vertical force components between the trailer and the hitch exceeded the vertical loading of the trailer at the kingpin. The trailer was heavily loaded toward its front over the kingpin, requiring much greater horizontal force to generate vertical lift than if the load had been evenly distributed.

The workers involved with loading trailers testified that a mislock is an obvious phenomenon. They stated that a mislock is easily seen because the vertical gap between the bottom of the trailer and the top of the hitch plate is apparent. Safety Board investigators agreed that a mislock could be easily seen after witnessing a mislock demonstrated by the CSXI personnel at Orlando. Investigators determined that if properly inspected, a mislock of a trailer would probably have been detected.

Closed Locking Jaws and Mislock Combination -- A combination of closed locking jaws and a mislock could have occurred because when a mislock occurs, the hitch locking jaws must be reset after the operating handle is moved back to the unlocked position either by moving the kingpin back out the hitch slot and opening the jaws or vertically lifting the trailer out of the hitch by prying the jaws open.

When a mislock was detected, the trailer was lifted vertically out of the hitch, and the jaws would be reset. For whatever reason, the operating handle was not moved to the unlocked position, and the jaws were not reset. The trailer was then reinserted into the hitch slot as

though the jaws were open, placing the kingpin up against the closed jaws unsecured and still resting on the one-way gate. Without close examination, the trailer would appear to be locked and secured into place; however, it could easily move forward over the still depressed one-way gate and out the front of the hitch slot. Since the loading crew stated that they did not reposition any trailers, it is unlikely that a combination of closed locking jaws and a mislock occurred.

Based on the evidence present, the possibility that the locking jaws were already closed when trailer REAZ 232980 was loaded onto flat car KTTX 251988 appears the most likely circumstance. Regardless of why trailer REAZ 232980 was not secured, the rub rail marks found on derailed flat car KTTX 251988 indicate that trailer REAZ 232980 was out of the hitch before CSXT 176 arrived in Selma. Therefore, the Safety Board concludes that trailer REAZ 232980 was improperly loaded and not secured onto flat car KTTX 251988 when it departed the Orlando Taft Yard. To determine whether a procedural failure in loading the trailer may have taken place, the Safety Board reviewed the loading operations.

Loading Operations At Taft Yard

The Safety Board explored the factors that might have affected the performance of the CSXI loading crew that did not detect the misloaded trailer. Because the CSXI procedures did not include documenting which crewmember was responsible for loading each trailer, the Safety Board could not determine who loaded the accident trailer. Therefore, the Safety Board examined those factors common to the crew performance, which included training and the adequacy of the inspection procedures.

Loading Crew Performance -- The Safety Board found that the CSXI loading crewmembers were technically competent to properly load and secure the trailers to the flat cars. The CSXI trains its loaders to work first as a groundman, who is responsible for determining whether a trailer has been properly secured to a flat car. All of the loading crewmembers, including the two workers who served as groundman, had been trained in accordance with company policy to perform the duties of a groundman. Those crewmembers who had worked as a packer and a truckdriver were also adequately trained to perform their specific loading duties. The workers had previously operated the type of hitch used on trailer REAZ 232980, and each crewmember was also familiar with the equipment needed to load and secure trailers onto flat cars when trailer REAZ 232980 was improperly secured. The Safety Board, therefore, concludes that the loading crewmembers were adequately trained to properly load and secure trailers onto flat cars.

Inspection Procedures -- A groundman can confirm that a trailer has been properly secured and not misloaded only after examining several pieces of equipment and cannot rely solely on the position of the indicator pin. During a mislock, for instance, the indicator pin being flush with the hitch indicates that the jaws are closed; however, the flush position does not confirm that the kingpin of the trailer has been correctly placed inside the jaws. Therefore, to detect a misloaded trailer, a groundman must examine the indicator pin, the locking jaws,

and the placement of the trailer. The loaders testified that a groundman can readily detect a misloaded trailer by following inspection procedures, but no mechanical device on the hitch alerts the loaders to a mislock.

A groundman's view, where he would normally stand, would be obscured in the loading operation by the overall hitch mechanism should a trailer be placed on the hitch with its kingpin on the one-way gate. Two visual cues would indicate a properly locked trailer in the hitch: the indicator pin in and no gap between the bottom of the trailer and the top of the hitch. Thus, it is conceivable for a groundman to assume that the trailer is locked in the hitch because of the appearance of these cues. However, a thorough inspection of the hitch would reveal the kingpin not in the jaws but on the one-way gate. If the kingpin is visible, the trailer is not properly secured in place.

The positioning of the misloaded trailer should have provided sufficient evidence that REAZ 232980 was not properly secured. Either the groundman did not follow the procedures to inspect the equipment for a misloaded trailer, or he performed the inspection according to procedure but did not detect the unsecured trailer. The groundman is the only crewmember in a position to detect an improperly loaded trailer. The Safety Board could not conclusively determine why the groundman did not identify the misloaded trailer.

The yard supervisor assigned work duties to the employees and also worked as a packer or in any other capacity that involved the loading and unloading of trailers. Because he did not work on weekends, he was not present when trailer REAZ 232980 was misloaded.[32] Nevertheless, the duties and inspections performed on a weekday are the same as performed on a weekend. Although the supervisor was not present, the loading procedures and operations should not have differed. The supervisor's presence in the yard during the week may ensure disciplined operations; however, his absence should not affect the method in which the operations are performed on a weekend.

Although the crewmembers responsible for loading the trailers onto the flat cars were capable of performing these operations, the CSXI did not have adequate procedures to ensure that a loader error, resulting in an improper securement of a trailer, could be detected and corrected. The CSXI loading procedures implied a hitch inspection by the loader only when the trailer was initially loaded. The procedures did not specify a separate inspection by another loading crewmember or supervisor after all trailers had been loaded onto the flat cars.[33]

The Safety Board determined that the one inspection of the hitches did not provide the loaders with the opportunity to detect an unsecured trailer. Before the accident, according to

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[32]The leadman assumed the supervisory responsibilities for the loading operations when the supervisor was absent.

[33]At the time of the accident, no uniform industry procedures or standards addressed the loading and inspection of trailers onto flat cars.

the September 1994 FRA study, some industry loading facilities had comprehensive inspection of hitches performed by a supervisor before a train departed, which ensured that all the trailers were properly secured. In some of these facilities, the supervisor's separate inspection detected a misloaded trailer, and the loaders then corrected the problem. The Safety Board concludes that the CSXI did not have a comprehensive inspection procedure to ensure that an unsecured trailer would be detected and the problem corrected. However, the Safety Board understands that since May 16, 1994, the CSXI has changed its postloading inspection process for trailers on flat cars to better ensure all trailers are locked in place before transport. The Safety Board commends the CSXI for its diligence in this matter.

FRA Actions

On February 1, 1995, the Safety Board wrote to the FRA about its safety report on the loading operations of TOFC/COFC railroad equipment. The Safety Board requested the current status of the action that the FRA has taken to resolve the seven problem areas listed in its September 1994 study, *Trailer-on-Flat Car (TOFC) and Container-on-Flat Car (COFC) Loading and Securement Safety Report*. The Safety Board indicated that the FRA should continue to discuss with the railroad industry and take appropriate action to address the seven problem areas identified in that study. Also, the Safety Board asked whether the FRA plans to initiate any regulatory action for the intermodal area in the railroad industry.

On February 21, 1995, the FRA informed the Safety Board:

> FRA's report on TOFC/COFC loading and securement safety stated that if the voluntary industry actions did not sufficiently address the identified problem areas, additional measures to reduce the potential for similar accidents would be taken. At this time, FRA does not plan to initiate formal regulatory actions regarding TOFC/COFC loading operations. [See appendix B.]

The Safety Board understands that the FRA has developed and plans to continue discussions with the railroad industry regarding the seven problem areas as specified in its September 1994 study. The Safety Board believes that the FRA should advise the Safety Board within 90 days of its progress with the railroad industry in its actions toward the seven problem areas identified in its TOFC/COFC safety study. The FRA should also ensure that the railroad industry has implemented the seven policies by December 31, 1995.

AAR Practices

The AAR is the leading trade organization to develop and set recommended operational practices for the railroad industry. However, the AAR has not developed standardized procedures that address the loading and inspection of TOFC/COFC. As a result of the Safety Board investigation of the Selma, North Carolina, accident, which included reviewing the

September 1994 FRA study, the Safety Board concludes that no industry standards addressed the loading, securement, and inspection of intermodal trailers on railroad flat cars on May 14, 1994. The Safety Board is aware of the activities of this organization and the industry since the Selma accident. It has also been informed of the plans for developing a manual, poster, and video for the industry and for incorporating the recommended practices of the loading, securing, and inspecting of TOFC/COFC equipment in manual seven of the open top loading rules. The Safety Board understands that the AAR is developing and plans to include in its proposed intermodal trailer and container securement manual comprehensive industry standards for the securement of intermodal trailers (TOFC/COFC) on railroad flat cars before transport. The Safety Board believes that the AAR should advise the Safety Board within 90 days of the progress toward the development of the manual, poster, and video for the railroad industry and the incorporation of the recommended practices for the loading, securing, and inspecting of TOFC/COFC equipment in manual seven of the open top loading rules. The AAR should also implement these actions by December 31, 1995.

The Safety Board noted that not all incidents of trailers falling off flat cars were included in the September 1994 FRA study. No single data base was available that accumulated all incidents or accidents involving TOFC/COFC shipments. The growth of the TOFC/COFC traffic across the United States necessitates having information available on these types of shipments. Therefore, the Safety Board believes that the AAR should advise the Safety Board within 90 days of the progress toward developing and maintaining a data base to accumulate all incidents that involve unsafe conditions for TOFC/COFC shipments, including trailers found unsecured, trailers falling from flat cars, and/or acts of vandalism. The AAR should also implement the use of this data base by December 31, 1995.

Locomotive Operating Compartment Crashworthiness

For over 20 years, the Safety Board has been concerned about the crashworthiness of locomotive operating compartments and has issued several safety recommendations to the FRA and the industry on this issue.

A collision between an Illinois Central (IC) yard train and an Indiana Harbor Belt (IHB) train occurred on September 8, 1970, at Riverdale, Illinois.[34] The IC caboose overrode the heavy underframe of the IHB locomotive and demolished its control compartment. The IHB engineer was found dead in the control compartment wreckage. Following its investigation of this accident, the Safety Board asked that the FRA and the industry continue to expand their cooperative efforts toward the timely improvement of the crashworthiness of railroad equipment, particularly as related to the protection of the occupants of locomotive control compartments. Safety Recommendation R-71-44 was classified "Closed--Acceptable Action" on November 14, 1975.

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[34]Railroad Accident Report--*Illinois Central Railroad Company and Indiana Harbor Belt Railroad Company Collision between Yard Trains at Riverdale, Illinois, on September 8, 1970* (NTSB/RAR-71/3).

An accident on October 8, 1970, involving a Penn Central Transportation Company freight train and a passenger train near Sound View, Connecticut,[35] demonstrated again the ineffectiveness of the crew compartment to withstand impact forces. As a result of this accident investigation, the Safety Board requested that the FRA complete its recently initiated efforts in the improvement of the design of locomotive operator compartments to resist crash damage (Safety Recommendation R-72-005). This recommendation was classified "Closed--No Longer Applicable" when the Safety Board asked the FRA to quickly conclude its study of improvements to the design of locomotive operator compartments to minimize crash damage and promulgate necessary regulations to assure the adoption of appropriate findings (Safety Recommendation R-78-27). The recommendation was issued after the Safety Board investigation of a Louisiana & Arkansas freight train collision with a log-laden tractor-semitrailer, in which two train crewmembers died, in Goldonna, Louisiana, on December 28, 1977.[36]

The investigation of the collision of three freight trains near Leetonia, Ohio, on June 6, 1975,[37] prompted the Safety Board to request that the FRA continue the investigation of the crashworthiness of locomotive cabs with emphasis on personnel safety and consideration of readily accessible crash refuge (Safety Recommendation R-76-009). Following FRA's assurance that it was continuing its studies in this area, the Safety Board classified Safety Recommendation R-76-009 "Closed--Acceptable Action" on August 6, 1978.

On December 15, 1976, an Amtrak train collided with an oil-laden tractor-cargo tank semitrailer, killing two train crewmembers and the truckdriver, near Marland, Oklahoma.[38] The Safety Board asked that the FRA require all head-end locomotive units be designed to prevent serious injury to crewmembers from penetration of flammable substances into control compartments (Safety Recommendation R-77-37).

On September 18, 1978, a Louisville and Nashville freight train collided head on with a yard train inside yard limits at Florence, Alabama.[39] The lead unit of the yard train overrode the lead unit of the freight train. The operator compartment provided no protection for the head brakeman and engineer, who jumped from their compartments but were run over by their units.

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[35]Railroad Accident Report--*Penn Central Transportation Company Freight Train Derailment Passenger Train Collision with Hazardous Material Car, Sound View, Connecticut, October 8, 1970* (NTSB/RAR-72/1).

[36]Railroad/Highway Accident Report--Collision of a Louisiana & Arkansas Railway Freight Train and L.V. Rhymes Tractor-Semitrailer at Goldonna, Louisiana, December 28, 1977 (NTSB/RHR-78/1).

[37]Railroad Accident Report--*Penn Central Transportation Company Train Collisions, Leetonia, Ohio, June 6, 1975* (NTSB/RAR-76/2).

[38]Railroad/Highway Accident Report--*Collision of an Amtrak/Atchison, Topeka and Santa Fe Railway Train and a Tractor-Cargo Tank Semitrailer, Marland, Oklahoma, December 15, 1976* (NTSB/RHR-77/3).

[39]Railroad Accident Report--*Head-End Collision of Louisville and Nashville Railroad Local Freight Train and Yard Train at Florence, Alabama, September 18, 1978* (NTSB/RAR-79/2).

As a result of this accident, the Safety Board requested in Safety Recommendation R-79-11 that the FRA expedite action on the previously issued Safety Recommendation R-78-27.

On August 11, 1981, a Boston and Maine Corporation freight train and a Massachusetts Bay Transportation Authority commuter train collided head on near Prides Crossing, Beverly, Massachusetts.[40] The 85,000-pound lead car of the commuter train overrode the 247,000-pound locomotive unit of the freight train and pushed the locomotive components into the operating compartment, killing three people. The Safety Board asked the FRA to expedite implementation of Safety Board recommendations to study structural protection for occupants of control cars and locomotive operating compartments (Safety Recommendation R-82-34).

After the completion of the FRA-sponsored report, *Analysis of Locomotive Cabs*, which is a study into the crashworthiness of in-service locomotives and into design applications for new locomotives to protect occupants from serious or fatal injury, the Safety Board classified Safety Recommendation R-77-37 "Closed--Acceptable Alternate Action" and Safety Recommendations R-78-27, R-79-11, and R-82-34 "Closed--Acceptable Action" on November 24, 1982.

On December 22, 1983, the Safety Board requested the FRA to initiate and/or support a design study to provide a protected area in the locomotive operating compartment for the crew when a collision is unavoidable (Safety Recommendation R-83-102). The recommendation was issued after the Safety Board investigation of a rear-end collision of two Burlington Northern (BN) Railroad Company freight trains near Pacific Junction, Iowa, on April 13, 1983.[41] The operating compartment of the lead locomotive unit on BN train 64T85 was overridden by the caboose of train 43J05 when the trains collided. The locomotive operating compartment was crushed and distorted, especially on the engineer's side. (When a locomotive strikes a caboose or a light freight car, that caboose or car usually overrides the locomotive operating compartment.)

The Safety Board also noted in its December 22, 1983, recommendation letter that the FRA had studied the crashworthiness of locomotives and developed much data, which included publication of the 1982 report, *Analysis of Locomotive Cabs*. However, neither the FRA had recommended nor the railroad industry had voluntarily adopted any significant changes in locomotive crashworthiness design standards. In response to the Safety Board's Safety Recommendation R-83-102, the FRA announced on April 30, 1984, its intention to begin a safety inquiry on issues of health and safety in the locomotive cab and to make the inquiry one of the two major safety efforts that FRA would undertake that year.

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[40]Railroad Accident Report--*Head-On Collision of Boston & Maine Corporation Extra 1731 East and Massachusetts Bay Transportation Authority Train No. 570 on Former Boston & Maine Corporation Tracks, Beverly, Massachusetts, August 11, 1981* (NTSB/RAR-82/1).

[41]Railroad Accident Report--*Rear-End Collision of Two Burlington Northern Railroad Company Freight Trains, Pacific Junction, Iowa, April 13, 1983* (NTSB/RAR-83/09).

Safety Recommendation R-83-102 was classified "Closed--Unacceptable Action/Superseded," being superseded by Safety Recommendation R-87-23 in which the Safety Board asked the FRA on September 9, 1987, to promptly require locomotive operating compartments be designed to provide crash protection for occupants of locomotive cabs. The Safety Board issued Safety Recommendation R-87-23 after its investigation of the rear-end collision of two Union Pacific Railroad Company freight trains near North Platte, Nebraska, on July 10, 1986.[42] Train CLSA-09 was traveling about 40 mph as it approached the standing train WPX-08. The engineer applied the brakes when the caboose of standing train WPX-08 became visible, but the speed of train CLSA-09 had been reduced to only 32 mph when the trains collided. The rear brakeman of train WPX-08 was killed, and the conductor injured. The engineer and head brakeman of train CLSA-09 were injured when they jumped from the train. Had they not jumped from the operating compartment before the collision, they would probably have been fatally injured.

In response to the April 20, 1988, letter from the FRA, the Safety Board noted in its June 7, 1988, letter that the FRA indicated that (1) it has been the objective of the FRA to promote an agreement between the two locomotive manufacturers to include a series of design improvements in the operating compartments of their new basic models, (2) the Locomotive Control Compartment Committee has proposed a list of specific design improvements for the locomotive operating compartment, and (3) the FRA tentatively intends to schedule hearings on this issue in September and October 1988. The Safety Board further replied that although an agreement between the two locomotive manufacturers would be desirable, the Safety Board questions the ability of the FRA to accomplish this objective without regulatory action. In addition, concerning the locomotive operating compartment hearings scheduled for September and October 1988, the Safety Board questioned the need to study this issue further because extensive information has been developed from the Safety Board accident investigations since 1970. The Safety Board advised the FRA that pending evidence that the issue of locomotive operating compartment crashworthiness would be resolved, Safety Recommendation R-87-23 would be classified "Open--Unacceptable Action."

On August 3, 1992, Congress enacted the Rail Safety Enforcement and Review Act of 1992 (Public Law 102-365). Section 10 of the act states that the Secretary of Transportation shall, within 30 months of the enactment date of this subsection, complete a rulemaking proceeding to consider prescribing regulations to improve the safety and working conditions of locomotive operating compartments. In support of the proceeding, the Secretary shall have conducted the research and analysis, including computer modeling and full-scale crash testing, as appropriate, to consider the costs and benefits associated with equipping locomotives with:

(1) braced collision posts;
(2) rollover protection devices;
(3) deflection plates;

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[42]Railroad Accident Report--*Rear-End Collision and Derailment of Two Union Pacific Freight Trains near North Platte, Nebraska, on July 10, 1986* (NTSB/RAR-87/03).

(4) shatterproof windows;
(5) readily accessible crash refuges;
(6) uniform sill heights;
(7) anticlimbers, or other equipment designed to prevent overrides resulting from head-on locomotive collisions;
(8) equipment to deter post-collision entry of flammable liquids into locomotive cabs;
(9) any other devices intended to provide crash protection for occupants of locomotive cabs; and
(10) functioning and regularly maintained sanitary facilities.

The act further states that if, on the basis of the proceeding, the Secretary determines not to prescribe regulations, the Secretary shall report to Congress the reasons for that determination.

To comply with the act, the FRA contracted the firm of Arthur D. Little to research and analyze the subject, which included compiling information on locomotive design and crashworthiness, the development of computer models to evaluate crashworthiness, and the generation and evaluation of design concepts that could potentially improve locomotive operating compartment survivability. Models were to be validated to the extent possible by comparing predicted results to actual accidents; no testing was included in the program.

Safety Board staff attended the August 29, 1994, FRA progress report meeting on the current status of the study, which then was about half completed. The FRA has projected that it will prepare a report to Congress by April 1995.

On January 4, 1995, the Safety Board advised the FRA by letter that it had reviewed recent locomotive crashworthiness activities and had noted two significant efforts that warranted recognition. First, are the crashworthiness standards for road units built after August 1, 1990. (The Safety Board is collecting recent accident data to use in evaluating these standards.) Second, the research in response to the Rail Safety Enforcement and Review Act, which requires full-scale locomotive crash testing, should yield significant data for the analysis of current and proposed crashworthiness features. Consideration should also be given to the features to be incorporated when locomotive units are rebuilt. The Safety Board informed the FRA in its January 4, 1995, letter that Safety Recommendation R-87-23 has been classified "Open--Acceptable Response" until the Safety Board has had the opportunity to determine whether the FRA has completed the appropriate actions.

In the Selma accident, the Amtrak train 87 assistant engineer was killed and the engineer was severely injured within the locomotive operating compartment as the unit derailed and overturned. (See figure 10.) The Safety Board could not conclude whether the death and the severe injury were caused by impact with the trailer, striking or being struck by objects within the operating compartment, or a combination of both. However, after examination of the control compartment interior, Safety Board investigators noted that the radio bracket, as positioned, was a potential contact-injury producing mechanism. Amtrak is removing, as a precaution, all radio brackets from its locomotive control compartments.

Figure 10. -- Lead unit of Amtrak train 87 locomotive at accident scene.

Locomotive Fuel Tank Crashworthiness

The lead unit fuel tank of Amtrak train 87 ruptured, and the spilled diesel fuel ignited as the unit derailed and overturned. The fire was outside the cab compartment of the unit and did not contribute to the assistant engineer's death or the engineer's injuries. However, this accident underscores the Safety Board concern about the potential for diesel fuel fires in railroad accidents to cause fatalities and injuries to trapped crewmembers, to contribute to hazardous materials fires in the train, and to endanger life and property near the accident site.

As the result of its 1992 locomotive fuel tank safety study,[43] the Safety Board made the following safety recommendation to the FRA:

R-92-10

> Conduct, in conjunction with the Association of American Railroads, General Electric, and General Motors Electro-Motive Division, research to determine if the locomotive fuel tank can be improved to withstand forces encountered in the more severe locomotive derailment accidents or if fuel containment can be improved to reduce the rate of fuel leakage and fuel ignition. Consideration should be given to crash or simulated testing and evaluation of recent and proposed design modifications to the locomotive fuel tank, including increasing the structural strength of end and side wall plates, raising the tank higher above the rail, and using internal tank bladders and foam inserts.

In its February 10, 1993, response, the FRA stated that it will act on this recommendation with the AAR, General Electric, and General Motors Electro-Motive Division and will collect data on fuel tank integrity. The FRA provided an update on fuel tank issues during its August 29, 1994, briefing on locomotive cab crashworthiness in general. It has also notified the Safety Board that it intends to periodically update the Safety Board on the status of this joint effort. Safety Recommendation R-92-10 is classified "Open--Acceptable Response."

Emergency Lighting

The postaccident inspection of the Amtrak train 87 passenger cars revealed that the fixed emergency lighting systems failed on several cars when they derailed. Three injured passengers interviewed after the accident stated that they had difficulty exiting the passenger cars because they were unable to see the emergency exit windows or were unable to see the ground when finally exiting through the doors to the outside. The Safety Board concludes that had portable emergency lighting been available to passengers they would not have experienced difficulty exiting the train when the fixed emergency lighting system failed.

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[43]Railroad Safety Study--*Locomotive Fuel Tank Integrity* (NTSB/SS-92/04).

The Safety Board addressed the need for Amtrak passenger cars to be equipped with portable emergency lighting for passenger safety when exiting the train in its investigation report of the Amtrak accident near Mobile, Alabama.[44] As a result of that accident, the Safety Board recommended on September 30, 1994, that Amtrak equip cars with portable lighting for use by passengers in an emergency (Safety Recommendation R-94-8). Amtrak notified the Safety Board on October 14, 1994, that it was evaluating several types of emergency-use portable lighting systems. This recommendation is classified "Open--Await Response." The Selma accident further illustrates the need for portable emergency lighting on Amtrak passenger cars.

Emergency Response

The transport of injured passengers and Amtrak crewmembers to the two hospitals was executed expeditiously. The hospitals were notified immediately after the accident and effected their disaster plans for receiving heavy casualties. No deficiencies were noted on the part of any organization or entity that responded to this accident. The Safety Board concludes that the response to this accident by fire, rescue, and police from the local and surrounding communities was timely and effective.

CONCLUSIONS

1. The weather, train handling, train equipment, track, and signal system neither caused nor contributed to this accident. The engineer and conductor of CSXT 176 as well as the engineer and assistant engineer of Amtrak train 87 were qualified for their duties and not medically impaired. Neither illicit drugs nor alcohol were factors in this accident for all operating train crewmembers. No evidence of vandalism was present.

2. The CSXI loading crewmembers were not influenced by fatigue; the lack of a postaccident toxicological testing requirement precluded determining whether the loading crew's performance was influenced by alcohol or drugs. In addition, the loading crewmembers were adequately trained to properly load and secure trailers onto flat cars.

3. Amtrak train 87 derailed after it collided with intermodal trailer REAZ 232980 that had either fallen or was falling from the 51st car of CSXT 176.

4. Trailer REAZ 232980 was improperly loaded and not secured onto flat car KTTX 251988 when it departed the Orlando Taft Yard.

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[44] Railroad Accident Report--*Derailment of Amtrak Train No. 2 on the CSXT Big Bayou Canot Bridge near Mobile, Alabama, September 22, 1993* (NTSB/RAR-94/01).

5. Trailer REAZ 232980 was out of position for satisfactory securement in the hitch and the kingpin was not within the locking jaws of the hitch mechanism.

6. The rub rail mark had to be made by the displaced trailer REAZ 232980.

7. The CSXI did not have a comprehensive inspection procedure to ensure that an unsecured trailer could be detected and the problem corrected.

8. No industry standards addressed the loading, securement, and inspection of intermodal trailers on railroad flat cars on May 14, 1994.

9. Had portable emergency lighting been available to passengers they would not have experienced difficulty exiting the train when the fixed emergency lighting system failed.

10. The response to this accident by fire, rescue, and police from the local and surrounding communities was timely and effective.

PROBABLE CAUSE

The National Transportation Safety Board determines that the probable cause of the derailment of Amtrak train 87 was the failure of the CSX Intermodal Corporation loading crew to properly secure the intermodal trailer to the flat car on CSXT 176 and the failure of CSX Intermodal Corporation to have in place a comprehensive inspection program.

RECOMMENDATIONS

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

-- to the Federal Railroad Administration:

> Advise the National Transportation Safety Board within 90 days of its progress with the railroad industry in its actions toward the seven problem areas identified in its *Trailer-on-Flat Car (TOFC) and Container-on-Flat Car (COFC) Loading and Securement Safety Report*. Also, ensure that the railroad industry has implemented the seven policies by December 31, 1995. (Class II, Priority Action) (R-95-21)

-- to the Association of American Railroads:

Advise the National Transportation Safety Board within 90 days of the progress toward the development of the manual, poster, and video for the railroad industry and the incorporation of the recommended practices for the loading, securing, and inspecting of TOFC/COFC equipment in manual seven of the open top loading rules. Also, implement these actions by December 31, 1995. (Class II, Priority Action) (R-95-22)

Advise the National Transportation Safety Board within 90 days of the progress toward developing and maintaining a data base to accumulate all incidents that involve unsafe conditions for TOFC/COFC shipments, including trailers found unsecured, trailers falling from flat cars, and/or acts of vandalism. Also, implement the use of this data base by December 31, 1995. (Class II, Priority Action) (R-95-23)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

JAMES E. HALL
Chairman

ROBERT T. FRANCIS II
Vice Chairman

JOHN A. HAMMERSCHMIDT
Member

March 21, 1995

APPENDIXES

APPENDIX A

INVESTIGATION AND HEARING

The National Transportation Safety Board was notified at 5:30 a.m. on May 16, 1994, that an Amtrak passenger train struck an intermodal trailer from a CSXT freight train. The investigator-in-charge and other Safety Board investigators were dispatched from the Washington, DC, headquarters and from the Chicago, Illinois, regional office. The investigative team studied operations, track, signals, mechanical, survival factors, and human performance.

The Federal Railroad Administration, CSX Transportation Inc., CSX Intermodal Corporation, National Railroad Passenger Corporation, Association of American Railroads, TTX Company, ACF Corporation, and Brotherhood of Locomotive Engineers assisted the Safety Board in the investigation.

On September 1, 1994, at Orlando, Florida, the Safety Board staff conducted a deposition proceeding, in which 11 witnesses testified, as part of its investigation of this accident.

APPENDIX B

FEDERAL RAILROAD ADMINISTRATION CORRESPONDENCE

U.S. Department
of Transportation
**Federal Railroad
Administration**

400 Seventh St., S.W.
Washington, D.C. 20590

FEB 21 1995

Mr. Robert C. Lauby
Chief, Railroad Division
National Transportation Safety Board
Washington, D.C. 20594

Dear Mr. Lauby:

Thank you for your February 1 letter concerning the Federal Railroad Administration's (FRA) response to safety issues as a result of the May 16, 1994, derailment of Amtrak train 87 at Selma, North Carolina, caused by a collision with an intermodal trailer.

On January 26, FRA invited numerous industry and government representatives, including the National Transportation Safety Board, to attend a meeting on Wednesday, February 22, at 9:00 a.m. in Conference Room 8334 - 8336 of the Nassif Building, 400 7th Street S.W., Washington, D.C. This meeting will provide a forum for industry representatives to update FRA and other interested parties on progress made to date in addressing the seven areas of safety concern identified by FRA following the Selma accident. Future plans for continuing progress in improving trailer-on-flat car and container-on-flat car (TOFC/COFC) loading and securement safety will also be discussed. Attendance at this meeting will provide you with the latest status on this project.

FRA's report on TOFC/COFC loading and securement safety stated that if the voluntary industry actions did not sufficiently address the identified problem areas, additional measures to reduce the potential for similar accidents/incidents would be taken. At this time, FRA does not plan to initiate formal regulatory actions regarding TOFC/COFC loading operations.

I hope this information is helpful, and hope to see you or your representative on February 22.

Sincerely,

Bruce M. Fine
Acting Associate Administrator
for Safety

APPENDIX C

ASSOCIATION OF AMERICAN RAILROADS CORRESPONDENCE

ASSOCIATION
OF AMERICAN
RAILROADS

T. J. Stahura
Director-Equipment Performance

G. L. Held
Director-Damage Prevention
and Loading Services

February 21, 1995

SUBJECT: AAR Intermodal Equipment Handling Task Force Progress

Mr. Michael J. Martino
Investigator
National Transportation Safety Board
490 L'Enfant Plaza, S.W.
Washington, D. C. 20594

Dear Mr. Martino:

I have attached a copy of a status report detailing the industry progress on intermodal securement handling issues as referenced in the FRA's September 15, 1994 report to the Secretary of Transportation entitled "Trailer-on-Flat Car (TOFC) and Container-on-Flat Car (COFC) Loading and Securement Safety."

Also enclosed are final drafts of the "Intermodal Trailer and Container Securement Manual" and the "Inspection for Locked Position" lunch room poster.

I will continue to keep you apprised of Task Force progress.

Sincerely,

P T Ameen

Patrick T. Ameen

PTA/aw

cc: Intermodal Equipment Handling Task Force

APPENDIX C

INTERMODAL EQUIPMENT HANDLING TASK FORCE

1. Uniform Minimum Set of Training Requirements

The AAR IEH Task Force has made considerable progress on several deliverables:

- An INTERMODAL TRAILER AND CONTAINER SECUREMENT MANUAL
  Final draft copy attached.
  To be issued 3/95.

- An INSPECTION FOR LOCKED POSITION lunch room poster
  Final draft copy attached.
  To be issued 3/95.

- TOFC & COFC SECUREMENT VIDEOS
  Two separate programs.
  Scripts and video footage complete.
  To be issued 5/95.

- AAR RECOMMENDED PRACTICE
  To be drafted by 5/1/95.
  Target issue date: 7/1/95.

- VARIOUS RULES REVISIONS
  Discussed under following sections.

The industry position is that the training deliverables detailed above are appropriate. The AAR Recommended Practice (similar to AAR RP-260 for INSPECTION AND MAINTENANCE OF ARTICULATED DOUBLE-STACK CONTAINER CARS implemented January 1,1994) will require that individual carriers supplement the AAR training programs with the development and institution of continuous and auditable training of personnel who are engaged in operating, loading, unloading and inspecting intermodal trailers, containers, and chassis. AAR will serve as a clearinghouse for collecting industrywide data on the nature and extent of training plans and accomplishments.

Individual railroads in attendance at the 2/22/95 meeting will discuss procedures in place and underway on their respective railway systems.

2. Written Standard Operating Procedures

Aside from the deliverables discussed above, individual railroads in attendance at the 2/22/95 meeting will discuss procedures in place and underway on their respective railway systems.

3. Post-loading, Pre-departure Inspection of Loaded TOFC/COFC Equipment

The scripts for both the container and trailer hitch securement videos state: "Pre-departure inspections of outbound trains must include a visual inspection for properly positioned and locked containers (and trailers)."

The individual carrier procedures, filed with AAR, will also include pre-departure inspection requirements. The scripts do not state who should perform this function--only that it be performed "...in accordance with procedures established by your company." This is because the pre-departure inspection function may be performed by carmen, train crews, intermodal personnel, or contractors--depending on the individual carrier or loading facility.

4. TOFC/COFC Securement System Preventative Maintenance Intervals

AAR Interchange Rule 27 addresses periodic inspection and maintenance intervals for trailer hitches. Interchange Rule 64 adequately addresses container pedestal maintenance.

The TTX Company representative will discuss preventative, scheduled maintenance programs for TOFC/COFC freight cars.

5. COFC Loading of Cars With Defective Trailer Hitches

The industry will promptly enact Field Manual and Open Top Loading Rules revisions prohibiting COFC loading of TOFC/COFC cars with defective trailer hitches. Target date is April 1,1995.

6. Design Standards for Trailers & Containers

- AAR Specification M-928, INTERMODAL (HIGHWAY) TRAILER HITCHES FOR FREIGHT CARS, was revised in 1994. The positive lock indicator color will be standardized as yellow. This is already an informal standard between the two principal manufacturers. AAR Specification M-928 will be modified effective July 1,1995 to require yellow positive lock indicators with a contrasting background area (preferably black) and a flush or slightly recessed positive lock indicator position.

- AAR Specification M-931, HIGHWAY TRAILERS, ALL TYPES, FOR TOFC SERVICE, was revised in 1988. The AAR Intermodal Steering Committee is responsible for this Specification. The AAR Intermodal Equipment Handling Task Force will review the subject Specification for compatibility with hitch loading

methods and recommend, by July 1,1995, any necessary revisions to the AAR Intermodal Steering Committee.

- AAR Specification M-930, CLOSED VAN-TYPE DRY CARGO CONTAINERS FOR DOMESTIC CONTAINER-ON-FLAT-CAR SERVICE, was revised in 1990. The AAR Intermodal Steering Committee is responsible for this Specification. The AAR Intermodal Equipment Handling Task Force will review the subject Specification for compatibility with container loading methods and recommend, by July 1,1995, any necessary revisions to the AAR Intermodal Steering Committee.

- Although not specifically referenced in the FRA recommendations, AAR Specification M-943, CONTAINER CHASSIS FOR TOFC SERVICE, was revised in 1987. The AAR Intermodal Steering Committee is responsible for this Specification. The AAR Intermodal Equipment Handling Task Force will review the subject Specification for compatibility with container loading methods and recommend, by July 1,1995, any necessary revisions to the AAR Intermodal Steering Committee.

7. Determination & Promotion of "Best Practices"

- POST IMPLEMENTATION AUDIT OF RECOMMENDED PRACTICE EFFECTIVENESS
  To be conducted within six months of implementation.

- IMPLEMENT IDENTIFIED REVISIONS & FINE TUNING (IF NECESSARY)
  Within three months of post implementation audit.

AAR Technical Services Division
February 21,1995