



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: January 4, 1991

In reply refer to: H-90-113

To: Mr. Arthur Cote
Secretary, Standards Council
National Fire Protection Association
Batterymarch Park
Quincy, Massachusetts 02269

About 7:38 p.m. on September 28, 1989, Wagon 7 of the Catlett (Virginia) Volunteer Fire Company (CVFC) was struck on its left side by a southbound National Railroad Passenger Corporation (AMTRAK) train consisting of 2 locomotives and 16 cars at a private driveway grade crossing off Virginia Route 28 about 1 mile south of Catlett, Virginia. The crossing was marked with a railroad crossing (crossbuck) sign, but was not equipped with automatic signals. According to the event recorder installed on the second locomotive, the train had been traveling about 77 mph before the collision, which occurred at dusk under otherwise clear atmospheric conditions.

The cab and chassis of Wagon 7 rotated counterclockwise 450° during the collision and came to rest facing north about 80 feet southeast of the crossing. The 2 locomotives and the first 11 cars derailed, the train separated between the fourth and fifth cars, and the fifth through the eighth cars jackknifed and telescoped together. The lead locomotive stopped about 965 feet past the crossing with the left side of the hose body from the 27-foot-long fire apparatus wrapped around its head end. Fires that broke out near the second locomotive and several of the derailed railroad cars were extinguished by other firefighters who responded to the emergency.

Wagon 7 was destroyed, the driver and the other firefighter in the cab were fatally injured, and three firefighters riding in a rear-facing canopied jumpseat aft of the cab sustained moderate to severe injuries. About 57 of the 399 passengers and crew on board the train sustained minor to moderate injuries. Property damage to Wagon 7, railroad rolling stock, and railroad right-of-way exceeded an estimated \$1 million.

Investigation disclosed that about 12 minutes before the collision the Emergency Operations Center (EOC) of the Fauquier County (Virginia) Sheriff's Department received a telephone call from a person reporting a vehicle on fire at his residence off Route 28 about 1 mile south of Catlett. The EOC radioed the CVFC and reported the type and location of the fire. At 7:32 p.m. the EOC was notified that the CVFC's Wagon 7, the first-due apparatus, was responding from the CVFC station house about 1 mile north of

the fire site. The EOC notified Wagon 7 that the vehicle on fire was "well involved."

The chief of the CVFC arrived at the station in his personal vehicle shortly after Wagon 7 left on the call. The chief, who was aware that contrary to usual procedure, no officer was aboard Wagon 7, radioed the wagon and asked whether a full crew was aboard. After receiving an affirmative response, he asked the firefighter riding in the right front seat and operating the radio if he was in charge. The driver took charge of the radio and, instead of responding to the chief's question, recommended that Tanker 7, with an extra supply of water, be held until the wagon arrived at the fire site and the crew determined if the tanker was needed. The chief agreed to hold the tanker.

At 7:35 p.m. Wagon 7 requested that the EOC repeat the directions to the fire. The EOC did so. When the chief heard Wagon 7's request, he knew that Wagon 7 had missed the entrance to the fire site. The chief and a CVFC lieutenant, who was the driver of Tanker 7, then radioed the EOC that they were responding to the fire. Seconds later, Wagon 7 radioed the chief that "We passed it. We're coming back from Calverton," a community about 1.6 miles south of the fire site. The chief responded, "I hope so."

The chief left Company 7's station house in his private vehicle, traveled south on Route 28, saw the smoke from the vehicle fire, and turned east into the driveway leading to the site. He traveled about 59 feet up an average 11.6-percent grade, looked in both directions at the top of the grade, and crossed a single set of railroad tracks paralleling Route 28. After entering the property, the chief radioed the EOC at 7:37 p.m. that he was at the fire site and that the vehicle on fire was fully involved.

Tanker 7, driven by the lieutenant and accompanied by two firefighters, left the CVFC station about one minute behind the chief. The lieutenant reported that as he approached the driveway to the fire site from the north, he saw Wagon 7 approaching from the south. All of its emergency lights were operating and both the driver and the other firefighter in the cab were looking to their right toward the fire.

Both vehicles arrived at the driveway entrance at about the same time. The lieutenant stopped the tanker to allow Wagon 7 to proceed. Wagon 7 overshot and partially blocked the entrance and had to back up to align the apparatus to turn into the driveway. Tests performed later with a similar apparatus indicated that this maneuver took about 16 seconds.

The lieutenant and another firefighter on the tanker reported that as Wagon 7 traveled up the grade toward the railroad tracks, they did not see the brake lights come on at any time and that the driver apparently made no attempt to stop or slow the apparatus before it reached the tracks. The lieutenant next heard two horn blasts which at first he thought were from another apparatus responding to the fire. Both the lieutenant and the chief reported that they saw the train's headlight as it approached the crossing.

The engineer in the cab of the lead locomotive stated that he first saw

Wagon 7 as it was climbing the grade when the train was an estimated 15 cars (about 1,200 feet) from the crossing. When Wagon 7 did not stop, the engineer said he placed the train's brakes in emergency and began to sound the locomotive's horn. He reported that as the locomotive approached the crossing, the occupants in Wagon 7's jumpseat looked toward the train but the driver did not.

Postaccident examination of Wagon 7 disclosed that the window on the driver's side of the cab was rolled completely down at the time of the collision and that the transmission was in the lowest gear. The track north of the grade crossing is straight and level for at least 3,700 feet, and there were no visual obstructions that may have prevented Wagon 7's driver from seeing the train after entering the driveway.

According to the chief, the 24-year-old driver of Wagon 7 had several years experience operating large commercial vehicles, had been trained as a designated apparatus driver by the company, and had been driving Wagon 7 on emergency calls for about 3 years. According to the chief, friends, and relatives, the driver was in good health at the time of the accident, and review of his medical history, preaccident activities, and postmortem toxicological tests disclosed no evidence of physical impairment.

Moreover, the chief reported that all CVFC apparatus drivers had repeatedly been cautioned to observe all traffic control signs and signals and when responding to a fire call to look carefully for trains at all grade crossings both while driving personal vehicles to the station and while driving a fire apparatus.

It could not be determined whether Wagon 7's electronic siren was operating when it entered the driveway. The tanker's siren reportedly was operating, and the tanker would have been within a few feet of Wagon 7. The operation of one or both the vehicles' sirens suggests that at the time Wagon 7 was entering the driveway, the noise level in the cab masked the sound of the approaching train's horn until it was too late to avoid the collision.

The Safety Board believes that the wagon driver's failure to determine that it was safe to proceed must be attributable not only to the usual pressures experienced by fire service personnel when responding to an emergency¹ but also to the series of events that occurred during Wagon 7's response to the fire call. What should have been a routine response to a fire that initially posed little threat to life or other property became in less than 6 minutes a response involving a succession of performance errors or omissions that resulted in a steadily increasing level of frustration and

¹"Sirencide" is the term used to describe the emotional reaction of emergency vehicle drivers when they begin to feel a sense of power and urgency that blocks out reason and prudence, leading to the reckless operation of the emergency vehicle. Firefighter's News, August-September 1990, pp. 36-37, as reprinted from Siren, newsletter of the New York State Office of Fire Prevention and Control.

stress for the two firefighters in the wagon's cab.

The chief's radioed inquiry concerning who was in charge undoubtedly alerted them to the fact that the chief was monitoring the emergency response and was aware that Wagon 7 had left the station without an officer. After completion of the call the chief would want to know why they had deviated from this established procedure. This probably led them to focus their attention on performing their duties properly during the rest of the fire call, thereby demonstrating their proficiency and justifying the absence of an officer aboard the wagon.

Although he had previously agreed to hold the tanker, when the chief heard Wagon 7 ask the EOC to repeat the directions to the fire site, he knew that the driver had passed it and, without further consultation with Wagon 7, both he and the lieutenant driving the tanker notified the EOC that they were responding to the fire. At that point Wagon 7's driver undoubtedly felt additional pressure to perform. He had passed the entrance to the fire site, his chief knew it, and now the chief had taken command and was himself responding. This pressure was exacerbated about 1 minute later when the chief radioed the EOC that he had reached the fire site while Wagon 7 was still en route, even though the chief had left the station some 4 minutes after Wagon 7.

As Wagon 7 returned from Calverton, the driver's attention was no doubt focused on locating and arriving at the fire site as soon as possible to redeem the crew in the eyes of the chief. The Safety Board believes that the fact that Wagon 7 initially overshot and partially blocked the driveway entrance is an indication of the driver's preoccupation with locating the fire site rather than looking ahead and properly aligning the apparatus to enter the driveway on the first approach. The realignment, which had to be done in front of the lieutenant and the other two firefighters waiting in the tanker, may have taken as long as 16 seconds and undoubtedly added to the frustration and stress being experienced by the firefighters in the wagon's cab.

Although some level of stress can enhance human performance, excessive stress can lead to substandard performance. When a person's arousal level is unduly increased by stressors, the focus of attention is narrowed to performance of the task perceived to be most important, while the quality of the performance of any peripheral task(s) deteriorates.²

Considering the stressors experienced by Wagon 7's cab occupants during the fire call, the Safety Board believes that by the time Wagon 7 entered the driveway, their focus of attention had narrowed to include only the task of arriving at the site of the fire. The peripheral task of determining that it was safe to proceed across the railroad tracks, which would have required scanning both left and right along the tracks, had been eliminated from their

²Wickens, C. D., "Engineering Psychology and Human Performance," Charles E. Merrill Publishing Co., University of Illinois at Champaign-Urbana, 1984, 20156-X, pp. 249-290.

perceived priorities.

From 1977 through 1988, seven grade crossing accidents nationwide resulted in the deaths of nine firefighters.³ In addition to the obvious dangers to fire crews and train occupants involved in such collisions, the failure of a fire apparatus to safely arrive at the site of an emergency increases the potential for additional loss of life and property. Therefore, the Safety Board believes that planning how to safely traverse grade crossings encountered en route is a necessary part of any fire company's emergency response plan.

In a 1986 study, the Safety Board concluded that a train's warning horn has become an ineffective warning device for large commercial vehicles unless the driver stops; idles the engine; turns off all radios, fans, wipers, and other noise-producing equipment in the cab; lowers the window; and listens for a train's horn before entering a grade crossing.⁴ Fire companies should be aware that even though warning devices such as sirens and air horns may be deactivated as a fire apparatus approaches a crossing, ambient noise levels in the cab may still mask the sound of an approaching train's horn.

In addition, railroad operating rules may not require that a train's horn be routinely sounded at some crossings, particularly those, such as the one at which this accident occurred, that lead to private residences in rural areas. A train's crew may also fail to sound a locomotive's horn at certain crossings even though the railroad's operating rules require it.⁵ Fire companies should therefore train personnel assigned to any large fire apparatus to visually determine that it is safe to proceed over a grade crossing.

If it is not practical to plan an emergency response route that avoids grade crossings, selection of crossings that are equipped with automatic warning devices is preferable to selection of those that are not. All planning should include identification of the location at the crossing from which a driver or other observer assigned to the apparatus can see the maximum available distance down the track(s) on both sides.

At crossings over a single straight track with no nearby obstructions, briefly stopping or slowing the apparatus to allow a proper scan both left and right may be sufficient. If the tracks are curved, vision is

³Data furnished by the Fire Analysis and Research Division, National Fire Protection Association, prepared under contract from the U. S. Fire Administration of the Federal Emergency Management Agency.

⁴NTSB Safety Study: "Passenger/Commuter Train and Motor Vehicle Collisions at Grade Crossings (1985)," NTSB/SS-86/04, 1986.

⁵For further information, see Railroad/Highway Accident Report-- "Consolidated Rail Corporation Train Collision with Island Transportation Corporation Truck, Roosevelt Avenue Grade Crossing Near LaFayette Street, Carteret, New Jersey, December 6, 1988." (NTSB/RHR-89/01)

obstructed, or the crossing has more than one set of tracks where the presence of one train may hide the approach of another, sight distance may be optimized by having one or more members of the crew cross the tracks on foot and look for approaching trains.

The Safety Board also believes that responsibility for compliance with any grade crossing plans developed must be apportioned between the driver of the apparatus and another crewmember who can communicate face-to-face with the driver while en route. A "challenge and response" dialogue between the driver and a designated crewmember should be instituted to determine the driver's intentions when approaching a railroad crossing (or any other identified hazard on the planned route), to remind the driver of the planned procedures for traversing a particular crossing, and to ensure that the driver is coping with stressors encountered during the response and not focusing only on arriving at the site of the emergency.

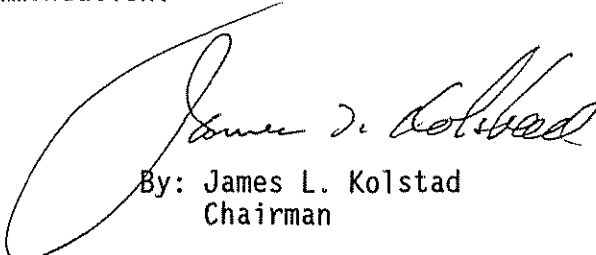
Therefore, the National Transportation Safety Board recommends that the National Fire Protection Association:

Incorporate into the occupational safety standards for fire departments procedures for the systematic evaluation of the hazards posed by highway/railroad grade crossings by fire companies and the development, implementation, and periodic review of existing plans to safely cross railroad grade crossings during an emergency response. Any plans should emphasize that the safe arrival of the apparatus at the scene of the emergency is the first priority. (Class II, Priority Action)(H-90-113)

Also, the Safety Board issued Safety Recommendations H-90-112 to the Federal Emergency Management Agency and H-90-114 to Operation Lifesaver, Inc.

The National Transportation Safety Board is an independent Federal agency with the statutory responsibility "to promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations" (Public Law 93-633). The Safety Board is vitally interested in any action taken as a result of its safety recommendations. Therefore, it would appreciate a response from you regarding action taken or contemplated with respect to the recommendation in this letter. Please refer to Safety Recommendation H-90-113 in your reply.

Chairman KOLSTAD, Vice Chairman COUGHLIN, and Members BURNETT, LAUBER, and HART concurred in this recommendation.



By: James L. Kolstad
Chairman