

LOG 5840



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: NOV 27 1995

In Reply Refer To: H-95-40

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About 12:30 a.m., on July 27, 1994, a tractor cargo-tank semitrailer loaded with 9,200 gallons of propane (a liquefied petroleum gas) and operated by Suburban Paraco Corporation was traveling east on Interstate 287 in White Plains, New York. The truck drifted across the left lane onto the left shoulder and struck the guardrail; the tank hit a column of the Grant Avenue overpass. The tractor and the semitrailer separated, and the front head of the tank fractured, releasing the propane, which vaporized into gas. The resulting vapor cloud expanded until it found a source of ignition. When it ignited, according to an eyewitness, a fireball rose 200 or 300 hundred feet in the air. The tank was propelled northward about 300 feet and landed on a frame house, engulfing it in flames.

The driver was killed, 23 people were injured, and an area with a radius of approximately 400 feet was engulfed by fire.¹

The National Transportation Safety Board determines that the probable causes of this accident were the reduction in the alertness of the driver (consistent with falling asleep) caused by his failure to properly schedule and obtain rest and the failure of the management of Paraco Gas Corporation, Inc., to exercise adequate oversight of its driver's hours of service. Contributing to the accident was the design of the highway geometrics and appurtenances, which did not accommodate an errant heavy vehicle. Contributing to the severity of the accident was the vulnerability of the bridge to collision from high-speed heavy vehicles.

¹For more information, read Highway Accident Report--*Propane Truck Collision with Bridge Column and Fire, White Plains, New York, July 27, 1994* (NTSB/HAR-95/02).

The Safety Board conducted a detailed examination of the driver's activities during the 3 days before the accident and of his habits and sleep patterns.

He reversed his work/rest patterns every few days. He customarily drove at night for 3 days, but during the 4 days when he was off duty, he slept at night. Research has demonstrated that alertness is compromised by such disruptions in work/rest patterns² and that nightshifts usually tire workers more than dayshifts do.³ Moreover, the accident occurred at 12:28 a.m., a point in the driver's circadian cycle at which his alertness and ability to perform would be reduced.⁴

His activities during the 3 days before the accident were well documented by product invoice records and witness observations. A 10-hour breakdown disrupted his schedule and delayed his deliveries. Consequently, he had little opportunity for meaningful rest or sleep during the 2 days before the accident. An hour and a half before the accident, he told a witness that he was 10 hours behind schedule.

By his own report, the driver slept in the sleeper berth for 2 hours on the day before the accident while he was waiting for a tow truck. Later in the day, he fell asleep for half an hour while his vehicle was being repaired. He had the opportunity to sleep in the truck for up to 3 hours during the late evening/early morning hours (about 24 hours before the accident), although the Safety Board could not determine whether he actually did so. Excluding these rest periods or other undocumented brief naps, he had had no significant rest during the 48 hours before the accident.

Fragmented rest, such as that experienced by the driver in this accident, has been associated with driver fatigue and a resulting decrease in performance. Research has shown that sleep accumulated in short time blocks is less refreshing than sleep accumulated in one long time period.⁵ Other research indicates that "...the more sleep is disturbed or reduced, for whatever reason, the more likely [that] an individual will inadvertently slip into sleep."⁶

²N. McDonald, *Fatigue, Safety and the Truck Driver* (London: Taylor and Francis, 1984).

³D.I. Tepas and T.H. Monk, "Work Schedules," G. Salvendy, ed., *Handbook of Human Factors* (New York: Wiley-Interscience Publications, 1987).

⁴T.H. Monk and J.A. Wagner, "Social Factors Can Outweigh Biological Ones in Determining Night Shift Safety," *Human Factors*, Vol. 31, No. 6, December, 1989.

⁵Dinges, D.F., 1989, "The Nature of Sleepiness: Causes, Contexts, and Consequences," In: Stunkard, A.J.; Baum, A., *Perspectives in Behavioral Medicine: Eating, Sleeping, and Sex*, Hillsdale, NJ: Lawrence Erlbaum Associates: 147-179, Chapter 9 (p. 147).

⁶(a) Mitler, M.; Carskadon, M.A.; Ceisler, C.A.; and others, 1988, "Catastrophes, Sleep and Public Policy: Consensus Report," *Sleep*. 11(1): 107. (b) Rosekind, M.R.; Gander, P.H.; Connell, L.J.; Co, E.L., 1994, "Crew Factors in Flight Operations X: Alertness Management in Flight Operations," NASA/FAA Technical Memorandum DOT/FAA/RD-93/1.

The Safety Board believes that the circumstances of this accident provide clear evidence that the truckdriver's performance was affected by fatigue. The movement of the truck from the center lane, as it "drifted" across the left lane and onto the shoulder at a shallow angle without displaying turn signals or brake lights, is a classic indicator of a driver that has fallen asleep.

In addition, the driver's inverted work/rest cycle, the late hour, and his accumulation of a maximum of only 5.5 hours of fragmented sleep during the 48-hour period before the accident provide further evidence that his performance was impaired by fatigue. Therefore, the Safety Board concludes that at the time of the accident the driver had fallen asleep because he was suffering from acute fatigue.

This driver was young and healthy and may not have recognized the degree of his fatigue. A review of his records showed no evidence of his receiving any training about the effects of fatigue. The test guide for the New York State Department of Transportation commercial driver's license makes the following statements:

Fatigue (being tired) and lack of alertness are bigger problems at night. The body's need for sleep is beyond a person's control. Most people are less alert at night, especially after midnight. This is particularly true if you have been driving for a long time. Drivers may not see hazards as soon or react as quickly, so the chance of a crash is greater. If you are sleepy, the only safe cure is to get off the road and some sleep. If you don't, you risk your life and the lives of others.

Your body gets used to sleeping during certain hours. If you are driving during those hours, you will be less alert. If possible try to schedule trips for hours you are normally awake. Many heavy motor vehicle accidents occur between midnight and 6 a.m. Tired drivers can easily fall asleep at these times, especially if they don't regularly drive at those hours. Trying to push on and finish a long trip at these times can be very dangerous.

The guide does not, however, discuss the effects of reversed work/rest patterns and fragmented sleep. Yet the carrier's scheduling practices required the driver to monitor his own fatigue. The Safety Board concludes that he might have rested before trying to complete his last load had he been trained in understanding the effects of a deficit in sleep and irregular or inverted schedules.

The Safety Board addressed the adequacy of truckdrivers' understanding of the factors affecting fatigue in the *1995 Fatigue Study*.⁷ The Board found that many of the truckdrivers in the sample of drivers who had been involved in fatigue-related accidents had not recognized

⁷*Factors that Affect Fatigue in Heavy Truck Accidents, Volume I: Analysis*, adopted January 18, 1995 (NTSB/SS-95/01).

that they needed sleep and had believed that they were rested when they were not. About 80 percent of the drivers involved in a fatigue-related accident rated the quality of their last sleep before the accident as good or excellent. As a result of the study, the Safety Board made the following recommendation to the Federal Highway Administration, the Professional Truck Driver Institute of America, the American Trucking Associations, Inc., the Commercial Vehicle Safety Alliance, and the National Private Truck Council:

Develop and disseminate, in consultation with the U.S. Department of Transportation Human Factors Coordinating Committee, a training and education module to inform truckdrivers of the hazards of driving while fatigued. It should include information about the need for an adequate amount of quality sleep, strategies for avoiding sleep loss, such as strategic napping, consideration of the behavioral and physiological consequences of sleepiness, and an awareness that sleep can occur suddenly and without warning to all drivers regardless of their age or experience. (Class II, Priority Action) (H-95-5)

The Safety Board believes that one method of reaching all new commercial truck drivers is the CDL examination. The Safety Board believes that the American Association of Motor Vehicle Administrators should review and augment the CDL manual and test materials to include information on the role of fatigue in commercial vehicle accidents and methods to identify and address fatigue.

The National Transportation Safety Board therefore issues the following safety recommendation to the American Association of Motor Vehicle Administrators:

In cooperation with the Federal Highway Administration and the American Trucking Association review and augment the commercial driver's license manual and test materials to include information on the role of fatigue in commercial vehicle accidents and methods to identify and address fatigue. (Class II, Priority Action) (H-95-40)

Also, the Safety Board issues Safety Recommendations H-95-32, -33, -34, -35, and 36 to the Federal Highway Administration, Safety Recommendation H-95-37 to the Research and Special Programs Administration, Safety Recommendation H-95-38 to the New York State Department of Transportation, Safety Recommendation H-95-39 to the American Association of State Highway and Transportation Officials, Safety Recommendation H-95-41 to the American Trucking Associations, Inc., and Safety Recommendations H-95-42 and -43 to Paraco Gas Corporation, Inc. The Safety Board reiterates Safety Recommendations H-94-5, H-95-3, and H-95-5 to the Federal Highway Administration.

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-95-40 in your reply. If you need additional information, you may call (202) 382-6813.

Chairman HALL, Vice Chairman FRANCIS, and Members HAMMERSCHMIDT and GOGLIA concurred in these recommendations.

By: 
Jim Hall
Chairman