

LOG 584C



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: NOV 27 1995

In Reply Refer To: H-95-39

Mr. Francis B. Francois
Executive Director
American Association of State Highway and Transportation Officials
444 North Capitol Street, N.W., Suite 249
Washington, D.C. 20001

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).

When the truck left the traveled way onto the negatively sloped shoulder and foreslope, its rollover speed was considerably reduced. Calculations based on a 0.26g rollover threshold show that in the center lane, which curved at a 1,522-foot radius and had a 6-percent superelevation, the rollover speed was 85 mph. On the shoulder, with a 1,542-foot radius and a minus 2-percent superelevation, the rollover speed was reduced to 74 mph. However, since the tire marks on the shoulder and foreslope indicate steering input at a maximum radius of 930 feet, the rollover speed on the shoulder was reduced to 58 mph. Once the truck was on the foreslope, with a superelevation of -12 to -16 percent, the rollover speed was reduced even further, from 36 to 44 mph.

The highway geometry beyond the traveled way, in combination with the tight turning radius of the steering input, reduced the vehicle's rollover speed, resulting in an unstable condition. At highway speeds of 55 to 58 mph, the truck would have traveled 79 to 84 feet per second. The tire marks left the traveled way 200 feet, or 2.5 seconds, before the truck reached the bridge. Even had there been rumble strips on the shoulder, the driver did not have enough time to perceive, react to, and avoid the hazard. Even if there had been time, once the truck lost stability, the driver could not recover. The Safety Board concludes that the truck exceeded its minimum rollover speed when it left the traveled way, at which point the vehicle lost stability and the driver was unable to recover.

Each design feature that the truck encountered, the pavement drop (3.5 inches), the slope of the ditch (-0.125 to -0.169), and the location of the guardrail, met the minimum AASHTO design guidelines in *A Policy on Geometric Design of Highways and Streets* and in the 1988 *Roadside Design Guide*. Each design feature by itself probably would not have created instability problems for the truck; but encountered together, they created a condition from which the driver could not recover. Because a passenger car has a much lower center of gravity and thus a higher rollover threshold, it probably could have negotiated these design features without stability problems; but this truck, with its high center of gravity and lower rollover threshold, could not. Therefore, the Safety Board concludes that the minimum AASHTO guidelines for the geometric design of highways are not always satisfactory for heavy trucks, especially those with high centers of gravity.

The Safety Board is encouraged by AASHTO's having used a greater variety of design vehicles for its 1990 and 1994 *A Policy on Geometric Design of Highways and Streets*. However, these vehicles are not being used to design safe cross sections. Because cargo tanks roll over more easily and because they often transport hazardous materials, the Safety Board believes that they should be added to the list of design vehicles and that their characteristics, especially their rollover threshold, should be considered when designing cross sections and horizontal curves.

The National Transportation Safety Board therefore issues the following safety recommendation to the American Association of State Highway and Transportation Officials:


Add a cargo tank to the design vehicles in the AASHTO *A Policy on Geometric Design of Highways and Streets*. (Class II, Priority Action) (H-95-39)

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-95-40 to the American Association of Motor Vehicle Administrators, 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-95-39 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