# National Transportation Safety Board

Washington, D.C. 20594

## Safety Recommendation

**Date:** May 25, 2001

**In reply refer to:** H-01-06 through -08

Honorable Norman Y. Mineta
Secretary
U.S. Department of Transportation
400 Seventh Street, S.W.
Washington, D.C. 20590

In the past 2 years, the National Transportation Safety Board investigated nine rear-end collisions in which 20 people died and 181 were injured (three accidents involved buses and one accident involved 24 vehicles).[1] Common to all nine accidents was the rear following vehicle driver's degraded perception of traffic conditions ahead.[2] During its investigation of the rear-end collisions, the Safety Board examined the striking vehicles and did not find mechanical defects that would have contributed to the accidents. In each collision, the driver of the striking vehicle tested negative for alcohol or drugs. Some of these collisions occurred because atmospheric conditions, such as sun glare or fog and smoke, interfered with the driver's ability to detect slower moving or stopped traffic ahead. In other accidents, the driver did not notice that traffic had come to a halt due to congestion at work zones or to other accidents. Still others involved drivers who were distracted or fatigued. Regardless of the individual circumstances, the drivers in these accidents were unable to detect slowed or stopped traffic and to stop their vehicles in time to prevent a rear-end collision.

As the Safety Board reported in 1995[3] and further discussed at its public hearing, Advanced Safety Technologies for Commercial Vehicle Applications, held August 31 through September 2, 1999, existing technology in the form of Intelligent Transportation Systems (ITS) can prevent rear-end collisions. Such systems, capable of alerting drivers to slowed or stopped traffic ahead, have been available for several years but are not in widespread use. The technology to alert drivers to traffic ahead includes adaptive cruise control (ACC), collision warning system (CWS), and infrastructure-based congestion warning systems. In the nine accidents investigated

[1] The accidents occurred in Moriarty, New Mexico; Sweetwater, Tennessee; Trenton, Georgia; Sullivan, Indiana; Tinnie, New Mexico; Wellborn, Florida; West Haven, Connecticut; Elk Creek, Nebraska; and Eureka, Missouri.

[2] Driver inattention is a major causal factor in about 91 percent of rear-end crashes, as reported in: U.S. Department of Transportation, ITS Joint Program Office, *Program Area Descriptions: Motor Vehicle Crashes—Data Analysis and IVI Program Emphasis* (November 1999).

[3] National Transportation Safety Board, *Multiple Vehicle Collision With Fire During Fog Near Milepost 118 on Interstate 40, Menifee, Arkansas, January 9, 1995, and Special Investigation of Collision Warning Technology*, Highway Accident Report NTSB/HAR-95/03 (Washington, DC: NTSB, 1995).

by the Safety Board, one (and sometimes more) of these technologies would have helped alert the drivers to the vehicles ahead, so that they could slow their vehicles, and would have prevented or mitigated the circumstances of the collisions.

The work being done by private industry and the Government on vehicle- and infrastructure-based technology is encouraging, but the pace of testing and of standards development for all vehicles and of deployment for commercial vehicles is cause for concern, given the increasing number of rear-end collisions and the number of fatalities when commercial vehicles are involved. Therefore, the Safety Board has explored the issues involved in deploying technological solutions in its special investigation report *Vehicle- and Infrastructure-Based Technology for the Prevention of Rear-End Collisions*,[4] which focused on some of the challenges, including implementation, consumer acceptance, public perception, and training associated with the deployment of such systems.

Rear-end collisions accounted for 1.848 million crashes in 1999, resulting in 1,923 fatal crashes. Of the fatal crashes, 770 involved commercial vehicles (trucks weighing more than 10,000 pounds and motorcoaches). This represented 40 percent of the fatal crashes, even though commercial vehicles only accounted for 3 percent of vehicles and 7 percent of miles traveled. In fact, in all types of collisions, trucks accounted for only 9 percent of fatal crashes. In work zones, commercial vehicles were involved in 62 percent of fatal rear-end crashes. The Safety Board concluded that accident statistics and the Safety Board's accident investigation findings indicate that accident consequences are more severe when commercial vehicles are involved in rear-end collisions and that the public can benefit from technology designed to help prevent these collisions. The Safety Board also concluded that recent accident investigation findings, coupled with the nearly 1.8 million rear-end collisions that continue to occur each year, underscore the need for effective CWSs to help alert drivers to obstacles ahead, thereby increasing their reaction time and preventing collisions or reducing the severity of impact.

The U.S. Department of Transportation (DOT) has set a goal of equipping 25 percent of new trucks and 10 percent of new cars with ITS technologies by 2010. Rear-end CWS technology could help meet that goal as well as contribute to the goal of reducing fatalities by 50 percent for truck-related accidents and 20 percent for accidents overall. Severe injuries and fatalities can and do occur when trucks run into passenger vehicles or vice versa. The 1998 Fatal Analysis Reporting System data indicated that 40 percent of fatal rear-end collisions involved commercial vehicles. The CWS can help reduce the fatalities and injuries associated with rear-end collisions and support the DOT in achieving its goals.

Today, highways are not limited to a speed restriction of 55 mph; traffic can travel at speeds up to 75 mph or more. At these high speeds, when a great speed differential may be present, such as when traffic is moving slower or is stopped, the driver needs more time than needed at slower speeds to take action to prevent a collision. The reasons given by the manufacturers for the detection distance not being greater on the current CWS is that as detection distance increases, so does the number of false alarms because the radar beam is wider than the lane width and objects that are not threats, such as bridge abutments or vehicles in another lane,

[4] For more information, read: National Transportation Safety Board, *Vehicle- and Infrastructure-Based Technology for the Prevention of Rear-End Collisions*, Special Investigation Report NTSB/SIR-01/01 (Washington, DC: NTSB, 2001).

particularly in a curve, are detected. Companies are working on measures to eliminate these false alarms. The current CWSs do not provide an auditory alert with enough time for the driver to avoid the collision because of the trucks' high rates of speed.

The National Highway Traffic Safety Administration (NHTSA) has stated that no current plans exist for rulemaking on rear-end CWSs. The DOT wants to understand how CWSs work so it can make appropriate recommendations on standards, if necessary. NHTSA indicated, however, that if the operational tests are successful and action by industry or by users to implement the CWS is still slow action, then it would consider enacting a rulemaking that would include requirements for test procedures, effectiveness, false alarms, and benefits. The Safety Board concluded that without performance standards for system operation and driver interface, the usage of numerous and nonuniform systems may result in operator confusion; thus, CWS technologies may not provide the driver with the ability to prevent rear-end collisions in some situations.

Current ACC systems are designed to only slow the vehicle by about 25 percent, after which the driver must take action. If the driver is in a low visibility situation and cannot see the vehicle in front of him, the ACC would begin to slow the vehicle due to the slower vehicle ahead. However, without a cue, the driver may not be able to determine whether the ACC is slowing at an appropriate rate or whether the driver needs to intervene and slow the vehicle. Without performance standards for system operation and driver interaction with ACC, the usage of numerous and nonuniform systems may result in operator confusion; thus, a driver may not understand how the system works and may not react appropriately if the system cannot slow the vehicle adequately.

As new technologies begin to be implemented, standardization of the driver interface and the operational characteristics of the systems must occur to prevent driver confusion. The locations of driver-activated safety systems, such as brake pedals, are standardized. Highway warning signs have uniform symbols, yet several ACC systems are currently on the market with no standards for their operation. For the driver to develop an appropriate mental model of how a system works, there needs to be consistency among systems.

Field experience is critical to understanding the full advantages (and disadvantages) of safety systems—crash tests and simulations alone cannot represent all situations.[5] The Safety Board is therefore pleased that the DOT is now involved in the operational tests of the CWS and the ACC. At the conclusion of these tests, a multitude of data and information will be available on the functionalities of rear-end CWS. Nevertheless, these systems were available several years ago, and, in 1995, the Safety Board recommended that testing be conducted on the CWS. Had the DOT begun testing at that time, the understanding and deployment of these systems would be far greater than it is currently.

As evidenced by the experience of companies whose trucks are equipped with the CWS and by Safety Board investigations, the CWS can help reduce rear-end collisions. Each of the accidents described in our special investigation report[6] may not have occurred, or their severity

[5] Joseph C. Marsh, IV, presentation "Evaluating the Safety of Air Bags – Lessons Learned for ITS," ITS America Workshop on Safety Evaluations on May 1, 1995.

[6] NTSB/SIR-01/01.

may have been considerably less, had the striking vehicles been equipped with the ACC to maintain an appropriate headway or the CWS to alert the driver of traffic ahead.

Even though the DOT has begun to field test the ACC and the CWS, it has no plans to require the use of these systems. At the public hearing, the Safety Board heard testimony that some companies were voluntarily equipping their fleets with the CWS or the ACC or both, and although the Safety Board lauds these efforts, the Board also recognizes that these carriers are in the minority. Relying on the industry to ensure that its trucks are equipped with this advanced safety technology is an ineffective strategy. One of the greatest challenges for vehicle-based systems is the time necessary for full-deployment of any system. For instance, it has been 14 years since all new vehicles were required to be equipped with center high-mounted stop lamps, and still many older cars are on the road today (due to normal turnover) that do not have these stop lamps. Without full deployment, the projected number[7] of rear-end collisions prevented will be reduced.

Therefore, the National Transportation Safety Board recommends that the U.S. Department of Transportation:

> Complete rulemaking on adaptive cruise control and collision warning system performance standards for new commercial vehicles. At a minimum, these standards should address obstacle detection distance, timing of alerts, and human factors guidelines, such as the mode and type of warning. (H-01-06)
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> After promulgating performance standards for collision warning systems for commercial vehicles, require that all new commercial vehicles be equipped with a collision warning system. (H-01-07)
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> Complete rulemaking on adaptive cruise control and collision warning system performance standards for new passenger cars. At a minimum, these standards should address obstacle detection distance, timing of alerts, and human factors guidelines, such as the mode and type of warning. (H-01-08)

The Safety Board also issued safety recommendations to the National Highway Traffic Safety Administration; the Federal Highway Administration; automobile, truck, and motorcoach manufacturers; the Intelligent Transportation Society of America; the American Trucking Associations, Inc.; the Owner-Operator Independent Driver Association; and the National Private Truck Council.

Please refer to Safety Recommendations H-01-06 through -08 in your reply. If you need additional information, you may call (202) 314-6440.

[7] NHTSA projected 49 percent.

Acting Chairman CARMODY and Members GOGLIA and BLACK concurred in these recommendations. Member HAMMERSCHMIDT concurred in Safety Recommendations H-01-06 and -08; Member HAMMERSCHMIDT did not concur in Safety Recommendation H-01-07.

*Original Signed*

By: Carol J. Carmody
Acting Chairman