

Log H-415

NATIONAL TRANSPORTATION SAFETY BOARD WASHINGTON, D.C.

ISSUED: August 8, 1984

Forwarded to:
Mr. Harry J. Lesko
President
Trailways Lines, Inc.
1500 Jackson Street, Suite 401
Dallas, Texas 75201

SAFETY RECOMMENDATION(S)
H-84-61 through -63

About 5:15 a.m. on November 30, 1983, a Trailways Lines, Inc., intercity bus traveling in the right lane of southbound U.S. 59 about 5 miles north of Livingston, Texas, struck the rear of an unloaded tractor-flatbed semitrailer operated by E. A. Holder, Inc. The bus then veered across the left southbound lane, crashed through a bridge guardrail, and vaulted to a creekbank 26 feet below the bridge deck. It was dark, the weather was cloudy, and there was no roadside lighting. The pavement of the four-lane, divided highway was dry. The truck had turned right onto southbound U.S. 59 about 927 feet before the accident site and according to postaccident tests had accelerated to about 42 mph when it was struck in the rear by the southbound bus. Six of the 11 bus passengers were killed; 5 bus passengers and the busdriver sustained moderate to severe injuries during the accident. The truckdriver later reported that he was injured. 1/

The Safety Board determined that the probable cause of this accident was the busdriver's lack of alertness, possibly due to fatigue, which resulted in his failure to recognize that he was overtaking a slower-moving truck until it was too late to avoid impact. Contributing to the severity of the crash was the excessive speed of the bus.

After the accident, two trips were made from the Lufkin bus terminal to the accident site, a distance of 43.2 miles. On each trip, about 52 minutes were required to complete the trip while operating at or near, but not exceeding, the posted speed limit. If the driver left Lufkin between 4:30 and 4:35 a.m. and the accident occurred at 5:15 a.m., the busdriver made the 43.2-mile trip in between 40 to 45 minutes, with an average speed of between 57 and 64 mph with no stops. Given that the busdriver made at least one stop en route from Lufkin to the accident scene, the bus would had to have been operated at a constant speed at or near 65 mph to maintain an average speed in that range.

The driver departed Lufkin between 5 and 10 minutes later than his scheduled time for departure. From the road tests, the Safety Board concludes that the busdriver probably was operating his vehicle above the 55-mph posted speed limit at or near 65 mph for most of the trip from Lufkin to the scene of the accident and that the driver may have been speeding to get back on schedule. He was due in Livingston at 5:20 a.m.

1/ For more detailed information read Highway Accident Report—"Trailways Lines, Inc., Bus/E.A. Holder, Inc., Truck, Rear End Collision and Bus Run-Off-Bridge, U.S. Route 59, near Livingston, Texas, November 30, 1983" (NTSB/HAR-84/04).

The schedule established by Trailways requires that the driver drive the approximately 49-mile trip from Lufkin to Livingston in 55 minutes, which requires an average speed slightly in excess of 53 mph.

Trailways should regularly monitor busdriver compliance with posted speed limits and take effective action against drivers who violate speed laws either on their own initiative or to comply with schedules.

The busdriver was not wearing the available seatbelt. The Safety Board concludes that the busdriver's use of the available seatbelt, as required by the Federal Motor Carrier Safety Regulations (49 CFR 392.16), would not have mitigated his injuries. The major impact area of the bus with the creekbank was at the left front of the bus where the busdriver was seated.

While Safety Board investigators were at the Trailways terminal in Houston for a postaccident examination of the bus involved in this accident, they noted that several Trailways drivers failed to buckle their seatbelts before driving buses from the terminal. Even though the use of a seatbelt would not have prevented the driver in this accident from receiving serious injuries, it is important that all drivers wear the seatbelt that is provided whenever the bus is moving. The ability to maintain control of the bus in an emergency or crash situation is seriously jeopardized if the driver is thrown from the seat. In a 1972 crash in Virginia, 2/ a car ran a stop sign and hit a large schoolbus. The bus ran off the road and partially overturned. All the bus occupants were injured. The Board found that "the second collision of the bus, into the embankment, was caused by loss of driver control; the nonuse of available seatbelts by the driver prevented the regaining of control." Trailways should require its drivers to wear their seatbelts whenever the vehicle is in motion.

Research indicates that human performance at certain tasks reaches its lowest level during the early morning hours just preceding dawn. This phenomenon, which is documented in many studies relating to fatigue and human performance during periods of shift work, is attributed to the effects of circadian rhythms--the daily variations in the level of physiological arousal.

The relationship between circadian rhythms and the commercial driving task is best addressed in a research effort initiated by the Bureau of Motor Carrier Safety (BMCS) in 1975 3/ in which the researchers examined, among other things, work periods that are irregular with respect to the day-night cycle. The research indicates that, on the basis of heart rate measurements, diurnal (daily) variations in the level of physiological arousal occurred in professional truckdrivers who drove during both daytime and nighttime hours, but that a disproportionate number of accidents involving "sleepy or inattentive" drivers occurred between midnight and 0800 when physiological indices of arousal are generally at their lowest levels.

2/ Highway Accident Report—"Schoolbus-Automobile Collision and Fire Near Reston, Virginia, February 29, 1972" (NTSB-HAR-72-2).

3/ "A Study of the Relationships Among Fatigue, Hours of Service, and Safety of Operations of Truck and Bus Drivers," U.S. Department of Transportation, Federal Highway Administration, Bureau of Motor Carrier Safety, 1972.

Other laboratory studies of human performance during periods of shift work have corroborated the commonly accepted view that human performance reaches its lowest level during the early morning hours. This period of comparatively poor performance represents the trough of a circadian rhythm in task performance. 4/ The tasks examined in the research included the passive monitoring of a monotonously repetitive environment with the requirement that certain, infrequent signals be reliably recognized, and the active processing of information, including the correct visual identification of various objects. As pointed out in the research, these tasks may be considered to be laboratory representations of two major components of highway driving--monitoring the highway for significant occurrences and correctly identifying those occurrences.

The results of the BMCS research showed that a highly disproportionate percentage of "dozing driver" accidents was found to occur in the hours between midnight and 0600. BMCS field experiments on relay truck driving, sleeper truck driving, and bus driving showed pronounced increases in subjective fatigue, marked changes in physiological state, and earlier degradation of performance of trips that involved driving during these hours.

The quality of sleep/rest received prior to working irregular hours may help in the control of the circadian rhythm impact. It is noted, however, that those drivers whose schedules end just prior to early morning are perhaps most vulnerable to diurnal variations. This is due to exposure to sleep-disturbing social and environmental stimuli present during daytime hours when these shift workers try to sleep. The cumulative effects of fatigue are felt to be significant for drivers on shift work. Some of the effects of fatigue on operator performance include disruptions in timing, loss of fine motor control, increased variability in performance, and lowering of performance standards. Operational tasks most affected by fatigue are those based upon minute cues in which vigilance and alertness are important. Vigilance appears to be the function most affected by fatigue. 5/

The busdriver in this accident was exposed to several factors which cause fatigue, such as vibration, monotonous monitoring of a dark highway, and physical inactivity resulting from confinement to his seat. A bus passenger reported that, about 10 minutes before the accident, he saw the busdriver's head nod and that the bus drifted onto the shoulder, an indication that the busdriver might have been fatigued or sleepy. In view of the circumstances of the accident, the driving environment, and the 24-hour work/sleep history of the driver, it is possible that the busdriver's lack of alertness to his driving task was related to the early morning hour of the accident and the effects of fatigue.

In 1973, as a result of its investigation of a bus accident in Richmond, Virginia, 6/ the Safety Board issued recommendation H-73-5 that the BMCS:

Assign high priority to a study of practical methods and means to prevent or to minimize dozing at the wheel by drivers of carriers in interstate commerce, toward the end that appropriate rulemaking will follow.

4/ Allusisi, E.A., Coates, G.D., & Morgan, B.B., Jr. Effects of Temporal Stressors on Vigilance and Information Processing. In R.R. Mackie, (ed.), Vigilance: Theory, Operational Performance, and Physiological Correlates, New York: Plenum Press, 1977.

5/ USN Flight Surgeon's Manual, United States Navy, pp. 651-653.

6/ Highway Accident Report--"Runoff and Overturn of Intercity Bus on Interstate 95, Richmond, Virginia, September 3, 1972" (NTSB-HAR-73-2).

The Federal Highway Administration responded to this recommendation by stating:

In regard to Recommendation H-73-5, there have been numerous "Stay Awake" devices available since 1960 which will warn a driver that he is dozing or is not responding in a normal pattern, implemented by a sensing system on the steering wheel. However, the cost per unit for these devices may be prohibitive. The Bureau of Motor Carrier Safety is of the opinion that these devices can be helpful but are not the answer to the problem. The Bureau believes that proper rest by drivers, sane scheduling of trips, and constant supervision by motor carrier management of drivers can remove the causes that induce drowsiness and instances of drivers falling asleep at the wheel.

Although proper driver rest is essential for the prevention of inattention/fatigue-related accidents, neither the BMCS nor management officials of motor carriers have the means to determine either the amount or the quality of rest obtained during driver "off-duty" periods. Regulations requiring the proper scheduling of trips and driver compliance with hours of service driving and on-duty limitations exist and generally are enforced by the BMCS.

The nature of the over-the-road driving task precludes the constant management supervision envisioned by BMCS as being part of the solution to the inattention/fatigue problem. Drivers for the most part are not in contact with management, nor can motor carrier management observe driver performance while a driver is away from management's direct supervision.

There are several types of devices available on the market designed to alert a driver that fatigue is setting in. Two common devices are readily available to the public. One device is activated when steering wheel adjustments become irregular, and the other, which is worn like a hearing aid, is activated when the driver's head begins to nod. Both of these devices emit a signal to warn the driver.

As a result of its investigation of this accident, the National Transportation Safety Board recommends that Trailways Lines, Inc.:

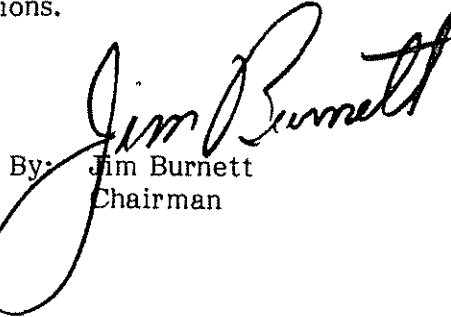
Regularly monitor the compliance of Trailways Lines, Inc., busdrivers with posted speed limits, and take corrective action as necessary to enforce the stated policy of the company that all drivers comply with posted speed limits. (Class II, Priority Action) (H-84-61)

Regularly monitor the compliance of Trailways Lines, Inc., busdrivers with seatbelt use requirements, and take corrective action as necessary to enforce the stated policy of the company that all drivers comply with Federal regulations requiring the use of seatbelts. (Class II, Priority Action) H-84-62)

Determine practical methods and means to prevent or minimize dozing at the wheel by drivers employed by Trailways Lines, Inc., and advise the Safety Board of its findings. (Class II, Priority Action) (H-84-63)

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 actions taken as a result of its safety recommendations and would appreciate a response from you regarding action taken or contemplated with respect to the recommendations in this letter.

BURNETT, Chairman, GOLDMAN, Vice Chairman, and BURSLEY and GROSE, Members, concurred in these recommendations.


By: Jim Burnett
Chairman

