

NATIONAL TRANSPORTATION SAFETY BOARD

HIGHWAY ACCIDENT REPORT

GREYHOUND BUS/MALONE FREIGHT LINES, INC.

TRUCK COLLISION

U.S. ROUTE 11W

BEAN STATION, TENNESSEE

MAY 13, 1972

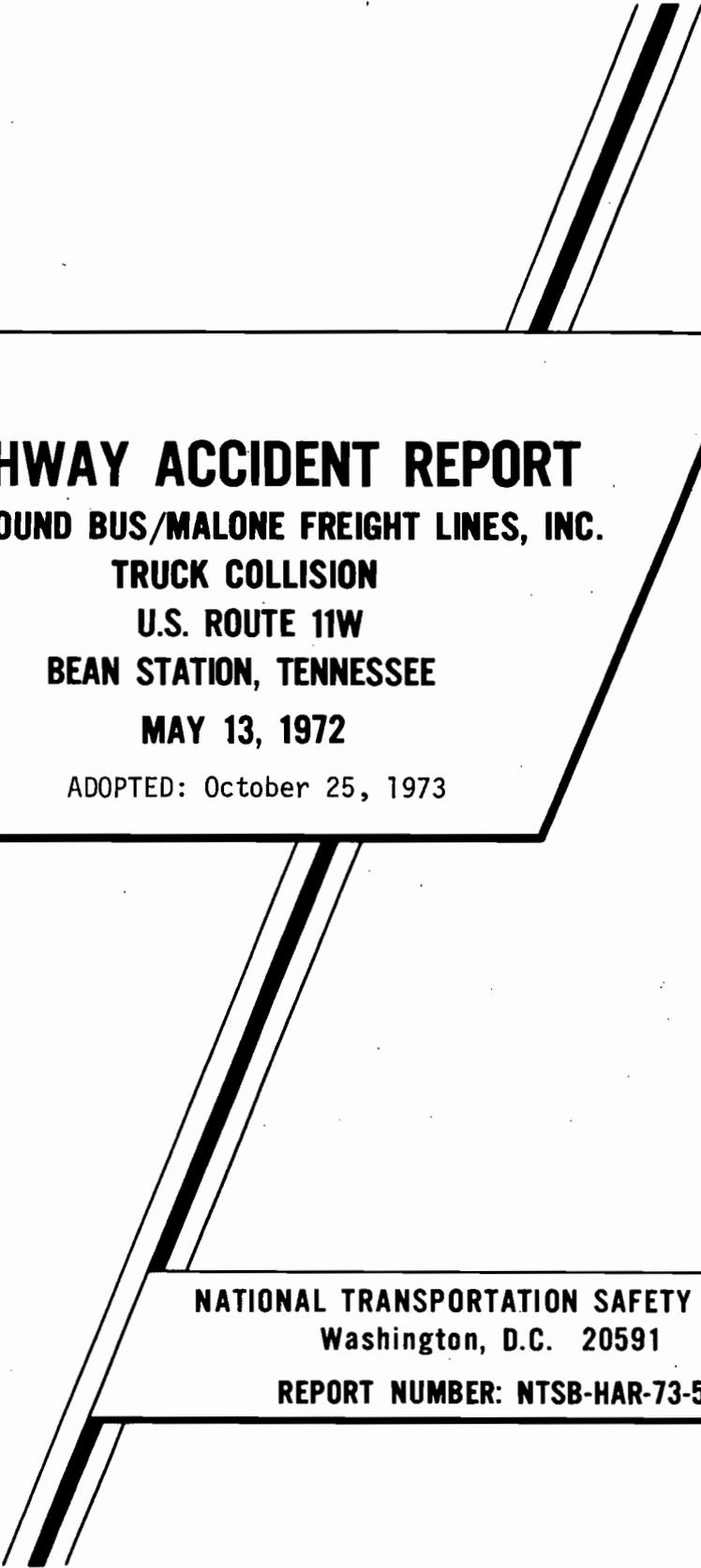
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NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C. 20591

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16. Abstract <p>This report describes and analyzes an accident which occurred on U.S. Route 11W near Bean Station, Tenn., on May 13, 1972. An eastbound intercity bus and a westbound tractor-semitrailer collided nearly head on in the westbound lane of the two-lane highway. The tractor and the trailer cargo were destroyed in a post-impact fire which involved only the tractor-semitrailer. The truckdriver, the busdriver, and 12 bus passengers died in the collision. Fourteen of the remaining 15 bus passengers were injured; 9 passengers were found outside the bus after it came to rest.</p> <p>The National Transportation Safety Board determines that the cause of this accident was (1) the driving of the bus in the opposing lane of traffic while the bus was passing an automobile without unobstructed clear-sight distance ahead, and (2) the busdriver's failure to avoid the tractor-semitrailer for reasons unknown. Factors which contributed to the collision and to the injuries and fatalities are cited in the report.</p> <p>The report contains recommendations to the Bureau of Motor Carrier Safety (Federal Highway Administration) and to the National Highway Traffic Safety Administration. The recommendations concern seat restraints for bus passengers and impact protection for interior panels around bus windows.</p>					
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FOREWORD

The accident described in this report has been designated a major accident by the National Transportation Safety Board under the criteria established in the Safety Board's regulations.

The report is based on facts obtained from an investigation conducted by the Safety Board and on information provided by the Bureau of Motor Carrier Safety of the Federal Highway Administration, the Tennessee Highway Patrol, and the Tennessee Department of Highways.

The conclusions, the determination of probable cause, and the recommendations contained herein are those of the Safety Board.

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BEAN STATION, TENNESSEE
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1. SYNOPSIS

At 5:35 a.m. on May 13, 1972, an eastbound Greyhound intercity bus drove over the broken centerline of U. S. Route 11W, a two-lane highway, and started to pass an eastbound automobile. As the front of the bus pulled even with the center of the automobile door, a westbound truck came into view around a curve. 1/

The busdriver made no attempt to get back into his own lane, and the bus collided with the truck nearly head-on in the westbound lane. The top speed of the bus before impact was estimated at about 55 m.p.h., and the top speed of the truck at about 45 m.p.h. After impact, the bus traveled an additional 86 feet and came to rest, right side up, in the eastbound lane. The tractor and truck were destroyed by a fire which did not reach the bus.

The truckdriver, the busdriver, and twelve bus passengers died in the crash. Fourteen of the remaining fifteen passengers in the bus were injured. Nine passengers were found outside the bus after it came to rest.

The National Transportation Safety Board determines that the cause of this accident was (1) the driving of the bus in the opposing lane of traffic while the bus was passing an automobile without unobstructed clear-sight distance ahead, and (2) the busdriver's failure to avoid the tractor-semitrailer, for unknown reasons.

Contributing to the fatalities and injuries was the lack of occupant restraints, which allowed some passengers to be ejected and others to be projected into sharp or unyielding interior bus components.

II. FACTS

The Accident

At 5:35 a.m., e.d.t., on May 13, 1972, a Greyhound intercity bus carrying 27 passengers was traveling eastbound on U. S. Highway 11W

1/ When used in this report, the term "truck" will indicate a tractor-semitrailer.

approximately 3 miles west of Bean Station, Tennessee. In the eastbound lane, directly ahead of the bus, was an automobile driven by an adult male and carrying a male hitchhiking passenger.

The driver of the automobile driving with his automatic cruise control set at 55 m.p.h., disengaged the cruise control, entered the westbound lane, and passed a slow-moving car ahead of him. The driver then watched in his rearview mirror as the bus also successfully passed the slow-moving car. He noticed that the wheels of the bus crossed over the white stripe which marked the outer edge of the westbound lane of the highway.

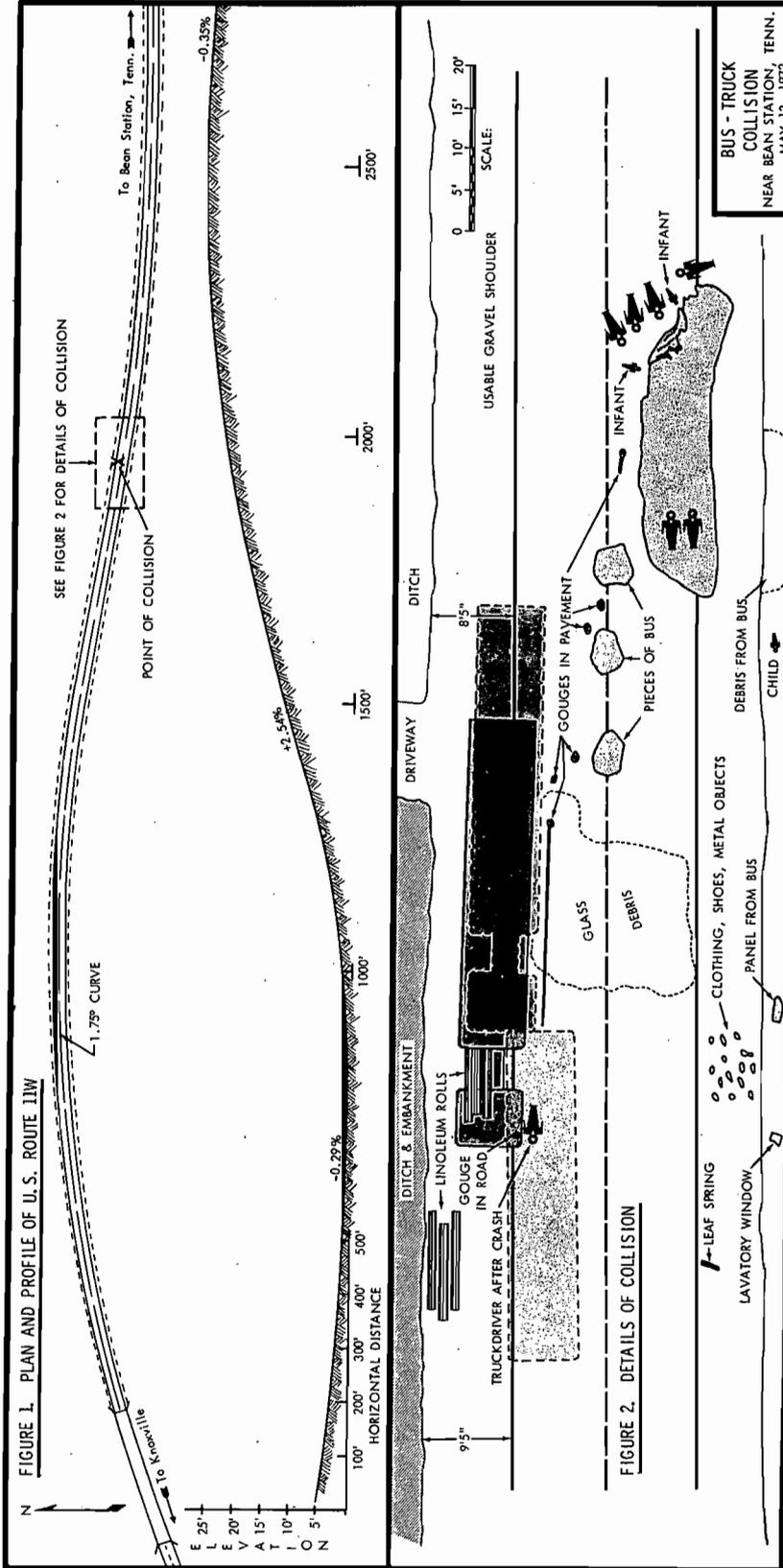
The automobile driver estimated that when the bus passed the slow-moving vehicle, the bus was traveling at a speed of 70 to 75 m.p.h., and his own car was traveling at a speed of 45 to 55 m.p.h. The bus re-entered the eastbound lane and proceeded to follow his automobile so closely that the automobile driver could not read the destination sign on the bus in his rearview mirror.

After the automobile and bus crossed a bridge, they entered a 1.75° curve to the right, with a 2.54-percent upgrade. (See Figures 1, 2, 3 and 4.) When the bus was about 1,500 feet into the curve, it began to pass the automobile. The bus moved into the westbound lane, pulled even with the center of the automobile's left-side door, and, according to the automobile driver, seemed to "hang there."

The Collision. At that point, the automobile driver first saw a tractor-semitrailer approaching in the westbound lane. Another tractor-semitrailer, which was traveling about 250 feet ahead of the automobile in the eastbound lane, had been blocking the car driver's view of the approaching vehicle. Realizing that an accident was imminent, the automobile driver tried to accelerate to give the busdriver room to pull back into his own lane, but the automobile did not gain speed fast enough. Watching through the outside and inside rearview mirrors, the automobile driver saw the left front of the bus strike the left front of the tractor-semitrailer. The automobile passenger also witnessed the collision. The automobile driver stated that he did not hear any braking noises from either vehicle prior to impact and estimated that the speed of the tractor-semitrailer was about 45 m.p.h.

Marks on the roadway and shoulder of the roadway indicate that at the moment of impact the right wheels of the tractor-semitrailer were on the shoulder and 5 feet north of the edge of the road. The two vehicles were in virtual alignment with the edge of the road. The left wheels of the tractor-semitrailer were 3 feet into the westbound lane and 8 feet north of the highway centerline.

The bus struck the tractor-semitrailer at a slight angle. The left front wheel of the bus was 6 inches onto the north shoulder of the highway,



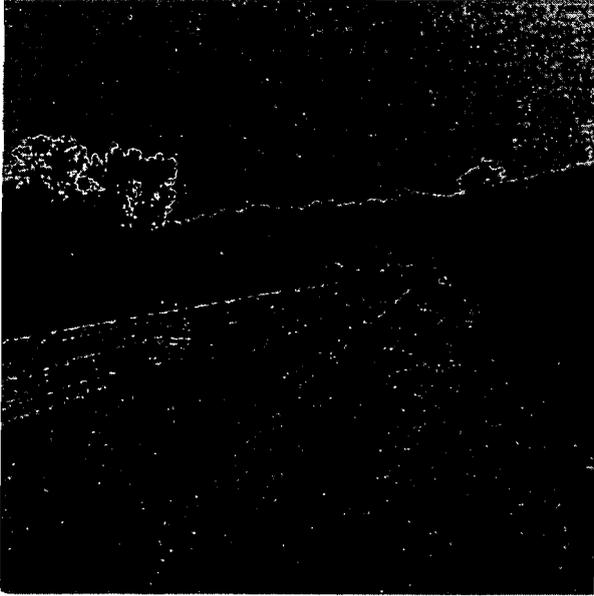


Figure 3. Accident site (picture taken at point of impact, facing west).

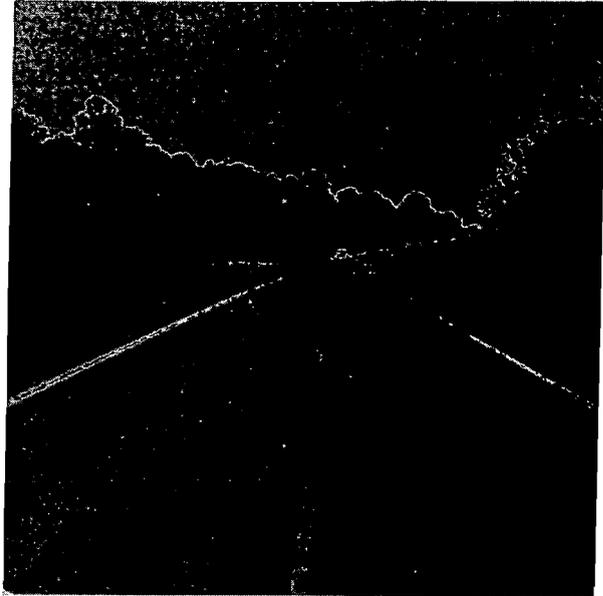


Figure 4. Accident site (picture taken 1,600 feet west of impact point, facing east).

and the left rear wheel was on the very edge of the road. The right front and rear wheels were 3 feet 6 inches and 3 feet left of the highway centerline, respectively.

After impact, the bus rotated counterclockwise. The vehicle traveled 86 feet before it came to rest, right side up, in the eastbound lane. Six adults, a child, and two infants were found outside the bus after it came to rest. Four of the adults and the two infants were on the pavement adjacent to the left side of the bus. The two other adults were found under the rear of the bus, and the child was found 10 feet south and 5 feet west of the right rear corner of the bus. Another passenger, an adult, was seen falling from the damaged left side of the bus after it had stopped.

Besides these nine passengers who were found outside the bus, several other passengers recall "waking up" outside the bus, but could not remember how they got there. About eight to ten passengers remained in the rear half of the bus, and two passengers were trapped in the front section.

After impact, the truck moved slightly to its right and forward about 12 feet. This is evidenced by a gouge mark found under the left front wheel of the tractor. The mark appeared to have been made as the tractor disengaged from the bus and fell onto the road. There were no

scrape marks leading up to or away from the gouge mark which would indicate further movement of the truck.

Witnesses. A truckdriver who had been following about one-quarter mile behind the westbound tractor-semitrailer stated that he saw the bus swerve into the westbound lane and collide with the truck. He stated, "I thought the busdriver must have had a heart attack, as he had plenty of time to see the truck and all kinds of room to get back on his side of the road." He said that the truck swerved to the right, onto the highway shoulder, and that its brake lights then came on. He thought that the truck had slowed and perhaps had stopped before the collision.

After the collision, this witness parked his vehicle, rushed to the scene, and tried unsuccessfully with a hand-held fire extinguisher to put out a fire which had erupted on the truck. The bus engine was still running, and a small fire had started in the engine compartment. The witness shut off the bus fuel valve, which stopped the engine and extinguished the fire.

The driver of a truck which had been following the bus saw the collision from about one-quarter mile away, but because of the curve in the road, he could not determine the position of the bus at the moment of impact. He estimated his speed at about 45 to 50 m.p.h., and said that the bus was pulling away from him. He estimated the speed of the bus to be between 50 and 55 m.p.h.

After the collision, the automobile driver stopped and backed his vehicle to the scene. He told the hitchhiker to get out and help in whatever way possible and then drove east to the nearest truck stop. There, without identifying himself, he notified the telephone operator of the accident and its location. He then returned and picked up the hitchhiker. 2/

Eight of the bus passengers who survived the collision were interviewed. None, however, could supply any details concerning the accident, since most were asleep at the time. Three of the passengers thought

2/ Neither the automobile driver nor the hitchhiker made himself known to police or anyone at the accident scene. Two days after the accident, the hitchhiker telephoned the owner of the truck involved in the collision from Jackson, Miss. He had read about the accident, and called to assure the owner that the bus had struck the truck, contrary to what had been reported in the news accounts. Although the hitchhiker would not identify himself, he did state that he had the automobile driver's business card and gave the truck owner the name and business address on the card. From this information, the automobile driver was located. Efforts to locate the hitchhiker have been unsuccessful.

that the driver was traveling somewhat fast, perhaps to make up time, but none of the three thought he was driving recklessly.

Rescue Efforts. The telephone operator who answered the automobile driver's call notified the Tennessee Highway Patrol and the Grainger County Sheriff's Department at 5:50 a.m. The Sheriff's Department called the Grainger County Rescue Squad, which arrived on the scene at 5:58 a.m. The first Highway Patrol unit arrived at 6:17 a.m. Twenty-two Highway Patrol personnel, 19 ambulances from four counties, and firefighting units from Bean Station and Morristown responded to the emergency calls.

Rescue workers used crowbars, air hammers, and acetylene torches to facilitate removal of the passengers who were left in the bus. The workers extricated the two passengers trapped in the front of the bus, and removed the eight to ten passengers in the rear half of the bus through the rear and side windows. Some of these passengers were found on top of each other; others were found beneath and between the seats. Rescue personnel removed at least two seats with power tools in order to extricate the injured. The last ambulance left at 7:10 a.m.

As a result of the accident, the truckdriver, the busdriver, and 12 bus passengers died. Fourteen of the remaining 15 passengers were injured.

Accident Site

U. S. Highway 11W from Knoxville to Kingsport, Tenn., is a heavily traveled thoroughfare for commercial traffic. The accident happened 819 feet west of log mile 29-1-25.05, in sparsely settled, rolling countryside.

At the accident site, the highway has one eastbound and one westbound lane, separated by a 4-inch-wide broken white line. The north and south edges of the highway are marked by 4-inch-wide solid white lines. On the north side of the highway, 50 feet east and west of the point of impact, is a usable gravel shoulder which varies in width from 8 feet 5 inches to 9 feet 5 inches. The lanes are each 11-feet wide.

Both eastbound and westbound vehicles have an unobstructed sight distance of 1,600 feet as they approach the impact point. The road surface through the accident site is concrete. At the time of the accident, the weather was cloudy but dry, and the sky was still dark. The posted speed limit through the accident area was 50 m.p.h. for trucks and 65 m.p.h. for automobiles.

Tennessee Department of Highway records indicate that in 1971 seven accidents occurred on the section of the highway one-half mile east and west of the point of impact. One of these accidents resulted in a death and an injury; the other six involved only property damage. There were

two accidents in 1970 and one in 1969; these, too, involved only property damage.

All ten accidents were within 1,950 feet of each other and generally occurred during daylight with clear and dry weather. The causes of the accidents were typically listed as "following too closely" and "failure to grant right-of-way to vehicle." No record was found of any passing accident other than the accident on May 13, 1972.

Federal Highway Administration statistics for the State of Tennessee indicate that the fatality rate of the interstate highway system is 3.62 as compared to 5.79 on the Federal primary system. The Bureau of Highway Planning and Research Division of the Tennessee Highway Department has conducted a study for the 5-year period 1968 through 1972 concerning accident rate figures on Route 11W, the subject of this investigation. This data shows that for the 111.7 miles of 11W, the Average Daily Traffic (ADT) varies from 10,000 vehicles per day to 22,000.

Interstate 81 (I-81) now under construction, parallels Route 11W and when completed will relieve 11W of a substantial amount of interstate traffic. The estimated ADT for Route 11W after Interstate 81 is completed and open to the public will drop to between 2,630 and 3,491 vehicles per day.

In the 5-year period covered, the study also reveals an average of 19 fatal accidents per year taking place on Route 11W and a total yearly average of 979 accidents.

The Tennessee Planning and Research Division estimates that I-81 will be completed to Bristol by the end of 1975. In order to accomplish this accelerated completion, the State of Tennessee sold bonds to raise the needed money. The bonds will be repaid when the Federal funds are available at their allocated annual rate.

Vehicles

The Bus. The bus, owned and operated by Greyhound Lines - East, was a 1955 General Motors, 43-passenger Coach Model PD-4501, equipped with a 285-horsepower diesel engine and a four-speed manual transmission. The rear-mounted engine was mechanically governed, and the top speed the bus could attain was about 65 m.p.h. Of monocoque design, the bus was equipped with two decks, a lavatory, and air-conditioning. The vehicle was constructed primarily of aluminum over a steel framework. In back of the driver's seat on the lower deck were two rows of paired seats and the lavatory. Three rows of seats were located on the opposite side. Seven rows of paired seats with five seats across the back of the bus were located on the upper deck, which was to the rear of and 28 inches above the lower deck.

The ceiling material was laminated melamine. Overhead parcel shelves, with extruded aluminum edgings, were suspended from the ceiling on each side. Interior trim between the side windows consisted of a vinyl-coated wall covering over a layer of fiberglass insulation and masonite as a base material.

Gross vehicle weight at the time of the accident was estimated to have been 35,350 pounds.

Severe impact damage to the bus precluded any meaningful evaluation of the mechanical condition of the bus prior to impact. No abnormalities, however, were observed in the careful examination which was undertaken. Tire tread depth was well above the minimum 2/32 of an inch set by 49 CFR 393.75(c). Two drivers who had driven this bus prior to this trip reported that the bus was in good mechanical condition. Neither driver mentioned any steering difficulties or defects.

The Truck. The truck involved in the accident was owned by the Malone Freight Lines Incorporated and consisted of a 1971 Kenworth tractor with cab over engine and a 1969 Malone semitrailer. The tractor was diesel powered, equipped with three axles, and weighed 15,171 pounds. The semitrailer weighed 12,200 pounds and was 40 feet long.

At the time of the accident, the truck was carrying 37,651 pounds of linoleum and adhesives. Although the postimpact fire precluded an examination of the tractor, an examination of the semitrailer revealed no mechanical deficiencies.

Vehicle Damage

The Bus. The impact area included the left 38.4 inches of the front of the bus. Impact damage extended along the left side through the length of the bus. (See Figures 5, 6, and 7.) Some minor damage was incurred during rescue operations.

Approximately three-quarters of the seats were displaced or twisted to some degree. Approximately one fourth of these seats sheared at the seat legs slightly above the bolting flange. (See Figure 8.) The interior paneling on the roof and side walls was split, and sharp edges were exposed. (See Figure 9.) The damage to the rear half of the bus was confined to buckling of the outer left side and roof panels. The interior passenger space of the rear half of the bus was not severely compromised. (See Figure 10.) The side windows in the rear half functioned as intended and were used by passengers with minor injuries to exit.

The Truck. The left side of the tractor chassis frame side rail was deformed upward and rearward approximately 4 feet. The right side rail was deformed to the right approximately 2 feet, but was not forced upward. The engine and transmission had been separated from the chassis



Figure 5. Damage to front of bus.



Figure 6. Damage to left side of bus.

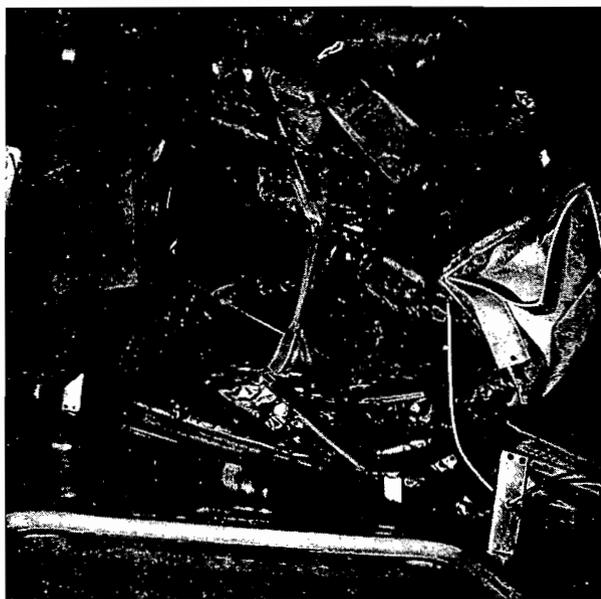


Figure 7. Forward section of bus, after collision.



Figure 8. Seat leg, sheared at flange.

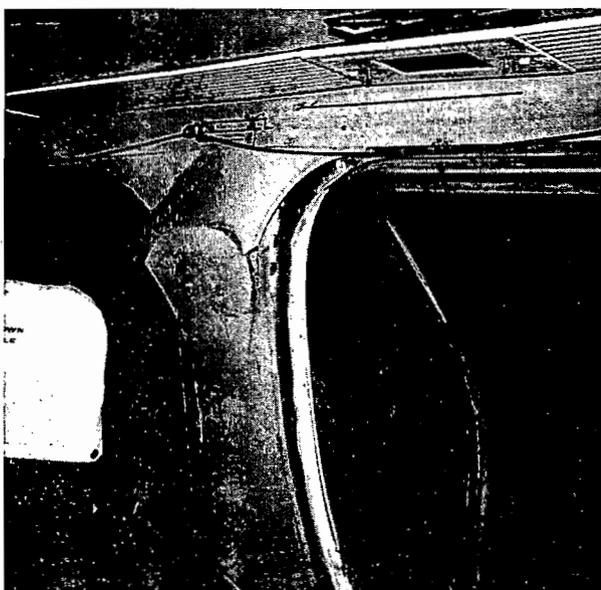


Figure 9. Split interior panel.



Figure 10. Interior of the rear section of bus, after collision.

assembly. The cab was destroyed in the postimpact fire. The fifth wheel, fifth-wheel mounting plate, and trailer upper coupler (kingpin assembly) were still in their normal coupled position and attached to the tractor side rails.

The transmission cover was removed in an attempt to determine which gear ratio the truck was in at the time of the accident. The main transmission was either in first or sixth gear. However, because the truck's auxiliary transmission could not be located, a more definite determination of the truck's speed range, i.e., whether the truck was in first or sixth gear, was precluded.

The front end of the trailer was extensively damaged by fire. The upper half of the aluminum side sheets burned between the vertical structural members. The front bulkhead was damaged by the forward movement and penetration of the cargo. The cargo was destroyed in the postimpact fire.

The Busdriver

The busdriver was a 57-year-old man, who had been employed as a driver by Greyhound Bus Lines East since October 23, 1945. At the time of the accident, he held a valid Virginia chauffeur's license with a restriction for corrective lenses. In addition, he held a doctor's certificate, dated April 4, 1972, which indicated that he was qualified to operate motor vehicles in interstate commerce.

The busdriver's Virginia driving record revealed no traffic violations or accidents. However, the company personnel file indicated that he had been involved in five chargeable accidents between 1947 and 1968.

Greyhound officials indicated that the busdriver had last driven the bus involved in the accident on December 31, 1971.

Activities Preceding the Accident. On May 12, 1972, the busdriver drove a bus from Roanoke, Va., to Knoxville, Tenn. He started at 7:30 a.m., arrived at 3:50 p.m., and checked into a local hotel at 4 p.m. After his evening meal, he retired at 6 p.m. He was awakened by the night clerk at 1 a.m., on May 13, and checked out at 2 a.m. When questioned about the busdriver's appearance, the night clerk could offer nothing more specific than, "He just looked tired."

The driver proceeded to the bus terminal, where he had breakfast with the chief supervisor. The supervisor stated that the busdriver appeared alert and sharp.

Because of a mechanical problem with the front door of the bus being used on the run which the driver was to take over, the driver and passen-

gers transferred to a second bus. This caused the bus to depart Knoxville at 4:45 a.m., 1 hour 15 minutes late, en route to Roanoke, Va. The busdriver drove the 42.4 miles to the accident site in 50 minutes, averaging 50 m.p.h.

Chemical Analysis of Pills. An envelope found on the driver's body after the accident contained (1) two yellow and red capsules imprinted "Roche 66," identified as Dalmane containing flurazepam hydrochloride, a legend drug used to induce sleep; and (2) one lightgreen and clear capsule containing white pellets and imprinted "USV-100," identified as Nitrospan containing nitroglycerin, a legend drug used to relieve angina pectoris, a form of heart disease which produces spasms of pain in the chest with feelings of suffocation.

When examined, these pills appeared to be worn. They had slight scratches, but the printing "Roche 66" and "USV-100" was legible.

Driver's Medical History. On May 30, 1966, while driving a bus near Winchester, Va., the busdriver suffered disabling severe chest pains involving the lateral half of the left pectoral area with radiation into the anterior left shoulder and into the upper left arm. He was hospitalized for 23 days for coronary occlusion with myocardial infarction.

On July 21, 1966, he was examined by Dr. Robert C. Crawford, the Greyhound medical examiner. On August 18, in a letter to the bus company, Dr. Crawford stated that the driver had suffered a heart attack.

On September 13, 1966, Dr. Homer A. Sieber, representing the driver's union, wrote the bus company that he was unable to find any evidence of heart disease after an examination of the driver. On October 27, Dr. Charles A. Hefner, an independent medical advisor mutually agreed upon by the company and the union, also wrote to the bus company that in his opinion the driver had not suffered a heart attack.

Examination of the Greyhound personnel file of the driver reveals that on January 26, 1968, as a result of a company physical examination, the driver was disqualified because of high blood pressure (170/90). ^{3/} He returned to duty 18 days later. Another physical examination, on January 31, 1969, again disclosed high blood pressure (170/90), but the driver was not disqualified. In subsequent exams, on January 29, 1970, and on January 25, 1971, the driver was found qualified to drive. From August 15 to October 5, 1971, he was on sick leave. On December 30, 1971, he was again granted 30 days' sick leave.

On January 25, 1972, the busdriver was again disqualified. No reason was cited, but the examination form did indicate a 4+ sugar count.

^{3/} Motor Carrier Safety Regulation 49 CFR 391.43 specifies a maximum blood pressure of 160/90.

The driver was hospitalized in Roanoke, Va., from January 28, 1972, to February 10, 1972. His medical diagnosis was (1) acute gastroenteritis, (2) diabetes with diabetic acidosis, and (3) bilateral pneumonia. The driver returned to work April 11, 1972.

Two additional letters concerning the driver's health were found in his personnel file. The first, dated April 4, 1972, states that the driver had gained 15 pounds and appeared to be in satisfactory control of his diabetes and able to resume driving. He was taking oral hypoglycemic agents and was under the close supervision of Dr. Homer Bartley, his personal physician. The other letter, dated on the day of the accident, was from Dr. Bartley and indicated that the driver had diabetes, but that it was under excellent control.

Copies of the letters pertaining to the health of the driver are shown in Appendix A.

Greyhound Medical Procedures and Driver Physical Requirements. The physical qualifications for Greyhound drivers are those required by Motor Carrier Safety Regulations (MCSR) 49 CFR 391.41. ^{4/} Greyhound requires that drivers up to age 50 be examined every 2 years (as required by Federal regulations), and that drivers over 50 be examined annually. The examinations are given by a company doctor.

If a physical deficiency is discovered during an examination, the driver is required to be treated by his personal doctor for that deficiency. If, for example, a driver has a blood pressure problem he would be required to seek medical treatment and supervision from his own doctor to bring the condition under control. The company doctor would monitor the driver's condition through further examinations until he was certain that the condition was under control, and he would then certify that the driver was fit for duty.

If a driver is disqualified by the company, the driver can seek the medical opinion of his own doctor. The driver and his doctor can then ask for medical arbitration, as provided for in the contract between the company and the union. The arbitration procedure calls for the designation of a third medical doctor, mutually agreeable to both parties, who determines if the driver is qualified to drive. His decision is binding.

The Truckdriver

The truckdriver was a 38-year-old male. He held a valid Alabama driver's license and a doctor's certificate, dated March 9, 1972, which indicated that he was qualified to operate motor vehicles in interstate commerce. His last traffic violation was for speeding in April 1970.

^{4/} 49 CFR 391.41, Physical qualifications for drivers.

On May 11, 1972, the truckdriver arrived at a manufacturing plant in Lancaster, Pa., at 10:24 p.m. Nothing is known about the activities of the truckdriver from that time until after 7:30 a.m., on May 12, at which time the trailer was sealed. However, near the loading dock, bunk rooms, a cafeteria and a snack bar were available to drivers.

The truckdriver departed the plant at 8:53 a.m. on May 12, en route to Memphis, Tenn., and drove the 517 miles to the accident site in about 20.5 hours. If he took 8 hours for rest, he would have averaged 41 m.p.h. during the trip. Since no driver logs were found at the accident scene, they were assumed to have been destroyed in the postimpact fire. The last daily log record the truck company had for this driver was dated May 8, 1972.

Autopsies

A partial autopsy conducted on the busdriver revealed that the liver was negative for drugs of abuse including barbiturates, narcotics, the phenothiazines and flurazepan. Injuries received by the busdriver precluded an autopsy examination of the heart. The truckdriver's body was burned to such an extent in the accident that a complete autopsy could not be performed.

III. ANALYSIS

The Accident

There are no indications that the design of the highway or the mechanical condition of the westbound tractor-semitrailer contributed to the accident. It is unlikely that a failure of the bus occurred, although this possibility cannot be entirely ruled out.

Both the automobile driver and the truckdriver who was following the bus estimated that the bus passed the slow-moving automobile at 55 m.p.h. At that time, the speed of the truck involved in the accident was estimated by the truckdriver following it to be 45 m.p.h.

The automobile driver estimated he first saw the approaching truck when it was about 330 feet away. It is logical to assume that the busdriver, occupied with passing the automobile, did not see the approaching truck any sooner than the automobile driver, because his view ahead would also have been blocked by the eastbound tractor-semitrailer ahead of the automobile.

Although the geometrics of the roadway on the approach to the accident scene may have provided adequate sight distance for passenger cars and buses following passenger cars, this was not true for passenger cars following trucks. Also, the fact that U. S. Highway 11W is a major commercial thoroughfare warrants double yellow centerlines on the highway.

Had the road been clearly marked with these lines, the bus driver probably would not have tried to pass the automobile.

An analysis of the time/distance factors for the drivers of the bus and truck involved in the accident from the moment of possible perception until impact can be developed as follows:

- An accounting for the principal units of energy lost by the bus in impact and deceleration indicates that the truck was probably traveling at about 27 m.p.h. at impact. This was a 18-m.p.h. reduction from its initial speed.
- Assuming a normal hard but not panic deceleration for the truck, i.e., producing about .35 g., the truck traveled about 120 feet while braking from 45 to 27 m.p.h. This braking would have taken 2.2 seconds.
- If it took another second for the truckdriver to perceive and evaluate the hazard, steer the truck towards the shoulder of the road, and activate the truck brakes, a total of 3.2 seconds elapsed from recognition of the hazard to impact. During that period of time, the truck traveled approximately 190 feet.
- During those 3.2 seconds, the bus, traveling at 80 feet per second, covered about 256 feet. Thus, the total distance between the bus and the truck when the truckdriver recognized the hazard was approximately 446 feet.

Operation of the Truck. The truckdriver had no alternative as to the evasive action which he took. Since the area north of the shoulder consisted of a ditch and a dirt embankment, any attempt to drive off the shoulder sharply would have resulted in the truck's becoming mired in the ditch or striking the embankment and being deflected across the highway into the path of the bus. Apparently, the truckdriver tried to give the bus as much clearance on the highway as possible and still not wreck the truck. It is possible that the truckdriver felt he had given the bus enough room to pass safely and expected the busdriver to swerve toward the eastbound lane and thus avoid a collision.

Operation of the Bus. The evidence clearly indicates that at the moment of impact, the bus was on the north side of the westbound lane. Thus, two questions arise which concern the operation of the bus. First, why did the busdriver attempt to pass the automobile without adequate clear sight distance? Second, why did the busdriver make no apparent attempt to avoid the oncoming tractor-semitrailer?

Although the circumstances which led to the busdriver's decision to pass the automobile could not definitely be established, several possibilities can be surmised.

First, the driver could have been attempting to make up lost time, since the bus was behind schedule. The automobile driver stated that the bus closed in on him very fast and was following very closely behind waiting for a chance to pass. Also, several passengers had the impression that the driver was trying to make up time.

That there was no apparent attempt at evasive action on the part of the busdriver is puzzling. One of the first natural reactions of the busdriver upon seeing the truck should have been to apply the brakes quickly and fully then try to steer in behind the automobile. The busdriver did not attempt to do this.

While he was supposedly deciding which way to respond to the truck, the busdriver could have been confronted with another problem that would have cost him valuable reaction time. The automobile driver tried to accelerate to allow the bus more room to steer in behind him, but stated, "I couldn't get my car to respond fast enough..." It is possible that the bus and the automobile were both accelerating at the same time. Also, because the bus was proceeding up a 2.54-percent grade, it may have been less able to accelerate. However, as both vehicles continued up the grade, the automobile did accelerate faster than the bus and was some distance ahead of it. This had to occur in order for the automobile driver to see the accident in his rear view mirrors and for the passenger to see it through the rear window. It would appear that the busdriver did have sufficient distance to steer in behind the automobile. This is also supported by the truckdriver who was following the truck involved in the accident. He stated the bus "...had plenty of time to see the truck and all kinds of room to get back on his side of the road."

It is clear, however, that the busdriver could have both decelerated and taken effective evasive action in the time available. Indeed, it is very difficult to understand why the bus struck the truck at all. At the point of impact, the truck was using only 3 feet of the traveled portion of the westbound lane. That left 8 feet of open road between the truck and the centerline. Unless the automobile was riding the centerline (and the driver said that he was driving on the south side of the eastbound lane and also was far enough ahead of the bus to see the impact in the mirror), there was at least another foot or two of open road next to the centerline in the eastbound lane. The 8-foot-wide bus could have passed between the truck and the automobile even had the automobile been beside the bus. This veteran busdriver should have observed this clearance distance by noting the position of the truck's headlights, which were to the busdriver's left. Yet, the left front wheel of the bus was 6 inches off the north side of the road when the bus struck the tractor.

Evaluation of Busdriver's Medical History

There is no direct evidence that would indicate that some physical abnormality affecting the driver was in any way contributory to the acci-

dent. Because, however, the possibility of a physical failure does exist, discussion of the busdriver's medical history is warranted. It would appear that close monitoring of drivers with medical histories similar to that of this busdriver is justified. The busdriver of today drives at turnpike speeds and is charged with the safety of 40 to 50 passengers. This is one of the reasons for the MCSR requirement for periodic physical examination and a medical certificate stating his/their physical condition.

There is conflicting medical opinion as to whether this busdriver ever had a heart attack. The bus company acknowledged that the driver's personnel record contained a notation of his heart attack. In addition, the driver had in his possession at the time of the accident a pill that is used in the treatment of angina pectoris. Since Nitrospan has no other use than treatment of angina pectoris, the driver may have been carrying the pill as a possible emergency treatment for either a recurrence of a past attack or some more recent difficulty of which he was aware. The presence of the Nitrospan implies that the busdriver was concerned about the possibility of an angina pectoris attack.

It is not possible to determine how long the driver had the Nitrospan pills in his possession. The busdriver's wife stated that, to her knowledge, he was never treated for heart disease and that she had never known him to take medications of any kind for such a condition.

The fact that the driver was under the medical supervision of his personal physician for diabetes mellitus is also significant. The busdriver's wife verified that he took oral hypoglycemic drugs and maintained a strict diet to control this condition. According to his doctor, if the driver did not take these drugs or consumed starches or sweets to excess, he could become drowsy or, at the extreme, lapse into a coma. The required dosage for this condition was a single capsule of one drug in the morning and another capsule of a second drug in the evening. The supervisor who had breakfast with the busdriver the morning of the accident stated that he did not see the driver take any medication. However, the driver may have taken the medication before leaving the hotel.

No evidence of these hypoglycemic drugs was found on the driver's body or among his personal possessions after the accident. The autopsy did not determine whether hypoglycemic drugs were present in the busdriver's body.

Therefore, it is not known whether the driver took the required medications. If he had failed to take the required medication, he may have become drowsy while driving the bus. This could explain why he ran off the road while passing the automobile, why there was no obvious emergency braking when he sighted the oncoming truck, and why he did not attempt to steer to the right to avoid the approaching truck. In a drowsy

condition, it may have required all of the available 3.2 seconds for the busdriver to perceive and comprehend the approaching truck.

Heart attack, high blood pressure, and diabetes mellitus all, if severe, are disqualifying conditions, according to the Motor Carrier Safety Regulation 49 CFR 391.43. The regulation specifies:

"Blood Pressure. Record with either spring or mercury column type of sphygmomanometer. If the blood pressure is consistently above 160/90 M.M. Hg., further tests may be necessary to determine whether the driver is qualified to operate a motor vehicle."

"Diabetes. If insulin is necessary to control a diabetic condition, the driver is not qualified to operate a motor vehicle. If mild diabetes is noted at the time of examination and it is stabilized by use of a hypoglycemic drug and a diet that can be obtained while the driver is on duty, it should not be considered disqualifying. However, the driver must remain under adequate supervision."

During the 4 years prior to the accident, the busdriver had been found unqualified by his company on at least two occasions because of high blood pressure; he was hospitalized and on sick leave for a month; and at the time of the accident he was under treatment and supervision for diabetes. However, he had a medical certificate, dated April 4, 1972, stating that he was qualified to drive commercial vehicles, issued in accordance with the criteria set forth in the Motor Carrier Safety Regulations. A personal physician stated that he had been closely monitoring the bus driver's physical condition for both high blood pressure and for diabetic control and believed that the busdriver was in good condition on both counts.

Therefore, although the driver did suffer from and was under the treatment for two physical abnormalities, it could not be determined during the investigation if any of these abnormalities were in any way contributory to the accident.

Bus Occupant Kinematics

Interviews with the bus passengers were of no assistance in determining the bus occupant kinematics, because most of the passengers were asleep and could not recall their body movements. However, most passengers were thrown forward as the bus decelerated, then to the left and toward the floor as the bus rotated counterclockwise. This leftward and downward movement was caused by the destruction of the structural integrity of the left side wall and floor which occurred when the left front of the bus was impacted.

The seats became dislodged and rotated to the left. This probably contributed to the literal "spilling out" onto the road of some of the passengers. The availability and use of occupant restraints, in this instance, could have prevented such "spilling out."

Three passengers were definitely ejected from the bus before it came to rest. They incurred fatal injuries. It is highly probable that the two occupants found under the rear end of the bus had been ejected from their seats and fell through openings in the damaged left side and then were run over by the bus. These passengers were probably ejected from the front half of the bus, since the rear had intact side walls and floor.

The third passenger definitely ejected before the bus stopped was the child who was found at the right rear of the bus and was believed to have been seated in the first row of seats in the upper deck. It is most probable that this child was also ejected through the left side of the bus and was run over by the bus, but because of his small size, did not remain under the bus.

Most of the fatalities were believed to have been seated in the left front section of the bus. The busdriver was undoubtedly killed at initial impact.

Rescue workers found four of the 12 passenger fatalities outside and next to the left side of the bus. It could not be determined whether the passengers found outside of the bus were ejected before or after the bus came to a halt. The occupant that fell from the bus after it came to rest died en route to the hospital.

Two survivors recalled "waking up" outside the bus, but do not remember how they got there. One had been seated on the right side of the bus in the second row by the window. It could not be determined whether this individual was ejected or helped from the bus. The orientation of the front seats of the bus suggests a possibility of ejection through the front of the bus. The third passenger was seated in the last row in the right rear of the bus next to the window. It could not be determined whether this passenger was ejected through the window adjacent to his seat, or climbed out and fell to the pavement.

Passengers who remained inside the bus after impact were exposed to several obvious injury-producing sources. First, the fracturing and splitting of the interior panels (side and roof) resulted in exposed sharp edges, which caused some lacerations. It was not possible to determine whether a passenger contacted the split panel shown in Figure 9, but those seated in the immediate area suffered head injuries and lacerations. The location of this split in the panel at the head-height of a passenger would make contact very probable.

The Safety Board recognizes proposed improvements in impact protection requirements 5/ and has so commented. 6/ However, additional benefits could be had if side window impact protection were also required by regulation as demonstrated by this accident.

Another source of injury was the failure of some of the seats. Figure 8 shows a seat with the legs attached to the mounting flange. This seat probably was broken as a result of a passenger's striking it as the bus decelerated at impact. Some of the occupants in the rear section were trapped under and between seats that had broken or had been deformed in some manner. A broken seat not only permits a passenger to be thrown forward, but subjects him to possible injury by the seat to his rear which may come down on top of him. In the absence of suitable occupant restraints, it is desirable to contain the passenger in his seated position between the seats, since this provides some cushioning effect.

Other injury-producing sources were flying glass and airborne materials from the bus interior.

A bus seating chart which indicates the severity of injury to each passenger is contained in Appendix B. Appendix C presents a detailed listing of bus-occupant injuries.

IV. CONCLUSIONS

1. Neither the design of the highway nor the mechanical condition of the truck contributed to the accident. It is unlikely that a mechanical failure of the bus occurred, although it can not be completely ruled out.
2. The truckdriver took the only evasive action available to him in an attempt to avoid the accident or reduce its severity.
3. At the moment of impact, the truck had decelerated to about 27 m.p.h.
4. The top speed of the bus prior to impact is estimated to have been 55 m.p.h. The speed at impact could not be determined because of unknown driver actions and lack of physical evidence.
5. The busdriver did not see the approaching truck until it was within about 446 feet of the bus, because his vision was blocked by a truck ahead in the eastbound lane.

5/ See NHTSA Proposed Rulemaking--Bus Passenger Seating and Crash Protection; Docket 73-3; Notice 1.

6/ See Letter of Recommendation from NTSB to NHTSA, May 10, 1973.

6. Based on the closing speed of the bus and approaching truck, the time for perception, decision, and reaction was 3.2 seconds for each driver.
7. The evidence at the scene and witness' observations indicate that there was sufficient room for the bus to pass between the oncoming truck and the automobile which the bus was passing. The busdriver could have avoided the truck.
8. Although the busdriver had a history of disqualifying physical conditions, and was apparently concerned at the possibility of an angina pectoris attack, there is no evidence that any of these contributed to this accident.
9. If the highway had been marked with a double centerline at the approach to the accident scene, the busdriver probably would not have tried to pass the automobile and the accident would not have occurred.
10. The installation of occupant restraints in the bus and their use by the passengers would have prevented some ejections and reduced the severity of some of the injuries.
11. The failure and rotation of the seat structures after impact contributed to the ejection of and injuries to the passengers. At present, there is no specific requirement for the strength of the seats in the Code of Federal Regulations. (FMVSS 207 applies to seat anchorages.)
12. The fracturing and splitting of the interior panels and the failure of the seats created a hostile injury environment and contributed to the severity of the injuries.

V. PROBABLE CAUSE

The National Transportation Safety Board determines that the cause of this accident was (1) the driving of the bus in the opposing lane of traffic while the bus was passing an automobile without unobstructed clear-sight distance ahead, and (2) the busdriver's failure to avoid the tractor-semitrailer for reasons unknown.

Contributing to the fatalities and injuries was the lack of occupant restraints, which allowed some passengers to be ejected and others to be projected into sharp or unyielding interior bus components.

VI. RECOMMENDATIONS

The National Transportation Safety Board recommends that:

1. The State of Tennessee, Department of Highways, study the need for double yellow center lines on U. S. Highway 11W in the area of this accident to insure a no-passing condition. Further, study and correct similar conditions in the state where sight distances can be obstructed by commercial vehicles. (Recommendation H-73-41)
2. The Bureau of Motor Carrier Safety of the Federal Highway Administration take positive action toward making available to bus passengers convenient restraints against being ejected from their seats in a crash or rollover. This recommendation, with similar intent but varying language, has been made in seven prior interstate bus crash reports issued by the Safety Board. (Recommendation H-73-42)
3. The National Highway Traffic Safety Administration revise part S7.1 of its Proposed Rulemaking--Bus Passenger Seating and Crash Protection; Docket 73-3; Notice 1, to require impact protection for interior panels located in and around bus passenger windows. (Recommendation H-73-43)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JOHN H. REED
Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ LOUIS M. THAYER
Member

/s/ ISABEL A. BURGESS
Member

/s/ WILLIAM R. HALEY
Member

October 25, 1973

APPENDIX A

BUSDRIVER'S MEDICAL HISTORY

ROBERT C. CRAWFORD, M. D., F. A. C. P.
1224 FRANKLIN ROAD
ROANOKE, VIRGINIA

C
O
P
Y

INTERNAL MEDICINE

August 18, 1966

Mr. L. W. Durand, Supervisor
Greyhound Bus Lines
Bullitt Avenue, S. E.
Roanoke, Virginia

Re: Mr. Frank G. Flick
421 Fugate Avenue, N. E.
Roanoke, Virginia

Dear Mr. Durand:

I am enclosing two copies of the medical summary regarding Mr. Flick. I am sorry that it is necessary for me to accept the diagnosis of the Winchester Memorial Hospital as of June 22, 1966, regarding the fact that this man did have a coronary occlusion with a myocardial infarction, commonly known as an acute heart attack. He has made a good recovery no doubt; however he is not able to participate in even intermittent heavy, physical exertion, as defined to be frequently necessary by your Safety Director.

If further information is desired concerning this man, it would be my pleasure to try to furnish you with that information.

With best wishes, I am

Cordially yours,

/s/ R.L. Crawford

Robert C. Crawford, M. D.

RCC/rb

MEDICAL REPORT

August 18, 1966

C
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FLICK, Mr. Frank G.
421 Fugate Road, N. E.
Roanoke, Virginia

This Greyhound Bus driver was first seen by me, for this examination as of July 21, 1966. He gave a history of, on May 30, 1966, having had three, sharp, heavy pain attacks involving the lateral one half of the left pectoral area with radiation into the left shoulder (anterior part) and into the left upper arm, in its entirety. These pains were very severe, and apparently struck him like a knife, and lasted for several minutes. He was driving a bus when these attacks occurred. The pains were not related. When he got to Winchester, following 30 minutes after the third such pain, this man became very short of breath at rest -- I gather pure air hunger, and without wheezing. He stated that he was just not able to get any breath in, even when sitting at rest. His shortness of breath at rest was relieved, at the Winchester Hospital by virtue of intravenous and intramuscular sedation and Aminophyllin. The pains were apparently not related. He had never had any pains like this before. There was no pleuritic quality to this type of pain. He was admitted to the Winchester General Hospital, under the care of Dr. E. W. Lacy on May 30, 1966. We have obtained the complete clinical record from the Winchester Hospital, through the courtesy of Dr. Lacy.

Mr. Flick was in the Winchester Hospital from May 30, 1966, until June 22, 1966. While in the hospital, the diagnosis of coronary occlusion with myocardial infarction was made, and is so recorded on the chart, as of June 22, 1966.

While in the hospital, Mr. Flick had no further return of pain, precordial pain, or left shoulder or left upper arm pain.

While in the hospital, he had seven or eight days of temperature between 100 to 101 which could not apparently be explained on any basis other than probable coronary thrombosis. His white count shortly after admission went up to 17,000 with 90% Segmented cells; by the 4th of June, 1966, the white cell count and the differential had returned to normal. There was no record of any drop in blood pressure. The first electrocardiogram in the hospital was recorded as being normal. The second, third and fourth, daily electrocardiograms showed one to one and a half millimeter depression of the ST segments in the standard leads and also in the CF leads, without any evidence of block or significant changes in the T-waves. The Electrocardiogram had returned to normal by June 9, 1966. The repeated ST segment depressions, following admission to the Winchester

Hospital were interpreted as representing a probable coronary or myocardial ischemia.

The SGOT examinations on May 31, 1966, and June 1, 1966, were normal, being between 18 and 20.

The chest x-rays and the gall bladder x-rays were completely within normal limits.

The gall bladder x-rays repeated here in Roanoke by Dr. Snead, were also recorded as being completely within normal limits. Certainly, we could not explain his symptoms on the basis of gall bladder disease.

The initial LDH test as of May 30, 1966, was 400, which is within normal limits. The LDH as of May 31st, showed 540 which is distinctly above normal. As of June 1, 1966, the LDH was 550 with a definite elevation of the fast moving fraction, which is the LDH-5 or the cardiac factor. It is significant, that as of June 6, 1966, the LDH factor had dropped down to 310 units.

All of the Electrocardiograms following June 9, 1966, were recorded as being completely normal with iso-electric ST segments.

The GI Series was checked out the latter part of June, and found to be within normal limits.

It does deserve mention that this man, prior to the attack of pain, was very tired, and weary, and during his hospitalization was recorded as being very very anxious at all times, and very understandably so.

From a consideration of all the information compiled at the Winchester Memorial Hospital would make it impossible for me to exclude the probability of this man having had a myocardial infarction. There just is no other way to explain this man's findings, after he arrived at the Winchester Memorial Hospital.

Fortunately, now this man has been at rest at home, until July 21, 1966, and has been asymptomatic. As of July 21st, when first seen here, his physical examination was entirely within normal limits. The blood pressure was 120/80. He was again checked as of August 1, 1966, and found to be within normal limits, after having been up and around for a week of normal activity of a mild type.

He was again examined as of August 15, 1966, and found to be within normal limits regarding mild activity for the past three to four weeks. His heart size was normal. The electrocardiogram remained again normal, as it was on July 25, 1966.

My impression is that this man has made a nice recovery from a clinical stand point regarding his probable coronary thrombosis as of May 30, 1966.

This man is perfectly able to do mild to very moderate physical activity at the present time with the avoidance of fatigue. In regard to the return to work as a Greyhound Bus Driver, the factor which concerns me, is the possible, or even probable, necessity for this man doing what has been defined by the Safety Director of Greyhound as being intermittent fairly heavy labor. This intermittent heavy labor would consist of lifting and moving around many suitcases and packages, up to 125 pounds. This man, is certainly not able to be exposed to even moderately heavy physical exertion. I feel that we would have to be compelled to accept the definition of heavy, physical activity, as defined by the Safety Director of the Greyhound Corporation. The definition of heavy physical activity, intermittently being necessary for Greyhound Bus Drivers, was obtained by Mr. Durand, the Branch Manager of the Greyhound Corporation from the Safety Director in either Memphis or Knoxville, Tennessee.

*According to Mr. Durand, the driver
might possibly be responsible for
changing a 250 tire.*

RCC/rb

Robert C. Crawford
Robert C. Crawford, M. D.

Roanoke Valley Medical Clinic

INTERNAL MEDICINE

1603 FRANKLIN ROAD, S. W.
ROANOKE, VIRGINIA 24016

TELEPHONE 345-8597

WILLIAM D. POE, M.D. MICHAEL J. MOORE, M.D.

HOMER A. SIEBER, M.D. JAMES E. WHELESS, M.D.

September 13, 1966

Mr. Larry Durand
Southern Greyhound Lines
First Street and Bullitt Avenue, S. E.
Roanoke, Virginia

C
O
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re: Mr. Frank Flick

Dear Mr. Durand:

Mr. Flick has asked that I write you regarding his ability to work.

He came to see me first on June 28, 1966, following his discharge from a hospital in Winchester, Virginia. The history of the illness was reviewed, and a summary and electrocardiograms were obtained from that hospital. The history was once again reviewed by me in great detail and he was given a very thorough examination on his first visit. An electrocardiogram and chest x-ray were obtained.

From the information available, it is concluded that Mr. Flick's illness could not have been related to his heart but, most likely, was an acute infectious process involving the lungs or, less likely, the gallbladder. In any event, he has made a complete recovery from this infection and is quite able to return to work.

I am unable to find any evidence whatsoever of heart disease.

Sincerely yours,

/s/ Homer A. Sieber

Homer A. Sieber, M. D.

HAS:af

CHARLES A. HEFNER, M. D.
203 PROFESSIONAL BUILDING
2037 CRYSTAL SPRING AVENUE, S. W.
ROANOKE, VIRGINIA 24014

October 27, 1966

Mr. L. W. Durand
Southern Greyhound Lines
44 Bullitt Ave., S. E.
Roanoke, Virginia 24013

C
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P
Y

Re: Mr. Frank Gilmer Flick, age 51
421 Fugate Road, N. E.
Roanoke, Virginia

Dear Mr. Durand:

I saw your employee, Mr. Frank Gilmer Flick, in my office on September 29, 1966. I am sure you are quite familiar with his history of an illness which had its onset while driving a bus between Roanoke and Washington, D. C. The patient reports to me that he had had a chest cold with congestion for about ten days prior to the illness which placed him in the Winchester Hospital. Mr. Flick reports that he had three or four stabbing pains in a 45-minute period, while driving the bus prior to arrival in Winchester. He states that his pains were needle like in the left chest and down the left arm and that the duration of these pains was only a "moment". Following admission to the hospital, the patient experienced no more chest pain and states that he had a chilly sensation and fever for several days. He was treated with antibiotics, nerve medicine, and sedatives at night, according to his statement.

On physical examination Mr. Flick is a 51-year old, white male, in no acute distress. His height is 73 inches, weight 178 pounds, blood pressure 150/90. He has a pigmented skin lesion of the scalp which is of long standing. The examination of the eyes, ears, nose and throat is non-contributory; the neck is negative. The heart and lungs reveal no abnormality. The abdomen is negative, as are the extremities and the reflexes.

A cardiogram was made in my office which revealed no significant deviation from normal. Mr. Flick's records from the Winchester Memorial Hospital were finally obtained and did not reveal convincing evidence that he had experienced a "heart attack."

Mr. L. W. Durand
Southern Greyhound Lines - 2
October 27, 1966

Re: Mr. Frank Gilmer Flick

On October 25, 1966, Mr. Flick was once again given an electrocardiogram which revealed no abnormality. Following this he was subjected to exercise consisting of making several trips over steps and in the next five minutes three electrocardiograms were taken. The patient did not experience any undue shortness of breath or chest pain with the above-mentioned exercise. The electrocardiograms failed to reveal any significant abnormality following exercise.

It is my impression that Mr. Flick did not have myocardial infarction or a coronary occlusion. I suspect his illness was of a respiratory nature and related to the cold and chest congestion which he tells me he had for about ten days prior to the events which resulted in his period of hospitalization.

I hope that the above information will be sufficient for your purposes. If I may be of further service to you or Mr. Flick please do not hesitate to call upon me.

Yours very truly,

/s/ Chas. A. Hefner

Charles A. Hefner, M.D.

CAH:vt

Copy - C. E. Cleveland, Secretary-Treasurer
Amalgamated Transit Union, Division 1493
P. O. Box 1801, Peoples Building
Charleston, West Virginia 25327

Copy - K. O. Almond, Executive Board Member
2612 Richards Avenue, N. E.
Roanoke, Virginia 24012

Enc. - Bill for services rendered

KEITH C. EDMUNDS, M. D.
2910 Fleetwood Ave., S. W.
ROANOKE, VIRGINIA 24015

774-3823

April 4, 1972

Mr. Coy Bennett
Greyhound Lines--East
44 Bullitt Avenue S. E.
Roanoke, Virginia 24013

C
O
P
Y

Re: Frank G. Flick
Roanoke, Virginia

Dear Mr. Bennett:

The above named patient was re-examined by me today after having been treated by his physician for the past two months for diabetes mellitus.

He has gained fifteen pounds in weight and appears to be under satisfactory control to resume his occupation as coach operator.

He is receiving oral hypoglycemic agents and is being closely followed by his personal physician, Dr. Homer Bartley.

Sincerely,

/s/ Keith C. Edmunds

Keith C. Edmunds, M.D.

KCE/nd

C
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M. D. Weiss
Cleveland, Ohio

J. O. Whitt

Greyhound Lines--East

Washington, D. C.

May 16, 1972

We attach copy of memorandum from Dr. Homer Bartley, Mr. Frank Flick's personal physician, outlining the medication Mr. Flick was taking

J. O. WHITT

Enc.

HOMER BARTLEY, M. D.
216 BOXLEY BUILDING
ROANOKE VIRGINIA 24011

May 13, 1972

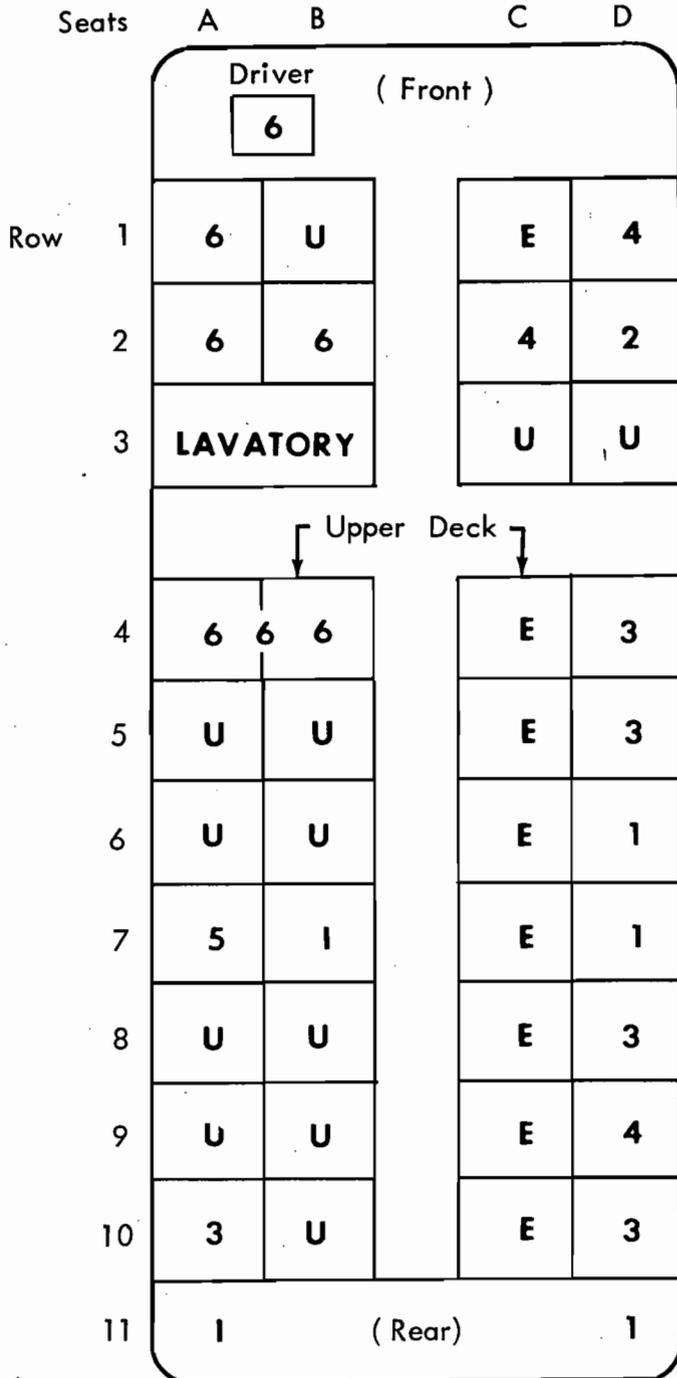
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Re: Frank Flick
3348 Hershberger Rd., N. W.
Roanoke, Virginia

I have been treating Frank Flick for the past several years. Patient had diabetes and this was under excellent control. I saw him on 3-21-72, 4-3-72 and again on 4-24-72. On all of these occasions the diabetes was under good control. Blood pressure was 120/70 on each visit. His mental clarity was excellent. This patient, on each occasion, indicated that his health was better and that he had been feeling better than he had for approximately three years.

/s/ Homer Bartley
Homer Bartley, M.D.

APPENDIX B SEATING CHART



BUS SEATING DIAGRAM
AND INJURY SEVERITY
OF KNOWN OCCUPANT
POSITIONS

INJURY SEVERITY CODE*

- 1 MINOR
- 2 MODERATE
- 3 SEVERE (NOT LIFE THREATENING)
- 4 SEVERE (LIFE THREATENING SURVIVAL NOT CERTAIN)
- 5 CRITICAL (SURVIVAL UNCERTAIN)
- 6 FATAL

* American medical association
Abbreviated injury scale (AIS).

E- EMPTY

U- UNKNOWN IF OCCUPIED

I- UNKNOWN INJURIES

APPENDIX C

BUS OCCUPANT INJURIES

Driver of Bus: Age 57, male. Unknown seatbelt use.

Injuries: Fatality

Occupant of Bus, Row 1, Seat A or B: Female

Injuries: Fatality

Occupant of Bus, Row 1, Seat D: Age 69, male

Injuries: Multiple fracture of the ribs, fracture of left humerus
ulva. Undisplaced fracture of pubic ramus on left.
Surgery for stabilization of chest with elevation of
sternum. Pneumonia imminent.

Occupant of Bus, Row 2, Seat A: Male

Injuries: Fatality

Occupant of Bus, Row 2, Seat B: Male

Injuries: Fatality

Occupant of Bus, Row 2, Seat C: Age 48, male

Injuries: Multiple fracture of the ribs. Hemopneumsthora
tracheostomy. Laceration and puncture wound of left
side.

Occupant of Bus, Row 2, Seat D: Age 23, female

Injuries: Fractured left leg.

Occupants of Bus, Row 4, Seats A and B: Age 27, female, Age 5, male,
Age 5 months, male

Injuries: Fatalities

Occupant of Bus, Row 4, Seat D: Age 22, male

Injuries: Cerebral concussion, laceration to left leg and fracture
of right fibula.

Occupant of Bus, Row 6, Seat D: Age 14, Male

Injuries: Minor abrasions, minor sprains. Treated and Released.

Occupant of Bus, Row 7, Seat A: Age 20, male

Injuries: Fracture dislocation of dorsal vertebrae No. 1 and 2, para-
lysis of legs from dorsal vertebrae No. 2 downward, fractured
posterior rim of cervical No. 1. Loss of bladder and bowel control.

Occupant of Bus, Row 7, Seat B: Age unknown, male

Injuries: Unknown

Occupant of Bus, Row 7, Seat D: Age 45, female

Injuries: Minor leg injuries. Treated and released.

Occupant of Bus, Row 8, Seat D: Age 33, male

Injuries: Cerebral contusion, severe laceration of the scalp in right parietal area, laceration of right wrist, fractured left humerus, contusion of chest wall.

Occupant of Bus, Row 9, Seat D: Age 22, female

Injuries: Severe cerebral contusion, compound fracture of right leg, fracture of both ankles, fractured pelvis, moderately severe brain injury.

Occupant of Bus, Row 10, Seat A: Age 31 male

Injuries: Cerebral concussion, laceration above right eye.

Occupant of Bus, Row 10, Seat D: Age 21, male

Injuries: Bleeding behind right ear drum, double vision, injured left knee.

Occupant of Bus, Row 11, Seats A & B: Age, unknown, female

Injuries: Unknown

Occupant of Bus, Row 11, Seats C & D: Age 24, female

Injuries: Laceration of scalp and lip. Bruised leg.

Occupant: Age 3, male

Injuries: None