

PB82-916202



# NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

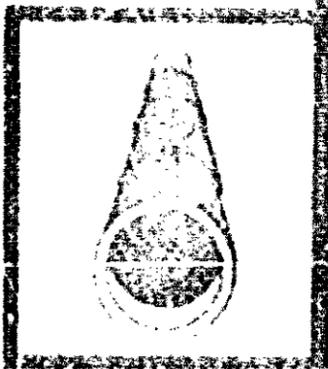
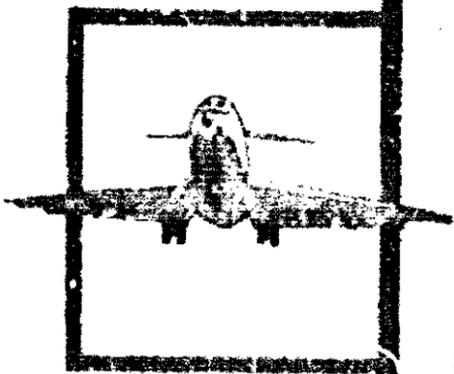
## HIGHWAY ACCIDENT REPORT

HERMAN DUVALI TRACTOR-POLE SEMITRAILER/  
S.L.&B ACADEMY, INC., SCHOOLBUS COLLISION  
U.S. ROUTE 45, NEAR WAYNESBORO, MISSISSIPPI  
OCTOBER 12, 1981

NTSB-HAR-82-2

UNITED STATES GOVERNMENT

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16. Abstract <p>About 2:40 p.m., c.d.t., on October 12, 1981, a truck tractor-pole semitrailer, laden with 16 75- to 80-foot pine logs was southbound on U.S. Route 45, about 1 mile south of Waynesboro, Mississippi. A schoolbus occupied by the driver and 49 students was also southbound following behind the truck. As the truck approached the Industrial Park Road, it moved into a right turn lane, decelerated, and initiated a 125° right turn. The overlength logs swung leftward across the southbound through-traffic lane and into the path of the overtaking schoolbus. The schoolbus struck the swinging logs, traveled forward to the right, struck the extreme front end of an eastbound automobile, which was stopped on Industrial Park Road at the intersection, and then struck and overrode a utility pole in the southwest quadrant of the intersection. Three bus passengers were killed, and 18 bus passengers and the driver were injured.</p> <p>The National Transportation Safety Board determines that the probable cause of this accident was the log truckdriver's failure to ascertain that the area near the rear of his truck was clear before turning and the busdriver's incomplete attention to the driving task. Contributing to the cause of the accident was the busdriver's failure to recognize the potential danger from the overhanging swinging logs on the turning logging truck. Contributing to the severity of the accident was the penetration of logs into the passenger area of the schoolbus.</p>					
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WASHINGTON, D.C. 20594**

**HIGHWAY ACCIDENT REPORT**

**Adopted: April 26, 1982**

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S.L. & B. ACADEMY, INC., SCHOOLBUS COLLISION,  
U.S. ROUTE 45, NEAR WAYNESBORO, MISSISSIPPI  
October 12, 1981**

**SYNOPSIS**

About 2:40 p.m., c.d.t., on October 12, 1981, a truck tractor-pole semitrailer, laden with sixteen 75- to 80-foot pine logs was southbound on U.S. Route 45, about 1 mile south of Waynesboro, Mississippi. A schoolbus occupied by the driver and 49 students was also southbound following behind the truck. As the truck approached the Industrial Park Road, it moved into a right turn lane, decelerated, and initiated a 125° right turn. The overlength logs swung leftward across the southbound through-traffic lane and into the path of the overtaking schoolbus. The schoolbus struck the swinging logs, traveled forward to the right, struck the extreme front end of an eastbound automobile, which was stopped on Industrial Park Road at the intersection, and then struck and overrode a utility pole in the southwest quadrant of the intersection. Three bus passengers were killed, and 18 bus passengers and the driver were injured.

The National Transportation Safety Board determines that the probable cause of this accident was the log truckdriver's failure to ascertain that the area near the rear of his truck was clear before turning and the busdriver's incomplete attention to the driving task. Contributing to the cause of the accident was the busdriver's failure to recognize the potential danger from the overhanging swinging logs on the turning logging truck. Contributing to the severity of the accident was the penetration of logs into the passenger area of the schoolbus.

**INVESTIGATION**

**The Accident**

About 2:35 p.m., c.d.t., on October 12, 1981, a schoolbus, owned by the S.L. & B. Academy, Inc., departed Wayne Academy, a private elementary and secondary school located in Waynesboro, Mississippi, en route to Buckatunna and State Line, Mississippi. The bus, which was occupied by the busdriver and 49 students, ages 5 to 15, was driven from the school to U.S. Route 45, and then south on U.S. 45 through Waynesboro.

At the same time, a truck tractor-pole semitrailer laden with 16 pine logs, some of which were 75 to 80 feet long, was also southbound on U.S. 45 through Waynesboro. The logs were being transported from Scott County, Mississippi, to a sawmill located south of Waynesboro.

As the truck traveled through the central part of the city, it stopped at a red traffic light. The truckdriver stated that he looked in the truck's rearview mirror and noticed the schoolbus stopped directly behind his vehicle. After the light turned green, both vehicles continued south on U.S. 45 with the schoolbus following the logging truck. According to the truckdriver, as he approached the intersection of U.S. 45 and Industrial Park Road, about 1 mile south of the Waynesboro corporate limits, he began to decelerate from a speed of about 50 mph, turned on his right turn signal, and moved into a right turn lane which extends about 400 feet north of the intersection. (See figure 1.)

According to the truckdriver, the truck was in third gear when he entered the intersection. The truckdriver stated that at that time his tachometer was indicating 1,300 rpm. The truckdriver later checked the speed relationship and stated that 1,300 rpm in third gear equalled 10 to 12 mph on the truck's speedometer. The truckdriver stated that he steered the truck about 1 foot toward the left and then began turning right. According to the driver, the truck was beginning to straighten out from the right turn when he felt a bump, looked into his left rearview mirror, and saw the schoolbus. The driver stopped the truck facing west on Industrial Park Road. (See figure 2.)

At least three logs on the truck were struck by the schoolbus; they penetrated the right windshield and passenger loading door area of the schoolbus, and one exited the left side in the area of the third passenger seat from the front. (See figure 3.)

After the initial impact the schoolbus swerved to the right, struck the front bumper of an eastbound automobile, which was stopped at the intersection on Industrial Park Road and passed across the front of the automobile in a "sideswiping" type action. The bus then left the roadway at the southwest quadrant of the intersection, crossed a grassy area and a private driveway, and struck and overrode a utility pole, which splintered as a result of the impact. The bus continued an additional 102 feet while swerving left before stopping facing east with its front end at the west edge of the pavement on U.S. 45. (See figure 4.)

The schoolbus driver stated: "I was driving about 35-40 mph and do not remember any traffic coming toward me. As I was approaching the Industrial Park Road, I remember seeing a car starting into the right lane of Highway 45 and coming from the Industrial Park Road. I prepared to stop if the car came onto the highway. The car backed up off Highway 45 southbound lane and I continued at my same speed. When I was almost even with the Industrial Park Road I felt a violent jar or force hit the bus." She further stated: "I do not remember seeing the truck ahead of me or beside me or turning. I have no recollection of seeing the truck before the accident. I have no recollection of ever before being at or near the intersection when log trucks were turning into the Industrial Park Road."

The driver of the automobile that was eastbound on Industrial Park Road and had stopped at the intersection intending to make a left turn stated that he had looked to his left and saw the truck with the schoolbus and two or three other vehicles behind the schoolbus, all in the travel lane. He then looked to his right and then to his left and saw that the truck had moved into the right turn lane and had blocked his view of the schoolbus. The automobile driver further stated that: "At the time the schoolbus came into view, there was a collision between the logs and the bus. At impact, the windshield of the bus exploded. I immediately put my car in reverse to try to get clear of the accident. Before I could move, I was struck on the front bumper of my car by the bus."

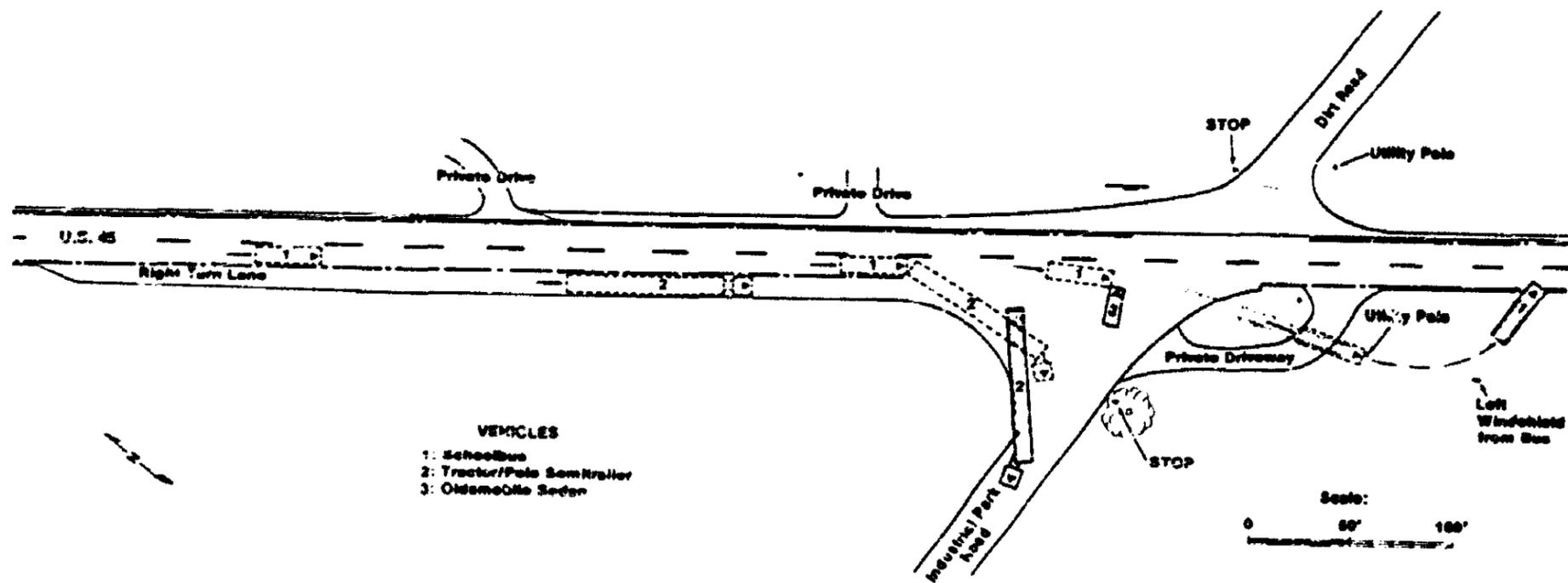


Figure 1.--Plan view of accident site.

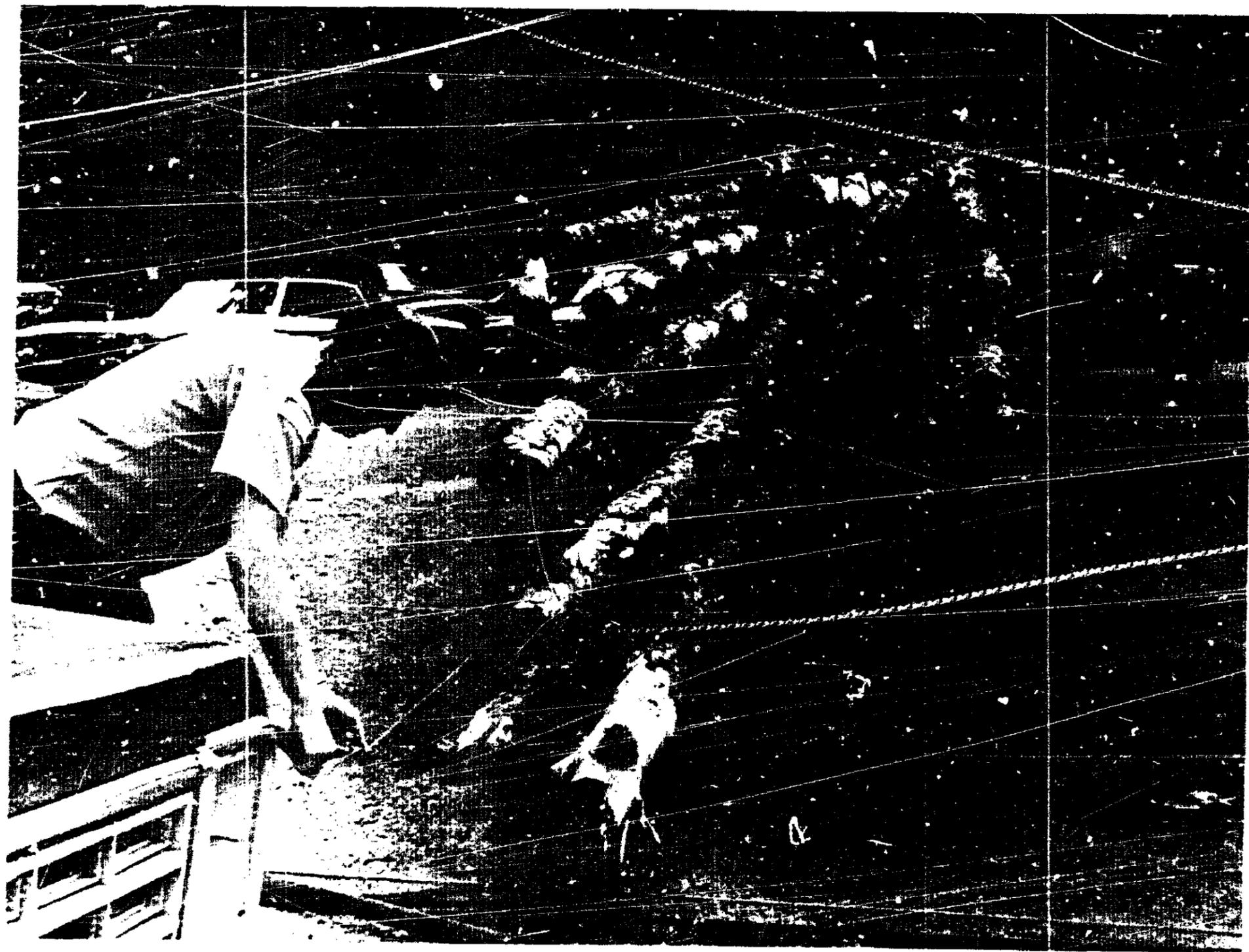
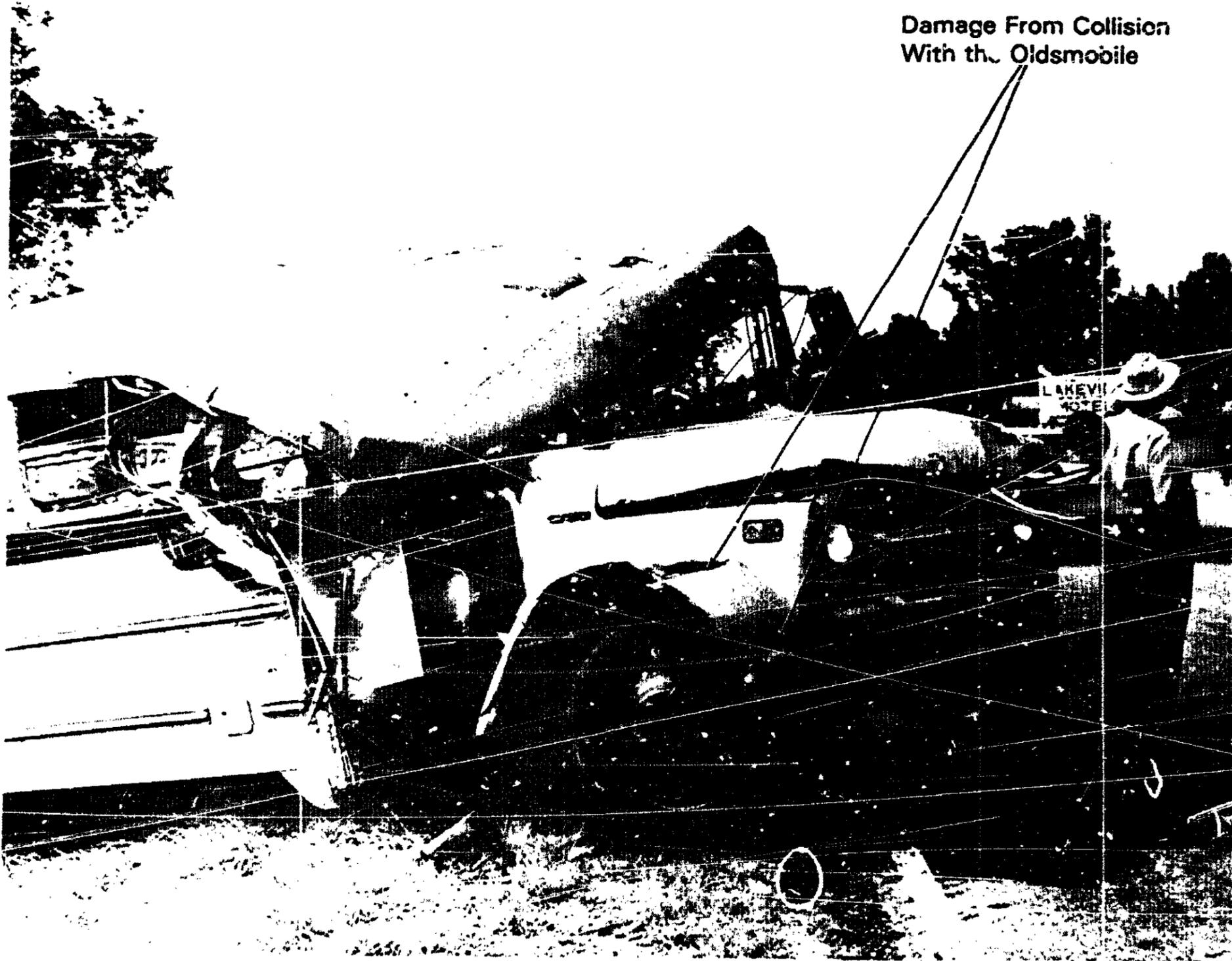


Figure 2.—Truck tractor and pole semitrailer at final rest. Note broken logs.



Figure 3.—Log penetration from the right side of the bus.



Damage From Collision  
With the Oldsmobile

Figure 4.—Right front of the bus at its final rest position.

When the truck stopped, live electrical wires fell across the truck and along the ground. (See figure 4.) Two power company employees, who were in the area, arrived on the scene within 1 minute after the accident and shut off power to the electrical lines.

Injuries to Persons

<u>Injuries</u>	<u>Drivers</u>	<u>Schoolbus</u>	<u>Total</u>
Fatal	0	3	3
Serious	0	6	6
Minor/None	3	40	43
Total	3	49	52

Two schoolbus passengers died at the time of the accident; the third passenger died about 4 hours later.

Vehicle Information and Damage

Schoolbus.—The schoolbus, a 1971 Chevrolet C/50 2-axle chassis, VIN 5ES21P118809, with a Thomas 60-passenger capacity body, Identification No. 15689-51390-0-2610, was purchased by the S.L. & B Academy, Inc. from a dealer in 1977. Records indicated that the bus had been owned previously by a school district in Gibson County, Tennessee. This was the only bus owned by the S.L. & B Academy, Inc.

The bus was equipped with an 8-cylinder, gasoline engine, floor-mounted, 4-speed manual transmission, manual steering, and air-over-hydraulic drum brakes. At the time of the accident, the odometer read 3,093 miles, but the actual mileage on the bus could not be determined.



Figure 5.—Right side of schoolbus.

The pedestal-mounted driver's seat was equipped with a lap belt which was not in use at the time of the accident. Seating for passengers consisted of 10 rows of bench seats with a center aisle. Passenger seats were not equipped with passenger restraints. An emergency exit door was located at the center rear of the bus.

The bus had passed a Mississippi periodic motor vehicle inspection on August 22, 1981. At the time, no precrash deficiencies or unusual conditions were noted for any of the mechanical systems.

The right windshield was severely cracked and pushed into the interior of the bus. The upper right A-pillar was torn away and the passenger loading door was fragmented. The right B- and C-pillars were buckled rearward. The right front corner of the roof was buckled and the upper A-pillar was displaced 59 inches rearward and 36 inches to the left. The right dash was torn from the cowl and displaced rearward. A hole caused by log extrusion was found in the left side of the bus in the left D- and E-pillar areas. The right side of the hood was abraded. The right end of the front bumper was displaced 7 1/2 inches rearward and damage from contact with the automobile extended about 96 inches rearward along the right side of the bus. The left front bumper was displaced about 22 inches rearward, and a pole imprint was found in the left side of the hood (leading edge). (See figures 5 and 6.) The air filter was torn from the carburetor, and the steering column was separated at the spline joint between the universal joint and the gearbox.

#### Pole Impact Damage



Figure 6.--Utility pole impact damage on left front of bus.

The passenger seat mountings were not separated; however, the driver's seat pedestal was torn loose on the right side. The backrests of the seats in the right first row and left first, second, and third rows were displaced and showed evidence of contact with the logs. (See figure 7.) The driver area space was substantially reduced due to deformation of the roof and dash. (See figure 9.)

Tractor-Pole Semitrailer.---The 1980 Mack R686, 3-axle truck tractor, VIN R6869T-59842, was owned by Herman Duvall. The tractor was equipped with a 300 c.i.d. diesel engine, 6-speed manual transmission, power assisted steering, and FMVSS-121 air brakes. At the time of the accident, the vehicle's gross weight was about 71,500 to 72,000 pounds. When the truck was inspected 3 days after the accident, the odometer reading indicated 134,587 miles. The 2-axle pole semitrailer had two bolsters 35 feet apart. The rear bolster was centered between the No. 4 and No. 5 axles. (See figure 9.)

About 18 pine logs had been loaded on the trailer with the large ends forward and extending about 5 feet forward of the lead bolster. The longest log remaining on the truck after the accident measured 77 feet long and extended 37 feet rearward from the rear bolster. The logs which were broken in the accident were not measured. Two pieces of pine log, one 27 feet 7 inches long and the other 5 feet 10 inches long, remained at the scene. Two additional pieces, one 9 feet 8 1/2 inches long and one about 4 feet long, were broken off and remained in the bus.

No deficiencies or unusual conditions were noted on the tractor or pole semitrailer. A visual inspection revealed no damage to either the tractor or semitrailer.

Automobile.---The automobile was a 1979 Oldsmobile Delta 88 Royale 2-door sedan, VIN 3N37R9X165023, equipped with an 8-cylinder engine, automatic transmission, power assisted front-disc, rear drum brakes, and power assisted steering. The Oldsmobile was registered to the driver. The vehicle was equipped with restraints which were not being used at the time of the accident.

Damage began at the left front corner and continued 37 1/2 inches to the right across the front. (See figure 10.) The front bumper was shifted 1 1/2 inches to the right. Log impact damage was found on the left rear wheel, left door, left front fender, hood, and right front fender. Maximum crush damage from impact by the logs was about 1 inch.

#### The S.L. & B. Academy, Inc.

The S.L. & B. Academy, Inc. was incorporated in August 1974 as a nonprofit, nonshare corporation under the laws of the State of Mississippi. The purpose of the corporation was to provide transportation for elementary and secondary (grades 1 through 12) students attending Wayne Academy.

According to the S. L. & B. Academy, Inc. president, the bus was maintained at local garages in State Line, Mississippi; however, no maintenance records on the bus were available. The busdriver said that the "bus was maintained in excellent condition."

The corporation selected and hired the schoolbus driver and established rules of conduct for the students while riding the bus. The corporation also established the route and stops made by the schoolbus. The morning trip originated at State Line, Mississippi, with intermediate stops at Bret, Battles, and Buckatunna, Mississippi and at a private residence on US Route 45. The afternoon trip included the same intermediate stops



Figure 7.—Interior of the bus looking toward the front.

Steering Wheel

Driver  
Seat

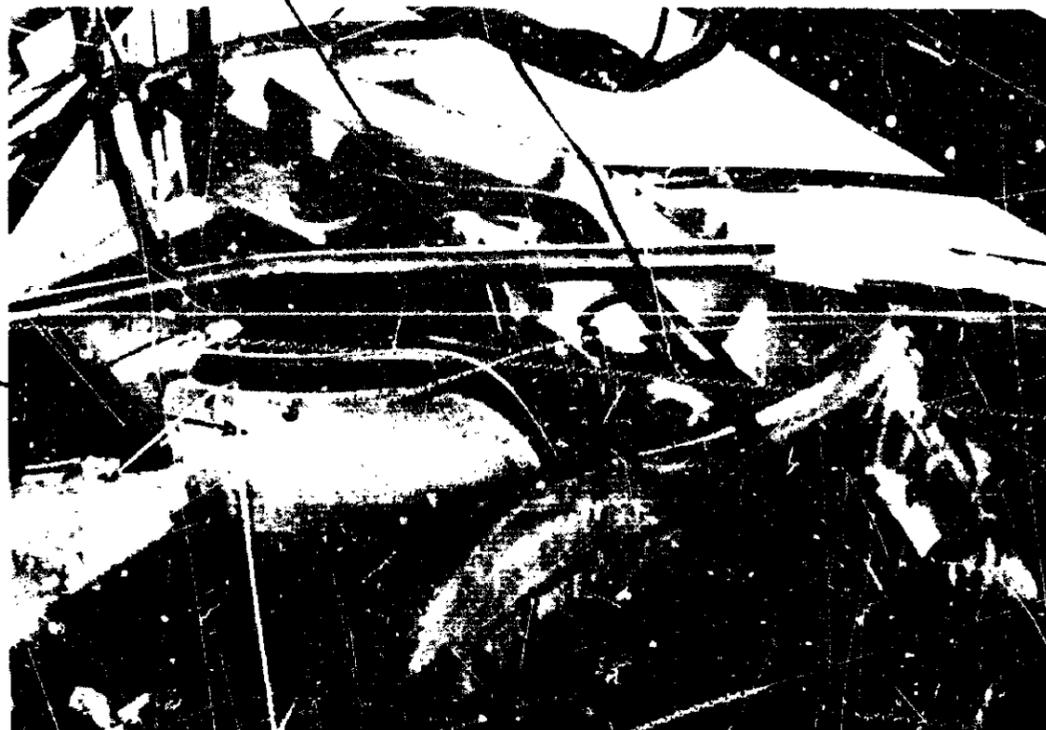


Figure 8.—Close-up of bus' driver area.

Rear Bolster

Front Bolster



Figure 9.—Truck tractor and pole semitrailer as viewed from the right rear.

### Damage from Log Impact

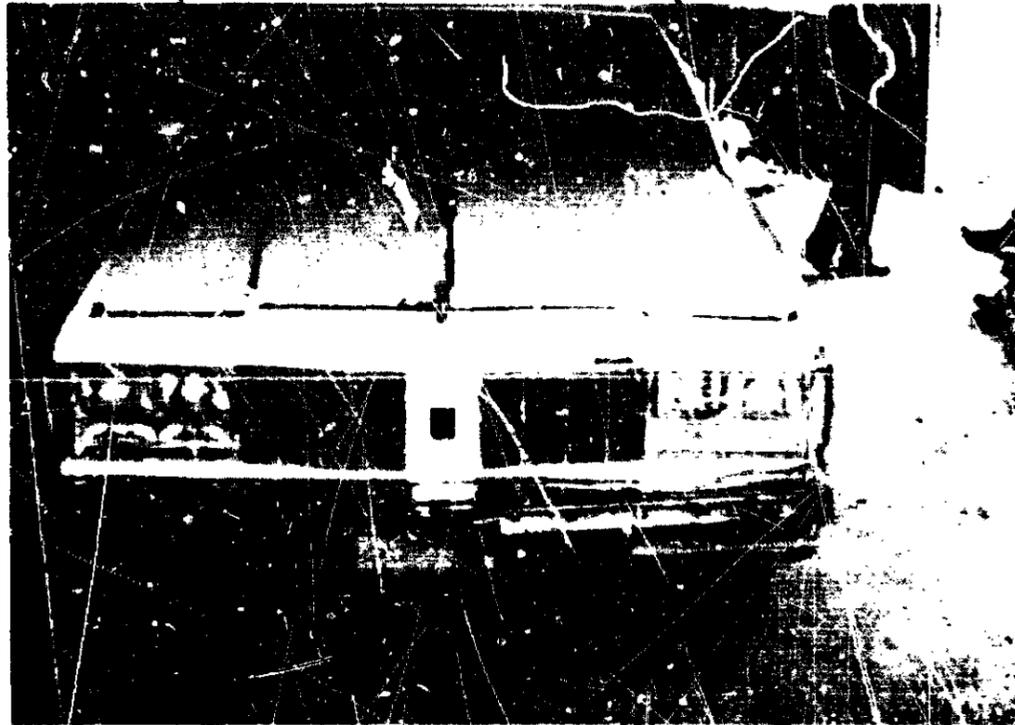


Figure 10.--Front view of automobile.

In reverse order. All of the schoolbus stops had been planned so that the bus was off the highway when students were either boarding or getting off the bus.

#### Driver Information

Busdriver.—The 26-year-old busdriver, a long-term resident of the area, held a valid Mississippi operator's license which had no restrictions. According to the driver, she had about 12 years' driving experience. The driver had not had any formal training for driving the bus, nor was she required to have such training or hold the certificate required for public schoolbus drivers. She had driven the accident bus during the 1979-1980 school year, but did not drive the bus during the 1980-1981 school year, and began driving again on the same route when school reopened in 1981. The busdriver stated that she had never been given a "...citation for any traffic violation." Her driving records did not show any violations or previous accidents. 1/

Truckdriver.—The 26-year-old truckdriver held a valid Mississippi commercial license which had no restrictions. He had been driving as a licensed driver for 11 years and as a professional truckdriver for about 4 years. He had been driving the accident truck for about 2 years and was familiar with the route and the intersection. The truckdriver's driving record showed no previous accidents or violations. The truckdriver told Safety Board investigators that he had been cited for speeding about 4 years before the October 17, 1981, accident. The truckdriver was not subject to the Federal Motor Carrier Safety Regulations (FMCSR) and did not hold a medical certificate. Two area residents told Safety Board investigators that the truck owner occasionally transported logs out of the State of Alabama into Mississippi. If these reports are true, Mr. Duvall, his drivers, and his trucks would have been engaged in interstate commerce and subject

1/ The State of Mississippi does not normally enter accident involvement on a drivers record and purges any violations over 3 years old from individual records.

to FMCSR. However, when questioned about the reports, the truckdriver stated that his log-hauling activities were restricted to the State of Mississippi. The Bureau of Motor Carrier Safety (BMCS) had no record on Herman Duvall as an interstate carrier.

The truckdriver reported that he had gone to bed about 9:00 p.m. on October 11, 1981, and had arisen about 4:45 a.m., his usual time, on the morning of the accident. He conducted a pretrip inspection of the tractor and pole semitrailer before departing his residence and then drove to Scott County for his first load of logs. The trip was delayed briefly because of a flat tire on the semitrailer. The first load was delivered to its destination, a sawmill located on Industrial Park Road, 0.65 mile west of the accident site. He then returned to Scott County, picked up a second load, and was en route to the sawmill when the accident occurred. The truckdriver reported that he normally hauled two loads per day.

Automobile Driver.--The 25-year-old automobile driver held a valid Mississippi operator's license which was restricted to corrective lenses. He was wearing corrective lenses at the time of the accident. He had been driving for about 10 years and had owned the Oldsmobile for about 21 months. His State driver title showed no record of violations.

#### Highway Information

U.S. Route 45 is a Federal-aid, minor arterial highway which traverses the eastern portion of the State of Mississippi from north to south. The highway enters Mississippi from the State of Tennessee, exits into the State of Alabama near State Line, Mississippi, and terminates at Mobile, Alabama.

In the area of the accident, U.S. Route 45 is a 23-foot-wide, two-lane highway traversing a rural, residential area. The highway was originally built in 1922 and paved to a 20-foot width in 1939. In 1970, the highway was widened and overlaid to a 24-foot width. The right turn lane was constructed in 1977 with a clay gravel surface and in 1978 was paved. U.S. Route 45 was overlaid in 1979, including the right turn lane. Pavement markings were included on this project. The right turn lane was constructed at the request of Waynesboro city officials, Wayne County officials, and members of the Industrial Park Road Board to help traffic conditions at the intersection. The right turn lane is 11 feet 9 inches wide, and extends about 400 feet north from the intersection pavement flanges. The angle between Industrial Park Road and the north leg of U.S. Route 45 is 55°.

Approaching the intersection from the north, U.S. Route 45 has a grade of 0.77 percent positive to the south and a typical crown of 0.01-foot per foot. Pavement striping consists of solid white edge lines along both edges of the pavement and a single broken yellow center stripe. There is no break in the west edgeline for the turn lane and no lines at the west edge of the turn lane. (See figure 11.)

The speed limit on U.S. Route 45 through Waynesboro is 30 mph. The speed limit changed to 45 mph for 0.3 mile, then to 55 mph at the Waynesboro corporate limits. A State law restricts schoolbus speeds to 45 mph. The 55-mph sign, which was 1 mile north of Industrial Park Road, was the last regulatory or warning sign posted on U.S. Route 45 approaching the intersection from the north at the time of the accident.

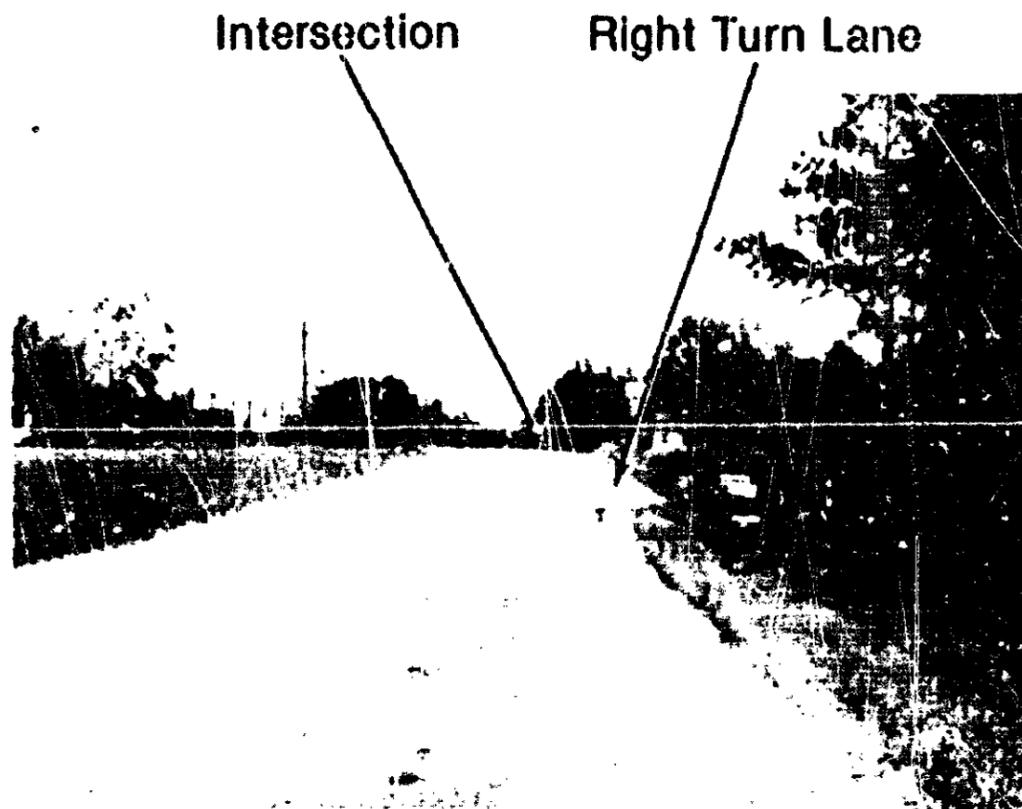


Figure 11.—U.S. Route 45 looking south toward the intersection.

The Safety Board contacted the Mississippi Department of Highways about its policy on signing and pavement striping on approaches to intersections. According to the representatives, if the sight distance to the intersection is less than 1,000 feet, advance warning signs are erected and center line skip striping is carried through the intersection. Edge lines (if provided for the highway) are stopped on either side of the intersection. "No passing zones" are provided if the highway alignment requires; however, "no passing zones" are not provided solely for the intersection. The Manual on Uniform Traffic Control Devices (MUTCD) has been adopted for use in the State of Mississippi by both the Commissioner of Public Safety and the State Highway Commission. The absence of signing near the intersection and no passing zones complies with the MUTCD insofar as signing at intersections where no special hazard exists is concerned. Traffic entering U.S. 45 from Industrial Park Road or the private driveway is controlled by stop signs.

Traffic counts taken in 1980 show an average daily traffic (ADT) of 5,680 vehicles for the area of the highway south of Waynesboro and north of the Industrial Park Road intersection, and an ADT of 5,110 vehicles south of the intersection. No counts of vehicles turning at the intersection have been made but observations made by the Mississippi State Highway Department indicate that there are a large number of vehicles, particularly southbound vehicles, turning during peak traffic hours (6:30 a.m. to 8:30 a.m., and 4:00 p.m. to 6:00 p.m.). The traffic counts do not distinguish the numbers of automobiles and trucks. One official at the sawmill estimated that about 125 trucks per working day enter the sawmill from the U.S. 45 - Industrial Park Road intersection.

Accident History.--Two other accidents have occurred at the intersection since January 1, 1978; one on March 19, 1980, and one on August 29, 1981. The March 19, 1980, accident involved a pickup truck and a logging truck and, according to the police accident report, occurred in the same manner as this accident. The 1981 accident did not involve a logging truck. During the onscene investigation of this accident, several

persons related details of near accidents to Safety Board investigators which were alleged to have occurred at the intersection and had involved turning logging trucks. However, none of these reports were documented in official county or State records.

The State of Mississippi utilizes input from Highway Department personnel, enforcement agencies, and the public in identifying locations where a particular hazard may exist. Once identified, an engineering study of the location is conducted and remedial action is taken based on the study and MUTCD guidelines. High accident locations are defined using the procedures described in the National Cooperative Highway Research Program (NCHRP) Report 152.

#### Physical Evidence

There were no tire marks from any of the involved vehicles in the vehicle-to-vehicle impact area. The approximate area of impact was located by the investigating police officer from debris lost from the bus during impact.

Dual tire scuff marks began in the southwest quadrant of the intersection, continued off the pavement, crossed a grassy area and a private gravel driveway, and extended toward the utility pole. (See figure 12.) The relationship of the scuff marks to the utility pole and the pole impact damage on the schoolbus indicate the marks were left by the bus' left rear tires. The bus' front tires left furrow marks in the grassy bank leading to the bus' final resting position and its right rear bumper gouged the dirt surface as it came to rest.

A 21.6-foot-long piece of pine log which had been broken off and was laying on the pavement at the scene of the accident was embedded with glass fragments in its small end. A hole and bits of red cloth were found in the small end of the log which indicated the precrash position of a 12-inch square red flag secured to the log by a screwdriver driven through the flag into the end of the log.

#### Meteorological Information

Based on weather information recorded at the airport in Meridian, Mississippi, about 51 miles north of Waynesboro, at the time of the accident, the temperature was about 79° F, the relative humidity was 69 percent, and the wind was out of the east (90°) at 8 mph. The sky was 100 percent overcast, but there was no precipitation and the road surface was dry.

#### Medical and Pathological Information

The busdriver suffered superficial physical injuries, the automobile driver complained of minor injuries, and the truckdriver was not injured. None of the three drivers involved in this accident reported any preaccident physical infirmities or disabilities. There was no indication that alcohol or drugs were involved.

The three fatally injured schoolbus passengers sustained blunt trauma injuries.

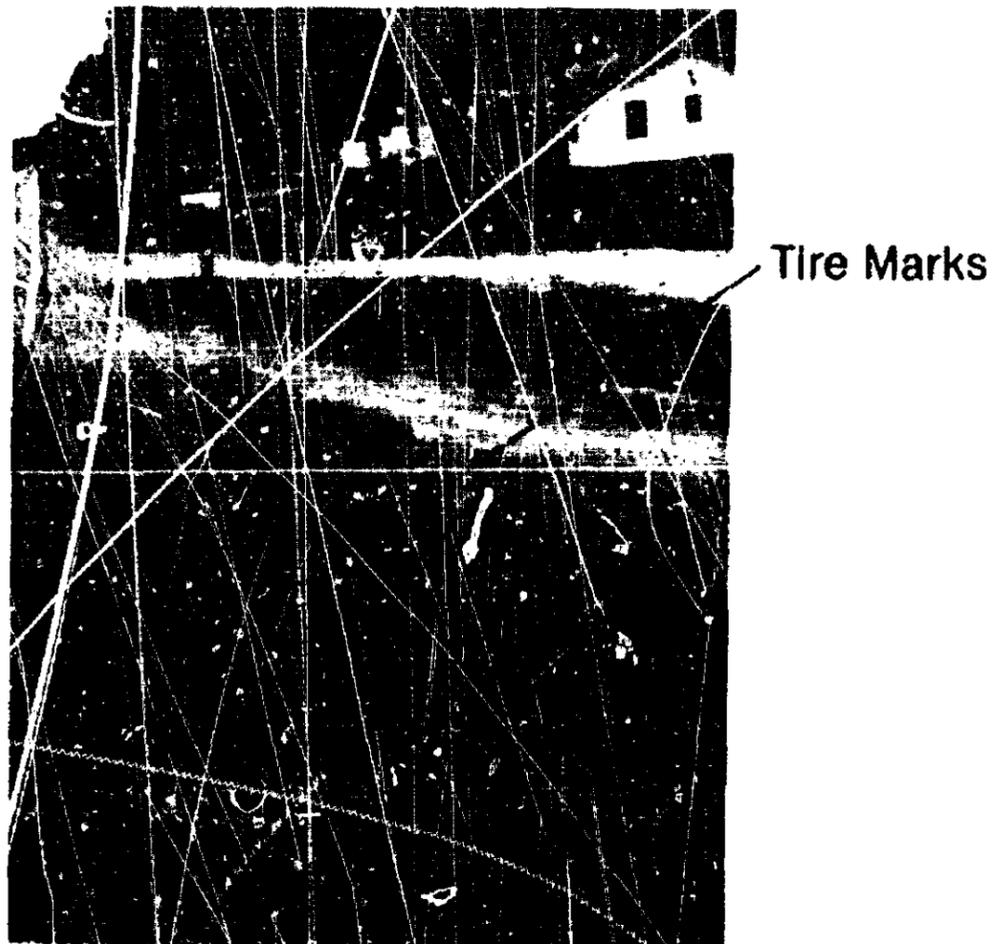


Figure 12.—Scuff marks probably left by the bus. The utility pole in the photograph replaced the pole struck by the bus.

### Survival Aspects

The truckdriver estimated the speed of his vehicle at 10 to 12 mph as he was turning. The busdriver estimated the speed of her vehicle had been between 35 and 40 mph which, because there was no avoidance action, represents her estimate of the speed of the bus at impact.

The bus was subjected to three separate impacts, the second and third of which were minor. During the initial (bus-to-logs) impact, the ends of at least three logs penetrated the right windshield of the bus, swept diagonally through the right front side of the passenger area, and, in the case of one log, pierced the left side panel at approximately the third passenger seat from the front. All three fatalities and the more seriously injured surviving passengers were sitting in the area traversed by the logs. (See figure 13.) Evidence indicates that several passengers including the three fatalities were subjected to direct contact with the logs. Because parents of the surviving passengers refused to permit any interviews with the student passengers, it could not be learned what action any of them may have taken to prevent or reduce injury.

Even though the driver's area was significantly reduced in size due to vehicle deformation, the busdriver suffered only superficial physical injuries.

Police officers from the Wayne County Sheriff's Department and Waynesboro Police Department responded immediately upon notification of the accident. Ambulances and nurses from the Wayne County General Hospital, which is located about 1.75 miles from the accident site, were on the scene within 7 to 8 minutes after the accident. The first injured student arrived at the hospital at 2:57 p.m., and all of the students were at the hospital by 3:15 p.m.

**Legend:**

**F-26 = Sex-Age**

**American Association for  
Automotive Medicine (AAIM)**

**AIS Severity Code**

- 1--Minor
- 2--Moderate
- 3--Serious
- 4--Severe
- 5--Critical
- 6--Unsurvivable
- 9--Unknown
- ⓪--Vacant Seat

**NOTE:**

**AIS--Abbreviated Injury Scale (AAIM)**

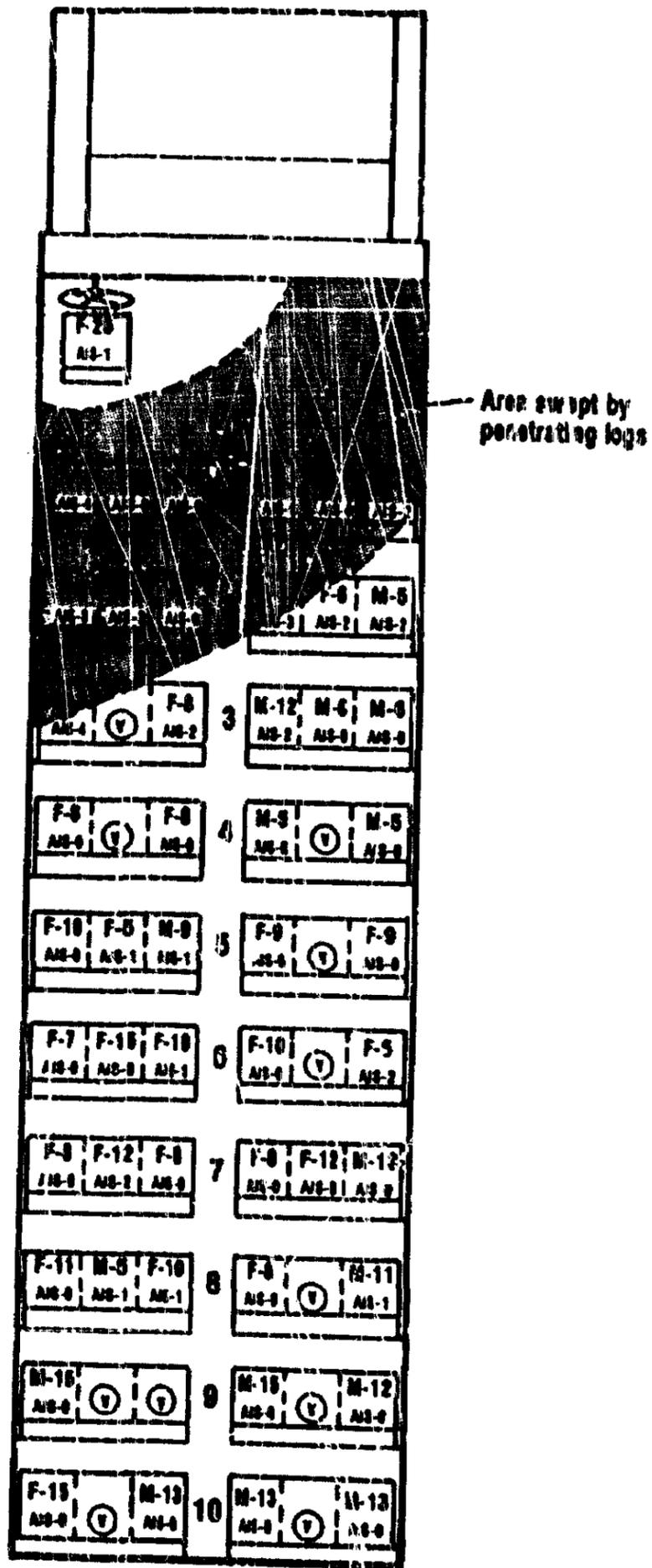


Figure 13.--Bus occupant seating diagram, injury classification, and age.

### Tests and Research

During the morning of October 13, 1981, the Mississippi Highway Patrol conducted a full-scale simulation of the turning maneuver using a different truckdriver and the accident-involved truck loaded with logs up to 87 feet in length. Sequential photographs taken as the truck approached the intersection and negotiated the right turn show that before initiating the turn the left tires of the semitrailer were touching the right edge line of the travel lane of the roadway. (See figure 14.)

The photograph depicting the lateral positioning of the truck as it would have been just before the accident corroborates the truckdriver's statement that he veered to his left about 1 foot before initiating the right turn (figure 14). Photographs taken through the turning maneuver show the logs swinging toward the east and encroaching upon the southbound travel lane. (See figure 15.)



Figure 14.—Truck just before initiating the right turn during the simulation.

During the investigation, Safety Board investigators observed traffic flow through the intersection. Most of the loaded logging trucks approached the intersection from the north and turned right onto Industrial Park Road. In each turn, the logs with extensive rear overhang encroached upon the U.S. 45 southbound travel lane. When there was other traffic close behind them, the logging truckdrivers sometimes stopped and allowed that traffic to clear before initiating the right turn. Drivers of vehicles following the logging trucks would observe the trucks approaching the turn, slow down, stay behind until the trucks were into the turn and the logs had cleared, and then accelerate through the intersection. On several occasions, both the truckdrivers and drivers of following vehicles stopped at the same time, causing momentary confusion, but no near accidents or significant traffic obstructions were observed.

Several trucks were timed, using a stopwatch, through a 90° turn. Timing was initiated as soon as right turn steering input was observed on the front wheels and stopped



Figure 15.—Truck during the turn simulation showing log encroachment on southbound travel lane.

when the load of logs was perpendicular to U.S. 45. Only those trucks were timed which had no impeding traffic circumstances. The time range for those trucks was between 6.4 and 8.2 seconds. The average was 7.5 seconds and the mean was 7.3 seconds. The curvilinear distance traveled was between 140 and 170 feet. Speed ranges computed for the times and distances was 11.6 to 14.9 mph.

#### Other Information

Logging Truck Accidents.--The Pine Belt is a geographical area defined by the covering of yellow (southern) pine trees. It is described as a belt-like area which is about 150 miles wide (north to south) and extends from Texas eastward into Georgia and South Carolina. Waynesboro is within this area. Because of its availability and characteristics, yellow pine is extensively used in building, particularly in residential construction. The logging industry is extensive throughout the Pine Belt area. There are two sawmills located on Industrial Park Road, both 0.65 mile west of U.S. 45. These sawmills are the destination for most of the logging truck traffic in the Waynesboro area.

Section 63-5-19, Mississippi Code of 1972, effective July 1, 1980, limits the maximum length of vehicles to 55 feet. However, Section 63-5-21 specifically excepts truck hauling forest products from length (including rear overhang) restrictions. Daytime flagging of loads is required. The logging truck with its 12-inch square red flag was in compliance with State laws.

The Safety Board attempted to determine the hazards to highway traffic created by trucks hauling logs with extensive rear overhang on a local, Statewide, and regional basis. To accomplish this, accident records were requested from the City of Waynesboro and Wayne County. In addition, inquiries were made of the States of Texas, Arkansas, Louisiana, Mississippi, Alabama, Georgia, Florida, and South Carolina requesting

information which would help define exposure data and the representation of such trucks in each State's accident statistics.

The Waynesboro Police Department furnished information which showed that 15 accidents involving logging trucks had occurred within the city limits between November 3, 1978, and November 12, 1981. No information was furnished which would indicate the percentage of such accidents to the total accidents occurring in that city. Three (20 percent) of the logging truck accidents involved swinging logs in a turning maneuver configuration similar to the truck's turning maneuver in this accident. Two of the three accidents involved property damage only and the third resulted in hospital treated injuries.

Information furnished by the Wayne County Sheriff's Department showed that between March 9, 1979, and August 14, 1981, there had been 12 accidents involving trucks with tree-length logs. No information was available on the percentage of all accidents investigated by the Sheriff's Department. All 12 accidents occurred on county roads outside of Waynesboro.

The 27 accidents investigated by the police department and the sheriff's department do not represent all of the logging truck accidents which have occurred within Wayne County during the specified time periods. Other accidents have occurred on State or Federal designated highways within Wayne County and were investigated by the Mississippi Highway Patrol. Because the State of Mississippi does not "...capture the type of tractor-trailer rigs on accident reports," the highway patrol could not furnish the requested accident statistics.

Only one of the other seven States contacted was able to furnish exposure data in terms of numbers of logging trucks registered or miles of operation. Neither was any of the States except Arkansas, able to provide any accident statistics pertaining to logging trucks. Current accident report coding does not provide for such information in six of the seven states.

Information furnished by the State of Arkansas shows that in 1977, there were 8,800 licensed vehicles engaged in the forest industry. Of these, 2,700 were pole and log trucks and 1,700 were registered for gross weight of 40,000 pounds or more. Accident statistics show that there were 36 accidents involving logging trucks in 1979 which resulted in no fatalities and 10 injuries; in 1980, there were 25 logging truck accidents resulting in 1 fatality and 10 injuries; and in 1981, there were 26 logging truck accidents resulting in 1 fatality and 7 injuries.

Texas, Arkansas, Alabama, Georgia, Louisiana, Florida, and South Carolina State law enforcement officials were asked to comment on whether or not log-hauling trucks presented a problem in highway safety within their respective States. There was no comment in the response from Georgia. The representative from Louisiana responded that "I have seen no information which would lead me to believe that these trucks present a particular problem." Conversely, the Alabama representative stated, "In response to your question as to whether or not these trucks present a problem in highway traffic safety, the answer is yes. Especially those hauling full length logs with a great overhang." The representative of the State of Florida stated that there were "moderate problems with accidents" involving turning trucks with swinging logs. The representative of the State of Texas stated that logging trucks were a traffic safety problem in that State, but "probably not more so than some" other type of trucks. The representatives of the States of Arkansas and South Carolina did not feel that a particular highway safety problem created by logging trucks existed in their State.

The State of Alabama law exempts trucks hauling tree length logs from the length (and overhang) restrictions. Louisiana State law provides that "...the load upon the rear vehicle of a combination of vehicles transporting forest products in their natural state shall not project more than 20 feet beyond the rear of the bed or rear tire of said vehicle whichever is further from the cabin. . . ." The State of Georgia has no laws or rules on overhang restrictions. Single tree-length logs may be hauled legally up to 75 feet long including the vehicle. Special permits are required for utility poles over 75 feet long and up to a 100-foot overall length. A rear escort vehicle is required if the overall vehicle/load length exceeds 100 feet. Georgia State law does provide, however, that an amber revolving light may be used in lieu of escort vehicles. The State of Texas does not restrict rear overhang, but limits overall vehicle length to 90 feet and restricts travel to daylight hours only. The State of South Carolina restricts overall vehicle length of pole trailers (including the load) to 80 feet and rear overhang to 6 feet. Vehicles exceeding 80 feet in length are required to have a special permit. The State of Florida restricts overall vehicle length to 55 feet with rear overhang restricted to 4 feet. The Florida Department of Transportation issues special permits for overall length over 55 feet up to 75 feet. It was reported that rear overhangs of 8 to 15 feet were common when operating with these permits. The State of Arkansas restricts overall vehicle length to 65 feet and rear overhang to 4 feet. All States require that rear overhang in excess of the specified restriction be flagged during daylight hours and lighted at nighttime.

The Uniform Vehicle Code (UVC) states that "...the load upon any vehicle operating alone or the load upon the rear vehicle of a combination of vehicles shall not extend more than 6 feet beyond the rear of the bed or body of such vehicle." <sup>2/</sup> The UVC further restricts overall vehicle length, inclusive of front and rear bumpers, to 55 feet except for specially designated highways, where the overall length of three-unit vehicles may be 65 feet. <sup>3/</sup>

Schoolbus Driver Training.--Section 37-41-57 of the Mississippi Code of 1972 states, in part, that: "The State Board of Education by and with the advice of the Department of Public Safety shall adopt and enforce regulations...to govern...all operations of all schoolbuses used for the transportation of school children when owned and operated by any county board of education or board of trustees in a separate school district or privately owned and operated under contract with any county board of education or board of trustees in a separate school district in this State." The Mississippi Department of Public Safety assists, during the summer months, in the training of schoolbus drivers who are to be employed as stated in the law. The Rules and Regulations of the State Board of Education Providing for the Operational Procedure of School Buses to Insure Safety of Pupils states, in part, that each schoolbus driver: "Must have attended a bus driver training school and hold a certificate not more than two years old." While drivers of privately owned and operated vehicles are not required to attend the training, officials stated that the training was available to such drivers if they wished to attend.

In 1979, the Safety Board recommended that each Governor of the 50 States, "Enact legislation to require that the driver of any motor vehicle with a seating capacity of more than 16 passengers, whether so employed or acting voluntarily, shall possess, in addition to a properly classified State drivers license, a certificate authenticating such driver's successful completion of a busdriver training course which conforms to Highway Safety Program Standard No. 17, Pupil Transportation Safety" (Recommendation No. H-79-31). Safety Board records show that the former Governor of the State of Mississippi did not respond to the recommendation.

<sup>2/</sup> Uniform Vehicle Code and Model Traffic Ordinance, Revised, 1971, Section 14-105.

<sup>3/</sup> Ibid, Section 14-104(c), (d).

Safety Board investigators contacted officials at the Mississippi State Department of Education, Building and Transportation Division, about whether or not specific reference to the potential hazard from trucks hauling forest products or other objects with extensive rear overhang was included in either the schoolbus driver training or the drivers education curriculum. The response was that such a specific reference was not included in either program. However, the State Department of Education informed the Safety Board that the lessons learned in this accident prompted the inclusion of a specific reference to the accident and the potential danger from extensive rear overhang in the schoolbus driver training curriculum to be taught in future classes. The Safety Board is pleased to note that the State Department of Education has taken this prompt step to enhance pupil transportation safety.

## ANALYSIS

### The Accident

The facts developed during the investigation of this accident disclosed that the truck tractor-pole semitrailer was southbound on U.S. Route 45 carrying logs, some of which were 77 feet or more in length. The schoolbus had been following the truck for at least 1.5 miles. As the two vehicles approached the intersection of U.S. Route 45 and Industrial Park Road, an Oldsmobile sedan approached the intersection eastbound on Industrial Park Road and stopped. The truckdriver moved his vehicle into a right turn lane, downshifted, and slowed to a driver-estimated speed of 10 to 12 mph before turning. Prior to turning, the truckdriver did not see and was not aware of the immediate proximity of the schoolbus, even though he had observed it earlier. The schoolbus was traveling at a constant, driver-estimated speed of 35 to 40 mph and was overtaking the log-laden truck. At that time according to the busdriver's statement, her attention was focused on the Oldsmobile and she was not cognizant of the truck. As the truck turned right, the pine logs, which extended at least 37 feet rearward of the rear bolster on the pole trailer, swung leftward and protruded into the southbound travel lane and into the path of the schoolbus. The busdriver, not being aware of the encroaching logs, did not take avoidance action and the accident ensued.

The investigation of causal factors in this accident was concentrated on those factors which could explain the apparent lack of preaccident avoidance action on the part of either the truckdriver or the busdriver. Further, investigation focused on the geometry of the intersection, turning characteristics of the truck and its load, and other features of the highway, i.e. signing, lane width, and pavement striping. The investigation also reviewed the Mississippi State laws relating to schoolbus driver licensing and training, the transportation of forest products, rear overhang restrictions, as well as accident experience, and factors relating to accident severity and survivability. Weather was not considered a factor in this accident.

The truckdriver had 4 years' experience transporting forest products. Also, he was thoroughly familiar with the vehicle he was driving and the route he was traveling; therefore, he was aware that the rear end of the logs would swing leftward into the travel lane when he made a sharp right turn. He had downshifted and had looked at the tachometer on the truck's instrument panel before initiating the turn. According to the truckdriver's testimony, he had noticed the schoolbus earlier, but as he approached the intersection, he did not realize that the schoolbus was overtaking his truck on the left while his truck was in the right turn lane. Thus, he approached and entered into the right turn without hesitation.

While observing the flow of logging trucks through the intersection, Safety Board investigators noticed on several occasions that the truckdrivers would move into the right turn lane, approach the intersection, and if they noted the presence of southbound traffic, stop before turning. This allowed the traffic to clear so that there was no conflict with vehicles when the logs protruded into the travel lane. The action of stopping also demonstrated that the truckdrivers were aware of the arc followed by the overhanging logs when they turned. Had the involved truckdriver noted the bus overtaking his vehicle, it is possible that he, like the others, would have stopped to allow traffic to clear before turning. In this manner, the accident could have been prevented. The Safety Board believes that the truckdriver, knowing that the logs would swing into the travel lane when he turned, had the obligation to see that traffic behind his vehicle was clear before initiating the turn. This is analogous to the responsibility of any driver intending to make a lane-change maneuver on a multilane highway. Therefore, the Safety Board concludes that the truckdriver's failure to be fully aware of the traffic situation around his vehicle before making the right turn was a causal factor in the accident.

While the schoolbus driver was familiar with both the highway and the vehicle which she was driving, she stated that she had no recollection of ever having previously seen logging trucks turn at the intersection. Regardless of whether the busdriver, a long-term resident of this area, had previously observed the operation of logging trucks at this intersection or would have been aware of the danger from overhanging logs when a logging truck is turning, prudent driving would have involved close observation of all traffic in the vicinity. However, the busdriver's statement that she did not remember seeing the truck ahead of her or turning together with the lack of evidence of any preimpact avoidance action leads to the conclusion that the busdriver's attention was not directed toward the truck as she approached the intersection.

According to the busdriver, her attention was focused on an eastbound automobile at Industrial Park Road which she perceived as "starting into the lane of Highway 45." Her statement indicated that she focused her attention on the car and made preparations to take avoidance action. According to the driver of the Oldsmobile, he had not encroached into the southbound travel lane. Although the Oldsmobile was stopped well beyond the stop sign, it was within the portion of the intersection opposite the right turn lane. Tire marks found in the southwest quadrant of the intersection define the position and path of the bus at that point. A projection northward from that path to the area of the schoolbus-automobile collision indicates that the automobile's front bumper was 3 to 4 feet west of the west edge line of U.S. Route 45 when the schoolbus struck the automobile.

The travel speeds as stated by both the busdriver and the truckdriver for their respective vehicles appear to be reasonably accurate. Safety Board investigators recorded the time for trucks to make a 90° turn, and the range of speeds (11.6 to 14.9 mph) calculated from those times spans the truckdriver's estimate of his speed. Computations based on momentum and energy indicate that the schoolbus was traveling 33 to 42 mph, which encompasses the busdriver's estimate of her speed.

The busdriver stated that she saw the automobile back up off the highway. The automobile driver, however, stated that he had shifted into reverse but did not have sufficient time to back up before his car was struck by the bus. While the point of impact between the schoolbus and the logs could not be precisely defined, the presence of debris on the pavement, coupled with a reconstruction of the geometry of the log ends as the truck turned, and the relative position of the logs and of the bus at impact permits

the calculation of a range for the impact area. That calculation indicates that after the bus struck the logs, it traveled 90 to 115 feet before striking the car. At a speed between 35 and 40 mph, the bus would have traversed this distance in about 1.7 to 2.5 seconds. If the automobile driver did shift gears after the initial impact, he would have had to have seen the crash, recognized that the bus was going to strike his car, reacted, and completed the shift within 1.7 to 2.5 seconds. The Safety Board, however, cannot assess the automobile driver's ability to have reacted in such a short period of time.

Reconstruction of the dynamics of the movements of the ends of the logs indicates that once pivoting began, there was about a 2-second lapse from the time the logs started to swing until the bus struck the logs. If the accident were to have been averted by the busdriver, recognition of the potential danger and appropriate avoidance action would have had to have been initiated before the logs started to swing. The relative positions and speeds of the truck and the bus made the collision inevitable once the logs began to swing. As the preaccident sequence of events unfolded, the busdriver focused her attention on the automobile to the exclusion of all other vehicles and events. This focusing of attention would have occurred at a critical time as the truck progressed into its right turn and the logs swung into the path of the bus. Effective defensive driving tactics require a driver to observe the complete traffic picture, rather than concentrating on one element. In this case, the complete picture would have included the logging truck.

The Safety Board concludes that this accident resulted from a combination of conditions and events which included the truckdriver's failure to monitor traffic behind him as he approached his turn, the busdriver's lack of knowledge of the potential hazard created by the turning logging truck, the busdriver's failure to monitor the movement of the logging truck as it was being overtaken by the schoolbus, and the automobile's proximity to the southbound travel lane of U.S. 45, which captured and held the busdriver's attention at a critical time.

#### Intersection Geometry

As the truck tractor was being turned from a southeast direction to a west direction, the pole semitrailer wheels slowed to a near stop (with respect to the original direction) and virtually pivoted before continuing on the new direction. The rear bolster on the semitrailer was mounted midway between the No. 4 and No. 5 axles. This meant that the rear bolster served as a pivot point for the logs while the truck was being turned. Since the truck was in a right turn maneuver, that portion of the logs aft of the rear bolster would swing in the opposite direction toward the travel lanes on U.S. Route 45. The 11.75-foot-wide right turn lane was not sufficient to permit much lateral movement before the rear ends of the logs protruded into the southerly travel lanes. The longer the overhang, the greater the protrusion. In most cases, the encroachment into the travel lanes only lasted about 3 to 5 seconds, as noted by Safety Board investigators during postaccident observations of the log truck traffic flow through the intersection.

In view of the number of truckdrivers and other motorists who stopped during the survey of the intersection conducted by Safety Board investigators, to allow one or the other to clear the intersection, it appears that many of the drivers traveling through the intersection were aware of the potential hazard and took appropriate defensive action. However, if a driver is not familiar with the displacement of the ends of logs overhanging the rear of logging trucks while turning or if a driver is momentarily distracted, there is little time to take any avoidance action, and as a result the potential for an accident is greatly increased. In this accident, the schoolbus driver had about 2 seconds to react from the time the left rear corner of the logs protruded beyond the west edgeline of the travel lane until impact.

The Safety Board concludes that the truckdriver's failure to ascertain the close proximity of the schoolbus, the busdriver's incomplete attention to the driving task, and the 37-foot rear overhang from the semitrailer's rear bolster were factors which contributed to this accident. Similar accidents at the intersection probably have been averted by the alertness and defensive driving tactics of the truckdrivers and other highway users. The Safety Board encourages defensive driving practices, but believes that the situation existing at the intersection demands a higher degree of defensive driving than can reasonably be expected. There are two primary reasons for this: (1) the lack of warning or information input to drivers not familiar with the potential hazards; and (2) the inordinate potential for accidents if a driver is momentarily distracted or inattentive. The geometrics of the intersection are such that when log trucks with extensive rear overhang are making a right turn from U.S. Route 45 onto Industrial Park Road there is no margin for error. The Safety Board believes that those agencies responsible for the highway transportation system should assure, either through design or regulation, a reasonable margin of safety to accommodate such movement.

### Highway Signing

While the policy of the Mississippi State Highway Commission is in accord with the MUTCD recommendations for signing on intersection approaches where no special hazards or unusual conditions exist, the Safety Board believes that is not the situation at the intersection of U.S. Route 45 and Industrial Park Road. One estimate indicated that about 125 trucks hauling forest products turn at that intersection each workday. The Safety Board believes that trucks with overhanging logs turning at this intersection 125 times per day constitutes a special hazard or unusual condition.

The MUTCD states, in part, that: "Warning signs are used when it is deemed necessary to warn traffic of existing or potentially hazardous conditions on or adjacent to a highway or street. Adequate warnings are of great assistance to the vehicle operator and are valuable in safe-guarding and expediting traffic." 4/ The MUTCD further provides that, on rural highways, warning signs should be placed about 750 feet in advance of the hazard or condition. On high speed roads, the MUTCD recommends advance warning distances as great as 1,500 feet. 5/

Although the busdriver had driven through the intersection numerous times, she said that she was not aware of the potential hazard associated with the displacement of overhanging logs on turning log trucks and, therefore, did not take the necessary precautions to avert conflict with the logs as they moved into the travel lane occupied by the schoolbus. If warning signs and special striping had been placed on the pavement to denote the danger zone, the busdriver may have noticed the signs and markings either on this occasion or previously and may have been aware that the turning of a log-hauling truck posed a potential hazard. The MUTCD states: "...warning signs are primarily for the protection of the driver who is unacquainted with the road. . . ." 6/ The concept also applies to drivers who are unacquainted with transient conditions, whether familiar with the road or not. Foreknowledge of the potential hazard could have caused the busdriver to be more attentive to the logging truck and to have taken precautions which would have averted the accident.

4/ Manual on Uniform Traffic Control Devices, Section 2C-1, pp 63.

5/ Ibid, Section 2C-3, pp 65.

6/ Ibid.

The Safety Board believes that potentially hazardous conditions frequently exist at this intersection, albeit transient and intermittent in nature, which warrant the placement of warning signs as recommended by the MUTCD and special highway pavement markings to denote the zone of potentially imminent danger. Another possible action to eliminate the hazard of logs associated with overhanging logs protruding into the travel lane would be the construction of a wider turning lane at the intersection.

#### S.L. & B./Academy, Inc. Schoolbus

The Mississippi State law, which requires all public school busdrivers and drivers of privately owned buses under contract to public school districts to attend schoolbus driver training courses and to have a certificate not more than 2 years old, does not apply to any bus owned and operated by the S.L. & B. Academy, Inc. The function of S.L. & B. Academy, Inc., was to provide for the transportation of its members' children, who were students of Wayne Academy, to and from that school. The selection of a schoolbus as the mode of transportation was, undoubtedly due to the large number of students being transported. The Safety Board has previously recommended that special training be required of drivers of all vehicles with a seating capacity of more than 16 persons. The safety related challenges and problems encountered in operating a schoolbus remain the same irrespective of the type of organization operating the schoolbus. While the circumstances of the accident are such that the Safety Board is unable to determine whether or not specialized training might have made a difference in preventing this accident, the Safety Board believes that the responsibilities of driving a schoolbus are such that special training is needed. The Safety Board further believes that it is inconsistent to require such training of public school busdrivers and drivers of privately owned buses under contract to public school districts while permitting the drivers of privately owned schoolbuses to operate those vehicles without such training. The Safety Board also believes that the potential hazard posed by logging trucks with extensive rear overhang, particularly when the logging trucks are turning, should be a part of the schoolbus driver training curriculum in areas where such hazards are likely to be encountered.

#### Survival Aspects

The parents denial of permission to investigators to interview the bus passengers prevented the exploration of the events that took place in the bus immediately before and during the collision. Similarly, no information was obtained regarding any forewarning the passengers had, individual actions taken for self-protection, nor the effects of the early crash forces on passenger kinematics before the logs penetrated and swept a portion of the passenger area. Some of the students seated in the area swept by the logs sustained minor injuries or no injuries, while others suffered serious to fatal injuries. There were unconfirmed reports that some of the students were forewarned and had time to get down onto the bus' floor before the logs penetrated. If this was true and students seated in the critical area, were involved, their getting onto the floor could have saved lives.

The logs penetrated the windshield and exited (in the one case) just below window sill level. Based on the evidence found within the bus, the logs traversed the passenger area at window sill height. Thus, any student who was below that height, either through a willful act or by being thrown to the floor by impact forces before the logs penetrated, survived the accident with no injury or comparatively minor injuries.

The body of the schoolbus maintained its integrity remarkably well considering the nature of the collision and the resultant forces to which it was subjected. Pillar separation was minimal and was restricted to areas involved in direct impact with the logs. There was no separation of any passenger seat anchors and the bus' roof deformation was largely restricted to an unoccupied area of the bus.

The rapid response of police officers, emergency medical technicians (EMT), nurses and power company employees provided timely emergency services at the scene. The Safety Board commends the quick action of the police officers from the Wayne County Sheriff's Department and Waynesboro Police Department, the EMT's and nurses from Wayne General Hospital, and the Mississippi Power Company employees who were at the accident scene and assisted with the emergency.

#### Log Hauling in the Pine Belt States:

The survey of the eight Pine Belt States, Texas, Arkansas, Louisiana, Mississippi, Alabama, Georgia, Florida, and South Carolina, revealed that only half of those States had any restrictions with respect to rear overhang in hauling forest products. Only one of the eight States, Arkansas, was able to provide any accident statistics, vehicle population, or exposure data regarding trucks used in transporting forest products. State law enforcement officials in each of the eight States were asked to comment as to whether or not there existed any indications that these trucks caused a particular problem in highway traffic safety in their respective States. Officials from the State of Georgia did not comment. Officials from the States of Alabama, Florida, and Texas believed that a problem existed, at least to some extent, while officials of the States of Louisiana, Arkansas, and South Carolina saw no particular indication of special problems.

During the investigation, several law enforcement officers and officials at different levels of government expressed concern about the hazards to highway safety presented by logging trucks; especially those with extensive rear overhang. During a 3-year period, 27 logging truck accidents were investigated by either the Waynesboro Police Department or the Wayne County Sheriff's Department. This number does not include accidents investigated by Mississippi Highway Patrol officers which occurred in Wayne County during the same 3-month period. There was no response from the local Highway Patrol Office to Safety Board requests for those statistics. Analysis of the accident reports obtained revealed that 20 percent of the accidents involved turn maneuvers by the trucks with a resultant swing of rear overhang logs. The data are not sufficiently extensive to be statistically reliable, but there is an indication that a problem could exist which should be studied by the Pine Belt States. The Safety Board notes that those States which restrict rear overhang on logging trucks also appear to be experiencing the least problems from those type of vehicles; this may well be attributable to the effectiveness of those restrictions. The Safety Board believes that sufficient justification exists to warrant a study by each of the Pine Belt States to determine the extent to which trucks hauling forest products with extensive rear overhang contribute to that State's highway safety problems and to take any appropriate remedial action.

### CONCLUSIONS

#### Findings

1. The truckdriver failed to check the area for traffic to his left rear or become aware of the traffic situation in the immediate vicinity of the truck before making a sharp right turn.

2. The busdriver apparently was not aware of the truck or its potential movements.
3. The busdriver focused her attention on the automobile to the exclusion of other traffic at a critical time.
4. The busdriver's attention to the automobile was probably due to the proximity of the automobile to the southbound travel lane on U.S. Route 45.
5. Intersection geometry required a hard right turn on the part of the truckdriver.
6. While turning, the trailer's rear tandem axles served as a pivot point. Pivoting caused the logs, which extended rearward at least 37 feet from the rear bolster, to swing left and to intrude into the southbound travel lane and into the schoolbus' path.
7. None of the involved vehicles had defects which were a factor in this accident.
8. Weather was not a factor in this accident.
9. Because of the potential hazard which exists at the intersection, highway signing did not conform to the Manual on Uniform Traffic Control Devices.
10. Appropriate warning signs and markings at the intersection could have forewarned the busdriver of the potential danger existing when logging trucks are turning at the intersection.
11. Schoolbus driver training is not required for drivers of privately owned and operated schoolbuses, but is available to such drivers.
12. The integrity of the schoolbus body was well maintained throughout the collision.
13. The fatalities and serious injuries on the schoolbus resulted from direct contact with the logs which penetrated into the passenger area of the bus, and were limited to those passengers in the front three rows.
14. Rapid response by police, emergency medical personnel, and power company employees provided prompt emergency services at the scene.
15. Responses received from State officials indicates that further study is warranted to determine the extent to which log-hauling trucks contribute to traffic safety problems in Mississippi, Alabama, and Georgia (States in the Pine Belt).
16. Those Pine Belt States which restrict rear overhang appear to be experiencing less highway safety problems caused by log hauling trucks than those States which have no such restrictions.

**Probable Cause**

The National Transportation Safety Board determines that the probable cause of this accident was the log truckdriver's failure to ascertain that the area near the rear of his truck was clear before turning and the busdriver's incomplete attention to the driving task. Contributing to the cause of the accident was the busdriver's failure to recognize the potential danger from the overhanging swinging logs on the turning logging truck. Contributing to the severity of the accident was the penetration of logs into the passenger area of the schoolbus.

**RECOMMENDATIONS**

As a result of its investigation of this accident, the National Transportation Safety Board recommended that:

**—the Mississippi Department of Highways**

Install appropriate advance warning signs to alert motorists of the potential hazard from turning trucks loaded with logs or other objects with extensive rear overhang at the intersection of U.S. Route 45 and Industrial Park Road and at all other intersections within the State of Mississippi where a similar hazards may exist. (Class II, Priority Action) (H-82-10)

**—the Governor of the State of Mississippi**

Introduce and support legislation to require that the driver of any motor vehicle with a seating capacity of more than 13 passengers, whether so employed or acting voluntarily, shall possess, in addition to a properly classified State drivers license, a certificate not more than 2 years old authenticating such driver's successful completion of a busdriver training course which conforms to Highway Safety Programs Standard No. 17, Pupil Transportation Safety. (Class II, Priority Action) (H-82-11)

Take steps to assure that reference to the potential hazard from trucks hauling forest products or other objects with extensive rear overhang, particularly the hazard from the swinging overhang during a turning maneuver, is included as part of the curriculum for all schoolbus driver training programs and driver's education programs throughout the State of Mississippi. (Class II, Priority Action) (H-82-12)

**—the Governors of the States of Florida, South Carolina, Georgia, Alabama, Mississippi, Louisiana, Arkansas, and Texas**

Conduct a study within each State to determine whether trucks hauling logs or other objects with extensive rear overhang represent a significant safety hazard to the motoring public. If the study determines that extensive rear overhang on trucks hauling logs or other objects with extensive rear overhang is a significant safety hazard, take appropriate remedial action. (Class II, Priority Action) (H-82-13)

**BY THE NATIONAL TRANSPORTATION SAFETY BOARD**

/s/ JAMES E. BURNETT, JR.  
Chairman

/s/ PATRICIA A. GOLDMAN  
Vice Chairman

/s/ FRANCIS A. McADAMS  
Member

/s/ G. H. PATRICK BURSLEY  
Member

April 26, 1982

**APPENDIX**  
**INVESTIGATION**

1. Investigation

The National Transportation Safety Board was notified of the accident via news media during the early morning hours of October 13, 1981. An investigative team from Washington, D.C., arrived at the accident scene at 10:20 p.m. on October 13, 1981. Representatives of the Mississippi Highway Patrol, the Wayne County Sheriff's Department, the Waynesboro Police Department, and the S. L. & B. Academy, Inc. participated in the investigation. Assistance in the investigation was rendered by representatives of the Mississippi Department of Highways, Wayne Academy, and Wayne General Hospital.

2. Deposition/Hearing

There were no depositions or hearings held in connection with this investigation.