

PB81-243917



NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

HIGHWAY ACCIDENT REPORT

DIRECT TRANSIT LINES INC.,
TRACTOR-SEMITRAILER/MULTIPLE-VEHICLE
COLLISION AND FIRE,
U.S. ROUTE 40,
FROSTBURG, MARYLAND
FEBRUARY 18, 1981

NTSB-HAR-81-3

UNITED STATES GOVERNMENT

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA 22161

TECHNICAL REPORT DOCUMENTATION PAGE

| | | | | | |
|--|--|---|--|--|-----------|
| 1. Report No. NTSB-HAR-81-3 | | 2. Government Accession No. PB81-243917 | | 3. Recipient's Catalog No. | |
| 4. Title and Subtitle Highway Accident Report--Direct Transit Lines, Inc., Tractor-Semitrailer/Multiple-Vehicle Collision and Fire, U. S. Route 40, Frostburg, Maryland, February 18, 1981. | | | | 5. Report Date July 7, 1981 | |
| | | | | 6. Performing Organization Code | |
| 7. Author(s) | | | | 8. Performing Organization Report No. | |
| 9. Performing Organization Name and Address National Transportation Safety Board Bureau of Accident Investigation Washington, D.C. 20594 | | | | 10. Work Unit No. 3288 | |
| | | | | 11. Contract or Grant No. | |
| 12. Sponsoring Agency Name and Address NATIONAL TRANSPORTATION SAFETY BOARD Washington, D. C. 20594 | | | | 13. Type of Report and Period Covered Highway Accident Report February 18, 1981 | |
| | | | | 14. Sponsoring Agency Code | |
| 15. Supplementary Notes The subject report was distributed to NTSB mailing lists: 8A, 8C and 16. | | | | | |
| 16. Abstract On February 18, 1981, about 4:10 p.m. eastern standard time, a tractor-semitrailer loaded with building supplies accelerated out of control while descending a steep 3-mile grade near Frostburg, Maryland. The combination vehicle was traveling eastbound on U.S. Route 40 when it passed and sideswiped a slower moving pickup truck in the eastbound lane. The combination vehicle then entered the city limits of Frostburg, Maryland, where it collided with eight vehicles and pushed them into six other vehicles. The semitrailer uncoupled and overturned, and the tractor pushed another vehicle with two occupants into a three-story commercial building before coming to rest. As a result, an explosion and fire erupted in the building. Three persons were killed, and the truck driver and 11 vehicle occupants were injured. Property damage was estimated at more than \$675,000. The National Transportation Safety Board determines that the probable cause of this accident was the failure of the truck driver to respond to appropriate regulatory and warning signs and to properly use the service brakes and transmission for speed control purposes which permitted the tractor-semitrailer to accelerate to a high rate of speed before entering the city of Frostburg. Contributing to the accident was the improper adjustment of the trailer's service brakes due to inadequate vehicle maintenance. | | | | | |
| 17. Key Words Runway tractor-semitrailer accident; loss of braking control; dry pavement; improper brake adjustment; poor vehicle maintenance; high speed; long steep grade brake-check areas; leased equipment, ICC carrier | | | | 18. Distribution Statement This document is available to the public through the National Technical Information Service-Springfield, Virginia 22161 (Always refer to number listed in Item 2) | |
| 19. Security Classification (of this report) UNCLASSIFIED | | 20. Security Classification (of this page) UNCLASSIFIED | | 21. No. of Pages 32 | 22. Price |

CONTENTS

| | |
|---|----|
| SYNOPSIS | 1 |
| INVESTIGATION | 1 |
| The Accident | 2 |
| Injuries to Persons | 2 |
| Vehicle Information | 3 |
| Tractor Damage | 3 |
| Transmission/Rear Axle | 5 |
| Tires | 6 |
| Brakes. | 6 |
| Semitrailer Damage | 7 |
| Suspension | 7 |
| Tires | 7 |
| Brakes. | 7 |
| Carrier Information | 7 |
| Driver Information | 8 |
| Highway Information | 9 |
| Survival Aspects | 16 |
| ANALYSIS | 16 |
| The Accident | 16 |
| Mechanical Condition of the Vehicle and Driver Action | 16 |
| Other Safety-Related Factors | 17 |
| CONCLUSIONS. | 18 |
| Findings | 18 |
| Probable Cause | 19 |
| RECOMMENDATIONS. | 19 |
| APPENDIXES | 21 |
| Appendix A--The Investigation | 21 |
| Appendix B--Driver's Vehicle Condition Reports | 22 |
| Appendix C--Description of Other Vehicles Involved in the Accident | 28 |
| Appendix D--Signing For U.S. Route 40 From Savage Mountain East Through Frostburg, Maryland. | 30 |

**NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C. 20594**

HIGHWAY ACCIDENT REPORT

Adopted July 7, 1981

**DIRECT TRANSIT LINES, INC., TRACTOR-SEMI TRAILER/
MULTIPLE-VEHICLE COLLISION AND FIRE
U.S. ROUTE 40, FROSTBURG, MARYLAND
FEBRUARY 18, 1981**

SYNOPSIS

On February 18, 1981, about 4:10 p.m. eastern standard time, a tractor-semitrailer loaded with building supplies accelerated out of control while descending a steep 3-mile grade near Frostburg, Maryland. The tractor-semitrailer was traveling eastbound on U.S. Route 40 when it passed and sideswiped a slower moving pickup truck in the eastbound lane. The tractor-semitrailer then entered the city limits of Frostburg, Maryland, where it collided with eight vehicles and pushed them into six other vehicles. The semitrailer uncoupled and overturned, and the tractor pushed another vehicle, with two occupants, into a three-story commercial building before coming to rest. As a result, an explosion and fire erupted in the building. Three persons were killed, and the truckdriver and 11 vehicle occupants were injured. Property damage was estimated at more than \$675,000.

The National Transportation Safety Board determined that the probable cause of this accident was the failure of the truckdriver to respond to appropriate regulatory and warning signs and to properly use the service brakes and transmission for speed control purposes which permitted the tractor-semitrailer to accelerate to a high rate of speed before entering the city of Frostburg. Contributing to the accident was the improper adjustment of the trailer's service brakes due to inadequate vehicle maintenance.

INVESTIGATION

The Accident

About 4:10 p.m. e.s.t. 1/ on February 18, 1981, a tractor-semitrailer (combination vehicle) was traveling eastbound on U.S. Route 40, a two-lane mountain highway approaching the city of Frostburg, Maryland, en route from Constantine, Michigan, to Manassas, Virginia. The weather was clear and dry with light gusting winds.

Witnesses observed the combination vehicle traveling down Big Savage Mountain at a high rate of speed. The vehicle was seen passing a mandatory brake check area, located about 1.2 miles east of the top of the mountain. None of the witnesses heard a distress horn or smelled or observed smoke from the vehicle's service brakes. Witnesses, who were in a position to observe, did not see either the front headlamp or the rear tail lamps flashing during the vehicle's descent.

1/ All times herein are eastern standard time.

The combination vehicle passed and sideswiped an eastbound 1973 Dodge pickup truck about 1/4 mile west of the city limits of Frostburg. The combination vehicle maneuvered around several vehicles, forced a westbound car off the road, and continued eastbound into the downtown business district; there it struck eight vehicles and pushed them into six other vehicles. During this sequence of events, an occupant of one of the vehicles was killed.

The tractor veered sharply to its right, causing the semitrailer to uncouple and overturn. The tractor continued on and pushed a 1972 Dodge Dart automobile, with two occupants, into the front wall of the building, causing the floor and right front corner to collapse. An explosion and fire erupted in the building immediately upon impact and the two vehicle occupants were killed. The fuel tanks on both the automobile and the tractor were ruptured by impact and released up to 18 gallons of gasoline and 123 gallons of diesel fuel. The fuel was probably ignited by sparks generated by sheet metal being dragged across the masonry and concrete structure as the vehicles penetrated the building. The building was destroyed and property damage to the building and involved vehicles was estimated at more than \$675,000.

Injuries to Persons

| <u>Injuries</u> | <u>Driver</u> | <u>Occupants of Vehicles</u> | <u>Total</u> |
|-----------------|---------------|------------------------------|--------------|
| Fatal | 2 | 1 | 3 |
| Nonfatal | 1 | 11 | 12 |
| None | 0 | 11 | 11 |
| Total | 3 | 23 | 26 |

Vehicle Information

The combination vehicle was a 1976 International Harvester Transtar II cab-over-engine tractor towing a 1973 Brown flatbed semitrailer. Both vehicles were owned and maintained by Marvin Deur of White Cloud, Michigan, and were leased to Direct Transit Lines, Inc., of Grand Rapids, Michigan. The combination vehicle was registered in the State of Michigan and was not subject to annual State inspection. However, since it was being used for interstate commerce, it was subject to terminal and roadside inspections as required by the Federal Motor Carrier Safety Regulations (FMCSR). The 3-axle tractor (VIN-B2327FGPA1457) was equipped with a 290 hp diesel engine, a 10-speed manual transmission, and air-activated drum brakes with "S" cam design on all axles. The tractor was equipped with 10:00 R20 radial tires on all three axles. The tractor's hubodometer had registered about 86,000 miles. The tractor was also equipped with type-1 occupant restraints (lap belts) for each designated seating position; it could not be determined if the driver restraint was in use during the accident. The two-axle semitrailer (VIN723004) was also equipped with air-activated drum brakes. The trailer was equipped with seven 11-24.5 and one 10:00-22 tubeless, regroovable commercial tires. The estimated gross combination weight of the vehicle at the time of the accident was 70,230 lbs.

Maintenance had been performed on the combination vehicle as follows:

| <u>Date</u> | <u>Repaired Item</u> | <u>Work Performed By</u> |
|-------------------|--|--|
| February 16, 1981 | Tractor: Installed electrical lighting components Replaced right rear brake chamber Repaired air leak | Quality Diesel Service Grand Rapids, Michigan |
| July 31, 1980 | Trailer: Relined one wheel and replaced bearings Repaired lighting system components Aligned trailer and repaired attaching frame items | Hudsonville Trailer Hudsonville, Michigan |

The vehicle repair on February 16 correlates to a prior driver complaint. On February 16, Direct Transit Lines, Inc., authorized the driver who was en route to Constantine, Michigan, to have repairs made on the vehicle after he complained of braking problems he had experienced earlier with the vehicle. (See appendix B.)

There were 15 other motor vehicles involved in the accident. See appendix C for a description of each vehicle.

Tractor Damage

The tractor was extensively damaged by impact and fire. The majority of the fiberglass cab, driver's compartment, engine controls, nonmetallic body components, air horn system, and fuel tanks were destroyed by the fire. All windows and other glass components, such as exterior lamps, were also destroyed. (See figures 1 and 3.)

Because of extensive fire damage to the brake lights and horn systems, the Safety Board could not determine if these systems were operating before impact. However, the last available pretrip inspection records indicate that the driver reported that both safety systems were functioning on February 14, 1981. (See appendix B.)

A postaccident inspection of the tractor's mechanical subsystems revealed the following:

Engine.--The tractor was equipped with an 355-cubic-inch, turbo-charged, six-cylinder Cummins diesel engine, serial No. 10541930; it had a maximum governed speed of 1,900 to 2,090 rpm.



Figure 1.--Front view of tractor.

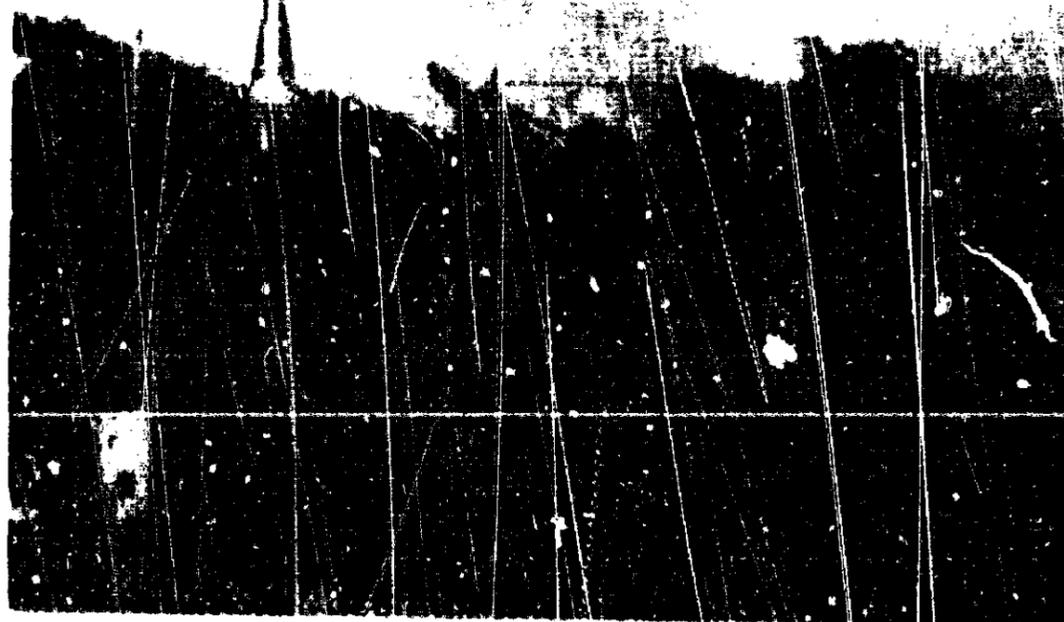


Figure 2.--Side view of tractor.

Representatives of Cummins Diesel advised the Safety Board that the engine in this series would be damaged if operated above 3,300 rpms. The engine damage would be demonstrated by twisting of the engine's governor and damage to the valve train from valve interference with the top of the piston. The Safety Board inspected the engine to determine if it had been damaged by overspeed. The cylinder heads were removed and the engine and fuel pump were examined; no visible damage was observed to the crankshaft, valves, or fuel pump. The tractor was not equipped with an engine brake or exhaust brake.

Transmission/Rear Axle.--The tractor was equipped with a Fuller Road Ranger 10-speed manual transmission without overdrive. The Safety Board unbolted the transmission from the vehicle and removed the shift linkage cover plate; no excessive wear was observed on any of the mechanical gear assemblies or shift mechanisms. The transmission was in the ninth-gear, which provided a gear ratio of 1.27 to 1 and a maximum speed of about 80 mph before the engine would be damaged by overspeed. (See figure 3 and table 1.) The Safety Board also examined both rear axle differential carrier assemblies and found them to be intact; the rear axle ratio for both differentials was determined to be 3.73 to 1.

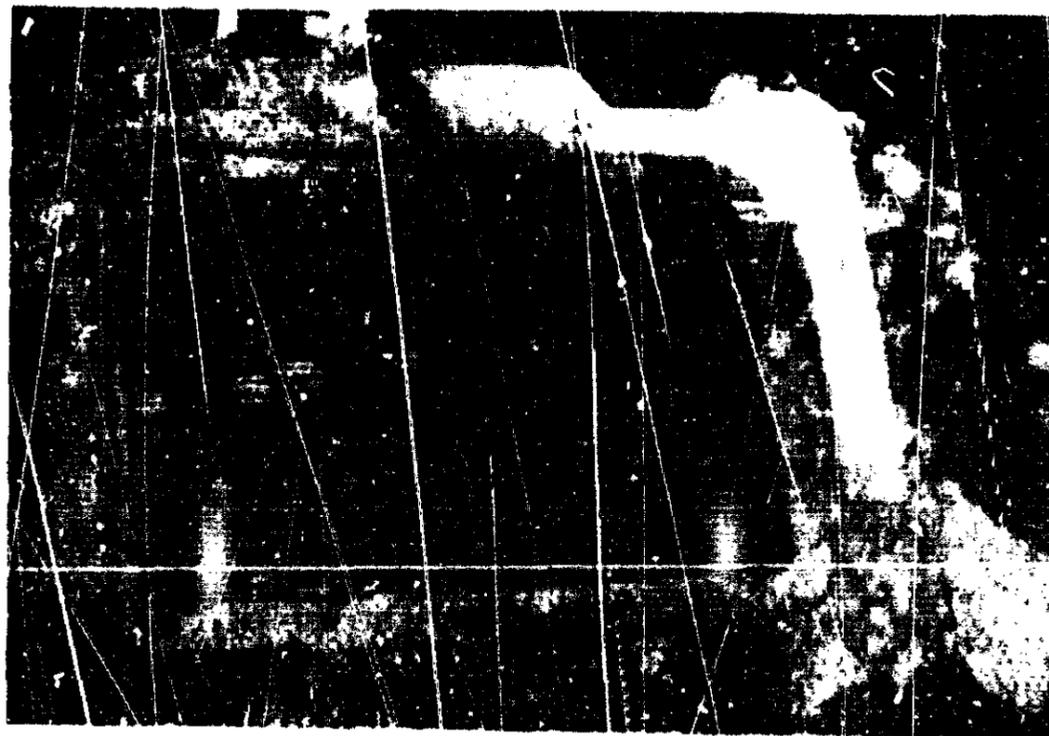


Figure 3.--Ten-Speed Manual Transmission In Ninth Gear.

Table 1.--Maximum Road Speeds at Various Engine Speeds for the 10 Transmission Ratios 1/

| Gear | Total <u>2/</u> Gear Ratio | ROAD Governed 2,090 rpm (mph) | SPEED Engine damage 3,300 rpm (mph) |
|------|----------------------------------|--|--|
| 1 | 38.22 | 6.7 | 10.5 |
| 2 | 27.94 | 8.6 | 13.6 |
| 3 | 21.74 | 11.1 | 17.5 |
| 4 | 16.78 | 14.4 | 22.7 |
| 5 | 13.24 | 18.3 | 28.9 |
| 6 | 10.22 | 23.6 | 37.3 |
| 7 | 7.87 | 30.7 | 48.4 |
| 8 | 6.15 | 39.2 | 62.0 |
| 9 | 4.74 | 50.9 | 80.4 |
| 10 | 3.73 | 64.7 | 102.1 |

1/ Based on a static load radius for the 10:00 R20 tire of 19.40 inches as determined from Goodyear Truck Tire Manual, August 1977.

2/ Total gear ratio is the final drive train gear ratio (transmission ratio times rear axle ratio.)

Tires.-- All of the tires were deflated and had been subjected to considerable fire damage, except for the left outer tire, which had separated from the rearmost drive axle during impact. The tire was still inflated and the tread depth exceeded FMCSR requirements.

Brakes.--The air brake system could not be pressurized because of extensive fire damage to the brake equipment hardware. The system was inspected and the following conditions were noted: (1) the spring brakes on the front drive axle were destroyed by fire; (2) the left rear drive axle brake actuator was broken from its mounting; (3) the right rear drive axle brake drum's diameter was 16.625 inches (manufacturer's specifications limited drum brakes to a maximum diameter of 16.620 inches); and (4) the brake linings were in good condition except for the brake linings on the right rear drive axle brake which were worn to the bonding rivet heads.

The slack adjustments, measured by hand for each axle brake actuator, were as follows:

| <u>Tractor Brake Position</u> | <u>Actuator</u> (Clamp-type) | <u>Measured Slack Adjustment</u> (Inches) | <u>Manufacturer's Recommended Stroke at Which to Readjust</u> (Inches) |
|---------------------------------------|---------------------------------|--|---|
| Front steering axle | 16 | 1.75 | 1.75 |
| Front drive axle | 30 | 1.75 | 2.00 |
| Rear drive axle <u>1/</u> | 30 | 1.75 | 2.00 |

1/ Slack adjustment for the left rear drive axle actuator could not be measured because of impact damage.

Semitrailer Damage

The semitrailer, which was not damaged as severely as the tractor, was inspected after its load had been removed; fire had damaged only the forward half of the vehicle. The semitrailer's header board was charred and slightly distorted. The wooden bed was also heavily charred around its midsection, and the forward-mounted trailer supports were bent slightly outboard. (See figure 4.)

Suspension.--The Safety Board inspected the trailer suspension and found (1) the U-bolt assemblies for the leaf springs on the rear tandem axle were extremely loose--the fasteners could be turned by hand, and (2) the welds for the leaf spring saddles were cracked on the left front, right rear, and left rear tandem axles.

Tires.--All tires were inflated and the air pressure levels varied from 73 to 88 psi. The tires were in generally good condition except that (1) the right front inner tire had a small cut on the inboard side, and (2) the left front outer tire exhibited visible bald spots in the tread section in several locations.

Brakes.--The brake system was pressurized and inspected, and (1) an external air leak was found near the relay emergency valve at the regulator reservoir tank; (2) the right front and left rear brake actuators had excessive play between the bushings and clevis pin; and (3) the emergency brakes remained applied for only 7 minutes 24 seconds after the air supply was removed from the trailer. (FMCR Part 393.43 specifies that the emergency brakes shall remain applied for at least 15 minutes). Slack adjustments, measured for each axle brake actuator, were as follows:

| <u>Trailer Brake Position</u> | <u>Actuator</u> (Clamp-type) | <u>Measured Slack Adjustment</u> (Inches) | <u>Manufacturer's Recommended Stroke at Which to Readjust</u> (Inches) |
|---------------------------------------|-------------------------------------|--|---|
| Right Front | 30 | 1.500 | 2.00 |
| Left Front | 30 | 2.250 | 2.00 |
| Right Rear | 30 | 2.500 | 2.00 |
| Left Rear | 30 | 2.375 | 2.00 |

Carrier Information

Direct Transit Lines, Inc., leases 125 truck tractors and 135 semitrailers owned by Marvin Deur and employed 114 over-the-road drivers. The company is authorized to engage in interstate and intrastate commerce involving the transportation of general freight under the Interstate Commerce Docket Nos. 046240 and 106603, respectively. Therefore, the company is subject to Federal Motor Carrier Safety Regulations (FMCSR).

On April 11, 1978, and February 27, 1981, the U.S. Department of Transportation, Bureau of Motor Carrier Safety (BMCS), conducted safety compliance surveys of the Direct Transit Lines, Inc. In 1978, the BMCS noted 46 violations of the FMCSR's, 54 percent of which were for failing to maintain or falsifying of FMCSR Part 395.8, "Driver's Daily Log," and 24 percent were for failing to keep proper inspection and maintenance records, FMCSR Part 396, "Inspection, Repair, and Maintenance." The

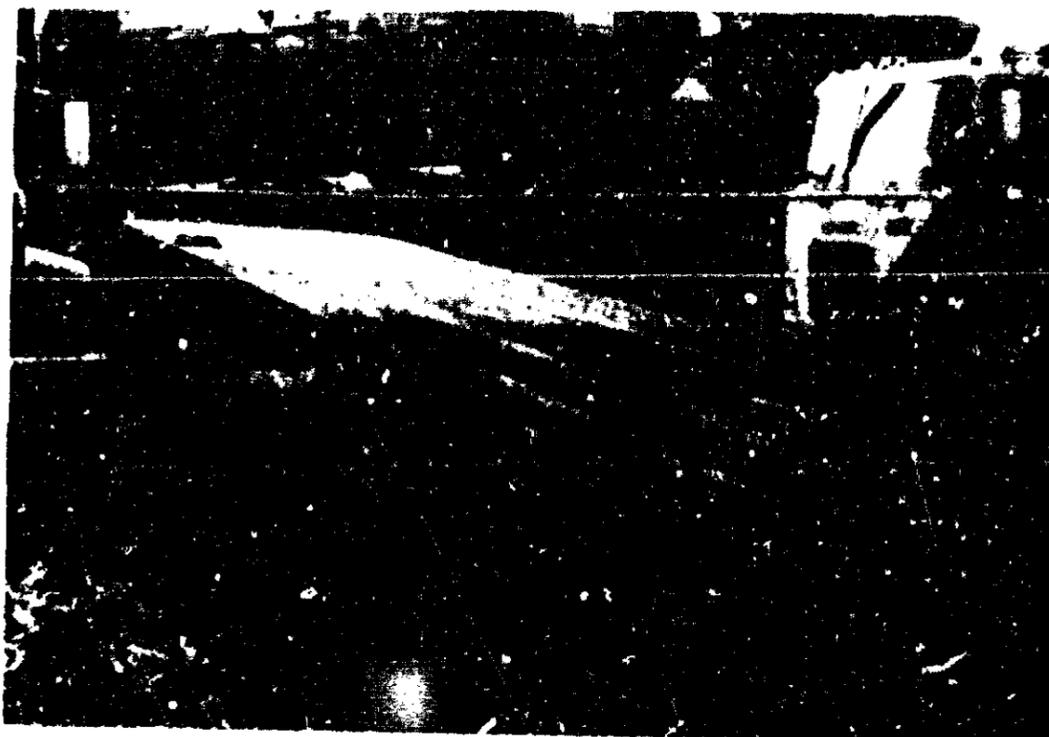


Figure 4.--Side view of semitrailer.

BMCS safety investigator recommended that a followup survey be conducted within 12 months.

The BMCS survey conducted on February 27, 1981, a week after the accident, noted 127 violations of the FMCSR's. The carrier was rated marginal with respect to compliance with FMCSR Part 396, "Inspection and Maintenance," and unacceptable for compliance with FMCSR Part 395, "Hours in Service of Drivers." BMCS rated the carrier's overall safety compliance evaluation as unsatisfactory.

Driver Information

The 37-year-old truckdriver had been employed with Direct Transit, Inc., since December 1980. He had previously worked primarily as a truckdriver for six other companies over a 7-year period. His records indicated the following driving experience:

| <u>Type of Equipment</u> | <u>Years</u> | <u>Mileage</u> |
|--------------------------|--------------|----------------|
| Straight truck | 5 | 300,000 |
| Tractor-semitrailer | 2.5 | 200,000 |
| Passenger car | 21 | 250,000 |

The driver had driven commercial vehicles regularly in the States of Arkansas, Alabama, Ohio, Indiana, and Michigan, and holds a valid chauffeur license for the State of Indiana with no restrictions. Neither company nor State records indicate the truckdriver's having been involved in any other motor vehicle accident. The Safety Board requested these States to check for any record of traffic violations on the truckdriver; the States reported the following:

| <u>State</u> | <u>Type of License</u> | <u>Recorded Violation</u> |
|--------------|-------------------------|---------------------------|
| Arkansas | No license No record | None |
| Alabama | No license No record | None |
| Indiana | Chauffeur | Speeding (1976) |
| Michigan | No license | Speeding (1962) |
| Ohio | No license No record | None |

The driver held a current medical certificate, dated January 13, 1981, as required by FMCSR's. The physical examination indicated that he was in good health with no reported medical problems. His vision was reported as 20/22 in both eyes without corrective lenses. The driver, a high school graduate, completed a course in mechanical and diesel training sponsored by the Sun Equipment Corporation. He had worked as a driver-mechanic in Fort Wayne, Indiana, before being employed by Direct Transit Lines, Inc.

The driver had driven the combination vehicle on at least six occasions before the accident. (See appendix B.) The driver logs from February 14 to February 18 were destroyed in the fire. The Safety Board could not determine if the driver had previously operated this combination vehicle over mountainous terrain.

The Safety Board requested an interview concerning his exact trip itinerary and description of the accident sequence, but he denied the request because of pending criminal charges brought against the driver by the State of Maryland.

Highway Information

U. S. Route 40 is an east-west Federal-aid highway which extends through Maryland from Pennsylvania to Delaware. In the Frostburg area, U. S. Route 40 is functionally classified as a "rural major collector" highway. The 1979 average daily traffic count was 8,700 vehicles in Frostburg and 2,200 vehicles on Savage Mountain. About 2 percent of these vehicles were heavy trucks and less than 1 percent were tractor-semitrailer combinations. From Savage Mountain east to Frostburg, a distance of about 2.7 miles, U. S. Route 40 consists of two 12-foot-wide lanes with asphalt and gravel shoulders varying in width from 5 to 11 feet. The asphalt pavement was in good condition and was marked with a solid yellow centerline, solid white edge lines, and no passing zones where appropriate. The posted speed limit along the descending grade from the top of Savage Mountain to the city limits of Frostburg was 50 mph; within the city limits, the speed limit was 25 mph.

In Frostburg, U. S. Route 40 becomes Main Street and passes through a school zone, a residential area, and a business district. U. S. Route 40/Main Street varies in width from 32 to 40 feet. Main Street is bordered by various businesses, concrete curbing and sidewalks, and metered parallel parking on the north and south sides.

U. S. Route 40 from the mountain crest to the accident site consists of numerous curves and tangent sections with curve radii that range from 299 feet to 3,000 feet. The highway's elevation changes from 2,900 feet to 1,200 feet in 2.7 miles. The average grade profile along the 2.7-mile descent ranges from 1.7 to 10.6 percent, with one uphill section that has an average grade of 4.2 percent. (See figure 5.)

There are two areas provided for trucks to pull off the road and check their brakes along U. S. Route 40 between the top of Savage Mountain and Frostburg; each one has brake-check lanes. One area is located at the top of the mountain and the other is 1.2 miles east of the mountain top. Both brake-check areas had signs requiring all trucks to pull off and stop. (See figures 6 and 7.)

Safety Board investigators evaluated the highway signing from the top of Savage Mountain to the accident site. Signs along the way warned truckdrivers of steep downgrades and of the need to descend these grades in the proper lower gear. The curve and hill signs were in accordance with the Manual on Uniform Traffic Control Devices (MUTCD). ^{2/} Signs identifying the brake-check areas were in place at least 1,000 feet in advance of each area and were signed with large regulatory and warning signs. (See figure 8.) Appropriate advisory speed signs were posted, but there were no speed limit signs visible until near the Frostburg city limits. (See figure 9.) The critical speed ^{3/} for this truck, for all horizontal curves from Savage Mountain to Frostburg, Maryland, was 75 mph or higher.

After the accident, the Maryland State Highway Administration (MdSHA) adopted the following traffic regulation relating to U. S. Route 40 in Garrett and Allegany Counties and put appropriate signing in place on February 27. (See figure 10.)

A weight restriction of 10,000 pounds or less gross vehicle weight for all vehicles along U. S. 40 between Piney Run Road at the Md. 546 interchange with U. S. 48 to the eastern city limits of Frostburg at Md. 36 (Vale Summit Road), a distance of 4.2 miles.

The Safety Board commends the State of Maryland for its prompt action in implementing weight restrictions for vehicular traffic on U. S. Route 40 through Frostburg.

The MdSHA accident records for U. S. Route 40 from Savage Mountain to the accident site revealed 373 accidents over the 7-year-period, 1973 to 1979. Nineteen percent of these accidents involved light duty trucks and 14 percent involved heavy duty trucks. ^{4/} In the eastbound direction, there were 205 accidents, 21 percent of which involved light duty trucks and 0.05 percent of which involved heavy duty trucks. Most of these accidents were within the city limits. Excluding this accident, there has been only one runaway truck accident on U. S. 40--October 1955. The brake-check areas were constructed as a result of the 1955 accident.

^{2/} The MUTCD is published by the Federal Highway Administration, U. S. DOT, 1978 and is the approved national standard for all highways open to public travel in accordance with Title 23, U. S. Code, Sections 109(b) and 402(c) and 23 CFR 1204.4.

^{3/} The critical speed is the speed at which the centrifugal force on a vehicle following a specific curve exceeds the traction force of the vehicle's tires on the pavement surface and causes the vehicle to slide sideways.

^{4/} Vehicles with a gross vehicle weight of 10,000 pounds or heavier.



Figure 6.--First brake check area east of Savage Mountain.

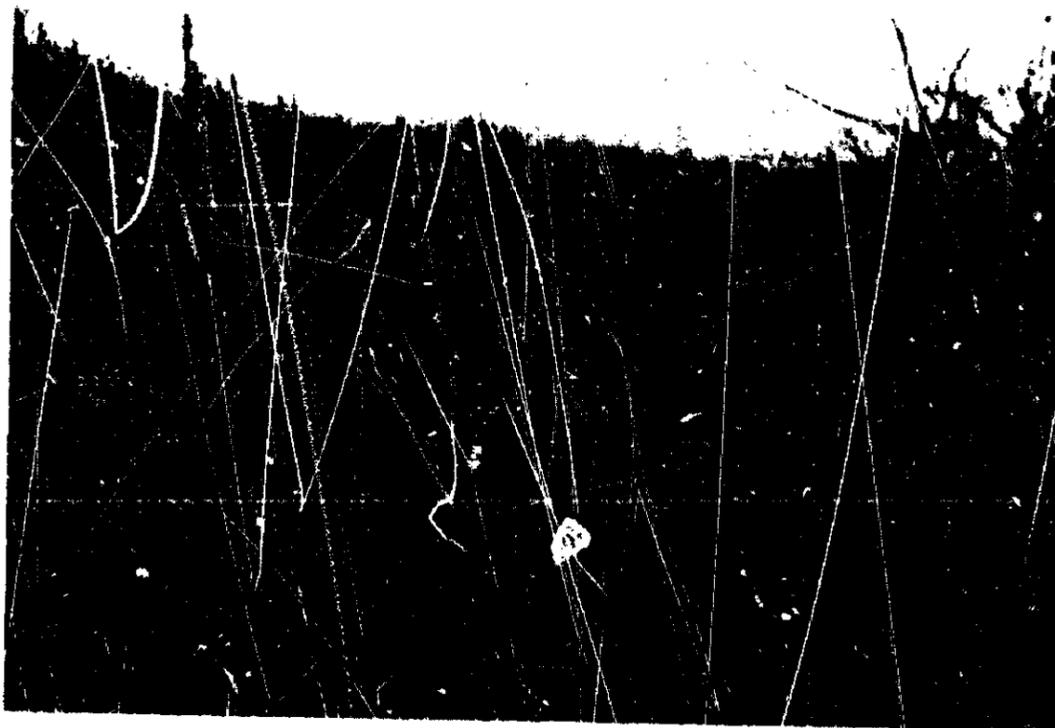


Figure 7.--Sign denoting second brake check area.

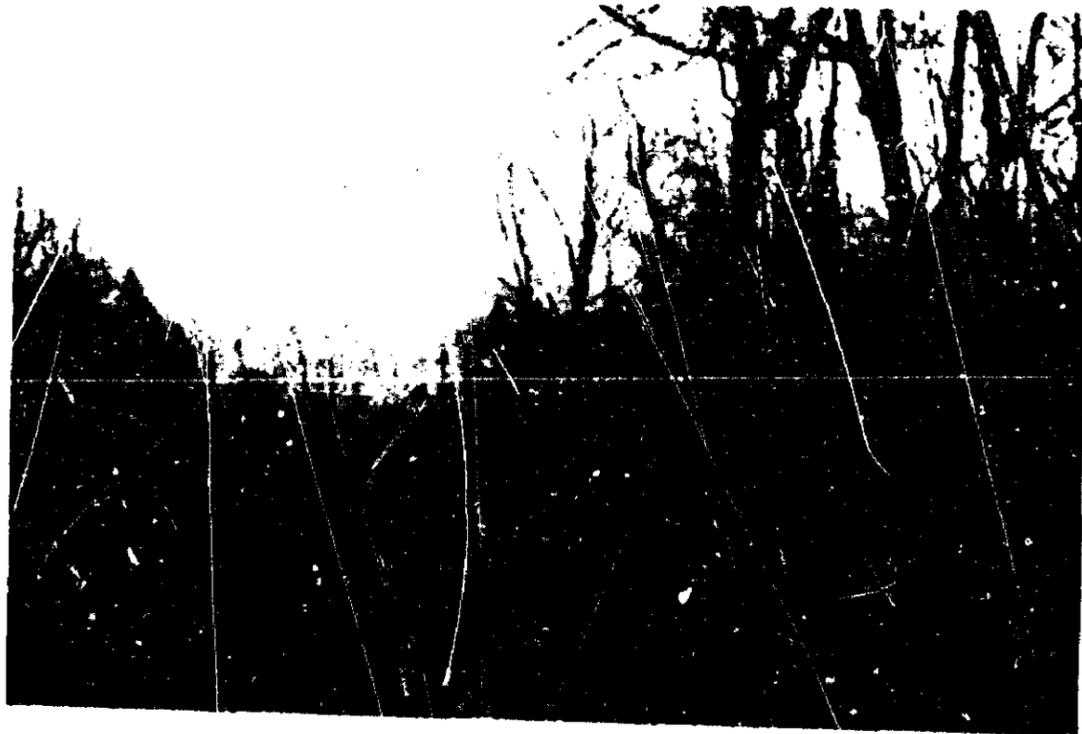


Figure 8.--Regulatory sign denoting second brake check area.



Figure 9.--Speed limit sign at city limits of Frostburg, Maryland.

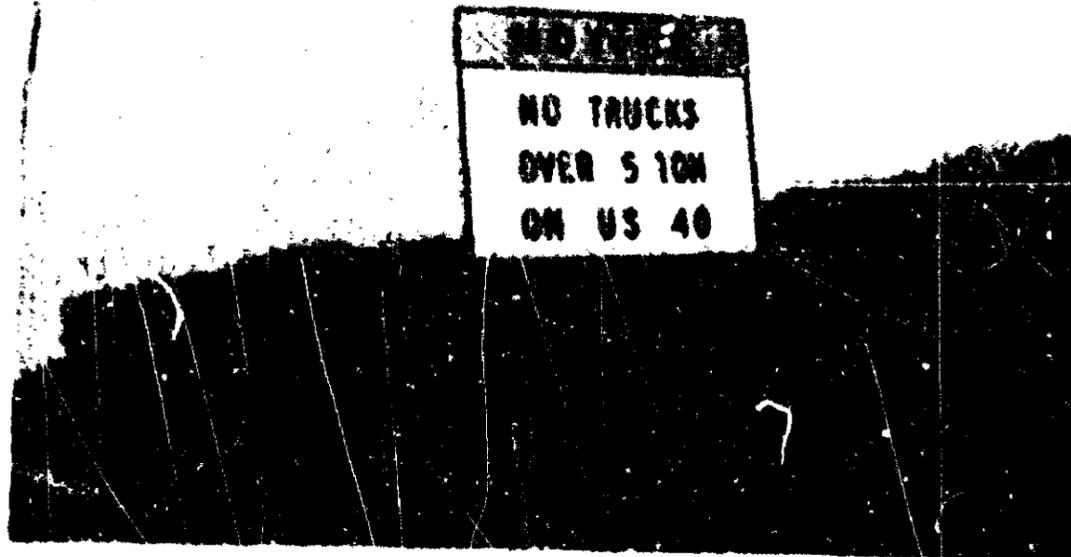


Figure 10.--Revised signs on U. S. Route 40 limiting heavy trucks weight to 5 tons.

While descending Big Savage Mountain on U. S. Route 40 eastbound, the first 1.15 miles do not offer many places to "ditch" a truck. ^{5/} Although the side slope to the right is steep, one could scrape the vehicle along the side of the mountain to the left. From the second brake check area to the western city limits of Frostburg, a distance of 0.56 mile, there are several places to the right to ditch a truck. The side slopes are gentle, and the area is generally residential with the houses set back from the road. The regulatory sign posted at the top of Savage Mountain instructs all truckdrivers to ditch their vehicle if the brakes fail. (See figure 6.)

U. S. Route 48 runs parallel to U. S. Route 40 from Keyzers Ridge to Cumberland, Maryland, and bypasses Frostburg. U. S. Route 48 is a four-lane, divided, limited-access highway which is functionally classified as "rural principal arterial." The 1979 average daily traffic for U. S. Route 48 near Frostburg was 9,500 vehicles. Basically, the highway was built to interstate specifications--the maximum grade is 6.9 percent and the horizontal curves are long and gradual with maximum curvatures of 3° and minimum radii of 1,909 feet. The highway is relatively new; the last section was completed in 1976. Therefore, U. S. Route 48 appears only on recent road maps and atlases. (See figure 11.) The old atlas found in the tractor cab during postaccident inspection did not show Route 48.

^{5/} To drive the vehicle off of the highway onto the surrounding terrain to avoid an accident.

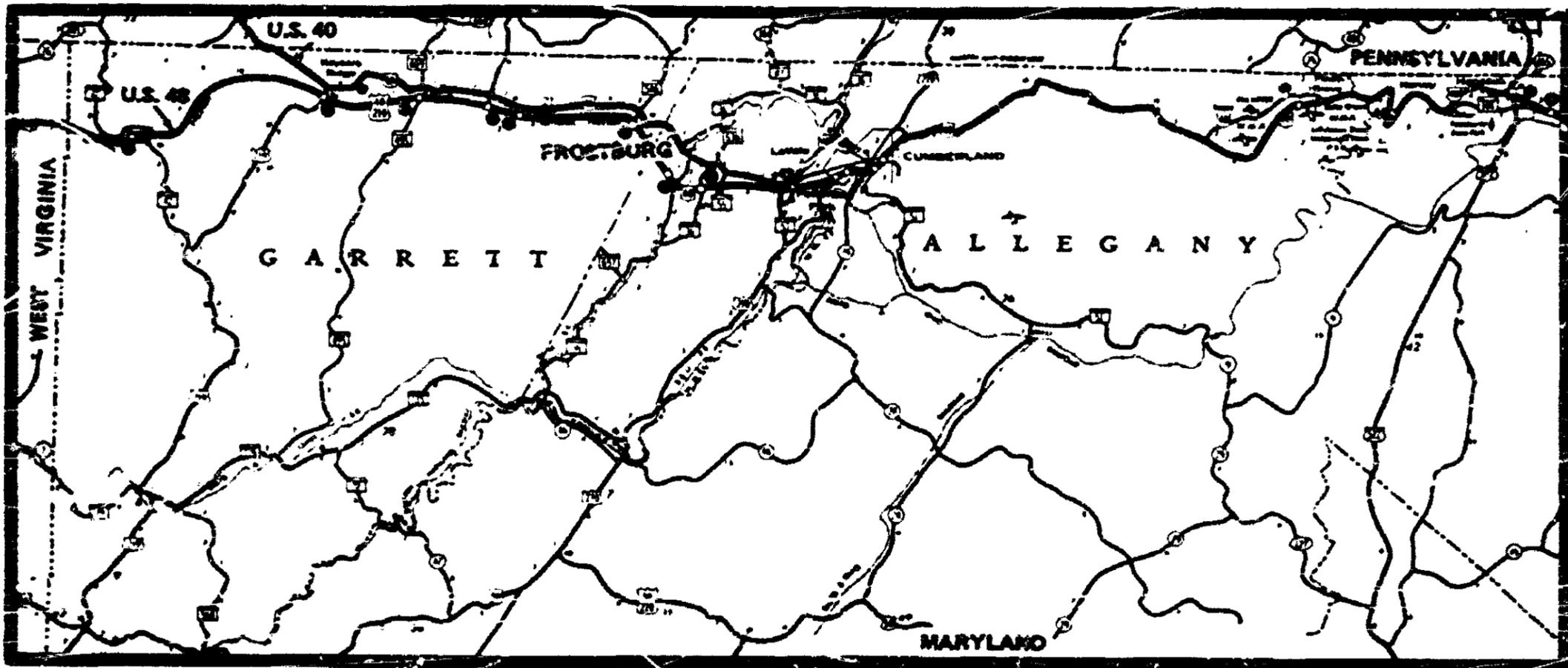


Figure 11.--State map depicting U. S. Routes 40 and 48.

Survival Aspects

Shortly after the tractor-semitrailer struck and drove the Dodge Dart into the three-story building, a fire erupted and the entire building became engulfed in flames. Emergency response units were notified at 4:28 p.m. and were dispatched to the scene. The Allegany County Civil Defense fire and rescue units arrived on the scene within 2 minutes after notification, and the Frostburg Police arrived on the scene within 3 minutes after notification. The nonfatal injuries consisted of contusions, lacerations, fractures, and first- to third-degree burns; all those injured received prompt medical attention. The driver of the tractor was pulled from the burning building and was transported to Sacred Heart Hospital in Cumberland, Maryland; he was later transferred to the Baltimore, Maryland, Burn Center by Maryland State Police helicopter. The driver was reported to have third-degree burns over 25 percent of his body.

The three fatalities were pronounced dead at the scene. The bodies of the two occupants of the 1972 Dodge Dart which was pushed into the building by the tractor were not discovered until after the fire was extinguished.

ANALYSIS

The Accident

While it is evident that the truckdriver lost control of the vehicle after beginning his descent from the top of Savage Mountain, there is not sufficient evidence to establish when and where the loss of control took place during the 2.74-mile descent. The exact sequence of driver's actions, such as brake applications or other attempts, if any, to slow the vehicle are not known to the Safety Board since the driver refused to comment on any of the events. However, the Safety Board can conclude that the truckdriver failed to comply with several visible regulatory and warning signs and permitted the combination vehicle to accelerate to a speed which rendered the already limited service brake ineffective and made down-shifting impossible.

Three factors combined to produce the events which precipitated the accident: the mechanical condition of the combination vehicle, driver actions during the descent, and his selection of U. S. Route 40. The degree to which each factor contributed to the accident cannot be determined exactly; however, the speed at which the runaway vehicle entered Frostburg contributed to the severity of the accident.

Mechanical Condition of the Vehicle and Driver Action

After the accident, the transmission was determined to be in ninth-gear. The maximum within-gear speeds calculated based on the postcrash findings range between 50 and 80 mph for the combination vehicle. However, the combination vehicle could not have exceeded the critical speed of 75 mph for the horizontal curves negotiated during the descent. There was no physical evidence to indicate that the vehicle lost lateral traction or slid sideways out of the tightest curve. Therefore, the estimated speed of the combination vehicle during descent ranges from 50 to 75 mph. The driver could not have successfully down-shifted the transmission after attaining any speed above 60 mph because the engine and transmission speeds could not be synchronized to accommodate the downshift.

Because of the extensive fire and impact damage to the brake equipment, the tractor brake system could not be pressurized after the accident. Therefore, the Safety Board was not able to accurately assess the preimpact capability of the tractor brakes.

Postaccident inspection revealed that three of the four trailer service brakes were out of adjustment. The pushrod strokes for the type 30 clamp-type brake chamber had exceeded the recommended 2-inch maximum operating range. Because of improper brake adjustment, the braking torque generated to retard wheel motion was reduced and stopping distances increased proportionately. If several brake applications were made while the vehicle was descending a long steep grade, the actual braking capability would be further reduced due to brake drum expansion. As the combination vehicle gained speed during the long descent, the already limited braking capacity of the vehicle became less and less effective and finally reached a level where the service brakes could not stop the vehicle.

As the combination vehicle approached the crest of Savage Mountain, the driver passed the three large signs posted to warn drivers of the steep grades and congested area for the next 9 miles. The driver also passed a regulatory sign requiring all trucks to use a lower gear while descending the mountain, to stop for the brake check area, and to ditch the vehicle if the brakes failed. The driver did not respond to any of these warning and regulatory signs. Witnesses stated that the driver proceeded down the mountain at a high rate of speed passing a second set of regulatory signs and a designated truck brake check area. None of the witnesses recalled seeing either brake lights on the trailer or smelling burning brakes, either of which would have indicated that the driver was attempting to stop his vehicle. Also, no one observed emergency flashing lights or heard distress horn signals from the combination vehicle during the descent.

If the driver had attempted to stop at the second truck brake check area, he would have been aware of the braking condition much earlier and could have attempted to downshift and use the truck's engine to control vehicle speed, or he could have attempted to ditch the combination vehicle immediately beyond the brake check area.

Based on the evidence, the Safety Board can only conclude that the driver elected to continue down the mountain allowing his speed to increase to a point where his brakes were ineffective. At that point his vehicle was a runaway over which he had only steering control. Eventually, the speed surpassed the speed at which he could negotiate the vehicle around roadway traffic as he entered Prosburg.

The Safety Board has investigated at least eight accidents, including this accident, involving runaway commercial vehicles on a downgrade. A significant causal factor in six of the eight accidents was improper adjustment of the vehicle service brakes. Five safety recommendations on brake adjustments have evolved from previous Safety Board investigations. The most significant recommendation (H-81-1) recommended that the National Highway Traffic Safety Administration (NHTSA) develop a Federal Motor Vehicle Safety Standard containing a performance requirement for all newly manufactured commercial vehicles to have equipment that would insure that service brakes were properly adjusted at all times. This recommendation remains in an "open" status.

The Safety Board could not determine why the driver selected U. S. Route 40 to travel eastward. U. S. Route 48 was a much better route for heavy trucks because of gradual curves and hills. The Safety Board believes that the driver may not have been aware of U. S. 48 since the old atlas found in the tractor cab did not show the route.

Other Safety Related Factors

The postaccident compliance survey of Direct Transit Lines, Inc., conducted by BMCS rated the carrier as marginal with respect to compliance with FMCSR Part 396,

"Inspection and Maintenance," and unacceptable for compliance with FMCSR Part 395, "Hours in Service of Drivers." The carrier's overall evaluation was rated unsatisfactory. The discrepancies uncovered during the postcrash inspection--improperly adjusted brakes, brake linings worn to bonding rivets, external air leaks, and loose suspension components--should have been detected and repaired during scheduled maintenance. The maintenance records indicate that the accident vehicle was probably subject to maintenance only after the driver complained of mechanical malfunctions while the vehicle was in use and not subject to a periodic inspection program. FMCSR Part 396.2 specifies that the motor carrier shall systematically inspect and maintain all vehicles used for interstate commerce to insure that they are safe and in proper operating condition.

The carrier currently leases the majority of its equipment. The lease places the maintenance responsibility on the lessor. However, the carrier is still ultimately responsible for the safe operation of all leased or otherwise contracted equipment and should have monitored the maintenance records to insure that the lessor did in fact have a systematic inspection and maintenance program for safe operation. The lessor is not subject to BMCS's jurisdiction and is not required to maintain its vehicle fleet at the level of safety specified by FMCSR. Because BMCS has no statutory authority over the lessor, enforcement action can only be brought against the operating motor carrier. Legislative effort should be initiated to permit BMCS to monitor lessors of motor vehicles that are being used for interstate commerce to insure compliance with all applicable FMCSR's.

Following its April 1978 survey of the company, the Bureau failed to follow up its own investigator's recommendation to reexamine the carrier within 12 months of the original survey. Based on the February 18, 1981, survey, the company's attitude and policies toward compliance with the FMCSR's remained unchanged. Numerous violations cited in the first survey were repeated in the later survey. BMCS should have conducted the survey earlier and also should have maintained a more strict surveillance of the carrier to insure that corrective action was being taken. If the survey had been conducted as recommended in 1979 and had produced findings similar to the 1981 survey, BMCS could have initiated further enforcement action to bring about improvements in the carrier's overall maintenance policies. These changes may have reduced the likelihood of this accident.

CONCLUSIONS

Findings:

1. Three of the four service brakes on the trailer were out of adjustment. Because of the deficiencies in the braking system, the limited braking capacity of the combination vehicle was not sufficient to prevent the vehicle from accelerating downgrade after the vehicle had gained speed.
2. The estimated speed of the combination vehicle during its descent on Savage Mountain ranged between 50 and 75 mph.
3. The driver probably would not have been able to successfully downshift the transmission after reaching a speed of 60 mph.
4. The truckdriver apparently did not respond to the several regulatory and warning signs during the descent and permitted the combination to accelerate to a speed which rendered the vehicle's limited braking ineffective and downshifting virtually impossible.

5. The truckdriver did not adequately utilize his deficient service brakes or transmission for speed control purposes.
6. The truckdriver failed to stop at the second truck brake check area.
7. The mechanical discrepancies on the combination vehicle should have been detected during routine inspection and maintenance.
8. The operating motor carrier is ultimately responsible for the safe operation of the vehicle even if the maintenance responsibility is contracted to other parties.
9. BMCS should have maintained stricter surveillance of the motor carrier after the initial safety compliance survey uncovered numerous violations of FMCSR.
10. The BMCS currently has no statutory authority to monitor and take enforcement action for violations of the FMCSR by lessors of motor vehicles used in Interstate Commerce.

Probable Cause

The National Transportation Safety Board determines that the probable cause of this accident was the failure of the truckdriver to respond to appropriate regulatory and warning signs and to properly use the service brakes and transmission for speed control purposes which permitted the tractor-trailer to accelerate to a high rate of speed before entering the city of Proctburg. Contributing to the accident was the improper adjustment of the trailer's service brakes due to inadequate vehicle maintenance.

RECOMMENDATIONS

As a result of the investigation of this accident, the National Transportation Safety Board has made the following recommendations to the Federal Highway Administration:

Maintain strict surveillance of Direct Transit Lines, Inc., and initiate appropriate enforcement action, if necessary, to ensure that all previous safety compliance violations are corrected. (Class I, Urgent Action) (H-81-44)

Initiate a legislative effort which would require lessors and/or contractors of motor vehicle equipment which is used for interstate commerce to comply with all applicable FMCSR. (Class II, Priority Action) (H-81-45)

Members GOLDMAN, AND BURSLEY disapproved the Recommendations and filed the following comments:

We believe that Recommendation H-81-45, which requests BMCS to "Initiate a legislative effort which would require lessors and/or contractors..." is insufficiently justified.

As stated in the report, under existing regulations, the carrier is ultimately responsible for the safe operation of all leased or otherwise contracted equipment. BMCS has clear authority to oversee compliance with safety regulations and to take

enforcement actions against the carrier. The carrier is capable of compelling the lessor to provide properly maintained vehicles through appropriate provisions in the terms of the lease or contract. BMCS has the authority to perform roadside inspections of leased vehicles and pull them out of service if unsafe conditions are found, and to enforce the safety regulations by other methods. Consequently, we believe that BMCS currently has adequate authority.

This recommendation would diffuse safety responsibility between the carrier and the lessor. This concerns us, since we believe the responsibility for compliance with the safety regulations should remain with the carrier.

Moreover, BMCS has only 187 investigators available to carry out its enforcement responsibilities, which the Safety Board has repeatedly highlighted as being inadequate. Therefore, we are concerned about tasking BMCS with yet additional responsibilities, especially since we do not believe they will lead to any increase in safety.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JAMES B. KING
Chairman

/s/ ELWOOD T. DRIVER
Vice Chairman

/s/ FRANCE H. McADAMS
Member

/s/ PATRICIA A. GOLDMAN
Member

/s/ G. H. PATRICK BURSLEY
Member

July 7, 1981.

APPENDIX A

1. Investigation

The National Transportation Safety Board was notified of this accident at 5:30 p.m. on February 18, 1981. Investigators were dispatched from the New York Field Office and Washington, D.C. Headquarters on February 19, 1981. Safety Board Investigators were assisted by representatives of the Maryland State Police, the Maryland State Highway Department, the Bureau of Motor Carrier Safety, and International Harvester Corporation.

2. Depositions/Hearings

There were no depositions taken nor a hearing held in conjunction with this investigation.

APPENDIX B

DRIVER'S VEHICLE CONDITION REPORTS
FROM FEBRUARY 9, 1981 TO FEBRUARY 14, 1981.

VEHICLE MAINTENANCE RECORDS
FOR TRACTOR NO. 314 AND TRAILER NO. 3082.

DRIVER'S VEHICLE CONDITION REPORT

AS REQUIRED BY THE D.O.T. FEDERAL MOTOR CARRIER SAFETY REGULATIONS, I SUBMIT THE FOLLOWING:

DATE: 2-11-81 TRACTOR NO.: 314 TRAILER NO.: 30-112

NOX
FEDERAL MOTOR CARRIER SAFETY REGULATIONS

- I detect no defect or deficiency in this motor vehicle as would be likely to affect the safety of its operation or result in a mechanical breakdown.
- I detect the following defects or deficiencies in this motor vehicle that would be likely to affect the safety of its operation or result in its mechanical breakdown:

| | | | | | | |
|--------------------------|--------------------------|----------------------|--------------------------|--------------------------|--------------------------|------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | TRAILER | TRACTOR | TRACTOR | TRACTOR | TRACTOR |
| <input type="checkbox"/> | <input type="checkbox"/> | BRAKES | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | STEERING |
| <input type="checkbox"/> | <input type="checkbox"/> | FIFTH WHEEL OR PLATE | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | TIRES |
| <input type="checkbox"/> | <input type="checkbox"/> | HORN | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | WHEELS OR RIMS |
| <input type="checkbox"/> | <input type="checkbox"/> | LIGHTS & REFLECTORS | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | WINDSHIELD WIPER |
| <input type="checkbox"/> | <input type="checkbox"/> | MIRRORS | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | OTHER: |
| <input type="checkbox"/> | <input type="checkbox"/> | SAFETY EQUIPMENT | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |

| |
|------------------------------|
| EXPLANATION OF DEFECTS NOTED |
| <i>Tire on</i> |
| <i>Handwritten</i> |
| |
| |
| ACTION TAKEN |
| <i>New tires</i> |
| |
| <i>Exhaust - T.C. N.H.</i> |
| |
| |

R. Keyser
DRIVER'S SIGNATURE

DRIVER'S VEHICLE CONDITION REPORT

AS REQUIRED BY THE D.O.T. FEDERAL MOTOR CARRIER SAFETY REGULATIONS, I SUBMIT THE FOLLOWING:

DATE: 2-11-81 TRACTOR NO.: 314 TRAILER NO.: 30-112

NOX
FEDERAL MOTOR CARRIER SAFETY REGULATIONS

- I detect no defect or deficiency in this motor vehicle as would be likely to affect the safety of its operation or result in a mechanical breakdown.
- I detect the following defects or deficiencies in this motor vehicle that would be likely to affect the safety of its operation or result in its mechanical breakdown:

| | | | | | | |
|--------------------------|--------------------------|----------------------|--------------------------|--------------------------|--------------------------|------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | TRAILER | TRACTOR | TRACTOR | TRACTOR | TRACTOR |
| <input type="checkbox"/> | <input type="checkbox"/> | BRAKES | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | STEERING |
| <input type="checkbox"/> | <input type="checkbox"/> | FIFTH WHEEL OR PLATE | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | TIRES |
| <input type="checkbox"/> | <input type="checkbox"/> | HORN | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | WHEELS OR RIMS |
| <input type="checkbox"/> | <input type="checkbox"/> | LIGHTS & REFLECTORS | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | WINDSHIELD WIPER |
| <input type="checkbox"/> | <input type="checkbox"/> | MIRRORS | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | OTHER: |
| <input type="checkbox"/> | <input type="checkbox"/> | SAFETY EQUIPMENT | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |

| |
|------------------------------|
| EXPLANATION OF DEFECTS NOTED |
| |
| |
| |
| |
| |
| ACTION TAKEN |
| |
| |
| |
| |

R. Keyser

MUDSONVILLE TRAILER



MUDSONVILLE, MICHIGAN 49420
PHONE 616-888-1000

0044

SOLD TO DIRECT TRAMIT LINES, INC.

Date 7-31-80

ADDRESS Box 5008
200 Colrain, S.W.
Grand Rapids, Mi. 49504

CITY (HARV DODD)

UNIT NO. 4182 WORK ORDER NO. 1810 COUNTRY MAN SALEMAN
TERMS: NET 10% AFTER PURCHASE
Paid in full within 30 days from the time
the invoice is received. Will be subject to a
charge of 1% a month or 1 1/2% per year.

| QUAN. | PART NUMBER | DESCRIPTION | LOT | NET | AMOUNT |
|-------|-------------|---|-----|------------------------------|--------|
| | | Repair radius rolls as necessary | | | |
| | | Check & correct alignment | | | |
| | | Straighten sides & springs | | | |
| | | Check & repair lights | | | |
| | | Repair gear supports & straighten | | | |
| | | Weld cracks around tracks | | | |
| | | Replace one support brace | | | |
| | | Pull one wheel | | | |
| | | Roll in one | | | |
| | | Replace bearing cones - | | | |
| | | Replace two bearing cups | | | |
| | | Replace oil seals | | | |
| | | Replace two anchor bolts | | | |
| | | Replace one hub seal | | | |
| | | TOTAL LABOR | | | 203.00 |
| | | TOTAL MATERIAL (see parts list attached) | | | 136.63 |
| | | | | F.T.S. X % | |
| | | | | SALES TAXABLE AMOUNT. | 136.63 |
| | | | | SALES TAX | 5.47 |
| | | | | FREIGHT-U.S. | |
| | | | | TOTAL AMOUNT | 342.12 |

Received By

X

* Seller represents that with respect to the production of the articles covered by this invoice, it has fully complied with the provisions of the Fair Labor Act of 1938, as amended.

APPENDIX C

DESCRIPTION OF OTHER VEHICLES
INVOLVED IN ACCIDENT

| | <u>VEHICLE</u> | <u>VIN</u> |
|-----|--|----------------|
| (1) | 1979 Chevrolet Malibu Station Wagon Owner: P. Cutter (Frostburg, Maryland) Damage: Transported prior to inspection. | 1W35H916415377 |
| (2) | 1977 Chevrolet 1/2 Ton Cargo Van Owner: Deluxe Cleaners, Inc., (Frostburg, Maryland) Damage: Side swiped on left side; transported prior to inspection. | CGD157V147155 |
| (3) | 1976 Ford Pinto Owner: M. L. McGrevey (Barton, Maryland) Damage: Transported prior to inspection. | 6T11Y116611 |
| (4) | 1974 Ford Maverick 4 Dr. Sedan Owner: M. Bowen (Frostburg, Maryland) Damage: Entire rear end pushed forward to passenger compartment; no fire damage observed. | 4K92F214581 |
| (5) | 1979 International Harvester Model S-1800 Owner: McClure-Logan Equipment (Frostburg, Maryland) Damage: Extensive fire damage to right front hood; and passenger compartment; rear steel bumper pushed inward and upward. | AA185JHA2747 |
| (6) | 1980 Plymouth Horizon TC3 Owner: K. Hartig (Frostburg, Maryland) Damage: Transported prior to inspection. | ML24AAD121609 |
| (7) | 1971 Chevrolet Nova Owner: S. Kendall (Frostburg, Maryland) Damage: Transported prior to inspection. | 174691W136847 |
| (8) | 1979 Dodge Ramcharger 1/2 Ton Pickup Owner: M. Winebrenner (Frostburg, Maryland) Damage: Transported prior to inspection. | A10JF9C115461 |

| | <u>VEHICLE</u> | <u>VIN</u> |
|------|---|----------------|
| (9) | 1979 Oldsmobile Cutlass 2 Dr. Sedan Owner: G. Pappas (Frostburg, Maryland) Damage: Transported prior to inspection. | 3M47F9M579347 |
| (10) | 1980 Chevrolet Citation 2 Dr. Sedan Owner: J. Diehl (Frostburg, Maryland) Damage: Left front side pushed inward; quarter panel, wheel, windshield damaged. | 1X087AT316812 |
| (11) | 1975 Plymouth Fury Custom Owner: R. Powers, Jr. (Frostburg, Maryland) Damage: Transported prior to inspection. | RH41G5A156363 |
| (12) | 1972 Dodge Dart Owner: C. Mitter (Luke, Maryland) Damage: Destroyed by fire and impact damage; entire left side pushed inward. | LH23G213148163 |
| (13) | 1977 Dodge Monaco Station Wagon Owner: R. Hagar (Frostburg, Maryland) Damage: Front end pushed rearward; roof curved inward; no fire damage. | DM45N7D173098 |
| (14) | 1975 Chevrolet Impala 4 Dr. Sedan Owner: L. Chambers (LaValle, Maryland) Damage: Destroyed by fire; roof, truck, and passenger compartment collapsed vertically during impact. | 1L89H5Y119058 |
| (15) | 1973 Dodge Power Wagon 1/2 Ton Pickup Owner: Kenny's Sign Shop Damage: Side riped on left side; Transported prior to inspection. | W24BF35139654 |

APPENDIX D

**SIGNING FOR U.S. 40 FROM SAVAGE MOUNTAIN
EAST THROUGH FROSTBERG, MARYLAND**

Signing

The following is a list of the pertinent signing from Big Savage Mountain east through Frostberg to Stoops Restaurant based on a postaccident survey. The curve and hill signs are standard signs and are in accordance with the Manual on Uniform Traffic Control Devices (MUTCD).

| <u>SIGN MESSAGE/DESCRIPTION</u> | <u>SIGNING LOG IN FEET</u> | <u>MILES</u> |
|---|--------------------------------|--------------|
| U.S. 40 RAMP - PINEY RUN ROAD | | 00 |
| * "NO TRUCKS OVER 5 TON ON U.S. 40 USE U.S. 48" | 945 | |
| NEW PINZEL ROAD | 2,245 | |
| * "ALL TRUCKS OVER 5 TON NEXT RIGHT" | 1,345 | |
| MD 548 | 3,600 | |
| * "NO TRUCKS OVER 5 TON" | 36,200 | |
| "TRUCK NOTICE 1000' AHEAD" | 6,847 | |
| "LEFT CURVE ADVISORY SPEED 30 MPH" | 6,030 | |
| "ALL TRUCKS PULL RIGHT STOP ON TOP OF MOUNTAIN" | 6,750 | |
| * "NOTICE NO TRUCKS OVER 5 TON" | 7,048 | |
| "ALL TRUCKS STOP--STEEP DOWN GRADE NEXT 9 MILES THRU CONGESTED AREA, DESCEND IN LOWER GEAR UNTIL NOTIFIED, IF BRAKES FAIL DITCH TRUCK IMMEDIATELY, PROCEED WITH CARE" | 7,148 | -0- |
| "ALL TRUCKS 2nd STOP 1 MILE AHEAD" | 7,967 | |
| GARRETT/ALLEGANY CO. LINE | 8,958 | |
| "TRUCKS STAY IN LOWER GEAR" | 9,095 | |
| "TRUCKS USE LOWER GEAR" (W7-2) | | |
| STANDARD HILL SIGN (W7-1) | 10,267 | |
| RIGHT CURVE SIGN | 10,470 | |
| RIGHT CURVE SIGN | 11,266 | |
| "ALL TRUCKS STOP 1000' AHEAD" | 12,429 | |
| "ALL TRUCKS STOP 500' AHEAD" | 13,640 | |
| "ALL TRUCKS STOP, CHECK BRAKES, DESCEND IN LOWER GEAR PROCEED WITH CARE" | 14,520 | 1.21 miles |
| RIGHT CURVE SIGN | 13,640 | |
| YIELD SIGN | 13,934 | |
| "END THIS GRADE OTHERS AHEAD, TRUCKS PROCEED WITH CARE" | 10,480 | 1.77 |
| "TRUCKS STAY IN LOWER GEAR" | 17,741 | |
| STANDARD HILL SIGN (W7-1) | 19,002 | |
| "TRUCKS USE LOWER GEAR" (W7-2) | | |
| STOOPS RESTAURANT | 21,620 | 2.74 miles |
| * "NO TRUCKS OVER 5 TON" | | |
| MD 36 SOUTH | 25,945 | |
| * "NO TRUCKS OVER 5 TONS" | | |

*Installed after the accident