



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: September 13, 2002

In reply refer to: H-02-15 through -18

Honorable Joseph M. Clapp
Administrator
Federal Motor Carrier Safety Administration
400 Seventh Street, SW
Washington, DC 20590

On May 31, 2001, about 3:28 p.m. central daylight time, a southbound Gayle Stuart Trucking, Inc., (Stuart Trucking) truck-tractor semitrailer exited Interstate 540 at State Highway 282 (SH-282) near Mountainburg, Arkansas. The driver was unable to stop at the stop sign at the bottom of the ramp. The 79,040-pound combination unit was traveling approximately 48 mph when it entered the intersection and collided with the right side of a westbound, 65-passenger, 1990 Blue Bird Corporation school bus operated by the Mountainburg, Arkansas, Public Schools. The school bus rotated approximately 300 degrees clockwise and overturned; the body, which partially separated from the chassis, came to rest on its right side on the eastbound shoulder of SH-282. The tractor semitrailer continued across the roadway, rotated about 60 degrees clockwise, overturned, and came to rest on its left side. Three school bus passengers seated across from the impact area were fatally injured; one was partially ejected. Two other passengers, one of whom was seated in the impact area, received serious injuries, and four passengers had minor injuries. The school bus driver and the truckdriver both sustained minor injuries.¹

The National Transportation Safety Board determined that the probable cause of the accident was the truckdriver's inability to stop the tractor semitrailer at the stop sign at the bottom of the ramp due to the reduced braking efficiency of the truck's brakes, which had been poorly maintained and inadequately inspected. Contributing to the school bus passengers' injuries during the side impact were incomplete compartmentalization and the lack of energy-absorbing material on interior surfaces.

The tractor semitrailer in the Mountainburg accident was equipped with manual slack adjusters on the tractor brakes and automatic slack adjusters on the trailer. Eight of the 10 brakes were either out of adjustment or nonfunctional at the time of the accident, and 4 brakes were unable to provide any braking force, even without taking into account heat buildup and drum expansion.

¹ For additional information, read National Transportation Safety Board, *Collision Between Truck-Tractor Semitrailer and School Bus Near Mountainburg, Arkansas, on May 31, 2001*, Highway Accident Report NTSB/HAR-02/03 (Washington, DC: NTSB, 2002).

When some brakes are out of adjustment, the remaining brakes must provide greater braking force whenever they are applied in order to stop the vehicle, increasing the rate at which they wear and thus become out of adjustment. The brakes on the first axle (1R and 1L) provided limited braking force because they were improperly adjusted (1R provided no braking force for a period of time before the day of the accident, as evidenced by the rusted brake drum reported by the driver). Brakes on axles 3L, 4R, and 5L could not provide much, if any, braking force since they were nonfunctional owing to poor maintenance and other broken components. Therefore, the remaining 5 brakes (3 on the tractor and 2 on the trailer) had to provide the braking force for 10 brakes, 3 of which were out of adjustment.

The driver said that he did a visual inspection of the brakes on the day of the accident and did not find them to be out of adjustment. The *Commercial Driver's License Manual* recommends that during a pretrip inspection, the driver, at a minimum, pull on the pushrod and measure the stroke. If the stroke exceeds 1/2 to 1 inch, the brakes should be adjusted. Postaccident inspection showed that the stroke on five of the six tractor brakes exceeded 2 inches and that one other (3L), on which the stroke was restricted to 1 7/8 inch by a broken spring, also needed adjustment. Accident damage would not have affected the brakes' stroke.

The driver did not follow recommended practice for measuring stroke during the pretrip inspection, and a visual inspection did not allow him to determine that the brakes were out of adjustment. While the commercial driver's license (CDL) practice is only recommended, not mandatory, it is an important part of the pretrip inspection because of the safety-related nature of the brake system and the possible consequences, as in the case of this accident, when brakes are not adjusted properly. The Safety Board concludes that the driver did not conduct a sufficiently thorough pretrip inspection on either the tractor or the trailer to discover the brake deficiencies.

As 49 *Code of Federal Regulations* (CFR) 383.111(e)(4) and (g)(5) state, all commercial vehicle operators must have knowledge of procedures for conducting safe and accurate pretrip inspections and knowledge of airbrakes. Title 49 CFR 383.113 requires that all CDL applicants demonstrate pretrip inspection skills pertaining to airbrakes, including the ability to determine brake conditions and proper adjustment. Interviews with the accident driver indicated that he knew how to adjust brakes. While the accident driver did have a CDL, he did not demonstrate that he was knowledgeable about procedures for conducting a safe and accurate pretrip inspection on the day of the accident or about the consequences of not conducting a thorough pretrip inspection. However, 49 CFR 396.13(a) only stipulates that a driver be satisfied that the motor vehicle is in safe operating condition before driving it; the regulations specify neither what must be done during a pretrip inspection, nor which procedures must be performed daily on a vehicle.

The Safety Board has investigated other accidents in which pretrip inspection procedures were lax as well. On March 2, 1999, near Santa Fe, New Mexico, a motorcoach began descending a 14-mile mountainous roadway, and halfway down, the driver found that the brakes were providing no retarding force.² The driver lost control of the bus, and it departed the right side of the roadway, crashed into a rock embankment, and overturned. Investigators found that

² National Transportation Safety Board, *Motorcoach Loss of Control and Overturn, New Mexico State Route 475, March 2, 1999*, Highway Accident Brief NTSB/HAB-01/01 (Washington, DC: NTSB, 2001).

four of the bus's six brakes were out of adjustment at the time of the accident and two brakes were nonoperational. Company mechanics did not routinely examine driver pretrip inspection forms and did not know whether company drivers completed pretrip inspections. The busdriver reported that in the 10 months he had worked for the company, he had never completed a pretrip vehicle inspection. A review of company maintenance records revealed that some drivers were occasionally completing vehicle inspection reports.

Had the Mountainburg and Santa Fe drivers been required to measure the stroke on each brake and to determine its adjustment before they began driving on the day of the accident and had they fulfilled such a requirement, they may have discovered that some brakes were out of adjustment and taken appropriate corrective action. The Safety Board believes that the Federal Motor Carrier Safety Administration (FMCSA) should revise CFR 396.13, Driver Inspection, to require minimum pretrip inspection procedures for determining brake adjustment.

Stuart Trucking's most recent safety review prior to the Mountainburg accident took place on December 5, 1989, and resulted in a satisfactory rating. Following the accident, the FMCSA conducted a compliance review that resulted in a conditional rating for factor 2 (driver factor), an unsatisfactory rating for factor 5 (accident factor), and a conditional rating overall. FMCSA staff did not inspect any vehicles during this review, even though the accident was vehicle-related. They relied instead on the motor carrier profile report, which listed 29 roadside inspections in the previous 12 months, resulting in four out-of-service vehicles (14 percent), all with out-of-adjustment brakes. The regulations at 49 CFR Part 385, Appendix B, state that if fewer than 34 percent of vehicles (the national average) inspected in the previous 12 months (when more than three vehicles receive roadside inspections) are placed out of service, then the carrier is rated satisfactory for the vehicle factor, as was the case in the postaccident compliance review of Stuart Trucking.

Safety Board investigators were concerned that the FMCSA did not inspect any of Stuart Trucking's vehicles. This accident involved a vehicle in which 8 of 10 brakes were out of adjustment or nonfunctional and the carrier's mechanic was not a qualified brake inspector, suggesting that more vehicles may have had brake problems than were detected in the 12 months of roadside inspections, yet the FMCSA did not inspect any vehicles during the compliance review immediately following this accident. Consequently, the Safety Board asked the Missouri Division of Motor Vehicles and Railroad Safety to conduct an additional review of the carrier and inspect all its vehicles. Of 12 vehicles examined, 5 vehicles (42 percent) had out-of-service violations. Not only did this review reveal an out-of-service rate higher than the FMCSA recorded in its compliance review, but investigators also determined that the brakes had not been maintained properly. Improper maintenance, which cannot be detected without conducting vehicle inspections, can be telling as to the condition of a carrier's vehicles. The Safety Board concludes that based on the inspection conducted by the Missouri Division of Motor Vehicles and Railroad Safety that followed the accident, had FMCSA staff inspected Stuart Trucking's vehicles during the 2001 compliance review, the carrier would probably have received a conditional rating in factor 4 (vehicle factor) instead of a satisfactory rating.

The FMCSA's overreliance on roadside inspections when conducting compliance reviews may lead to underestimating the number of out-of-service vehicles. As noted above, the percentage of out-of-service vehicles found during the terminal inspection of Stuart Trucking

was triple that found during the previous 12 months of roadside inspections. The Safety Board is concerned that carriers may be operating unsafe vehicles that are not detected during a roadside inspection or compliance review and that, as a result, the carrier's rating may be inaccurate because it misrepresents the proportion of out-of-service vehicles. The FMCSA will not conduct a terminal inspection if three or more of a company's vehicles received roadside inspections in the previous 12 months. But the vehicles that receive roadside inspections may not be representative of the entire fleet. The Safety Board believes that the FMCSA should require that vehicle inspections of a motor carrier's fleet be conducted during compliance reviews.

Title 49 CFR Part 396.24, Qualification of Brake Inspectors, requires that each brake inspector successfully complete an apprenticeship program or a training program or have a certificate or experience totaling 1 year; in addition, the motor carrier must maintain evidence of qualifications. Stuart Trucking's mechanic, who was responsible for maintaining most of the company's tractors and trailers, had not received any formal training in brake inspection, although he did have more than 1 year of experience and, under current rules, was eligible for certification. The owner said that he was not aware of the regulations requiring anyone who inspects or maintains brakes to be certified.

Although the person responsible for maintaining the brakes on the trailer of the accident vehicle had experience in brake maintenance, the condition of the trailer's brakes belied this experience, since three of the trailer's four brakes had broken parts or were nonfunctional at the time of the accident. Two brakes (4L and 5L) had broken springs, and during installation of one spring brake (4R), the pushrod was cut too short, rendering the automatic slack adjuster inoperable. Stuart Trucking's mechanic did not detect the latter problem in the 4 years between installation of the 4R spring brake in 1997 and the accident. In fact, brakes 4R and 5L had quite likely been inoperative for some time, since the brake drums were rusted, indicating the shoes had not been in contact with the drums. A qualified mechanic should have noticed this problem during routine maintenance and inspections.

In addition, the absence of grease at the fittings and brake camshaft bushings suggested a lack of periodic lubrication, and the Arkansas Highway Police and ArvinMeritor, Inc.,³ staff both commented on the poor overall condition of the trailer's brake system. During their follow-up vehicle inspection, Missouri Division of Motor Vehicle and Railroad Safety inspectors stated that Stuart Trucking staff's knowledge of truck maintenance seemed to be lacking; these inspectors also noted that some defects they found were obvious and did not appear to be recent. A brake inspector with sufficient training and knowledge would probably have identified the problems with the brakes on this semitrailer and fixed the brakes so that they were operative. The Safety Board concludes that the Stuart Trucking mechanic lacked proper training in brake maintenance and inspections, did not detect the poorly adjusted or inoperative brakes on the trailer, and did not perform recommended maintenance.

The Safety Board has investigated other accidents in which a motor carrier did not use a certified brake inspector to perform maintenance on its vehicles. In the aforementioned accident near Santa Fe in 1999, investigators found that the steering and drive axle brakes were out of adjustment, that the auxiliary weight-bearing axle brakes were not operational because they were

³ ArvinMeritor is a supplier of commercial vehicle components, including air brakes.

“cammed over,”⁴ and that both drums were worn beyond the manufacturer’s acceptable limits. During postaccident inspection of the carrier by the New Mexico Motor Transport Division, all but two of the inspected motorcoaches were placed out of service due to mechanical defects, most of which were related to the brake systems. The carrier did not keep brake mechanic qualification records, as required, and none of the three company mechanics interviewed could adequately describe the maximum brake adjustment levels for the brakes on the motorcoaches, how to conduct a vehicle brake inspection, or how to adjust brakes.

Under the current compliance review process, the FMCSA does not consider violation of 40 CFR 396.25 “critical.” Thus, if a motor carrier does not have a qualified brake inspector, it does not affect the carrier’s rating. In fact, in its compliance review of Stuart Trucking, the FMCSA did not even note that a qualified brake inspector certificate was not on file. The Safety Board believes that during compliance reviews, the FMCSA should rate companies as unsatisfactory in the vehicle factor category if the mechanics and drivers responsible for maintaining brake systems are not qualified brake inspectors.

As the Mountainburg and Santa Fe accidents demonstrate, experience working in a maintenance shop is not always sufficient to ensure that a mechanic has the knowledge necessary to maintain a truck brake system. The FMCSA is remiss in permitting mechanics to work on brakes without knowing whether they have the requisite skills in brake maintenance. The Safety Board believes that the FMCSA should revise 49 CFR 396.25, Qualifications of Brake Inspectors, to require certification after testing as a prerequisite for qualification and specify, at a minimum, formal training in brake maintenance and inspection.

The National Transportation Safety Board recommends that the Federal Motor Carrier Safety Administration:

Revise 49 *Code of Federal Regulations* 396.13, Driver Inspection, to require minimum pretrip inspection procedures for determining brake adjustment. (H-02-15)

Require that vehicle inspections of a motor carrier’s fleet be conducted during compliance reviews. (H-02-16)

During compliance reviews, rate companies as unsatisfactory in the vehicle factor category if the mechanics and drivers responsible for maintaining brake systems are not qualified brake inspectors. (H-02-17)

Revise 49 *Code of Federal Regulations* 396.25, Qualifications of Brake Inspectors, to require certification after testing as a prerequisite for qualification and specify, at a minimum, formal training in brake maintenance and inspection. (H-02-18)

⁴ A condition in which the s-cam rotates beyond the service brake cam rollers and remains lodged in this position. The cause is generally a combination of out-of-adjustment brakes, worn brake shoes, and an excessively worn drum.

The Safety Board also issued safety recommendations to the National Highway Traffic Safety Administration, Commercial Vehicle Safety Alliance, National Fire Protection Association, and spring brake manufacturers and reiterated a recommendation to the U.S. Department of Transportation.

Please refer to Safety Recommendations H02-15 through -18 in your reply. If you need additional information, you may call (202) 314-6177.

Chairman BLAKEY, Vice Chairman CARMODY, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in these recommendations.

By: Marion C. Blakey
Chairman