

Fatality Investigation Report

OR 2006-14-1

Log truck driver killed when brakes fail on steep road

SUMMARY

On April 19, 2006, a 42-year-old log truck driver was killed when he apparently jumped from his runaway truck after his brakes failed on a steep, narrow gravel road. The driver had less than 1 year of experience operating a semi-truck. Earlier in the day, the driver entered the mill yard with his rear trailer brakes smoking. The trailer air-brake lines had been damaged by dragging on the



The truck driver apparently jumped from his runaway truck and was crushed by the wheels before the truck plunged over a hillside. (stock photo)

ground, and he fixed one air line with electrical tape. On the last load of the day, just prior to the incident, the driver stopped on the downhill road to allow another truck to pass. At a subsequent series of S-curves, the driver apparently jumped from his truck when the brakes failed and was run over by the wheels before the truck plunged over a hillside. The victim was found dead at the scene. The truck and trailer, on later inspection, had seven of ten brakes out of adjustment.

CAUSE OF DEATH: Crushing chest and abdominal injuries

RECOMMENDATIONS

- **A truck driver should double-check brake safety before driving on a steep grade.**
- **Truck drivers and employers must ensure all vehicle brakes are maintained in safe operating condition.**
- **Employers must ensure that all workers are adequately trained and possess the tools and equipment necessary to work safely.**
- **Regulators, industry associations and manufacturers should collaborate to advance safety technology for heavy trucks.**
- **Drivers should be prepared for brake failure.**

INTRODUCTION

On April 19, 2006, a 42-year-old log truck driver was killed when he apparently jumped from his runaway truck on a steep, narrow gravel road after the brakes apparently failed. OR-FACE was notified of the incident the next day by Oregon OSHA. This report is based on Oregon OSHA, police, and medical examiner reports, with additional input from Motor Carrier Safety Enforcement at the Oregon Department of Transportation.

The employer was a contract logger, since 2005, with about 19 employees. The firm performed land clearing, road building, timber harvesting, and trucking, and operated its own vehicle maintenance shop with a mechanic and assistant.

The mechanic and drivers met occasionally for safety training. Drivers inspected their trucks daily prior to use and adjusted their brakes about once a week.

The log truck driver in this incident had 1 year of experience driving a log truck. He obtained his commercial driver license while working at the logging firm and received on-the-job training by a senior driver for 3 months. Additional training on brake adjustment occurred with the firm's maintenance mechanic. Beyond a basic adjustment, however, truck drivers were not instructed on the maintenance of the brakes and brake air lines. Damage to the trailer air-brake lines was a common problem, due to dragging on the ground. Appropriate fittings to fix faulty air-brake lines were not carried in each truck.

INVESTIGATION

On the day of the incident, the log truck driver delivered a load of logs to a mill in the morning, and arrived with his rear trailer brakes smoking. The truck brakes locked as the truck entered the mill yard, due to a leak in the air-brake lines. The trailer air-brake lines had evidently been damaged by dragging on the ground. The driver attempted to fix one of the air lines by wrapping it with electrical tape. The driver then called the experienced driver who had been his mentor and mentioned he had dragged his air lines a little bit, without mentioning they had rubbed all the way through. On an earlier occasion, during his first 6 months, the driver had a similar occurrence and the experienced driver came to his truck and fixed the air-brake lines with a brass splice to get him through the day. No action was taken on the day of the incident.

The driver picked up his last load of the day from the logging site at about 12:30 p.m. When the trailer was lifted off of the truck at the landing site, coworkers observed the trailer brakes were not set to prevent the trailer from rolling. The driver then set the trailer brakes, which evidently worked at that time.

Once loaded, the driver set off downhill. After about 1 mile, he stopped to allow a truck coming uphill to pass. After the truck passed, the driver called on his CB radio that he was heading down the hill, reportedly "in his normal, enthusiastic voice." About 1 mile farther, at the point where skid marks were discovered from the driver's truck, the road became very steep (a 15%-20% grade, according to a fireman at the scene). A dump truck driver coming up the road a short time later discovered the log truck driver lying face down in the middle of the road, and immediately

called for help. Emergency responders were not successful in reviving the victim and he was pronounced dead at the scene. The log truck was located about 200 feet down a hillside, lodged between several trees with the cab completely crushed.

The county sheriff report states: “When the victim jumped out, it appears that he bounced off the hill and fell under the truck’s trailer where he was crushed.”

The Oregon OSHA investigator called on the Oregon Department of Transportation to inspect the truck. The ODOT inspection found all six brakes on the truck out of adjustment; and seven of the ten brakes on the tractor-trailer combination out of adjustment. The inspection also found a constant leak in the air-brake line that had been repaired with electrical tape.

Two plausible scenarios may explain the cause of brake failure in this incident, one implicating the damaged trailer air-brake line, and one implicating the out-of-adjustment brakes.

Scenario 1. Investigators speculated that the wait on the hill just prior to the incident may have drained the leaking trailer air-brake application line, and prevented application of the brakes.

Scenario 2. Alternately, the brakes may have worked, but with so many brakes out of adjustment, the stopping force was concentrated on those brakes still in adjustment on the trailer, leading to overheating and brake fade. Excessive heat produces expansion and a gaseous build-up that separates the brake surfaces, particularly with drum brakes, common on semi-trailers. Repeated overheating can also glaze the brake surfaces and reduce friction. Overheating was evident with the smoking trailer brakes earlier in the day. Only a short distance was traveled from the point where the driver stopped on the way downhill to the point where brake failure occurred, but the steep grade and full load could have rapidly overheated the working brakes.

RECOMMENDATIONS/DISCUSSION

Recommendation #1. A truck driver should double-check brake safety before driving on a steep grade.

A driver is required to make a pre-trip inspection of critical safety features on a truck at the beginning of each work day, including all brake components. Drivers are also required to report any safety defects at the end of each work day, which must then be corrected before the truck is allowed on the road again. The driver must be satisfied that the truck is in safe operating condition (CFR 396.11, 396.13). This incident emphasizes the need for a driver to inspect or test the truck brakes more often in a hard braking situation – ideally before each trip downhill.

Recommendation #2. Truck drivers and employers must ensure all vehicle brakes are maintained in safe operating condition.

Brakes on log trucks take enormous stress, and drivers must understand their dependence on proper maintenance. The time frame for failure of the brake adjusters can be as short as a month. Automatic adjusters need to be checked regularly, every few days or once a week, just like the earlier manual brake adjusters, however when an automatic brake adjuster is out of adjustment, it needs to be replaced. Manual adjustment will only briefly fix the problem and should be done only in an emergency.

In this incident, although the firm's mechanic was experienced and had current training, he and the drivers made routine adjustments to automatic brakes instead of replacing them in the shop as recommended in the *Oregon Commercial Motor Vehicles 2005-2006* drivers manual, stating:

It is recommended that when brakes equipped with automatic adjusters are found to be out of adjustment, the driver take the vehicle to a repair facility as soon as possible to have the problem corrected (5-5).

The manual also states that "routine adjustment of most automatic adjusters will likely result in premature wear of the adjuster." In other words, adjustment of an automatic brake adjuster actually makes the problem worse. The National Transportation Board advises in a 2006 report:

Truck Air Brake Warning: Manually adjusting automatic slack adjusters is dangerous, can lead to deadly consequences

NTSB found from interviews, a survey, and inspection of trucking safety manuals that there is a general lack of knowledge and skills related to automatic brake adjusters in the trucking industry. A majority of truck mechanics and drivers are still adjusting automatic brake adjusters as they did manual adjusters earlier. NTSB emphasizes: "This situation needs to change and change quickly."

Employers must effectively supervise the work environment, equipment, and worker activities to ensure safety. This incident emphasizes the importance of routine inspection and maintenance of equipment, and supervision of safe work practices. New drivers in particular should be closely supervised and receive frequent reinforcement of safe work practices.

Employers should not assume that inspection and maintenance procedures are automatically completed. All repairs and maintenance must be documented by the mechanic and the records preserved (CFR 396.3). In addition, a periodic formal assessment by the employer, also with a written record, can help to promote accountability for safety. Monthly safety meetings provide another valuable opportunity for drivers, mechanics, and supervisors to meet together to discuss safety issues.

Recommendation #3. Employers must ensure that all workers are adequately trained and possess the tools and equipment necessary to work safely.

Mechanical training for truck drivers needs to be appropriate for the degree of vehicle maintenance expected of them. Training and ongoing safety meetings should emphasize the

conditions where drivers are personally responsible for brake maintenance, and specify when serviceable life is exceeded and shop maintenance is required. Drivers should not be encouraged to attempt maintenance beyond their abilities.

All drivers should be trained to properly repair a damaged air-brake line, and employers should ensure the drivers possess the simple tools and equipment necessary for the job. In this instance, drivers needed to have appropriate splices. The repair made to the air-brake line with electrical tape is not considered an effective means of fixing a leak, and violates Federal Motor Carrier safety rules (CFR 571.106 S7.3.8). In a similar incident, reported in news from another state, an air-brake line damaged by dragging on the ground was fixed with a toothpick and electrical tape, and the driver thought the solution was adequate and did not stop at available shops along the highway for a proper repair. The truck driver walked away from the ensuing episode of brake failure, but the crash event was fatal for others.

Reinforcement is essential for promoting safe work behavior. Employers should consider using safety-related posters and flyers for bulletin boards, stickers to place on vehicles, and safety manuals in the cab. Posters and a variety of other educational materials are available, sometimes free, from manufacturers of the most common brake adjusters on the market. Training manuals on brake adjustment are available for use by drivers. As equipment changes, employers need to be sure all materials are updated.

Recommendation #4. Regulators, industry associations and manufacturers should collaborate to advance safety technology for heavy trucks.

According to the *Oregon Commercial Motor Vehicle* driver's manual, "out-of-adjustment brakes are the most common problem found in roadside inspections." The recent Large Truck Crash Causation Study found nearly 30% of all heavy trucks involved in crashes had brakes out of adjustment (though brake failure was not necessarily the cause of the crash), compared to 2% of passenger vehicles. The prevalence of the problem of brakes out of adjustment in heavy trucks gives the issues involved in this incident related to air brakes a general significance. Regulators should collaborate with industry associations and use nationwide statistics to address problem areas in truck brake technology. Areas of concern highlighted by this incident include (a) the common tendency for drivers to adjust automatic brake adjusters like older manual brake adjusters, (b) air lines susceptible to damage by stretching and dragging, and (c) drum brakes commonly equipped on cargo trailers, which are more susceptible to brake fade.

Recommendation #5. Drivers should be prepared for brake failure.

The Mine Safety and Health Administration advises that drivers can avoid injury through skilled operation of a vehicle in an emergency – and should be prepared for runaway/rollover, engine failure, a steering problem, tire failure, fire, and brake failure. A driver's ability to control stress and respond well to the situation may be critical to survival.

Brake failure is a terrifying experience, and rehearsing your response in advance is useful. A typical response to brake failure in a semi-truck involves three distinct steps: (a) downshift,

(b) engage the engine brake, and (c) find an escape ramp or obstacle to stop the truck. Unfortunately, this sequence of steps may not be possible for log truck drivers operating in highly hazardous conditions on narrow unpaved roads with steep grades, curves, and drop-offs. The inertia of a loaded trailer moving down a steep grade can prevent downshifting; application of the engine brake can cause the wheels to slide out of control on gravel; using an obstacle to stop the truck could send the load of logs forward through the cab; and finding a viable escape route off of a hillside logging road is unlikely. In these conditions, a log truck driver has few options when brake failure occurs.

The driver should first try to activate the brakes and downshift, and consider if it is safe to apply the engine brake. In a majority of cases, brake failure is only partial or momentary. Know your truck and how all the braking systems respond, so you will be prepared to act purposefully to slow down with minimum panic. If this does not work, the suggestions below represent alternate, desperate measures.

1. Consider laying the truck over in a ditch.

If the road has an inside ditch line, it may be possible to run the wheels on one side into the ditch and tip over. The load of logs contacting the ground should help stop the vehicle and also prevent the logs from crashing through the cab. This procedure has saved many lives. The driver must wear a seatbelt to stay secure in the seat and avoid being ejected from the cab.

A driver should not try to tip over the truck and trailer by using a raised berm on the ledge of a drop-off. MSHA advises that a runaway truck will not be stopped by a berm, but go right over the edge.

2. If the log truck is headed over a ledge, the driver should consider jumping.

This incident indicates the unlikelihood of survival if a log truck driver remains in the cab when going over a ledge. In most instances, the cab will be completely crushed by the immediate impact and the shifting load of logs. For other types of trucks and vehicles, MSHA emphatically recommends that drivers do not attempt to jump free of the truck. Staying in the cab with the seatbelt fastened offers the best chance for survival. A log truck on a mountain road represents a different situation. Only the driver can decide the odds and make the choice to jump or stay in the cab.

If you must jump, unlatch your seatbelt and pull the truck to the right to clear a space in the road on the driver's side. Try to commit the right side of the trailer over the hillside before jumping, so the wheels are unlikely to swerve back into the road. Step out and jump from the running board, and try to jump a good distance from the truck. Jump before the cab rises to a severe angle, which would make exit more difficult and the height of the jump more dangerous. The fatal result in this incident, however, indicates the importance of strategy and timing, as the driver can be run over by the wheels of the rig as it passes.

This recommendation is a last resort, and applies only to offroad log trucks. For other situations, or other kinds of trucks or heavy equipment, the driver may be safer by staying in the cab.

REFERENCES

Federal Motor Carrier Safety Administration. (2006). *Report to Congress on the Large Truck Crash Causation Study*. Available online: www.fmcsa.dot.gov/facts-research/research-technology/report/ltccs-2006.htm

Mine Safety and Health Administration. *Truck drivers safe operating procedures*. Available online: www.msha.gov/s%26hinfo/safety/hcard/trucksaf.asp

National Transportation Safety Board. (2006). *Highway accident report: Collision between a Ford dump truck and four passenger cars*. Available online: www.nts.gov/publictn/2006/HAR0601.pdf

Oregon Driver and Motor Vehicle Services. (2006). *Oregon Commercial Motor Vehicle 2005-2006* [Commercial drivers license manual]. Oregon Department of Transportation.

Technical Services Forensic Engineering. Online resource for truck safety: www.e-z.net/%7Ets

FOR MORE INFORMATION

Oregon Fatality Assessment and Control Evaluation (OR-FACE)
Center for Research on Occupational and Environmental Toxicology (CROET)
Oregon Health & Science University (OHSU)
3181 SW Sam Jackson Park, L606
Portland OR 97239-3098

Phone 503-494-2281
Email: orface@ohsu.edu
Website: www.ohsu.edu/croet/face/

Oregon Fatality Assessment and Control Evaluation (OR-FACE) is a project of the Center for Research on Occupational and Environmental Toxicology (CROET) at Oregon Health & Science University (OHSU). OR-FACE is supported by a cooperative agreement with the National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (U60/OH008324), through the Oregon Worker Illness and Injury Prevention Program (OWIIPP), Oregon Public Health Division.

OR-FACE reports are for information, research, or occupational injury control only. Safety and health practices may have changed since the investigation was conducted and the report was completed. Persons needing regulatory compliance information should consult the appropriate regulatory agency