Log H-566D

National Transportation Safety Board

Washington, D. C. 20594

Safety Recommendation

Date: June 26, 1992

In Reply Refer To: H-92-64 through -68

Mr. Gene Bergoffen, Executive Vice President
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In accidents investigated by the National Transportation Safety Board, numerous brake deficiencies are cited as causal or contributing factors. Although the Safety Board has recommended changes to address these recurring problems, brake system deficiencies continue to be factors in accidents. In 1989, the Safety Board began a study to determine the effectiveness of airbrake systems on heavy trucks and buses. This study focuses on brake system issues, highlights potential problems, and makes recommendations that address the systemic problems associated with heavy vehicle brake-related accidents.[1]

One of several practices that can greatly upset a heavy vehicle's brake system balance is the use of brake linings that do not meet the original equipment specifications. While these aftermarket linings can degrade the available brake torque on all axles, this reduced torque manifests itself more on the steering axle, due to being equipped with smaller brake chambers.

The Safety Board is aware that truck manufacturers that equip their vehicles with smaller chambers on the front axle also use a higher friction coefficient brake lining to compensate for the smaller chamber. However, interviews with some of the accident-involved carriers and industry representatives indicated that vehicle owners are less careful than manufacturers to compensate for the smaller chambers. These interviews suggested that owners may replace linings with cheaper, lower coefficient linings. The interviews also indicated that most of the carriers did not know the frictional ratings of their brake linings.

[1]For more detailed information, read Safety Study--*Heavy Vehicle Airbrake Performance* (NTSB/SS-92/01).

It is unclear how widespread this practice is in the trucking industry. However, the Safety Board is concerned that the potential is great for aftermarket installation of linings with frictional charateristics less than the manufacturer's recommendations, which would result in a reduced brake torque output. The Safety Board believes that more information in the owner's and the truck maintenance manual alerting the owner or the shop of the need to use linings that meet the original equipment specifications may help prevent accidents.

Another recurring problem is the lack of steering axle brakes, which reduces a combination vehicle's stopping capability and increases its susceptibility to jackknifing. Given the conditions of a light load, a road surface with reduced friction, and the need for a panic brake application, a vehicle without front axle brakes may not be able to avoid a jackknife situation.

The absence of brakes on the steering axle also greatly increases the likelihood of overworking the other brakes on a loaded truck. This problem is especially critical when one or more of the remaining brakes are inoperative.

Because all tractors manufactured since July 25, 1980, are required to have brakes on their steering axles, this safety problem is thought to be diminishing. However, because the Safety Board's five-State five-axle truck inspection program found that 5 percent of the combination vehicles on the interstate system and 8.9 percent on the off-interstate system were without brakes on their steering axles, the Safety Board maintains that this condition is still a problem. Yet, the number of vehicles without steering axle brakes is small enough that equipping the remaining vehicles with brakes on the steering axles would not impose a large economic burden on the carriers.

The Safety Board believes that there are significant safety advantages in retrofitting the pre-1980 tractors with steering axle brakes. Once a vehicle is equipped with steering axle brakes, one more factor is eliminated that, when combined with other less controllable factors, could lead to a jackknife.

With respect to the problem of jackknife, all the stability-related accidents investigated for this study involved conditions conducive to jackknife: vehicles that were lightly loaded on at least the drive or trailer axles and for all but one accident, a wet roadway with reduced frictional qualities.

To add to this problem, current Federal regulations for in-service heavy vehicles do not adequately address stability under variant load and road surface conditions. Therefore, the Safety Board believes that heavy vehicle drivers should be advised of the propensity of lightly loaded combination vehicles to jackknife under certain conditions.

The Safety Board believes that an overriding problem examined by this study, out-of-adjustment brakes, can be attributed partially to a lack of knowledge concerning brake adjustment procedures. Carriers' policies for adjusting brakes vary as do manufacturers' policies and industry guidelines; no universally accepted brake adjustment procedures exist. In addition, Safety Board interviews revealed that some carriers, drivers, and mechanics do not understand how to adjust brakes, and an even larger number of them do not understand when to adjust brakes. A simple, clear, and standardized method is needed for adjusting airbrakes on heavy

vehicles. The lack of a standard procedure for adjusting airbrakes is being addressed by an effort coordinated by the American Trucking Associations.

Another issue examined by the study was the sizing of airbrake components for heavy vehicles. When Safety Board investigators examined some of the brake maintenance literature seeking a suitable method of calculating braking force at the tire/road surface, they found the AL-Factor formula in the "Grey-Rock Diagnostic Engineering Service Manual." However, when investigators compared calculated results of braking force using the AL-Factor formula to results from NHTSA dynamometer work, they discovered that the AL-Factor formula predicted braking force values that were consistently 40 percent higher than the measured values from the NHTSA dynamometer. (Details and some examples of this work are found in SAE paper 910126, "Heavy Truck Deceleration Rates as a Function of Brake Adjustment.")

Although none of the major tractor manufacturers interviewed by the Safety Board said they used the AL-Factor formula in sizing brakes, this methodology is discussed often in the literature available to the fleets. Consequently, the Safety Board is concerned that some maintenance facilities may be using this procedure to size replacement parts and thus are undersizing brake components.

Therefore, the National Transportation Safety Board recommends that the National Private Truck Council:

> Encourage members to use replacement parts that meet original equipment specifications (particularly brake linings and valves) when replacing brake components. (Class II, Priority Action) (H-92-64)
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> Encourage members to voluntarily install steering axle brakes on all heavy vehicles that currently do not have steering axle brakes. (Class II, Priority Action) (H-92-65)
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> Advise members about the propensity of lightly loaded combination vehicles to jackknife, especially when traveling on low-friction road surfaces. (Class II, Priority Action) (H-92-66)
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> Work with the American Trucking Associations to complete and distribute to member carriers appropriate brake maintenance materials that clearly establish standard inspection techniques (including adjustment indicators), inspection and adjustment interval guidelines, and an adjustment method (covering both manual and automatic slack adjusters) for S-cam brakes on heavy vehicles. Encourage members to provide a copy of the information to each driver of a heavy vehicle and to each mechanic who services heavy vehicles. (Class II, Priority Action) (H-92-67)
>
> Encourage members to discontinue the use of the AL-Factor formula. (Class II, Priority Action) (H-92-68)

Also as a result of this study, the Safety Board issued Safety Recommendations H-92-50 through -55 to the National Highway Traffic Safety Administration, H-92-56 through -59 to the Federal Highway Administration, H-92-60 through -62 to the 50

States and the District of Columbia, H-92-63 to the Interstate Towing Association and to the Towing and Recovery Association of America, H-92-69 through -73 to the Owner-Operator Independent Drivers Association, H-92-74 through -78 to the American Trucking Associations, H-92-79 and -80 to the Motor Vehicle Manufacturers Association, H-92-81 to the Professional Truck Driver Institute of America, H-92-82 to the Society of Automotive Engineers, and H-92-83 and -84 to airbrake component manufacturers.

The National Transportation Safety Board is an independent Federal agency with statutory responsibility "to promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations" (Public Law 93-633). The Safety Board is vitally interested in any action taken as a result of its safety recommendations. Therefore, it would appreciate a response from you regarding action taken or contemplated with respect to the recommendations in this letter. Please refer to Safety Recommendations H-92-64 through -68 in your reply.

COUGHLIN, Acting Chairman, and LAUBER, HART, HAMMERSCHMIDT, and KOLSTAD, Members, concurred in these recommendations.

By: Susan M. Coughlin
Acting Chairman