



## National Transportation Safety Board

Washington, D. C. 20594

### Safety Recommendation

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Date: June 26, 1992

In Reply Refer To: H-92-56 through -59

Honorable Thomas D. Larson  
Federal Highway Administration  
400 7th Street, S.W.  
Washington, D.C. 20590

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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.<sup>1</sup>

This study identified aftermarket brake linings that do not meet the original equipment specifications, low torque brakes on steering axles, and the lack of brakes on steering axles as contributing factors in truck accidents. Further, the Safety Board's inspections of heavy truck brakes show that the presence of these conditions is not a rare or isolated occurrence.

Another serious deficiency found by this study was out-of-adjustment brakes. In 1981, the Safety Board issued Recommendation H-81-1 to the National Highway Traffic Safety Administration (NHTSA) requiring manufacturers of airbrake actuation devices to incorporate indicators that will warn users when brakes must be adjusted. In 1988, the Safety Board issued Recommendation H-88-30 to the NHTSA that automatic slack adjusters be required on all newly manufactured vehicles equipped with air-mechanical brakes. In response, the NHTSA published a Notice of Proposed Rulemaking in May 1991 to amend the Federal Motor Vehicle Safety Standards to

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<sup>1</sup>For more detailed information, read Safety Study--*Heavy Vehicle Airbrake Performance* (NTSB/SS-92/01)

include these requirements. If adopted, the amended standard will help carriers and drivers to keep their vehicle brakes in proper adjustment.

However, the Safety Board now believes that the requirement should be amended further to require that the adjustment indicator be able to display the brake adjustment condition with the brakes in an unapplied position. The indicator that remains visible after release would allow one person to walk around a vehicle and visually check the brake adjustment. Most current adjustment indicators (such as pushrod marking) generally require two people to perform this task: one to apply the brakes and the other to watch the indicators.

Another issue examined by the study was the practicality of conducting stopping tests during routine roadside inspections. Most existing inspection facilities do not have enough space to conduct any type of stopping performance test. During its heavy vehicle inspections, the Safety Board observed that many facilities had only limited space to park a few out-of-service vehicles. While most facilities could set aside the 40 feet needed for the actual stop, few have the distance necessary for acceleration and turn-around. In addition, the Safety Board believes that most drivers would be hesitant to subject their vehicles and loads to the demands of an emergency stop from any speed.

The Safety Board believes that the braking performance of in-service vehicles could be evaluated better and more safely by means other than a full-scale vehicle stop. For example, the technology exists to develop relatively inexpensive roller dynamometers for installation at roadside inspection facilities. The Safety Board believes that a dynamometer capable of measuring brake force at each axle would enable an inspector to isolate deficiencies within the braking system that could lead to unbalanced braking and vehicle instabilities. Any brake force values measured by the dynamometer could be converted to a braking efficiency value that inspectors could use in deciding if a vehicle should be placed out of service. The advantage of using a dynamometer is that force and efficiency values are calculated for a vehicle's actual loading and maintenance conditions. This device could simplify an evaluation of brake system component performance and has the advantage of not subjecting the vehicle, cargo, and inspection personnel to the rigors of stopping tests.

A method that could be used as an alternative to the dynamometer would be braking efficiency calculations. The Safety Board believes that software could be written for small handheld calculators that would enable an inspector to input measured values from the vehicle. Using these values, the software would calculate brake force and efficiency. This output could be used to determine if the vehicle should be placed out of service. This method has the advantages of allowing the inspector to evaluate braking efficiencies at various brake adjustments, temperatures, and loads.

Both methods--dynamometer testing and brake efficiency calculations--have the single advantage of not subjecting the vehicle, cargo, and inspection personnel to the rigors of stopping tests. Both would also allow the prediction of unbalanced braking forces, thus providing some instability analysis. While the Safety Board acknowledges that either method will require additional research and further development, the Board believes that after adequate development the appropriate method should be implemented in the commercial vehicle inspection program. The Board believes that either method is a reasonable solution to the inadequacies of the current brake performance requirement for in-service vehicles.

The Safety Board used several national and State data sources in support of this study. Data sources on heavy vehicle accidents were analyzed to identify the scope of brake-related accidents as well as the potential costs to society associated with such accidents. The analysis indicated that brake-related accidents may be substantially underrepresented in the available data sources, primarily because of underreporting by investigating agencies.

In 9 of 15 brake-related accidents that the Safety Board investigated, State and local investigating agencies failed to identify deficient brakes as a factor in their final reports. Consequently, the Safety Board believes that the available data do not allow the role of braking deficiencies in accidents to be readily evaluated.

Therefore, the National Transportation Safety Board recommends that the Federal Highway Administration:

Develop adequate performance criteria for allowable combinations (brake size, lining friction, and axle rating) of airbrake system components on heavy vehicles, and prohibit the use of component combinations that do not meet the criteria. (Class II, Priority Action) (H-92-56)

Encourage the installation of vehicle brake adjustment indicators on all vehicles equipped with airbrake systems for easy detection of adjustment levels. (Class II, Priority Action) (H-92-57)

Promote, in conjunction with the National Highway Traffic Safety Administration, the development and use of hardware, such as the roller dynamometer, capable of measuring the braking capability of a heavy vehicle at roadside inspection facilities. (Class II, Priority Action) (H-92-58)

Review the national highway data system to ensure that sufficient data can be obtained to readily evaluate the role of braking deficiencies in commercial vehicle accidents. (Class II, Priority Action) (H-92-59)

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-92-60 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-92-64 through -68 to the National Private Truck Council, 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 98-633). 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-92-56 through -59 in your reply.

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



By: Susan M. Coughlin  
Acting Chairman