



# National Transportation Safety Board

Washington, D. C. 20594

## Safety Recommendation

Date: April 29, 1991

In Reply Refer To: H-91-12

the Governors and legislative bodies  
of those States without fire-apparatus  
inspection programs  
(see attached list)

On May 10, 1990, a 1974 Hahn custom pumper fire engine operated by the Waterbury Fire Department (WFD), while responding to an emergency call in Waterbury, Connecticut, ran off the road and hit a large tree when the driver lost control on a steep downgrade. The fire engine carried five paid firefighters and 500 gallons of water. Two firefighters were fatally injured, one firefighter sustained moderate injuries, and the driver and remaining firefighter sustained only minor injuries. The pavement was wet from previous rain.<sup>1</sup>

This accident and several others involving emergency fire apparatus<sup>2</sup> responding to alarms prompted the Safety Board to conduct a special investigation to determine the adequacy of fire apparatus maintenance and inspection, fire department operating procedures, and occupant seatbelt use. National Fire Protection Association (NFPA)<sup>3</sup> data indicate that between 1980 and 1989, 15 percent<sup>4</sup> of all firefighters who died in the line of duty died as a result of accidents involving fire apparatus that were en route to alarms. As part of this special investigation, the Safety Board examined 8 separate fire apparatus accidents and conducted an informal survey of the 50 States and the District of Columbia to determine their requirements for inspecting fire apparatus.

<sup>1</sup>For more detailed information, read Special Investigation Report--"Emergency Fire Apparatus," (NTSB/SIR-91/01).

<sup>2</sup>For the purposes of this report, "fire apparatus" refers to the heavy fire vehicles, such as pumpers/engines, ladder trucks, heavy squad units, 10,000 pounds and over, that transport people, and specialized equipment, such as foam/crash units used at airports.

<sup>3</sup>The National Fire Protection Association (NFPA), organized in 1896, is an independent, voluntary membership, nonprofit organization that develops voluntary standards and codes which serve as guidelines for the fire services in all phases of operations.

<sup>4</sup>One hundred and seventy-nine firefighters

The Waterbury Fire Department (WFD) fire engine was equipped with an automatic transmission and air-mechanical service brakes. A mechanical examination of the vehicle following the accident indicated that the front axle brakes had no defects and that the push-rod adjustments were within operating limits. An accumulation of rust was observed in both the left and right rear axle brakes. Three of the four rear axle brakeshoes were not making contact with the drum upon application. The lower left and both the upper and lower right brakeshoes were frozen at the anchor pins. The rear axle brake chamber push-rod adjustments were within operating limits on the right side and at the maximum operating limit on the left side. The air chambers were misaligned, and the push rods had severe wear markings on the sides.

If only one brakeshoe out of four makes contact with one of the two drums, the rear axle receives only 25 percent of the brake retarding force that it should. According to Safety Board calculations, which took into account the size of the air chamber (24 square inches on the front axle and 30 square inches on the rear axle) and which assumed an air pressure application of 100 psi, the rear axle brakes were in such poor condition that the apparatus had only 58 percent of its original braking capability. The driver indicated that the wet/dry switch<sup>5</sup> was in the wet position, thus providing only 50 percent of the braking capability of the front axle. The condition of the rear axle brakes, coupled with the use of the wet/dry switch in the wet position, reduced the original braking capability of the vehicle to about 36 percent.

The accumulated rust around the anchor pins of the WFD apparatus rear axle brakes indicated that they were in need of lubrication. According to the manufacturer's service manual, the brakeshoe pins should be cleaned and lubricated after every 500 hours of use. Based on the hour-meter recorded measurements, the accident vehicle's brakeshoe pins should have been serviced in November 1989. The rust and the frozen condition of the pins indicate that the service was not performed. The Safety Board concludes that the BAR did not adequately maintain the accident vehicle's brakes and did not follow the manufacturer's recommended service guidelines.

Following the Waterbury accident, a mechanical inspection of the WFD fire apparatus was conducted by the Connecticut Department of Motor Vehicle (CDMV) Commercial Vehicle Safety Unit. The CDMV indicated that because of the condition of the brakes, the vehicle failed the safety criteria used in the commercial vehicle roadside inspection program developed by the Commercial Motor Carrier Safety Assistance Program (MCSAP) of the Federal Highway Administration (FHWA).<sup>6</sup> After

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<sup>5</sup>Many vehicles use a manual limiting valve (commonly called a dry road/slippy road valve or wet/dry switch) that is controlled by a pneumatic switch in the cab. In the "dry road" position, the valve is a 1:1 valve. In the "slippy road" position, it reduces front brake pressure to 50 percent of control line pressure at all control line pressure levels.

<sup>6</sup>North American Uniform Service Criteria, Commercial Vehicle Safety Alliance, February, 1990, Out-of-Service Condition: When any motor vehicle(s) by reason of its mechanical condition or loading, is determined to be so imminently hazardous as to likely cause an accident or breakdown, or when such condition(s) would likely contribute to loss of control of the vehicle(s) by the driver, said vehicle(s) shall be placed out of service. No motor carrier shall require nor shall any person operate any motor vehicle declared and marked "out-of-service" until all required repairs have been satisfactorily completed.

the accident, the Waterbury City Maintenance Department examined the brakes of the WFD first-line fleet of 9 engines and 5 ladder trucks; 9 of the 14 (64 percent) were withdrawn from service to be repaired.

At the time of the Waterbury accident, the State did not require the inspection of emergency vehicles. After the accident, the CDMV initiated a voluntary non-fee inspection program for fire service vehicles. From July 1, 1990, to January 3, 1991, the CDMV inspected 559 fire apparatus from 64 cities and towns. During this period, 193, or 35 percent, of the fire apparatus failed the CDMV roadside inspection. Fifty percent of the deficiencies involved brakes, 18 percent involved steering systems, and the remaining deficiencies involved tires, suspension systems, and fuel leaks.

About 2:34 p.m., on October 24, 1990, a Spillway Volunteer Fire Department (SVFD) firefighter was dispatched in a tanker truck to transport 1,000 gallons of water to other firefighters at the scene of a house fire in rural Tarrant County, Texas. Before departing on the fire call, she had been babysitting the fire chief's 2-year-old daughter. She was unable to find another babysitter and took the infant with her. The 1963 International Loadstar 1600 firetruck was not equipped with seatbelts, and the infant was not restrained in a child safety seat.

The firetruck was eastbound on Farm-to-Market Road 1886 at a witness-estimated speed of 45 mph when the driver began negotiating a shallow left curve on a 6-percent downgrade. The right side tires of the firetruck dropped 5 inches off the right pavement edge, and the driver steered to the left and lost control of the vehicle. The firetruck eventually travelled off the pavement on the south side of the road, dropped 10 feet, and crashed head-on into a dirt embankment. The firetruck exploded into flames at impact, and both occupants were killed.

The postaccident examination of the Tarrant County, Texas, fire apparatus disclosed numerous mechanical deficiencies, including under-inflated tires, worn steering components, worn brake drums, and a rusted brake drum, all of which indicate inadequate maintenance. The apparatus had been inspected at an inspection station designated by the Texas Department of Public Safety (DPS) and had received an Annual Vehicle Inspection Certificate dated October 5, 1990, which was 19 days before the accident.<sup>7</sup> The requirements of the Texas inspection for this apparatus consisted of 22 elements that included emissions testing, examinations of the lights, horn, windshield wipers, and tires, and a brake test that required the vehicle to stop within 20 feet at a speed of 10 mph. This inspection did not include a visual or mechanical examination of the brakes.

The Safety Board conducted a limited survey of the 50 States and the District of Columbia to determine whether the States require vehicle inspections for fire emergency vehicles. Currently, 19 States require fire apparatus to be inspected periodically by the State or by designated fleet inspection stations.

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<sup>7</sup>In July 1990, the DPS Motor Vehicle Inspection Unit cited the designated inspection station that had issued the certificate for issuing certificates of inspection without completing the required safety inspections

Table 1--States Requiring Periodic State Fire Apparatus Inspections

Arkansas	New York
California	North Carolina
Connecticut <sup>8</sup>	Oklahoma
District of Columbia	Pennsylvania
Hawaii	Rhode Island
Louisiana	South Carolina
Maine	Texas
Massachusetts	Utah
Mississippi	Vermont
New Hampshire	Washington <sup>9</sup>
New Mexico <sup>10</sup>	

Among the 18 highway safety program standards issued by the Department of Transportation were the periodic motor vehicle inspection (PMVI) standards. The Highway Safety Act of 1966 gave the Secretary of Transportation the authority to withhold highway construction funds if highway safety program standards were not met. By 1975, 31 States and the District of Columbia had periodic inspection programs. However, according to a report<sup>11</sup> by the U.S. General Accounting Office (GAO), the Highway Safety Act of 1976 removed the Secretary's authority to withhold highway construction funds and provided that State safety programs could be approved without meeting all of the 18 program standards. Ten States repealed the program as a result of the 1976 Act.<sup>12</sup>

The GAO report states that a 1989 National Highway Traffic Safety Administration (NHTSA) study<sup>13</sup> and other data show that periodic vehicle inspection programs reduce accident rates. The NHTSA study concluded that periodic inspection programs reduce the number of poorly maintained vehicles on the highways, but that available data do not conclusively demonstrate that inspection programs significantly reduce accident rates. The GAO took exception to this conclusion and reexamined the eight studies quoted in the NHTSA study. The GAO found that:

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<sup>8</sup>Voluntary program.

<sup>9</sup>Voluntary program.

<sup>10</sup>Fire apparatus inspection is required by the State Fire Marshall's Office.

<sup>11</sup>Motor Vehicle Safety, "NHTSA [National Highway Traffic Safety Administration] Should Resume Its Support of State Periodic Inspection Programs," Report to the Chairman, Subcommittee on Oversight and Investigations, House Committee on Energy and Commerce, United States General Accounting Office, (GAO/RCED-90-175), July 1990.

<sup>12</sup>Those States that repealed PMVI programs after the 1976 legislation are listed with the dates of start and repeal: Colorado (1937-1981), New Mexico (1953-1977), Georgia (1965-1982), Wyoming (1967-1977), Florida (1968-1981), Idaho (1968-1976), Kentucky (1968-1978), South Dakota (1968-1979), Indiana (1969-1980), Nebraska (1969-1982)

<sup>13</sup>"Study of the Effectiveness of State Motor Vehicle Inspection Programs," NHTSA, (Washington, D.C., August 1989)

Taken together, the studies discussed in NHTSA's report as well as several other studies identified by GAO indicated that inspection programs reduce accident rates. These studies included estimates of accident reduction ranging from less than 1 percent to as high as 27 percent. The actual magnitude of the reduction is unknown. GAO agrees with NHTSA that all of the studies had limitations either of scope, age, or methodological completeness. Thus, while the large majority of studies point to a safety benefit from inspection programs, they do not provide a reliable basis for judging how much effect the programs have on accident rates.<sup>14</sup>

As a result of the 1990 report, the GAO recommended that:

...the Secretary of Transportation direct NHTSA to support state periodic motor vehicle inspection programs through such actions as (1) sponsoring research, (2) assisting inspection states to share their experiences and adapt to changing automotive technology, and (3) promoting public awareness of the need to properly maintain the safety-critical components of vehicles.

After the implementation of a MCSAP random roadside inspection program in Connecticut in 1986, the percentage of vehicles that had to be removed from service because of out-of-service violations declined,<sup>15</sup> indicating an improvement in the general condition of the commercial vehicles on the road. Fire apparatus are equipped with many of the same mechanical features as other heavy trucks and can do fully as much damage in the event of an accident. However, most States do not have an oversight program for these vehicles that is comparable to the MCSAP inspections for heavy trucks. For example, although the Tarrant County, Texas, fire apparatus was inspected shortly before the accident, the vehicle was not taken out of service even though the apparatus was in poor condition. The Texas inspection did not provide the level of scrutiny that an inspection under MCSAP (mechanical) criteria would have provided. Additionally, the voluntary inspections of fire apparatus in Connecticut indicate that many of these vehicles are not maintained properly.

Currently, MCSAP programs do not include fire apparatus, and because of the random nature of MCSAP inspections, the Safety Board believes that it would be inappropriate to include them in MCSAP. However, the Safety Board believes that an improvement in the condition of fire apparatus could be expected if these vehicles were subjected to the level of inspections that commercial vehicles receive through MCSAP. Therefore, the Safety Board believes that States should require the inspection of fire apparatus and that these inspections should be performed by commercial vehicle inspectors in accordance with MCSAP (mechanical) criterion to ensure continuity in the depth and level of the inspections.

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<sup>14</sup>GAO, executive summary, p 5.

<sup>15</sup>In 1986 70 percent of the heavy commercial vehicles inspected during CDMV MCSAP random roadside inspections failed or were put out of service because of safety violations; in 1990, 40 percent failed

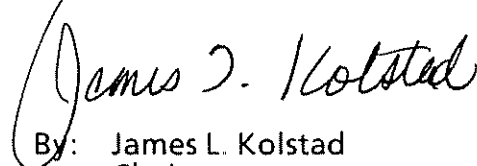
Therefore, the National Transportation Safety Board recommends that the Governors and legislative bodies of those States without fire-apparatus inspection programs:

Develop and implement a fire-apparatus inspection program that requires periodic inspections performed by commercial vehicle inspectors in accordance with the Federal Highway Administration Motor Carrier Assistance Program vehicle (mechanical) inspection criterion. (Class II, Priority Action) (H-91-12)

Also, as a result of its investigation, the Safety Board issued Safety Recommendations H-91-3 through -6 to the U.S Fire Administration of the Federal Emergency Management Agency, Safety Recommendations H-91-7 through -10 to the International Association of Fire Chiefs, and Safety Recommendation H-91-11 to the National Fire Protection Association.

The National Transportation Safety Board is an independent Federal agency with the 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 recommendation in this letter. Please refer to Safety Recommendation H-91-12 in your reply.

KOLSTAD, Chairman, COUGHLIN, Vice Chairman, and BURNETT, LAUBER, and HART, Members, concurred in this recommendation.

  
By: James L. Kolstad  
Chairman

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