

Log H-5716



**NATIONAL TRANSPORTATION SAFETY BOARD**

Washington, D.C. 20594

**Safety Recommendation**

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**Date:** May 24, 1993

**In reply refer to:** H-93-21 and -22

Mr. Donald Carnahan, President  
National Association of State Directors  
of Pupil Transportation Services  
Director of Pupil Transportation  
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At 3:24 p.m. on July 31, 1991, a 1989 72-passenger school bus operated by Mayflower Contract Services, Inc., was traveling eastbound on undivided, two-lane Tramway Road from the Palm Springs (California) Aerial Tramway parking lot. On board the bus were 45 girl scouts and 8 adult advisors. During the descent, the bus increased speed, left the road, plunged down an embankment, and collided with several large boulders. The busdriver and 6 passengers were killed; 47 passengers were injured.<sup>1</sup>

National Transportation Safety Board tests indicated that speeds between 13.3 (closed throttle) and 19.3 (full throttle) mph were necessary before the accident bus transmission would downshift from third to second gear. Since analysis determined that the accident bus was traveling above this speed range when it negotiated the curve at the guardrail/culvert, the transmission could not be forced to downshift into second, thereby negating transmission use for regaining speed control. Measurements and computations indicated that the bus was traveling 64 mph where the tire yaw marks began at the curve. Tests revealed that the transmission would normally upshift from third to fourth between 24.0 and 37.6 mph and would automatically upshift from third to

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<sup>1</sup>For more detailed information, read Highway Accident Report--Mayflower Contract Services, Inc., Tour Bus Plunge from Tramway Road and Overturn Crash near Palm Springs, California, on July 31, 1991 (NTSB/HAR-93/01).

fourth at 50.5 mph to protect against engine overspeed. If the busdriver had selected and kept the selector lever in third gear, the bus would have automatically upshifted from third to fourth before the yaw marks began. However, any automatic upshift from third to fourth occurred after the busdriver had lost speed control. Because of the vehicle's degraded braking capacity, he could not decrease speed to effect a downshift.

The Safety Board concludes that although the Allison automatic transmission feature that permits automatic upshifts did not cause or contribute to this accident, an upshift occurrence may be the first warning that the transmission can no longer help maintain speed control and immediate action must be taken to reduce speed to effect a downshift back into the desired gear range. Therefore, the Safety Board believes that the National Association of State Directors of Pupil Transportation Services (NASDPTS) should encourage its membership to incorporate school and tour busdriver training that includes automatic transmission upshift characteristics and proper transmission operation in mountainous terrain, where appropriate, into each school jurisdiction busdriver training curriculum.

At the Mayflower terminal, the specified pretrip inspection procedures, which included applying the parking brake and then attempting to pull the vehicle ahead, as well as test stopping an unloaded vehicle, could not have detected that the front brakes were out of adjustment. The parking brakes applied only the rear axle brakes, and an unloaded vehicle test stop would not load the brake system sufficiently to exhibit the degraded condition of the front brakes. Under these conditions, only an inspection of the front brakes by a qualified person that included push rod travel measurement from release to full application could have determined an adjustment was needed.

The Mayflower vice president of maintenance stated that the notation on the July 19 preventive maintenance inspection report under "Adjust air brakes (if applicable)" meant that the accident bus brakes had been adjusted. However, the Mayflower mechanic who performed this inspection stated that he did not adjust the brakes during that inspection.

Mayflower records indicate that the accident bus traveled 1,134 miles between the July 19 inspection and the July 31 accident. Although the brake lining wear rate per mile can vary because of terrain traveled and driver use, it is unlikely the front brake linings wore to the extent that the push rod travel increased from 1 inch (at which point the mechanic who performed the July 19 inspection stated he would readjust the brakes) or less to 2 1/4 inches or more in 1,134 miles. The data indicate that the mechanic either failed to inspect the front brakes or failed to follow his criteria for readjustment. In either case, the Safety Board concludes that the brakes were not adjusted at the last

inspection 12 days before the accident, and the steering axle brakes were out of adjustment at the time of the accident.

An ambiguity exists in the California brake inspection regulations, as written, which require that brakes on school buses be "inspected" every 30 days (45 days for buses used in tour or charter service), and in the Mayflower policies and procedures. From the statements of the Mayflower vice president of maintenance and the Mayflower mechanic who performed the July 19 inspection, the entry "Adjust air brakes (if applicable)" meant to adjust brakes in all cases and to adjust brakes if needed, respectively.

The Safety Board believes that to "inspect" push rod travel on air/mechanical brakes (to determine if adjustment is necessary) takes at least as much time and effort as the actual adjustment itself. A requirement that brakes be adjusted rather than "inspected" during each brake system inspection would therefore impose no additional burden on maintenance personnel responsible for periodic brake inspection and adjustment. In addition, such a requirement would eliminate ambiguities that lead to differing interpretations, as occurred in this case, of the meaning of "inspect" as presently contained in California regulations and in Mayflower policies and procedures. The Safety Board believes that the NASDPTS should encourage its membership to require that all school and tour bus air/mechanical brakes with manual slack adjusters be fully adjusted at each required inspection.

Therefore, the Safety Board recommends that the National Association of State Directors of Pupil Transportation Services:

Advise your membership of the facts and circumstances of this accident and encourage them to incorporate automatic transmission upshift characteristics and proper transmission operation in mountainous terrain, where appropriate, into each school jurisdiction busdriver training curriculum.  
(Class II, Priority Action) (H-93-21)

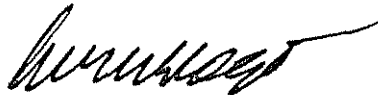
Encourage your membership to require that all school and tour bus air/mechanical brakes with manual slack adjusters be fully adjusted at each required inspection. (Class II, Priority Action) (H-93-22)

Also, the Safety Board issued Safety Recommendations H-93-10 and -11 to the Federal Highway Administration, H-93-12 and -13 to the State of California, H-93-14 and -15 to the California Department of Education, H-93-16 and -17 to the California Highway Patrol, H-93-18 to the Mount San Jacinto Winter Park Authority, H-93-19 to the National Committee on Uniform Traffic Laws and Ordinances, H-93-20 to the American Association of State Highway

and Transportation Officials, H-93-23 to the General Motors Corporation Allison Transmission Division, and H-93-24 through -26 to the Mayflower Contract Services, Inc.

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 recommendations in this letter. Please refer to Safety Recommendations H-93-21 and -22 in your reply. If you need additional information, you may call (202) 382-6850.

Chairman VOGT, Vice Chairman COUGHLIN, and Members LAUBER, HART, and HAMMERSCHMIDT concurred in these recommendations.

  
By: Carl W. Vogt  
Chairman