



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: November 21, 2000

In reply refer to: H-00-31 and -32

Mr. Charlie Gauthier
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National Association of State Directors of Pupil Transportation Services
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The National Transportation Safety Board is an independent Federal agency charged by Congress with investigating transportation accidents, determining their probable cause, and making recommendations to prevent similar accidents from occurring. We are providing the following information to urge your organization to take action on the safety recommendations in this letter. The Safety Board is vitally interested in these recommendations because they are designed to prevent accidents and save lives.

These recommendations address the potential for passenger injuries as a result of the school bus emergency exit door design and as a result of school bus seat cushion bottoms that are removable or hinged. The recommendation is derived from the Safety Board's investigation of the October 21, 1999, school bus and dump truck collision in Central Bridge, New York,¹ and is consistent with the evidence we found and the analysis we performed. As a result of this investigation, the Safety Board has reiterated two safety recommendations and issued six new safety recommendations, two of which are addressed to the National Association of State Directors of Pupil Transportation Services. Information supporting these recommendations is discussed below. The Safety Board would appreciate a response from you within 90 days addressing the actions you have taken or intend to take to implement our recommendations.

Federal regulations permit a seat to be positioned adjacent to a side emergency exit door if the seat cushion bottom automatically assumes a vertical position when not in use; therefore, a bus passenger may be seated directly against the side emergency exit door. The size and spacing, as well as door release mechanism performance, standards are prescribed in 49 *Code of Federal Regulations, Federal Motor Vehicle Safety Standards* (FMVSSs), Part 571.217; however, the

¹ For additional information, read National Transportation Safety Board. 2000. *School Bus and Dump Truck Collision in Central Bridge, New York, on October 21, 1999*. Highway Accident Report NTSB/HAR-00/02. Washington, DC.

regulations do not contain design requirements for the release mechanism and associated hardware.

Although the side emergency exit door of the accident bus met Federal regulations, it presented a safety hazard for passengers. Components of the side emergency door release mechanism protruded from 1.9 to 4.5 inches into the occupant compartment adjacent to the seat. These components consisted of unprotected metal rods, bars, a handle, and bolts. None of these components were padded or recessed for occupant protection. If struck by an occupant seated beside the door during an accident sequence, these surfaces could easily result in minor to serious, and possibly lethal, blunt force injuries to that occupant.

In this accident, a restrained chaperon was in the flip-up seat adjacent to the side emergency exit door. Due to the dynamics of the collision, this passenger was not initially propelled laterally into the door. However, she stated that after hitting the seat in front of her, she then fell towards the side emergency exit door. Although the passenger did not first strike the door, handle, or locking rods, the potential for lateral motion into this door during a side impact situation existed. In the simulation, the unrestrained occupant hit the side of the seatback with a force equivalent to approximately 14 times her body weight. If the dump truck had hit the bus on the opposite side, this occupant would have struck the side emergency exit door and protruding structures with considerable force, sufficient to have caused significant, and possibly fatal, injuries. In addition, many of the other passengers may have received their injuries by moving laterally during the accident sequence and then striking the sidewalls and windows.

In its 1999 report *Bus Crashworthiness Issues*,² the Safety Board noted that some passengers not seated in the area of intrusion were seriously or fatally injured in school buses involved in lateral impacts with large vehicles. Some of these injuries were sustained when occupants struck the sidewalls. Of the six school buses that were examined during the special investigation, only one was equipped with a side emergency exit door. No occupants were seated adjacent to the door or in any of the seats surrounding the door.

The Safety Board concludes that the potential exists for injuries to school bus passengers seated adjacent to side emergency exits with protruding door handles and latches during side impact or rollover accidents. Current FMVSSs do not address the protection of those passengers seated adjacent to emergency exits with protruding door handles and latches because the standards do not contain design requirements. Therefore, the Safety Board believes that the National Association of State Directors of Pupil Transportation should inform its members of the potential for injury to passengers from protruding door handles or latching mechanisms on emergency exit doors. Consider not placing passengers in those seat positions adjacent to emergency exit doors so equipped.

During the Central Bridge accident, a number of the school bus seat cushion bottoms were displaced because the latching clips at the base of the seat cushions were unlatched or loosely attached. As a result, two lap belt-restrained passengers in row 10 on the right side of the bus

² National Transportation Safety Board. 1999. *Bus Crashworthiness Issues*. Highway Special Investigation Report NTSB/SIR-99/04. Washington, DC.

came to rest, still restrained, with their knees almost touching the bus floor and their backs against the seat cushion.

The occupant kinematics for these passengers seated in the impact area indicate that the forces during the collision caused the passengers to move toward the sidewall and forward as the bus rotated after the initial impact. During the accident sequence, their seats most likely flipped upward at the hinges (attached to the front frames) due to the lack of proper securement and the passengers' forward movement onto the front of the seat cushions.

Both of the seriously injured passengers' (row 10) lateral and forward movements during the accident sequence (and possibly belt slack) resulted in their slipping under their lap belts and coming to rest with their backs on the seat cushion and their knees near the floor. The lap belts, with the pivoting seat cushion, may have resulted in higher forces during the impact of the passengers' lower extremities with the seatback in front and the sidewall. The Safety Board concludes that the school bus passengers, whether lap belt-restrained or unrestrained, may have sustained more severe injuries because the seat cushion bottoms were unlatched.

Since 1984, the Safety Board has found seat cushion latching to be an issue in a number of investigations and has recommended solutions concerning the attachment of the bottom seat cushion to the seatframe. Most school bus manufacturers indicated in a 1987 National Highway Traffic Safety Administration survey that they would permanently affix the seats in future production; however, the accident bus, manufactured in 1997, was equipped with the hinged and latched seat. The Safety Board also discovered that many school bus manufacturers are still using seat cushion bottoms that are not permanently attached to the seatframe. Furthermore, since a number of the seat cushion bottoms on the accident bus were found improperly secured during the postaccident inspection, the Safety Board is concerned that the inspection of the latches by the States or operators does not ensure that the seat cushion bottoms are securely reattached to the seatframe after routine cleaning. Therefore, the Safety Board believes that the National Association of State Directors of Pupil Transportation Services should inform its members again of the safety hazards of not ensuring that the seat cushion bottom latching clips are properly latched at all times.

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

Inform your members of the potential for injury to passengers from protruding door handles or latching mechanisms on emergency exit doors. Consider not placing passengers in those seat positions adjacent to emergency exit doors so equipped. (H-00-31)

Inform your members again of the safety hazards of not ensuring that the seat cushion bottom latching clips are properly latched at all times. (H-00-32)

The Safety Board also issued safety recommendations to the National Highway Traffic Safety Administration, the Federal Motor Carrier Safety Administration, the Maintenance Council of the American Trucking Associations, and the Commercial Vehicle Safety Alliance.

Additionally, the Safety Board reiterated safety recommendations to the National Highway Traffic Safety Administration. In your response to the recommendations in this letter, please refer to H-00-31 and -32. If you need additional information, you may call (202) 314-6440.

Acting Chairman HALL and Members HAMMERSCHMIDT, GOGLIA, BLACK, and CARMODY concurred in these recommendations.

Original Signed

By: Jim Hall
Acting Chairman