

UNITED STATES OF AMERICA
NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: May 22, 1973

Adopted by the NATIONAL TRANSPORTATION SAFETY BOARD
at its office in Washington, D. C.
on the 10th day of May 1973

FORWARDED TO:)
Mr. James E. Wilson)
Acting Administrator)
National Highway Traffic Safety)
Administration)
Washington, D. C. 20590)

SAFETY RECOMMENDATION H-73-16 to H-73-19

The National Transportation Safety Board welcomes the opportunity to comment on Notice 1, NHTSA Docket No. 73-3, 49 CFR 571, Bus Passenger Seating and Crash Protection. As written, this proposed rulemaking would apply to all types of buses regardless of type of service, structure and configuration, or passenger needs. Little consideration is given to differences in operating conditions and accident experience among interstate (long-haul) buses, municipal (transit) buses, and school-buses. This problem probably arises from the vehicle-type classification system used for Federal Motor Vehicle Safety Standards, which does not rigorously characterize vehicles in relation to their intended utility. Different utility patterns produce different hazards, and different motivations for safety standards. If the vehicle types were more precisely defined, the safety needs would be separable and requirements could be better matched to needs than is presently possible with the performance-option approach. An examination of three types of service shows that a better match can be specified.

Interstate or intercity bus service is characterized by relatively long distances between stops. Passengers board and debark at bus stations or depots. Travel is frequently over major highways, such as Interstate routes, with intermixed traffic moving at high speed. Crashes sometimes result in overturn because of the higher center of gravity of these buses and the high-speed interaction with highway features. Passengers must remain restrained to reduce injuries during overturn if they are to escape. Most passengers are adults, but small children, even babies, must also be accommodated. Passengers move around relatively little during the trip and they often sleep.

To the Board's knowledge, interstate-bus seats have not been a significant source of contact injury to passengers in fore-and-aft collisions, although there have been isolated cases in which seats have pulled loose. In overturn accidents, however, passengers are frequently thrown from their seats to the inside wall of the bus 6 to 8 feet below. In forward crashes, they may be propelled down the center aisle and even out the front window. Passengers sometimes catch their feet and legs under a seat. In overturns, unrestrained passengers have frequently been ejected through side windows. The effectiveness of the projected standards for bus side-window retention and release is not yet known.

Transit bus service involves buses operating at intermediate or low speeds, intermixed mainly with passenger-car traffic. Transit buses are not intended to operate on the Interstate system. In their stop-and-go operation there is a continual movement of passengers, many of whom are standees. Passengers leave their seats before the bus is stopped, and their seats are taken by others while the bus is in motion. The constant movement of passengers requires suitable handholds, not only overhead for standees, but at each seat, so that passengers can steady themselves while entering or leaving their seats.

Transit buses rarely overturn, and the Board knows of no passenger ejections resulting from crashes while such buses have been engaged in strictly transit-type operations. Decelerations are rarely so severe that passengers are thrown from their seats, although standees are often jostled or thrown to the floor in sudden stops or minor collisions. The enforcement of seatbelt use in transit buses would be impossible, even with alarms or signaling systems. A high level of vandalism is an expected condition, and the full range of passenger sizes must be accommodated.

Protection of passengers in transit-type buses used in interstate charter service is the responsibility of the Federal Highway Administration, which can establish and enforce its own requirements for any vehicles in such service.

Schoolbus service is characterized by relatively low-speed operation over ABC-type highways, although some schoolbuses operate regularly on the Interstate system. Numerous stops are made inbound to pick up passengers and outbound to drop off passengers; at the school, total loading or unloading occurs. Under these conditions, there is no need for passengers to leave their seats while the bus is in motion.

Since students are more susceptible to controls than are other types of bus passengers, the schoolbus provides an opportunity to initiate training in seatbelt use, which would be effective in other vehicles for the life of the student. In addition, each schoolbus seat can accommodate

three small children. Like interstate buses, schoolbuses are subject to overturn.

In order to provide a basis for treating these differing needs and justifications for seating safety in the various types of buses, the National Transportation Safety Board recommends that the National Highway Traffic Safety Administration:

- (1) Establish separate vehicle-type classes for transit buses, interstate buses, and schoolbuses, based upon exact definitions of the intended use and performance of the buses in defined highway environments. Factors which should be considered include at least the number and classes of passengers carried, the maximum intended speed of operation, the classes of highways over which operation is intended, the luggage-carrying capability, the duration of trips, and the intent to provide for standing and/or seated passengers. (Recommendation No. H-73-16)

Because in the normal transit environment overturn is infrequent and speeds are slow, the cushioning features of side-by-side seats, applicable to fore-and-aft collisions, have greater play than do passenger restraints. For this reason the Safety Board recommends that the National Highway Traffic Safety Administration:

- (2) Require, for the transit-bus category, that seats have the characteristics of the proposed rulemaking's first performance option only. Steps should be taken later to provide crashworthiness features in the structural area or to meet other needs typical of the stated and defined utility performance, e.g., the need to accommodate standing passengers. (Recommendation H-73-17)

In interstate or intercity bus accidents, the cushioning performance required in the first performance option would not protect passengers against tumbling about after bus overturn, projection down the aisle, or ejection through windows. For this reason, a seatbelt should be provided for those who wish to use it. Furthermore, seatbelts are necessary for several types of child-protection devices which cannot otherwise be used by interstate-bus passengers but which could be integrated into bus operations if belts were available.

The National Transportation Safety Board recommends that the National

Highway Traffic Safety Administration:

- (3) Require, for the interstate-bus category, the cushioning performance called for in the first performance option in order to provide a defined level of protection for those passengers who do not use an installed restraint. The seat strength performance and seatbelts called for in the proposed rulemaking's second performance option should also be required. The warning system should not be required. (Recommendation H-73-18)

This recommendation, if adopted, would provide cushioning protection for those who do not wish to wear a seatbelt and, at the same time, would avoid denying seatbelts for those who wish to use them. Because most interstate buses are used for fare-paying passengers, the value of a seatbelt cannot be determined primarily by comparing the lives saved with the cost of installation and maintenance. Instead, the value of a seatbelt lies in the opportunity which it gives the passenger to protect himself in an environment in which the risk he takes is determined by others. In an overturn, the passenger should be afforded the same seatbelt protection as the busdriver.

A warning system reporting seatbelt use to the busdriver would represent a responsibility which he could not fulfil. Passengers could be informed about the need to use seatbelts by notices and instructions similar to those now used to explain the use of escape windows.

In regard to the third vehicle-type class, the Safety Board recommends that the National Highway Traffic Safety Administration:

- (4) Require, for the schoolbus category, the cushioning performance called for in the first performance option along with the seat strength performance and seatbelt anchorages at each seat location proposed in the second performance option. The warning system should not be required. Consideration should also be given to establishing a separate category of schoolbus for intermittent higher-speed or Interstate-highway operation which would require seatbelts to be installed. (Recommendation No. H-73-19)

If adopted, this recommendation would provide the same protection as required for a transit bus, but would permit schoolbus users to install seatbelts to protect students in overturns and would insure that seatbelts

could be added for training purposes if the necessary training arrangements were available. This recommendation would also permit a schoolbus to be upgraded to higher-speed status (with two children per seat) by adding the belts and supervision.

The Safety Board believes there is a need to explain to the parents of schoolchildren and school officials the improved protection provided by seatbelts, the classes and identifications of various seatbelts, and the possible benefits of coordinating seatbelt instruction with the use of the belts in the schoolbuses. NHTSA has a consumer information authority which is suitable to this task.

In summary, the Board's proposed method of defining the three vehicle-type classes and adjusting the requirements to each type is believed relevant to actual operating conditions. This approach provides a definite enforceable action rather than an option for each class of service. The options are undesirable because they result in different degrees of protection in different crash situations. This would permit a lesser degree of protection to be provided by the bus operator without knowledge of the passengers.

Other Comments. Although the Board endorses the development of test criteria and methods as well as the 10-second requirement for the resistance of structures to deformation under loads, we urge that dynamic tests of full-sized seats be required for different seat designs to assure an adequate level of performance in crash situations. Such tests should employ instrumented test dummies which can reveal what happens to seats and passengers in dynamic situations. Such determinations cannot be made from static load tests.

Because seat weights vary considerably, the Board does not favor the use of seat weight as a criterion for seat deformation resistance, but recommends use of a given loading based on typical passenger weights.

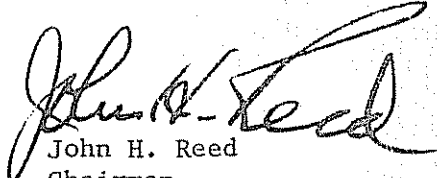
The passenger-protection system of any type of bus is incomplete unless the bus is subjected to escape tests in various bus attitudes and in foreseeable accident environments. Escape performance criteria should be defined and tests of the seating required in the standard. Note that overturn is not a significant condition for buses in the transit category.

The Board believes that the proposed seatbelt "warning" or signaling system has no practical merit for any type of bus. Such a system would add unduly to the cost and create substantial maintenance problems. For transit buses, no seatbelts are recommended, and no warning device is pertinent. For schoolbuses, the pupil transportation standard should be

coordinated with the seating standard by addition of a requirement that all passengers remain seated while the bus is in motion. Changes could also be made in the pupil transportation standard to meet the condition in which seatbelts are adopted for schoolbuses by local jurisdictions.

These recommendations will be released to the public on the issue date shown above. No public dissemination of the contents of this document should be made prior to that date.

Reed, Chairman, McAdams, Thayer, Burgess, and Haley, Members, concurred in the above recommendations.

By: 
John H. Reed
Chairman