STATEMENT OF JOHN H. REED
CHAIRMAN OF THE NATIONAL TRANSPORTATION SAFETY BOARD
BEFORE THE
SUBCOMMITTEE ON ROADS
COMMITTEE ON PUBLIC WORKS
UNITED STATES SENATE
CONCERNING H.R.4354, A BILL TO AUTHORIZE STATES
TO PERMIT THE OPERATION OF BUSES NOT IN EXCESS OF
102 INCHES ON THE INTERSTATE SYSTEM
FEBRUARY 14, 1972

I am John H. Reed, Chairman of the National Transportation Safety Board. With me today are: Mr. Fritz Puls, General Counsel; Mr. William C. Foster, Acting Director, Bureau of Surface Transportation Safety; Mr. Anthony L. Schmieg, Chief, Highway Safety Division; and Mr. Eric C. Silberstein, Legislative Affairs Officer.

We appreciate the opportunity of appearing before your Subcommittee to discuss H.R.4354. On May 4, 1971, the Safety Board presented its position on this bill to the House Public Works Subcommittee on Roads. The Safety Board opposed the passage of the Bill pending the results of the analysis and review of hazards or safety improvements derived in part from existing bus safety recommendations of the Board and in part from observations of 102-inch wide buses and descriptive literature. We proposed that an assessment of the safety problems associated with wider buses could be accomplished by scientific testing and analysis of available engineering information, instead of waiting for accidents to occur.

Among the identifiable safety hazards we previously pointed out and which the Department of Transportation is now studying are:

(a) Frequency of excursion into other lanes will increase with wider buses under present driver capabilities and highway configurations. This question involves vehicle steering capability,

stability and driver steering bahavior.

(b) Possible improved braking by all models of buses, including braking performance characteristics.

(c) Possible reduced tire loadings on wider buses resulting in increased or decreased traction.

(d) Changed visibility of road ahead for other vehicles due to the six-inch wider bus and concomitant two-foot increase in bus height.

(e) Increased influence of wind blast in passing other vehicles in opposite directions which might affect safety margins of some vehicles.

In our testimony today, we will discuss issues from our previous statement. The Safety Board has seen and ridden in two different types of 102-inch wide buses manufactured for intercity use. Also, our staff has discussed with the Department of Transportation three types of hazards visible in the 102-inch wide buses.

Certain hazards appear to be inherent in the wide bus as a result of designs made possibly by the 102-inch width, and there must be assurance that these hazards can be controlled before the increased width is allowed.

The increased height of the bus, made possible by the increased width, has placed seated passengers at a greater height than ever before. In the 12-foot high bus, the head of a six-foot tall seated passenger is over nine feet above the level of the road. In the event that the bus overturns, this will produce a higher velocity of striking the ground at that location than in any previous bus designs. Also,

the linear velocity of unrestrained passengers is proportionately increased by the added height, thus tending to increase the severity of injuries sustained. The tumbling effect of the unrestrained passengers thrown from their seats is also increased. We feel that passenger safety will be decreased by raising passenger seats to this height. The floor level is already above the impact level for passenger cars. The only apparent reason for raising passengers is to obtain greater luggage and express package capacity in the space below the passengers. There is nothing wrong with this concept as long as it is not accomplished at the expense of passenger safety.

In four separate reports of major highway accidents the Safety Board has recommended that restraints for passengers be made available to keep them in their seats and the Department of Transportation is considering a regulation for this purpose. Positive assurance that methods for keeping passengers in their seats on bus overturning should be required before 102-inch wide buses are allowed.

In addition, the increased height of 102-inch buses raises the center of gravity and provides a relatively poor overturn stability factor for a loaded bus, as compared to the stability factors in some contemporary buses. The stability factor of a vehicle is the ratio of the center of gravity height to one-half of the vehicle tread width and is a specific numerical relationship which can be related directly to the likelihood or the susceptibility of the vehicle to overturn.

There is no way in which the stability factor for the proposed 102-inch wide bus can be estimated unless we know its tread width and center-of-gravity height. One 102-inch wide bus seen by the

Safety Board did have a wider tread width. A second had a wider and higher bus body superimposed on a 96-inch wide axle with the same suspension and braking systems. The stability factor for these two buses appear to be different. According to a brochure entitled "The Measure of a Safer Bus" published by the National Association of Motor Bus Owners and the intercity bus industry, comparative distances from the ground to the floor of passenger seating area range from 44 inches for present single-level buses, to 66 inches for present dual-level buses, to 68-3/4 inches for the 102-inch buses now in service. The brochure does not mention any proposed increase in tread width.

The Safety Board has suggested to the Department of Transportation that in this study of the comparison of the safety factors of the 96-inch wide and 102-inch wide buses, an effort be made to correlate the occurrence of bus passenger fatal accidents with bus overturning in all accidents over a period of years. The Safety Board's impression from accidents investigated and reviewed is that overturning of buses is present in the majority of bus passenger fatal accidents.

Because of the stability factor, higher and wider buses can be very sensitive to changes in the load weight in the express compartment. Increased express package capacity, combined with raising of passenger seated height requires that express package area be fully loaded in order to preserve even the present overturn stability numbers. When a bus is carrying adult passengers, as on a one-day excursion, with no cargo in the underfloor compartments, the overturn stability factor will be adversely affected. Presently the stability factor of wider buses is not controlled by regulation. It appears necessary that this

hazard be controlled by a standard before the buses are approved. Such a standard would help reduce the occurrence of a bus overturning by requiring ballasting in buses when operated with passengers and very little or no cargo in the cargo compartment. Ballasting might be accomplished by using removable tanks or other weights in the lowest part of the luggage compartment which could be removed when the luggage and express capacity space is completely filled. Since there will be increased economic benefit from the operation of 102-inch wide buses with greatly increased express capacity, it does not appear unreasonable to require safer vehicles.

Another problem previously reported by the Safety Board is the difficulty of passengers escaping from bus windows when the bus is overturned. The windows are presently eight feet above the side wall of the bus on which passengers will come to rest when thrown from their seats. The increased width would also increase the height of the escape windows Following study of a bus overturn and fire accident in which 19 of the 30 passengers failed to escape from the bus even though the impact of the crash was relatively minor, the Board requested that the Department of Transportation establish standards for escape from buses similar to those used in commercial passenger aircraft. Actual performance tests of escape from buses should be required so that it definitely can be known that passengers can escape from a bus when it is in any of the possible attitudes following a crash. It appears that the increased width of the bus will decrease the probability of successful escape in overturn accidents. The Board does not believe that these tests would be very expensive. The most probable difficulty in conceiving of performance

tests is that many buses could not pass the performance tests without the addition of other escape methods than the windows currently used.

With the higher bus in an upright attitude, the pushout window escape avenues are higher and might cause additional or more severe injuries when a person drops or falls to the ground.

When the wider bus is on its side, the pushout window escape routes are now six inches farther from the passenger who must stand on the side arms of the seats, push an 80 pound window up and hold it open while he climbs out. This is a most difficult and hazardous task for even an agile person. After exiting from the window, the passenger is now eight and one-half feet above the road or ground and the descent, especially when made in a hurry, could be dangerous. For senior citizens, heavily-built persons, or the infirm, escape may be impossible without considerable assistance. The adequacy of windows as exits for escape when passengers are injured is doubtful because of the difficulty in reaching and entering the exit so far removed from support, as well as the height of the exit above ground level.

A NTSB staff member has performed the exercise of exiting from the pushout window of an intercity bus of current design while it was in an upright attitude. It required considerable contorsion and physical effort and was especially painful when, as he was preparing to drop from the window ledge to the ground, the window dropped on his hands.

It is important to note that time is a critical factor in escape from buses following a collision even without the bus overturning. The University of Oklahoma Research Institute under contract to the National Highway Traffic Safety Administration published a report entitled "Escape Worthiness of Vehicles and Occupant Survival," dated December 1970.

Under the chapter on Resume of Principal Findings on page XXI of the final report, they state as finding no. 9, "Minimum demonstrated escape times for inclusion in a performance standard have not been studied specifically under this contract. However, escape times longer than 90 seconds with 50 percent of the exits usable should be viewed with skepticism."

The report discusses escape tests using a schoolbus in an upright attitude, and while laying on its side. The bus was occupied by 58 high school students. Escape tests were made under daylight and simulated night conditions. Some of the students were injured by pushout windows falling on them and by jumping from the bus even though mattresses had been placed on the ground under all exits. In this experiment escape times were excessive. The average times for escape were as follows:

(1) Bus in Upright attitude. Using all exits.

(a) Daytime . . . . . 41.0 seconds
(b) Night time (simulated) . . . . 43.5 seconds

(2) Bus on its side.

(a) Daytime, using all exits . . . 82 seconds
(b) Daytime, only rear exit . . . .107 seconds
(c) Night time, using all exits . .154 seconds
(d) Night time, only rear exit . .161 seconds

The Safety Board is concerned about what these escape times would be if a 102-inch wide intercity bus were substituted for the schoolbus and the young, agile students were replaced by an average load of commercial bus passengers. This question was first raised by the Board after its investigation of the Baker, California, bus accident. The Safety Board's

recommendation no. 7, released in that accident report on December 31, 1968, called upon the Federal Highway Administration and bus industry to change the basis of its regulatory requirements intended to insure escape from buses so that they are based upon tests of performance of occupants escaping from buses standing or laying in all basic attitudes. The report suggested that consideration be given to test procedures presently employed by the Federal Aviation Administration for regulation of escape techniques and systems. The recommendation also called for emergency escape instructions to be available at each passenger location. The FAA minimum escape performance time is 90 seconds.

This recommendation was repeated again in the Safety Board's accident report entitled, "Chartered Interstate Bus Crash, I-80S, Beaver Falls, Pennsylvania, December 26, 1968," which was released on March 19, 1970. Fortunately fire did not follow this bus crash, because it required some 15 minutes to clear the injured from within the bus as it lay at an angle, wedged in a drainage ditch.

To the Board's knowledge, other than the tests referred to above, involving a schoolbus, no such escape tests have been made nor have performance standards been established.

These results strongly suggest that all buses should comply with performance standards.

For the reasons stated, the Safety Board recommends that H.R.4354 not be enacted until the completion of the Department of Transportation's studies and until the DOT has promulgated, and the bus industry has implemented, safety standards including:

(1) A standard to insure that bus passengers will be retained in their seats when a bus overturns either by advance seating or by making restraints available to passengers.

(2) A standard to control the overturn stability of buses occasioned by their center of gravity height and to insure that the center of gravity height continues to be controlled irrespective of the loading conditions of the bus.

(3) A standard to assure escape from the bus in all attitudes which it may assume after a crash, based upon actual performance tests.

I hope this information is useful in assisting your Subcommittee in its work and I would like to assure you that the Safety Board is prepared to provide you with any additional information which you might find necessary. Again I would like to thank you for this opportunity to testify today. My staff and I would be very happy to try and answer any questions you or the Committee Members may have.