

overturn. The failure of the bus steering gear occurred during rollover, and not in the collision with the station wagon.

3. The strength of the roof-support structure of the "picture-window" type bus was inadequate in that it permitted gross downward and sideward crushing of the roof in a moderate rollover.

4. The bus exhibited critical localized structural failure in side-window posts as the result of a design which permitted loads to be concentrated at points which were not compensated for the stress. This localized failure would probably have been discovered in controlled rollover tests or rollover simulations.

5. Feasible design and structural changes in this type of bus would improve crashworthiness and enhance occupant survivability in rollover accidents.

6. The station wagon was across the middle of the westbound lanes, stopped or moving slowly toward the median, when impact occurred. This movement was illegal under Section 304.015 of the Missouri State Code.

7. The station wagon should have been clearly visible to the busdriver from a distance of about 300 to 400 feet, which would have permitted ample time for driver reaction and suitable evasive action.

8. The busdriver took no evasive action until the bus was 50 to 75 feet from the station wagon, indicating that his attention must have been focused elsewhere for at least 2 or 3 seconds prior to seeing the station wagon.

9. The speed of the bus, about 60 to 65 miles per hour, was compatible with the visibility ahead and the reported stopping capability of the bus.

10. The partial structural disintegration of the station wagon, including the separation and failure of its fuel tank, was consistent with the severity of the lateral impact to which it was subjected. No existing requirements were violated.

11. The use of available seatbelts by the station wagon occupants would have prevented the ejections and reduced the injuries of the two occupants to a survivable level.

V. PROBABLE CAUSE

The National Transportation Safety Board determines that the probable cause of the crash was the unorthodox and unlawful maneuvering of the station wagon on a limited-access highway by a driver under the influence of alcohol, and the delayed evasive action by the busdriver.

A cause of the secondary bus crash (leading to rollover) was the lockup of the bus brakes, which prevented steering control after the initial crash.

Causes of the injuries and fatalities to bus occupants were localized critical failure of window columns, which caused loss of structural integrity of roof-support structure in a moderate-speed rollover; the tumbling of passengers within the bus, which was permitted by the absence of any form of passenger restraint; the ejection of passengers through windows which opened under structural distortion of the bus; and the presence of hard and unyielding interior bus components.

Contributing to the injuries of the two occupants of the station wagon was their failure to wear available seatbelts.

VI. RECOMMENDATIONS

The National Transportation Safety Board recommends that:⁷

1. The Federal Highway Administration and the National Highway Traffic Safety Administration institute appropriate rulemaking action to require all newly-constructed interstate-type buses to be equipped with approved occupant

⁷The Safety Board has recommended attention to the problem of providing suitable restraints to bus passengers in four previous accident reports, and is continuing the recommendation in somewhat more detailed form in this report. The basis of the recommendation has been not only to prevent fatality and injury where the belts are used, but to allow passengers the rightful opportunity to employ a safety device of recognized effectiveness. The recommendation would also provide to passengers the form of safety belt protection already provided to the driver by Federal regulation, thus providing equal protection by regulation. The previous recommendations have not been adopted by the Federal Highway Administration based upon cost/benefit reasoning.

straints, active or passive, for all seating positions in such buses. The Board recommended essentially this same action in four other accident reports released December 31, 1968, March 19, 1970, June 1, 1971, and November 1, 1971, respectively. Such rulemaking would carry out the expressed intent of the (then) National Highway Safety Bureau—later the NHTSA—in the “Preamble to Amendment to Motor Vehicle Safety Standard No. 208,” Docket 2-13, Notice 3, on September 30, 1970, by the Acting Director of that Bureau: “The extension of Standard No. 208 is based on the proposition that, so far as practicable, drivers and passengers in all types of vehicles should be afforded the means of protecting themselves from personal injury that seatbelts provide . . .” (Recommendation No. H-73-1)

2. The National Highway Traffic Safety Administration expedite rulemaking under Docket 70-16 (MVSS 121) to improve the antilock braking capability of bus (and truck) braking systems.⁸ (Recommendation No. H-73-2)

3. The Bureau of Motor Carrier Safety, Federal Highway Administration, review intercity bus design and the types of damage suffered in rollover accidents in an attempt to determine whether structural strength in the window areas may have been reduced in recent years in buses having very large side windows; and that BMCS prepare a rollover performance test, or other performance tests, for buses which can reveal the structural strength of buses in the areas stressed by rollover. (Recommendation No. H-73-3)

4. The manufacturers of intercity-type buses review their existing designs of buses having very large side windows to determine whether it is technically feasible to prevent critical localized structural failures and to increase the general strength of the window area of buses: by the use of greater-strength window columns; by employing a larger number of continuous structural members through the window area; and by using smaller windows. (Recommendation No. 73-4)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD:

/s/ JOHN H. REED
Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ ISABEL A. BURGESS
Member

/s/ WILLIAM R. HALEY
Member

Louis M. Thayer, Member, was not present and did not participate in the adoption of this report.

January 31, 1973.

⁸See *Commercial Motor Vehicle Braking*, a special study released by the Safety Board on January 18, 1973.