

APPROPRIATE CRASH PROTECTION FOR WHEELCHAIR RIDERS ON LARGE PUBLIC TRANSIT BUSES

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ABSTRACT

Securement of wheelchairs and occupant restraint for wheelchair riders on buses is one of the most difficult problems facing transit providers. The primary findings of this literature review include the following: 1) there is very little published information regarding transit bus safety; 2) the focus of most reported wheelchair incidents involved non-collision events, in which inappropriate wheelchair securement or rider restraint resulted in minor injuries; 3) studies spanning thirty years indicate that the large transit bus is an exceedingly safe form of transportation; and 4) wheelchair riders do not face undue risk of injury in this transportation environment. Further study is required to characterize rarely occurring severe transit bus crashes. The resulting information is needed to establish an appropriate level of crash protection so that the next generation of wheelchair securement and occupant restraint systems are not only reasonably safe but also easy to use and acceptable to wheelchair riders and transit bus operators.

INTRODUCTION

Offering a safe mode of travel for wheelchair riders is one of the most challenging tasks facing providers who operate large transit “city” buses (1). Commonly used existing strap-type wheelchair securement and restraint systems (WTORS) that comply with U.S. Americans with Disabilities Act (ADA) (2) are inconvenient for wheelchair riders, have contributed to bus driver injuries, and have delayed travel (1,3). Despite over a decade of WTORS development since the ADA regulations, there is still no securement system that is able to satisfy the challenging ADA crash protection standard without hindering the transit process. Our 1996 review of crash risk and crash environment for all vehicles that transport wheelchair riders (4), suggests that transit buses are, along with school buses, the safest form of transportation for general ridership and that the ADA standards may be more stringent than necessary. This paper summarizes our recent review of published information that can be used to estimate wheelchair rider risk aboard large transit buses.

METHOD

We used several search methods, including a critical review of reports on wheelchair securement dating from 1978 and online searches of U.S. national organizations charged with enhancing bus safety, such as the Transportation Research Board and the Federal Transit Association. We searched for all papers and reports describing transit (fixed route) bus accidents, crashes, and injuries sustained by both wheelchair and vehicle seat occupants.

RESULTS

We found very little information that addresses transit bus safety regarding passengers who ride in wheelchairs and we found no published case studies of crash-related fatal injuries to bus passengers either seated in a wheelchair or on a vehicle seat.

Wheelchair Rider Injury Frequency and Severity

- A Project Action study (5) found that 35 of 1.1 million one-way trips included incidents that included wheelchair riders, although none of the incidents were due to a vehicle crash.
- Dejeammes (6) found little published data regarding the risk of crashes and wheelchair occupant injuries. The data that she did find indicated that injuries and fatalities aboard public transport vehicles are “extremely rare” and are usually the result of frontal impacts or abrupt crash avoidance maneuvers such as sudden braking.

- A National Electronic Surveillance System (NEISS) database review for the time period of 1988 to 1996 identified only three wheelchair rider injuries that occurred while a bus was in motion (4) and a study by Richardson found no transit bus wheelchair rider deaths during the period from 1973 to 1991 (7).

General Rider Injury Frequency and Severity

As expected, we found much more information regarding general ridership crashes, injuries, and general safety concerns. Several sources (8,9,10) began with unambiguous statements that buses are exceedingly safe; e.g., “The urban transit bus is an extremely safe transportation mode choice...” (8). Fatality rates for bus passengers, especially school and transit bus passengers, are many times lower than for passenger cars, and even lower than that for trains and planes (Figure 1).

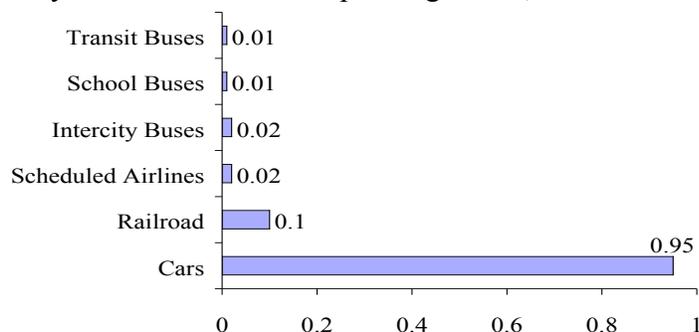


Figure 1. Average fatalities per million passenger miles.

Data from the National Safety Council Accident Facts (1991-1996 editions) Itasca, IL: National Safety Council as summarized by Shaw (4).

DISCUSSION

This study found that there is very little information regarding either wheelchair or general passenger injuries for transit bus crashes. This lack of available information suggests that there have been relatively few efforts undertaken to investigate and to improve transit bus passenger safety. This suggests that passenger safety is not a high priority concern, possibly because the transit bus is one of the safest modes of transportation.

Severe bus crashes are uncommon. Because there are very few wheelchair riders relative to other passengers, it is not surprising that severe bus crashes involving wheelchair rider injuries have not been reported. Despite serious deficiencies in bus crash reporting systems, it is very unlikely that there have been substantial numbers of wheelchair riders injured in bus crashes.

This study found little justification for the ADA-mandated level of frontal impact protection in terms of published crash and injury data. There were neither reported analyses of actual crashes, nor reports of severe crashes equivalent to the 32 km/h, 8-10g frontal barrier crash that formed the basis for the ADA WTORS requirements. Some researchers (6,11) have proposed that protection up to the 1g level would be appropriate for large transit buses because it would be sufficient for commonly occurring evasive maneuvers. Wheelchair securement and occupant restraint systems designed to such a protection level would likely be easier to use and more acceptable to wheelchair riders and transit bus operators than present systems. Although the results of this study indicate that protection at the 1g level is more justifiable than the ADA implied 8-10 g level, we advocate further investigation of the rare transit bus crashes that exceed 1g.

CONCLUSIONS

The primary finding of this study is that there is very little published information regarding transit bus safety and crash environment. There is no information to suggest that wheelchair riders face undue risks aboard transit buses. The results of this study indicate that protection at the 1g level is more justifiable than the ADA implied 8-10 g level. However, we propose further investigation of the rare transit bus crashes that exceed 1g. This information would facilitate the

development of improved WTORS that would better balance the need for occupant protection with the needs for efficiency, convenience, user acceptance, and cost.

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