



U.S. Department of Transportation  
Federal Transit Administration



## Crashworthiness/Crash Energy Management Follow-up for Less than 30 Ft Bus

### Background

This study examines the crashworthiness of “cutaway” or body-on-chassis medium-duty transit buses that are less than 30 feet long and builds upon the FTA research report [Crashworthiness/Crash Energy Management for Transit Buses](#), which identified existing public transportation bus crashworthiness standards, including crash energy management (CEM) applications for body-on-chassis (cutaway) buses, and serves as a foundational resource for this research report. The operating environments and the general characteristics of paratransit passengers further highlight the need for crashworthiness standards for cutaway vehicles; both lead to a greater likelihood of increased injury severity and fatalities when collisions occur.

Although current state, U.S., and international standards exist, many applicability restrictions exclude cutaway transit buses, and many occupant protection standards are limited to drivers of the vehicles, thus leaving passengers vulnerable.

### Objectives

FTA directed this comprehensive study with the following objectives:

- Background research and analysis on needs and gaps for new standards related to crashworthiness and CEM for less than 30-ft paratransit body-on-chassis buses (cutaways)
- Background research and analysis on related existing standards
- Case study evaluations for Florida, California, New York, and Pennsylvania
- Supplemental evaluations using NTSB investigation reports and recommendations associated with similar vehicles
- Findings related to voluntary standards, guidelines, or recommended practices

### Findings

*Limited data restrict the ability to determine if the absence of or limited standards contribute to injuries or fatalities, and work remains to be done to improve the crashworthiness of cutaway vehicles.*

The ability to research collision events for rural public transportation agencies and the paratransit buses used to provide that service is significantly influenced by National Transit Database limitations; however, there is no method available to identify injuries and fatalities that could be due to lack of crashworthiness standards. To determine if the absence of or limited standards contribute to injuries or fatalities, case studies were conducted in California, Florida,

New York, and Pennsylvania to evaluate collisions on a case-by-case basis, focusing on collisions that resulted in injuries or fatalities; however, the case studies did not demonstrate that the lack of crashworthiness standards led to any injuries or fatalities from these events.

Based on the results of NTSB investigations and corresponding recommendations, there remains work to be done to improve the crashworthiness of cutaway vehicles, including removing the weight applicability restrictions for several standards; developing standards for frontal, side, rear, and rollover collisions; requiring manufacturers to comply with newly-developed occupant crash protection standards; and increasing roof strength standards. NTSB recognizes that medium-size buses, regardless of weight, operate in a manner similar to motor coaches and, as such, should be held to similarly stringent standards.

General findings include the following:

- To allow analyses by vehicle types to be comprehensive and comparable across geographies, transit agencies should include specific vehicle type in the event descriptive data reported to the NTD.
- Very limited data indicate that injuries or fatalities in paratransit and rural public transit collision events are specifically due to the structural integrity of cutaway vehicles. Transit agencies should consider the expanded applicability of FMVSS or other standards in cutaway vehicle procurement specifications.
- There is limited data to suggest that injuries or fatalities in transit bus collision events are specifically due to the design of vehicle seating and associated apparatus. However, academic research indicates that lower standard vehicle seatback designs and tracking/anchorage assemblies can increase the likelihood of injuries or fatalities in secondary collision impacts.

## Benefits

Transit agencies would benefit from additional research to support the development of industry standards or guidance designed to mitigate the injuries and fatalities associated with secondary impact collisions in cutaway vehicles. The transit industry can use the findings in this report to support specifications that help improve safety outcomes that may occur in a collision event.

## Project Information

### FTA Report No. 0141

This research project was conducted by the Center for Urban Transportation Research at the University of South Florida. For more information, contact FTA Project Manager Raj Wagley at 202-366-5386 or [Raj.Wagley@dot.gov](mailto:Raj.Wagley@dot.gov). All research reports can be found at <https://www.transit.dot.gov/about/research-innovation>.