

School Bus Crash Investigation
Dynamic Science, Inc.
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The crash investigation process is an inexact science which requires that physical evidence such as skid marks, vehicular damage measurements, and occupant contact points be coupled with the investigator's expert knowledge and experience of vehicle dynamics and occupant kinematics in order to determine the pre-crash, crash, and post-crash movements of involved vehicles and occupants.

Because each crash is a unique sequence of events, generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) or their safety systems.

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Background

This three vehicle crash involved a 1996 International bus which was struck in the rear by a 1997 International Dump truck. It was selected for additional follow-up study due to injuries sustained by the driver and passengers. A remote-style investigation was conducted during which information was sought from the investigating police jurisdiction and the bus owners (the school district).

Summary

This crash involved a 28 passenger yellow, 1996 International school bus (Vehicle 1) which was traveling south on a four lane interstate highway in lane 3. Vehicle 2, a 1997 International dump truck, was traveling behind the bus in lane 3. The school bus was slowing down to accommodate traffic ahead. Vehicle 1 was steering slightly right in an attempt to change lanes (from 3 to 4). The driver of Vehicle 2 apparently did not notice the bus slowing down and Vehicle 2 struck the right rear of the school bus. Vehicle 2 then veered right into lane 4 and struck Vehicle 3, a 1992 Chevrolet van. This caused the driver of Vehicle 3 to lose control. Vehicle 3 rotated to the right and struck a median on the right side of the highway. Vehicle 2 crossed the right shoulder and the median and struck a concrete barrier.

The weather was clear, the road surface was dry and it was daylight. The roadway is a four lane interstate highway and the police reported speed limit is 89 Km/h (55 mph).

Contact on the bus extended approximately from the right rear bumper corner to the left for 101 cm (40 inches). The maximum crush at the rear bumper corner extended forward on the right side for 127 cm (50 inches). The bus suffered damage to the frame, rear bumper, emergency exit door and the rear and side body panels. Damage to the vehicle cost \$19,595 to repair. Both vehicles were driven from the scene.

The school bus has a seating capacity of 28 passengers. It was transporting 5 children between the ages of 14 and 17 (at the time of the crash), as well as the bus driver. There were 7 seat rows in the bus, as depicted in figure 1, with the left side seats having 2 designated seating positions and the right side seats having 2 designated seating positions.

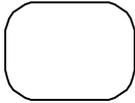
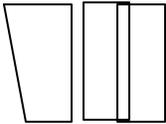
A exemplar school bus was photographed and measured. The seats were of the high back seat design. The back of the seats measured 62 cm (24 in.) above the seat cushion. The leading edge of the seat cushion was 42 cm. (16.5 in.) above the floor while the rear edge was 40 cm. (15.7 in.) above the floor. The angle of the seat back was 80.4 degrees and the cushion angle was 4.8 degrees. The lateral dimension of the seat cushion was 99 cm. (38.9 in.) on the left side, and 77 cm (30.3 in.) on the right. The lateral width of the bus (interior) is shown as 230 cm (90.6 in.).

The longitudinal width of the seats cushions are 38 cm (15 in.).

School buses of this type are sometimes configured with 2 integral child seats and 2-point lap restraints in the first two rows of seats on both sides of the bus. It is unknown what type restraints were available, if any, on this particular bus. There was a lap and shoulder belt for the driver.

According to the police report there were 5 teenaged children on the bus in addition to the bus driver at the time of the collision. Two of the children received neck injuries. Five occupants of the bus were transported to a local hospital via ground transportation. After being treated all the injured were released. One of the students required out-patient physical therapy which concluded on February 20, 1997.

One of the injured children, a 14 year old male was sitting in row 1 seat 1 at the time of the collision. He was treated for lower spine strain and C spine injury. The second injured student, a 14 year old female was sitting in seat 7, second row left side on the aisle. This child received unknown type injuries. The third injured child was a 16 year old male who was sitting in seat 20, row five, left side, in side seat. The fourth child injured, was a 14 year old male and was sitting in seat 25, row 7, right side, inside seat. The fifth child who was injured in the collision was a 14 year old female who was sitting in seat 26, row 7, right side, aisle seat. All seating positions are marked on the interior bus diagram.

			
Row 1		INJURED CHILD	Row 1
Row 2		INJURED CHILD	Row 2
Row 3		Row 3	
Row 4		Row 4	
INJURED CHILD	Row 5		Row 5
Row 6		Row 6	
Row 7		INJURED CHILD	INJURED CHILD
Row 7		Row 7	Row 7