

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 crash involved a 1990 Blue Bird school bus which was struck in the rear by a 1989 Mack tractor and trailer combination. The school bus had slowed and was in the process of stopping in a line of vehicles which had stopped for another school bus that was discharging passengers. Prior to coming to a complete stop, the school bus was struck in the left rear by the tractor and trailer. This impact knocked the school bus forward into a 1990 Cadillac Seville. This case was selected for additional follow-up study due to the injuries of child 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 64 passenger yellow school bus which was traveling south on a two lane roadway. The school bus was being driven by a 67 year old male driver. It is unknown if the driver of Vehicle 1 was restrained. There were 46 school aged children on the bus in addition to the bus driver at the time of the collision. It was very foggy the morning of the collision and the roadway was damp. The driver of Vehicle 1 stated that he had his headlights on and had his roof strobe was actuated. The speed limit is posted as 64 Km/h (40 MPH). The collision occurred on a late January morning in 1997.

Vehicle 2, 1989 Mack tractor and trailer combination was traveling behind the bus and apparently did not see the bus coming to a stop. Vehicle 2, struck the left rear corner of the bus and in turn the bus was forced forward in the rear plane of Vehicle 3, a 1990 Cadillac Seville that was being driven by a 30 year old female. Vehicle 2, the tractor trailer, was loaded with logs at the time of the collision. The estimated weight given by the police was a total of 19,958 Kg (44,000 pounds).

Contact on the bus extended from approximately the center of the rear bumper to the left rear bumper corner and into the left rear body panels. The estimated cost of repairing the damage to the bus was \$ 17,666.74. Both Vehicles 1 and 2 were towed from the collision scene. Vehicle 3 was driven from the scene.

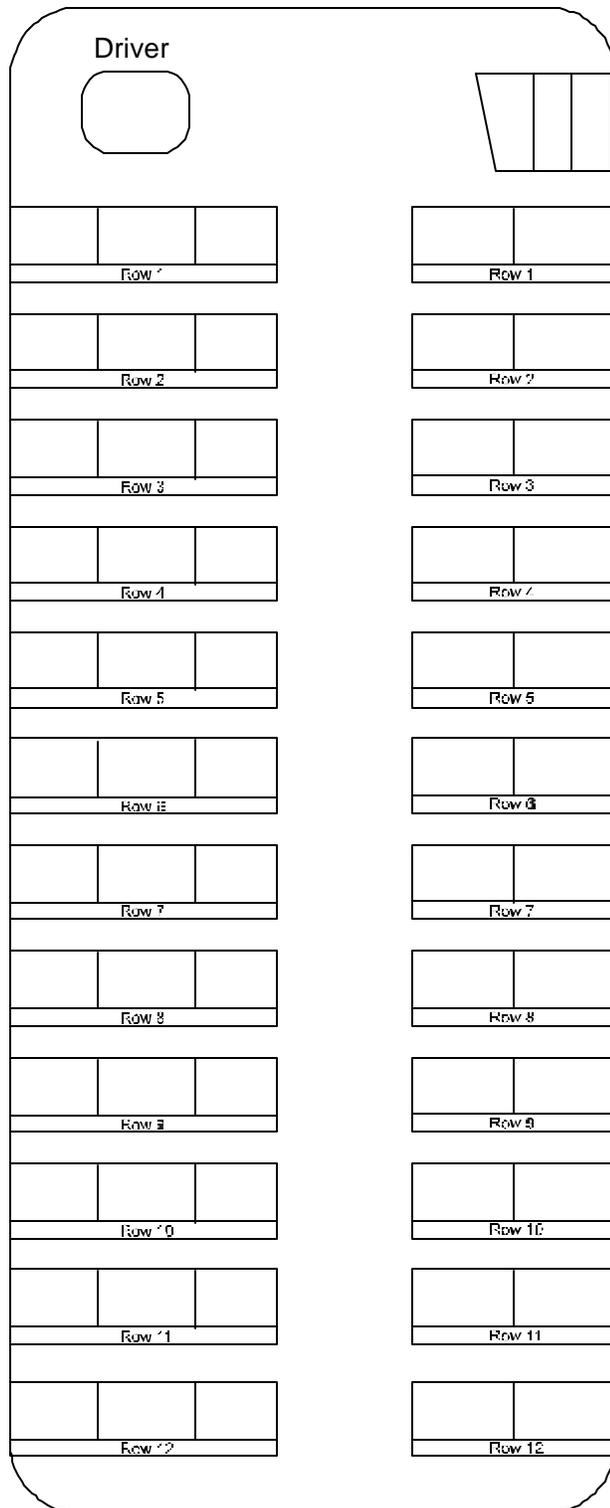
The school bus has a seating capacity of 64 passengers. It was transporting 46 children between the ages of 8 and 19, and the bus driver. There were 11 rows of seats in the bus, as depicted in figure 1, with the left side seats having 3 designated seating positions and the right side seats having 3 designated seating positions.

An exemplar school bus was photographed and measured. The seats were of the high back design 61 cm (24 in.) above the seat cushion and at an 80.5 degree angle. The leading edge of the seat cushion

was 38 cm. (15 in.) above the floor while the rear edge was 41 cm. (16.1 in.) above the floor. The angle of the seat cushion was 2.0 degrees while applying pressure to the measuring device. The lateral dimension of the seat cushion was 97 cm. (38 in.) on the left side, and 97 cm (38 in.) on the right. The seat cushion width was 39 cm (15.4 in.). The lateral width of the bus (interior) is 230 cm (90.6 in.) . The distance between the seat back to seat back cushion was 60 cm (23.6 in.) The aisle width measured 50 cm (19.7 in.)

The bus was not equipped with restraints for each seating position. The driver's position had a 3-point manual lap/shoulder belt.

Twelve students were transported to a local hospital via ground transportation. Of these, 11 were treated and released and 1 student was admitted. It is unknown what types of injuries were suffered by the student passengers. The police report reveals that most of the injuries were complaints of pain with no visible injuries. The exact seating locations are unknown for the injured students.



46 children in unknown seating positions