Seat Belts on School Buses: NTSB Crash Investigations

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NHTSA School Bus Occupant Protection Meeting
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Overview

• NTSB investigations of seat belt equipped school buses

• Two lap belt school bus crashes:
  • Chesterfield, NJ
  • Port Saint Lucie, FL

• Occupant Simulations

• Conclusions

• Recommendations
NTSB Investigations of Seat Belt Equipped School Buses

Central Bridge, NY - 1999
Conasauga, TN - 2000
Milton, FL - 2008
Chesterfield, NJ-2012
Port Saint Lucie, FL-2012
Anaheim, CA - 2014
Chesterfield, NJ

Lap Belts
Lateral Impact
High Impact Force in Back of Bus
Less Proper Belt Use
(Compared to Pt. St. Lucie)

Port St. Lucie, FL

Video Evidence
Seat Integrity Issues
Animation of Accident Reconstruction

School Bus and Roll-Off Truck Collision at Intersection

Near Chesterfield, New Jersey
February 16, 2012
HWY12MH007
Chesterfield School Bus - Left Side

Courtesy Burlington County Prosecutors Office
Chesterfield School Bus - Right Side

Courtesy Burlington County Prosecutors Office
Chesterfield - Injury Information

School bus occupants

- 25 passengers
  - 1 fatality
  - 5 serious injuries
  - 10 minor injuries
  - 9 uninjured
- Driver: minor injuries
School Bus Lap Belts

• New Jersey requires passenger seat belts on school buses

• Lap belts:
  • Some worn properly
  • Many lap belts either worn improperly or not worn at all
Port Saint Lucie: Crash Description
Port Saint Lucie, Florida
Port Saint Lucie – Injury Information

School bus occupants

- 30 passengers*
  - 1 fatality
  - 8 serious injuries
  - 11 minor injuries
  - 10 uninjured
- Driver – minor injuries

* Injuries were also AIS coded.
Onboard Video Systems

• Continuous video and audio system
• Four interior cameras
• 15 frames per second; 59 min 39 sec
• Began prior to student loading; ended 15 minutes after impact
  • Vehicle and occupant motion
  • Passenger egress
  • Emergency response
Port Saint Lucie – Belt Use Information

Belt Use

- ⬤ = Belt Used Properly
- ● = Belt Adjusted Loosely
- ◼ = Belt Not Visible

= Camera Positions

AOI
Chesterfield: Occupant Kinematic Simulations

Lap Belted

Unbelted

0.00 s
Chesterfield: Occupant Kinematic Simulations
Chesterfield: Occupant Kinematic Simulations
Occupant Kinematics Simulation
Lap Belt Simulation
School Bus and Roll-Off Truck Collision at Intersection
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Chesterfield: Unbelted Occupant Motion

Time = 0.0 second

Time = 1.4 seconds
Chesterfield: Lap Belted Occupant Motion

Time = 1.4 seconds
Injury from Contact on Non-Protected Interior Surfaces

- Lap belts do not prevent injury from upper body flailing
- Hard surfaces a risk even with compartmentalization and/or lap belts
- Previous recommendation to protect interior surfaces
Reducing Flailing Injuries

Lap Belted 0.00 s

Lap/Shoulder Belted 0.00 s
National Transportation Safety Board

Occupant Kinematics Simulation
Lap/Shoulder Belt Comparison Simulation

School Bus and Truck Tractor Semi-Trailer Collision at Intersection
Near Port Saint Lucie, Florida
March 26, 2012
HWY12FH008
Conclusions

• Some lap belts worn improperly or not at all

• Lap belts can provide a benefit to passengers who wear them properly

• Properly worn seat belts enhance school bus safety
Conclusions (cont.)

• Properly worn lap/shoulder belts reduce injuries related to upper body flailing

• Educate students, parents and school districts about proper belt use on school buses
Recommendations

• 1999 Bus Crashworthiness Report:
  • Develop performance standards for school bus occupant protection (H-99-45)
  • Guidelines to assist in training about importance of proper belt use (H-13-32, -33, -35)
  • Lap/shoulder belts should be considered when purchasing belt-equipped buses (H-13-36)
Thank You

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