NHTSA
Motorcoach Crash Test
Objective

• Obtain crash pulse from severe frontal crash event
• Obtain dummy readings for
  – Different dummy sizes
  – Different seat types
    • No belts
    • Lap and shoulder belts (3 – point belts)
    • Lap belts (2 – point belts)
    • Different seat manufacturers
• Study seat and seat attachment strength for different dummy sizes and rear occupant loading
• The test was conducted at the Vehicle Research and Test Center in December 2007.
Motorcoach Details

- 2000 MCI 102EL3 Renaissance
- Series 60 diesel engine
- B500 Allison Automatic transmission
- 54 seats
- 45 ft long, 12 ft 6 inches tall
Seats on the Motorcoach

- Baseline seats
  - No belts
  - American Seating

- Seats with Belts
  - MCI/Amaya
    - 3 point belts – 4 rows (dual seats)
    - 2 point belts – 1 row (dual seats)
  - Freedman Seating
    - 3 point belts – 1 row (dual seats)
Seats (Continued)

- Baseline (No belts)

- MCI/Amaya/FAINSA
  - 3 – point
  - 2 – point

- Freedman 3 – point
Seat Attachments

- 9 occupied, 13 unoccupied rows using OEM equipment
- 2 occupied rows reinforced
Test Conditions

- Speed: 30 mph (48.3 kph)
- Frontal impact: 0 degrees; full overlap
- Fixed Rigid Barrier
- Data channels: 355 dummy; 26 vehicle channels @ 12500 samples/sec
Occupants

• Hybrid III 50\textsuperscript{th} percentile male – 17 dummies
  – 175 cm (5 ft 9 in) tall and 77 kg (170 lb)

• Hybrid III 5\textsuperscript{th} percentile female – 3 dummies
  – 150 cm (5 ft) tall and 50 kg (110 lb)

• Hybrid III 95\textsuperscript{th} percentile male\textsuperscript{**} – 2 dummies
  – 188 cm (6 ft 2 in) and 100 kg (220 lb)

• Each dummy has
  – Accelerometers in head and chest
  – Load cells in upper neck and femur
  – Chest displacement potentiometer

\textsuperscript{**} The 95\textsuperscript{th} percentile male dummy is not in FMVSS
Post Test Pictures
Observation - Restraints

- Unbelted dummies:
  - High head accelerations
- Dummies with 2-pt belts:
  - High head accelerations
- Dummies with 3-pt belts:
  - Low head and neck accelerations
- All dummies have low chest accelerations and chest displacements and femur loads
Observation- Unbelted Dummies

- Unbelted dummies typically made head contact with the backseat in front within 150-180 ms
- Dummies on the aisle seats ended up on the floor and dummies on the window seats ended up on the front seats or on the floor
Observation – Belted Dummies

- Dummies stayed in seats
- Head/Knee contact with front backseat for 95\textsuperscript{th} male dummies
Future Plans

- Conduct roof crush, flammability and evacuation tests
- Evaluate the data for rulemaking recommendations
- Complete information can be found at the www.regulations.gov; docket # NHTSA-2007-28793
Observation – Seat Hardware

• All seat attachments including baseline stayed intact
• Baseline seats and Freeman seatback broke/bent when impacted by unbelted dummies from behind