



# National Transportation Safety Board

## Medium-Size Bus Seat Belt Systems

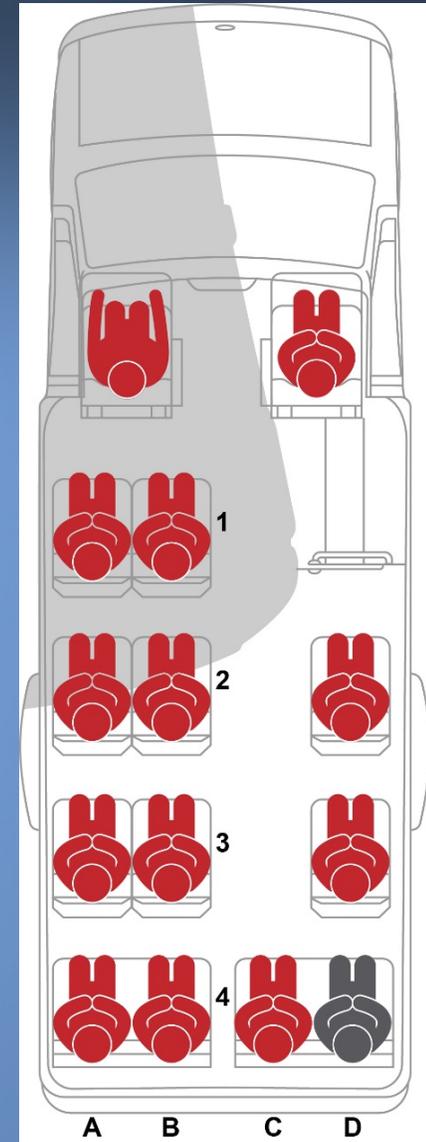
Ronald Kaminski

# Overview

- Injury summary and seat belt usage
- Lap belt effectiveness and design
- Lap/shoulder belt requirements

# Occupant Injuries

- Lap/shoulder belts worn by driver and front passenger
- Lap belts worn by bus passengers
- Intrusion zone: blunt force trauma
- Outside intrusion zone: head, neck, abdomen, and pelvis injuries
- Severe injuries due to upper body flailing



# Survivability

- Surviving a severe crash
  - Maintain space
  - Control motion of body
  - Ride-down crash forces
- Lap belt studies
  - Upper body flailing not controlled
  - Lap belts can sometimes cause injuries



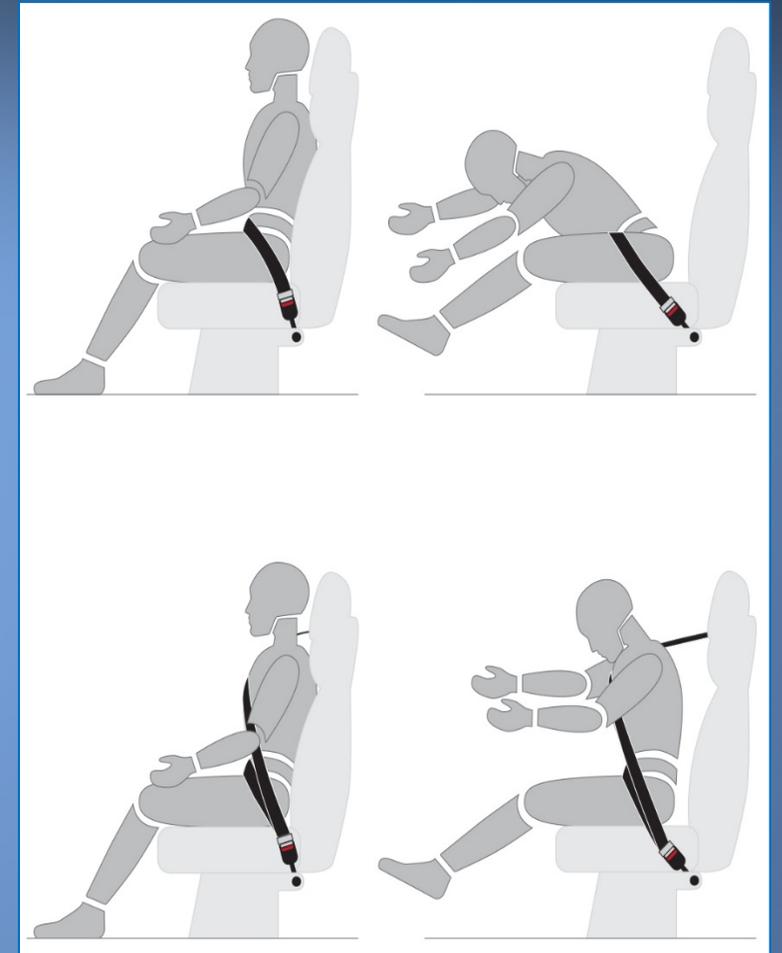
# Lap Belt Design

- Narrow lap belt anchorage points (6.5 inch)
- Narrow anchorage points contributed to severity of injuries
- FMVSS 210 allows narrow anchorage points
- Proposed recommendation to NHTSA to amend FMVSS 210



# Lap/Shoulder Belt Requirement

- Medium-size buses excluded
- Medium-size buses not required to have belts for passengers
- Lap/shoulder belts provide greater restraint
- Lap belt forces concentrated to pelvis and abdomen



# Previous NTSB Investigations

- Lack of occupant protection on medium-size buses
- 2009 Dolan Springs, Arizona
- NTSB safety recommendation (H-10-3)
- Occupants of medium-size buses deserve same level of protection as passengers on motorcoaches, large buses, and passenger vehicles



# Medium-Size Bus and Seat Manufacturers

- Lap/shoulder belts offered as optional equipment
- Consumer demand increasing
- Medium-size buses outsell motorcoaches by 5:1 ratio
- Need for voluntary safety-focused action by medium-size bus manufacturers and seat manufacturers

# Summary

- Lap belts provided insufficient protection
- Narrow anchorage points worsened injuries
- Lap/shoulder belts provide better protection
- Medium-size bus manufacturers and seat manufacturers should install lap/shoulder belts as standard equipment



**NTSB**