



**National
Transportation
Safety Board**

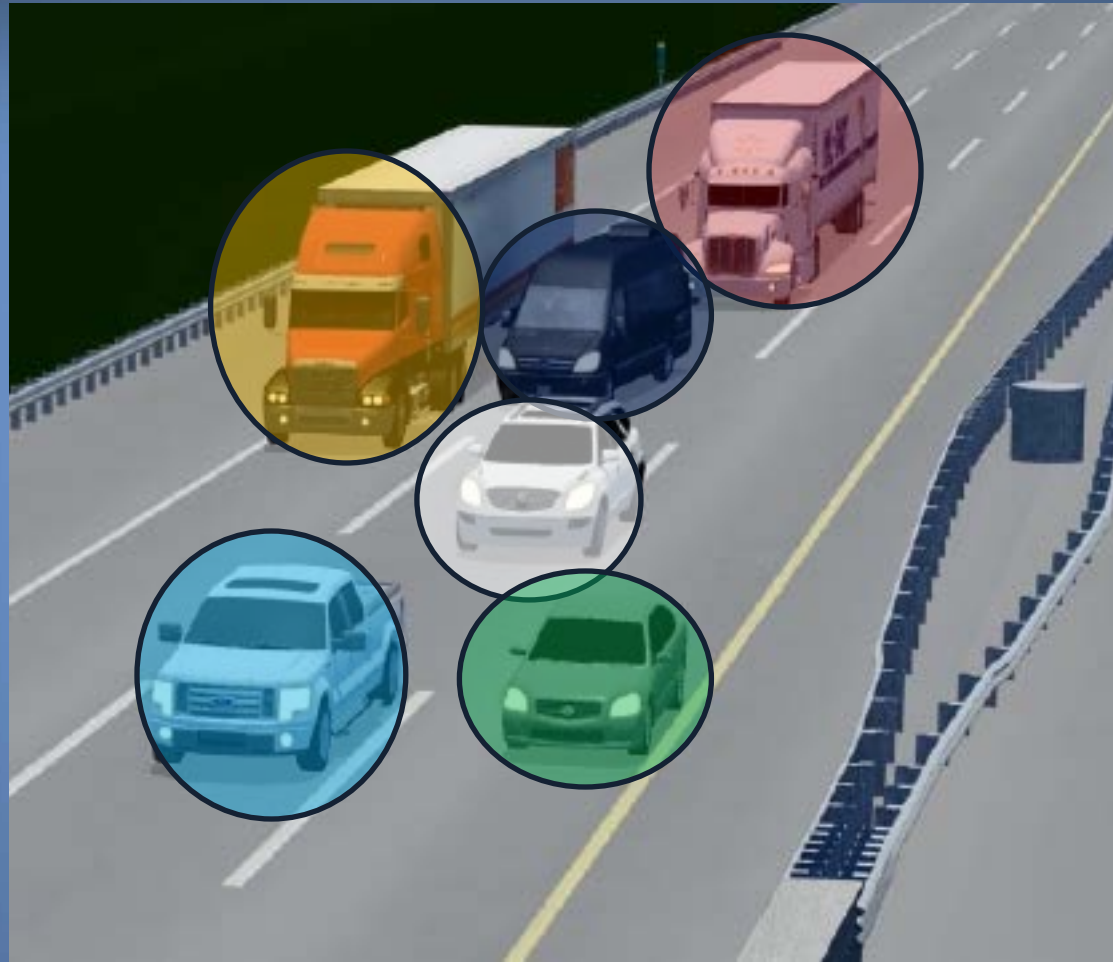
Multiple Vehicle Work Zone Crash on Interstate 95 Cranbury, NJ June 7, 2014

Pete Kotowski - IIC

Location



Accident Description



Animation

Multiple Vehicle
Accident
Cranbury, NJ
June 7, 2014

Combination Vehicle



Source: NJSP



Source: NJSP

Limo van



Source: NJSP

Injured

The crash involved—

- 6 Drivers
- 15 Passengers
- 1 Fatal
- 4 Serious
- 5 Minor
- 11 Uninjured

On-Scene Staff

- Dave Rayburn, Highway Factors
- Dennis Collins, Human Performance
- Mike Fox, Motor Carrier
- Bob Squire, Reconstruction
- Ben Hsu, Recorders
- Shane Lack, Simulation
- Tom Barth, PhD, Survival Factors
- Jennifer Morrison, Vehicle Factors
- Pete Kotowski, Investigator-In-Charge

Report Development Staff

- Deb Bruce, PhD, Project Manager
- Gwynne O'Reagan, Report Editor
- Alice Park, Animation
- Julie Perrot, Safety Recommendations
- Dr. Mary Pat McKay, Medical Officer
- Kristin Poland, PhD Biomechanical Engineer
- Shannon Bennett, General Counsel
- Steve Blackistone, State Government Affairs

Parties

- FMCSA
- NHTSA
- New Jersey State Police
- New Jersey Turnpike Authority
- Middlesex County Prosecutors
Homicide/Fatal Crash Unit
- Bendix Commercial Vehicle Systems
- Walmart Transportation

Safety Issues

- Driver fatigue
- Work zone safety
- Forward collision warning system data
- Critical event recording system data
- Occupant protection
- Vehicle modifications
- Emergency medical services (EMS) standards



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Fatigue and Fatigue Management

Dennis Collins

Overview

- Driver Fatigue
- Driver Performance
- Fatigue Management Programs
- Fatigue Technologies

Driver Fatigue

- Four hours sleep opportunity in previous 33 hours
- Awake in excess of 28 hours
- Missed sleep cycle
- Crash at 12:55 a.m.

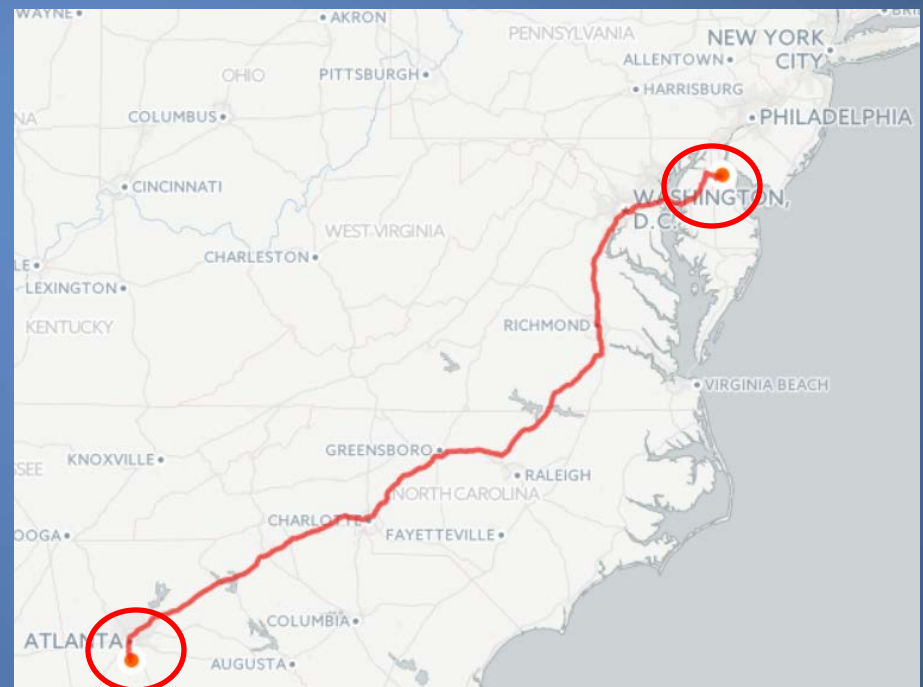
Driver Performance

- Did not comply with reduced speed limit
- No reaction to slowing traffic
- Did not respond to visible tail lights until ~ 200 feet



Fatigue Management Programs

- Long history of fatigue advocacy
- Atypical drive
- Fatigue management programs could reduce chance of similar poor decision

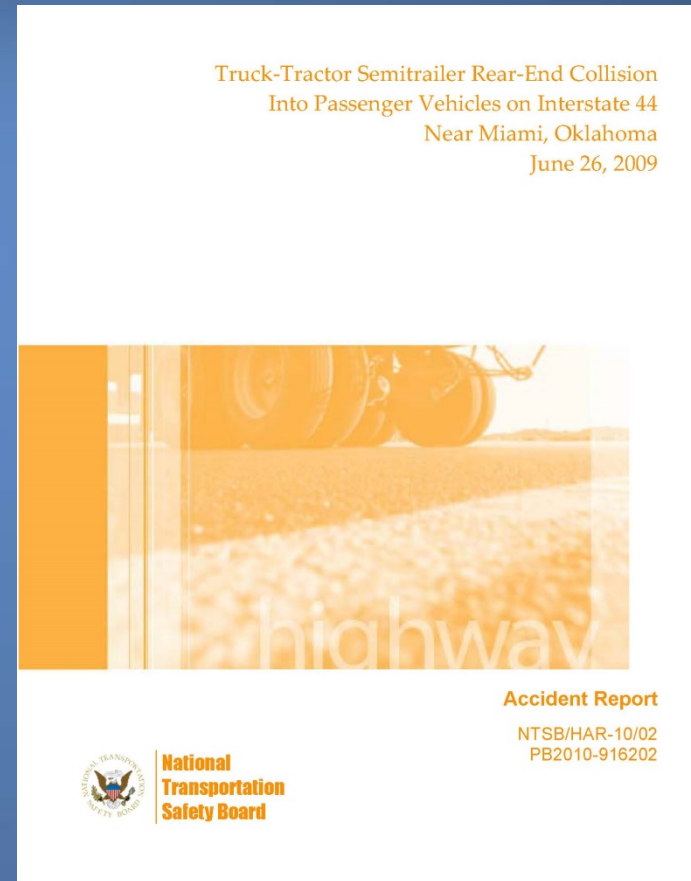


Fatigue Management Programs

- Broad approach to address fatigue risk
- Hours-of-service regulations do not address off-duty choices
- Employer did not have and was not required to have program

Fatigue Management Programs

- NTSB recommendation to FMCSA
- Open – Unacceptable Response
- Requirement would increase safety
- Carriers can act on own



Technology Addressing Fatigue

- 2005: Osseo, WI
- 2009: Miami, OK
- 2012: New York, NY
- Field Operational Test in 2014



Summary

- Driver was fatigued
- Delayed response
- Off-duty choices a factor
- Fatigue Management Programs go beyond Hours of Service
- Requirements would improve safety



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Highway Work Zone Safety

David Rayburn

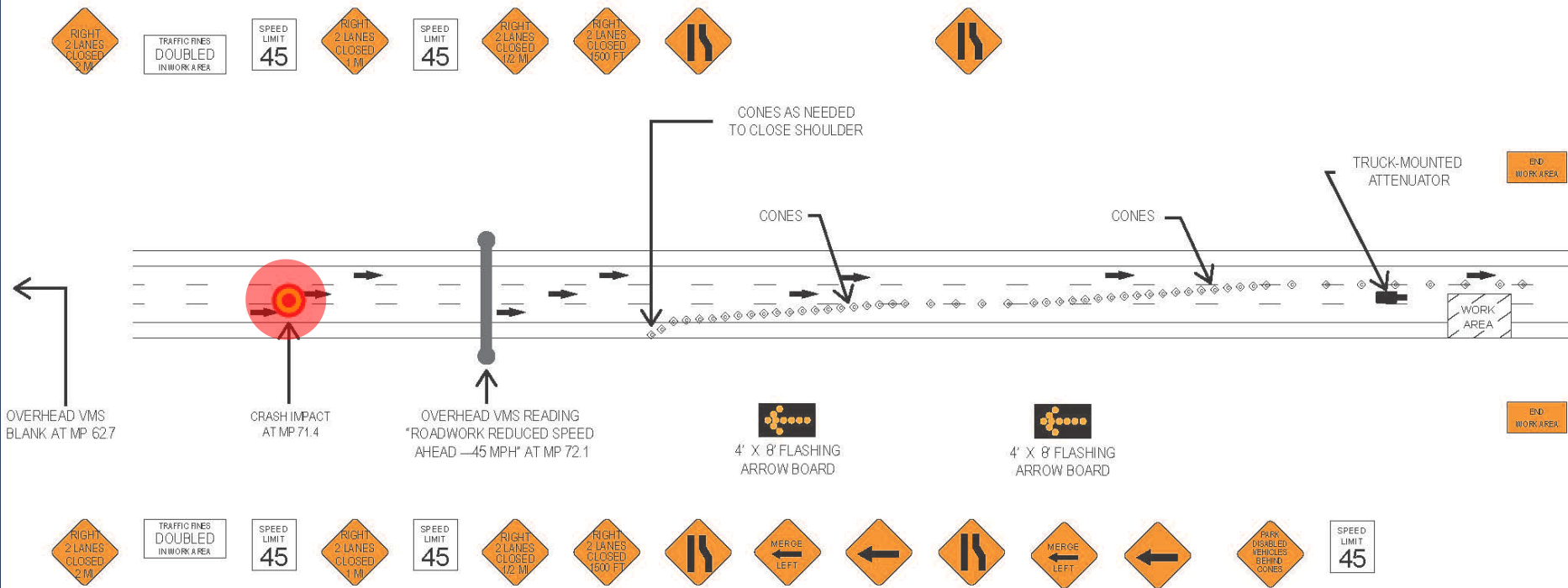
Overview

- Highway Factors Issues
 - Trucks are over-represented in fatal work zone crashes
 - Work zone safety needs to be improved, including reducing vehicle speeds

Crash Risk of Heavy Trucks

- 4.5% of registered vehicles
- 8-9% of miles driven
- 11.2% of all fatal crashes
- 23.6% of fatal work zone crashes
(FMCSA data for 2013 shows 28%)

Work Zone on I-95 near Cranbury, NJ



Work Zone Requirements and Guidance

- FHWA Work Zone Safety Program and Clearinghouse
- Work Zone Best Practices Guidebook August 2013
- MUTCD 2009 Edition
- 23 CFR Part 630 Subpart J Work Zone Safety and Mobility

TTC Plans on Interstates

MUTCD Sec. 6G04 “Modifications to Fulfill Special Needs”

- Additional devices
- Upgrading of devices
- Increased distances
- Lighting

MUTCD Improvements Needed

- More specific guidance on when advance warning distance
- Use of transverse rumble strips to alert drowsy drivers
- End-of-queue protection
- Speed control devices

Speed Differentials and Traffic Queues

- Truck could have stopped before impact if traveling at speed limit of 45 mph
- 2012 NYC crash included recommendations to address speed of heavy vehicles
- Reiterate Recommendations to NHTSA

Summary

Work zone safety needs to be improved by amending the MUTCD guidance for work zone projects on freeways to advise engineers on the use of supplemental traffic control strategies to mitigate crash events with heavy trucks in work zones



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In-Vehicle Forward Collision Warning Systems

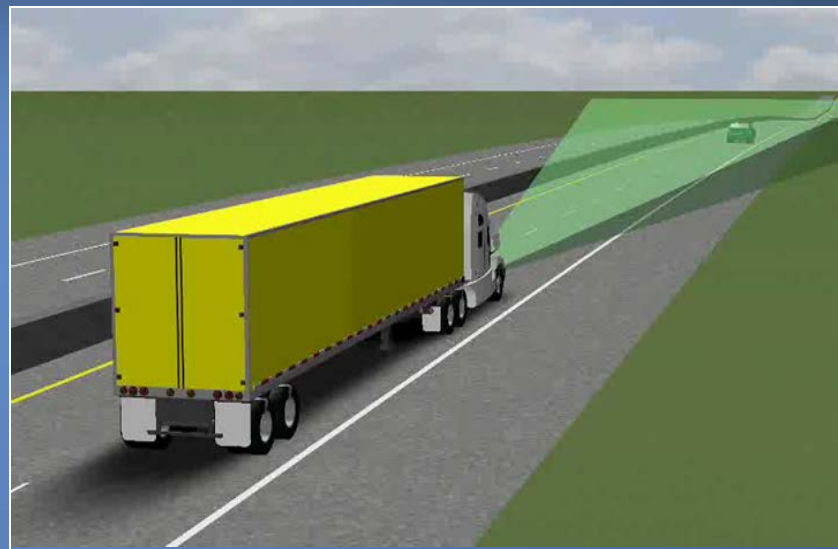
Jennifer Morrison

Overview

- In-vehicle forward collision avoidance onboard the Peterbilt truck
- Data limitations
- Previous recommendations

Bendix Wingman ACB

- Combines:
 - Cruise control
 - Electronic stability
 - Roll stability
 - Anti-lock brakes
- Radar with 500 ft range
- Braking in cruise control only
- Warning alerts available at all times



Bendix Wingman ACB



Example of Following Distance Alert Display



Example of Stationary Object Alert Display



Example of Impact Alert Warning Display



Bendix Wingman Postcrash Data

- No trouble codes
- System functional
- Capable of delivering alerts prior to a loss of radar sensor communication



Bendix Wingman Postcrash Data

- Five seconds of data at 0.5 sec intervals—
 - Cruise control was not in use
 - No radar data
 - No audible alerts recorded
 - Alerts range down to fractions of a second
 - An alert lasting less than 0.5 sec can not be ruled out

Data Limitations

- Data storage a constraint to system analysis and accident reconstruction
- Incomplete record of system performance
- Systems capable of storing and retrieving performance information are needed

Collision Avoidance Advocacy

- NTSB has a long history of advocating collision avoidance systems
- Two decades of examination
 - Potential to prevent or mitigate 80% or more of fatalities and injuries in rear-end crashes
- 2015 Special Investigation Report
 - Closed and superseded previous recommendations
 - Issued new recommendation to NHTSA
 - Issued new recommendations to vehicle manufacturers

Summary

- In this crash—
 - The truck in this crash was equipped with a forward collision warning system
 - Incomplete record of system performance
- Needed—
 - Better data for system improvements
 - Standards and industry-wide adoption



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Critical Event Recording Data

Mike Fox

Presentation Overview

- Equipment and technology
- Critical event reports
- Driver's performance issues
- Performance data to improve safety

Qualcomm System

- All Walmart fleet equipped
- Telematics tracks:
 - Driver hours
 - E-log
 - Driver alerts



Critical Event Reports (CERs)

Hard Brake



Stability Control



Instant E-mail to Management



Driver Performance - CERs

- 9 CERs or 3 per month
- No policy in place
- Identify safety vulnerabilities
- Analyze “near misses” or other safety risks

Summary

- Walmart has technology in place
- CERs conduct risk assessment
- Predictive model of risk
- Data in aggregate terms



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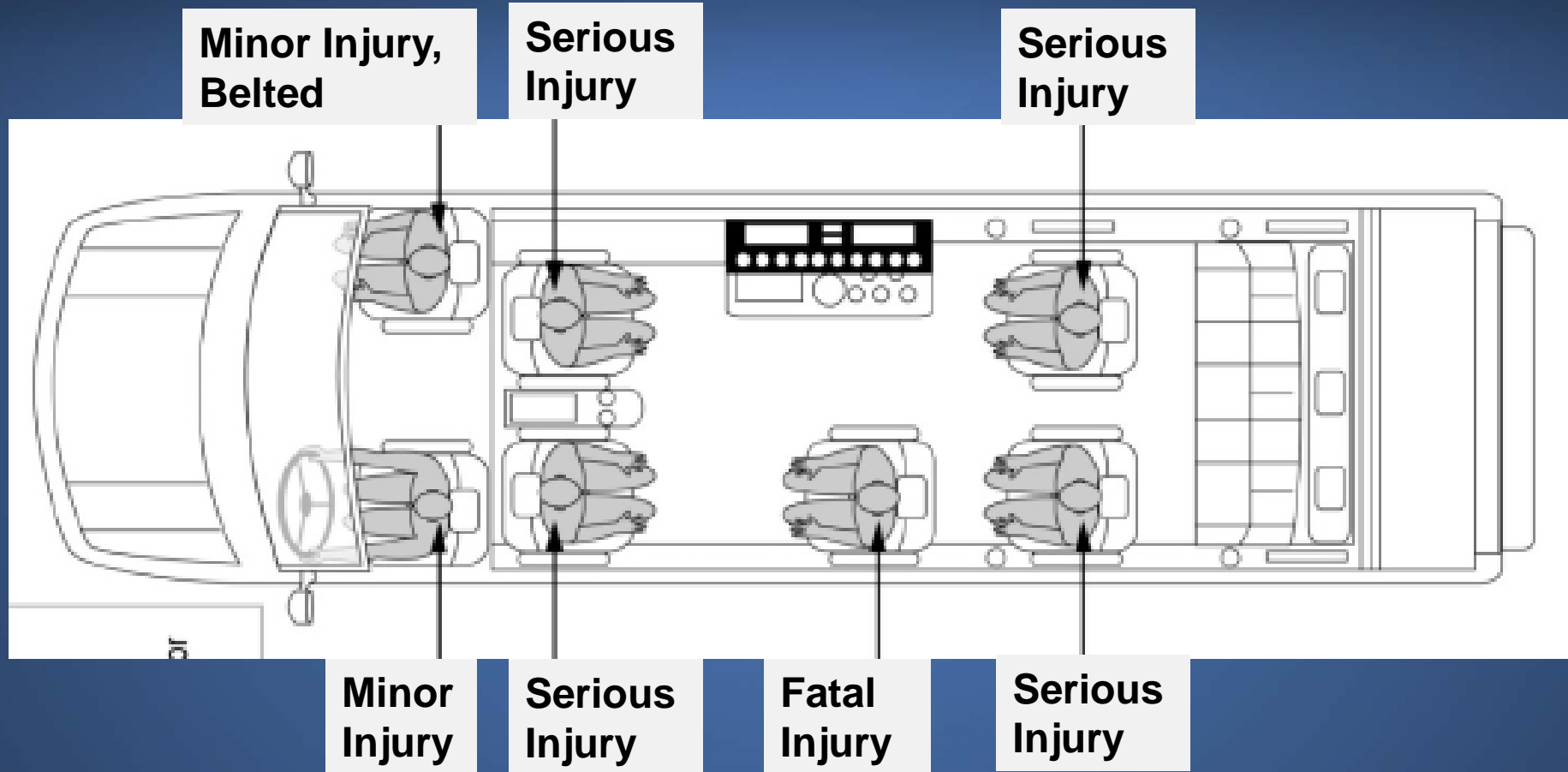
Occupant Protection, Vehicle Modifications, and EMS Standards

Thomas Barth, PhD

Overview

- Survival factors
 - Seat belt use
 - Vehicle modifications
- Emergency response
 - EMS standards

Limo Van



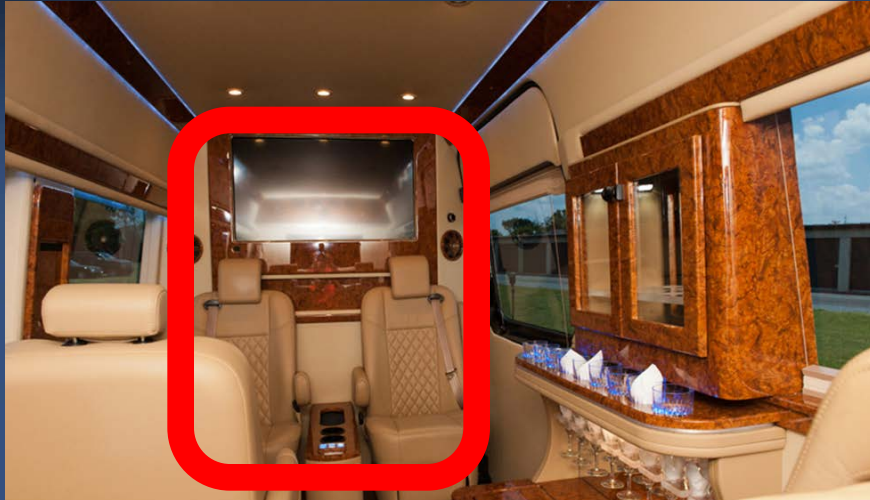
Passenger Compartment Damage



Seat Belt Requirements and Safety Culture

- Delaware and New Jersey law requires use of seat belts
- Limousine environment is easy to overlook the use of seat belts
- No pretrip safety briefing was required, and none was given
- Encourage proper use of head restraints

Vehicle Modifications - Partitions



Source: Atlantic Transportation



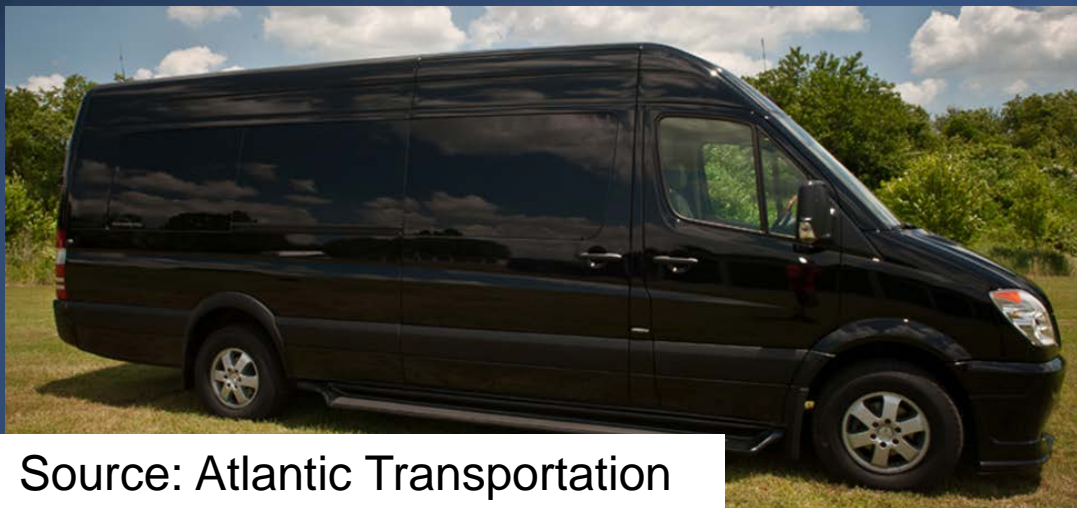
Source: Atlantic Transportation

Front Partition

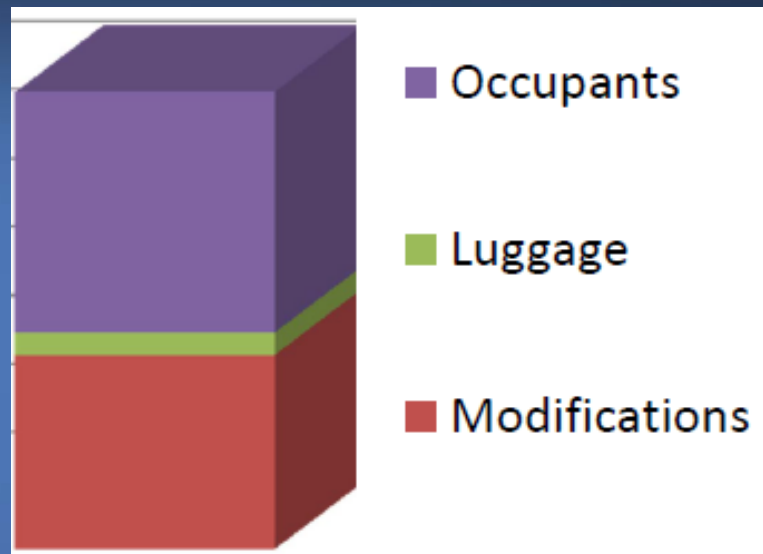
Back Partition

- No emergency exits required
- Limo van not a defined “bus”

Limo Van Payload



Source: Atlantic Transportation



Added seats, equipment, and luggage,

- Used about half the total payload
- Left only 150 lbs average per occupant

Evacuation and Rescue

Sliding door was the only designated exit

Partitions delayed access and evacuation



Source: NJSP



NTSB

Emergency Response

Fire: Hightstown

Basic life support:

Cranbury

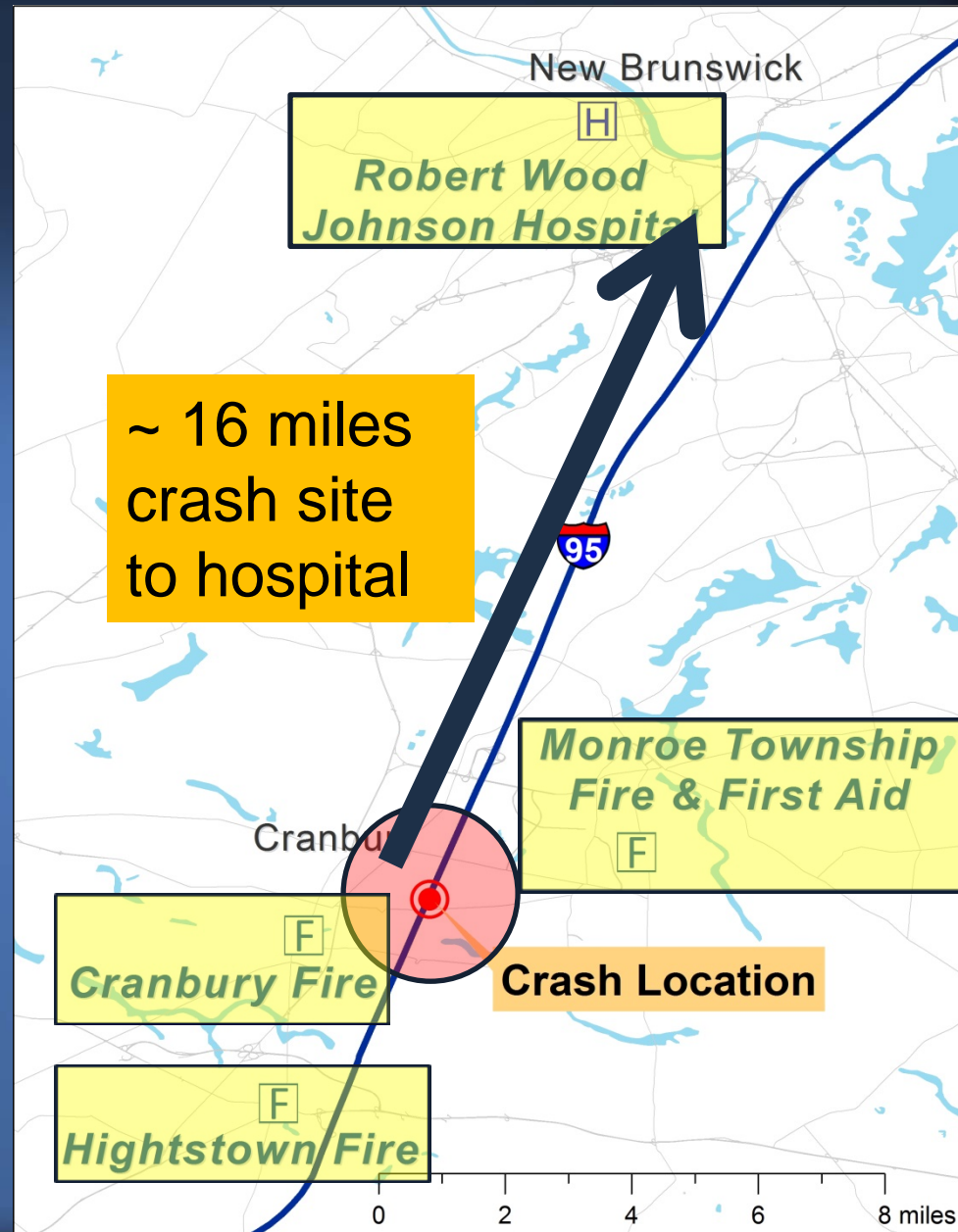
Hightstown

Monroe

Advanced life support:

Robert Wood Johnson

University Hospital



Emergency Response

- Delayed dispatch of sufficient medical services
- Scene confusion and substandard care of the injured
- Root cause attributed to a lack of training and oversight
- Professional and volunteer organizations need consistent training and practice standards

Summary - Occupant Protection

- Reiterate recommendation for pretrip safety briefings
- Guidance for limousine operators
 - Direct passengers to use seat belts
 - Encourage proper use of head restraints

Summary – Vehicle Modifications

- Retain a full-size exit plus an additional exit on an adjacent side
- Communicate capacity information from vehicle manufacturer to operator

Summary – EMS Standards

- State and municipal agencies work with EMS providers to establish minimum training and practice standards



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