National Transportation Safety Board

# LESSONS LEARNED FROM NTSB BUS CRASH INVESTIGATIONS

Stephanie Shaw
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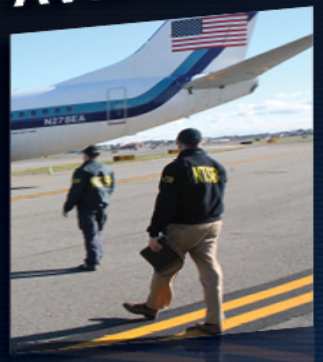
Alabama School Transportation Association Conference
June 6, 2019

# OVERVIEW

- About us
- Ongoing investigations
- School bus occupant protection
- Report on school bus safety
  - Baltimore, MD & Chattanooga, TN crashes
- Other school transportation-related investigations
- Final thoughts

AVIATION



HIGHWAY


MARINE


RAILROAD

PIPELINE


# Our Mission

The NTSB is an independent Federal agency charged by Congress with **investigating** every civil aviation accident in the United States and significant accidents in the other modes of transportation – highway, marine, railroad and pipeline – and **issuing safety recommendations** aimed at preventing future accidents.

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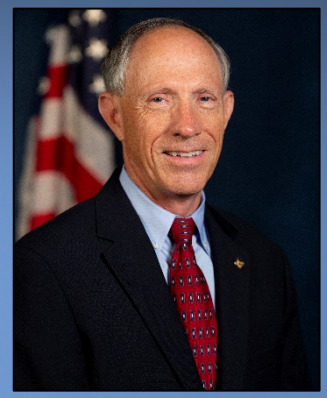
# BOARD MEMBERS AND STAFF

5 Board Members (1 vacant)

- Chairman Robert L. Sumwalt
- Vice Chairman Bruce Landsberg
- Earl F. Weener, Ph.D.
- Jennifer Homendy

- 400 staff (HQ, 4 Regional Offices, Training Center)

Chairman
Robert Sumwalt



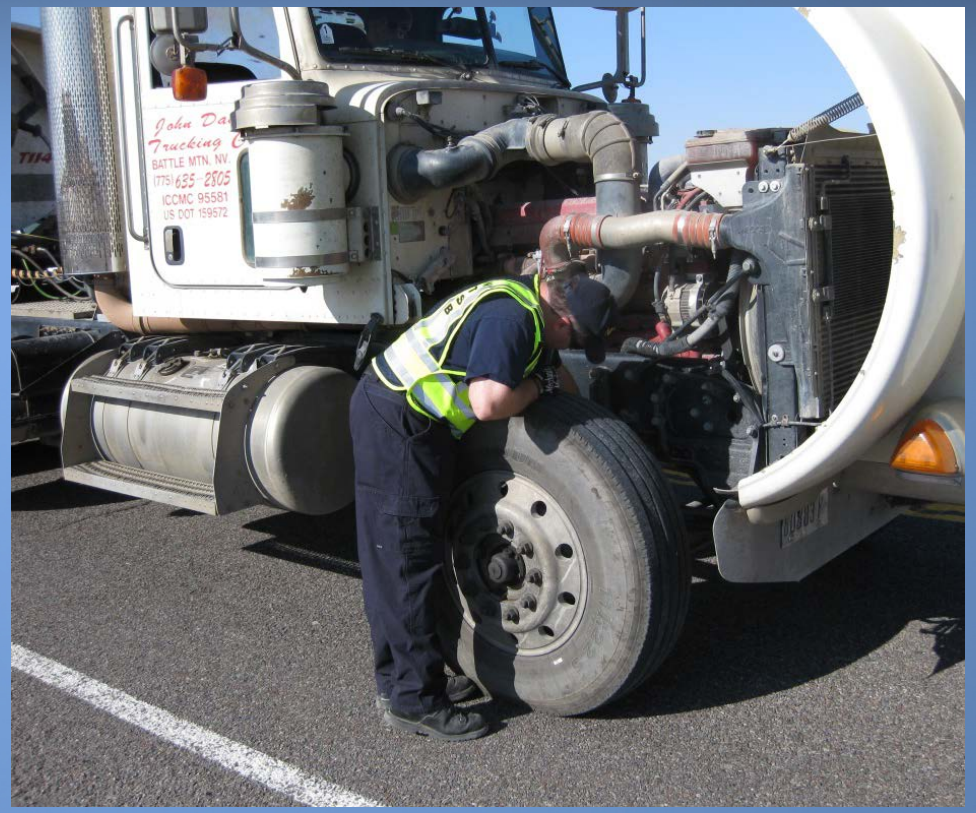
Vice Chairman
Bruce Landsberg

Member
Earl Weener

Member
Jennifer Homendy

# OFFICE OF HIGHWAY SAFETY

- Total staff of about 30 - managers, investigators, writers, and support staff
- Crashes monitored 24-7 from NTSB's Response Operations Center
- Ready to "Launch" at a moment's notice



# NTSB INVESTIGATIONS

- NTSB's three teams of highway investigators launch to about 21 crashes per year

- Launch selection criteria
  - **High public interest?**
  - New or emerging issues?
  - Can we make a difference?
  - Do we have the resources?

# ASPECTS OF THE INVESTIGATION

- Human Performance
- Survival Factors
- Highway Factors
- Vehicle Factors

# TYPES OF HIGHWAY INVESTIGATIONS

Valhalla, NY 2/3/15

Gray Summit, MO 8/5/10

Williston, FL 5/7/16


Orland, CA 4/10/14

Minneapolis, MN 8/1/07



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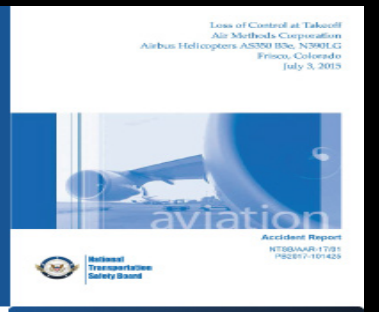


**On-scene Investigation**

**Preliminary Report**

**Public Hearing**

**Board Meeting**

**Final Report**

# NTSB process at a glance

- Organizational meeting
- Groups & parties
- Progress meetings
- Media briefings
- Press releases

- Factual information

- Fact finding
- Depositions
- Witnesses
- Docket

- Docket
- Findings
- Conclusions
- Probable cause
- Safety recommendations

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GOVERNMENT IN THE SUNSHINE ACT

# BOARD MEETING

- Public meeting in Washington, DC
- Webcast
- Staff presentations
- Board member deliberations
- Official adoption of:
  - Report
  - Findings
  - Probable cause
  - Safety recommendations

# NTSB SAFETY RECOMMENDATIONS

- Safety recommendations are the Board's most important product

- Developed to remedy system, hardware, operational or policy failures identified during investigations or safety studies


"These safety recommendations, if acted upon, would prevent future tragedies similar to these."



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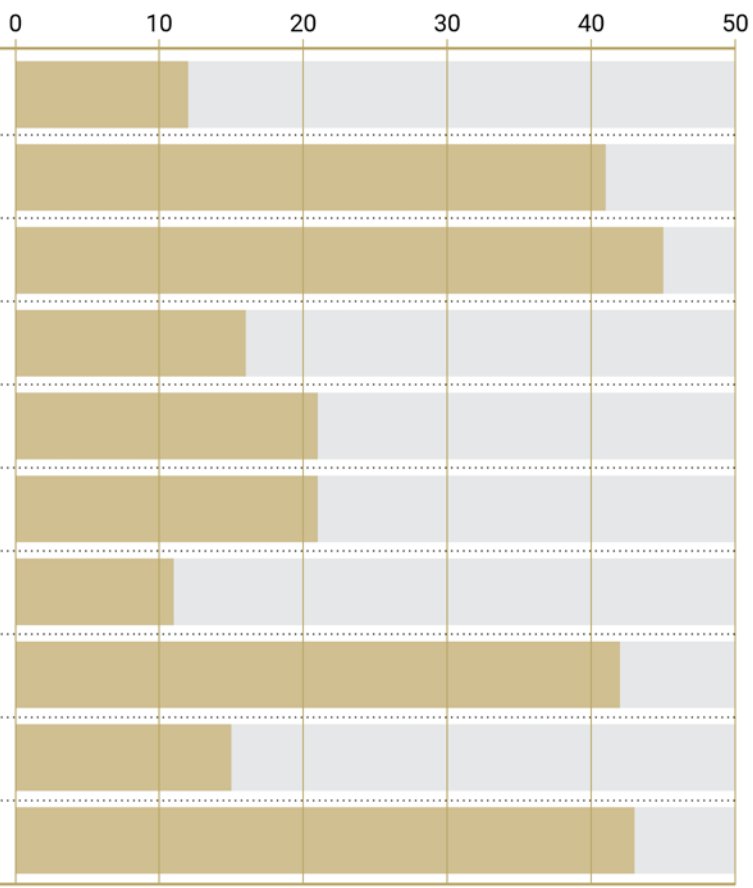
- Increase Implementation of Collision Avoidance Systems in All New Highway Vehicles
- Ensure the Safe Shipment of Hazardous Materials
- Improve the Safety of Part 135 Aircraft Flight Operations
- Strengthen Occupant Protection
- Implement a Comprehensive Strategy to Reduce Speeding-Related Crashes
- Eliminate Distractions
- Reduce Fatigue-Related Accidents
- End Alcohol and Other Drug Impairment
- Require Medical Fitness – Screen for and Treat Obstructive Sleep Apnea
- Fully Implement Positive Train Control
- Improve the Safety of Part 135 Aircraft Flight Operations

# Summary Table of 2019–2020 MWL-associated Open Safety Recommendations (as of December 11, 2018)

| TOPIC AREA | OPEN SAFETY RECOMMENDATIONS |
|---|---|
| Eliminate Distractions | 12 |
| End Alcohol and Other Drug Impairment | 41 |
| Ensure the Safe Shipment of Hazardous Materials | 45 |
| Fully Implement Positive Train Control | 16 |
| Implement a Comprehensive Strategy to Reduce Speeding-Related Crashes | 21 |
| Improve the Safety of Part 135 Aircraft Flight Operations | 21 |
| Increase Implementation of Collision Avoidance Systems in All New Highway Vehicles | 11 |
| Reduce Fatigue-Related Accidents | 42 |
| Require Medical Fitness—Screen for and Treat Obstructive Sleep Apnea | 15 |
| Strengthen Occupant Protection | 43 |
| **Total** | **267** |



# RECENT NTSB INVESTIGATIONS

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# ONGOING: OAKLAND, IOWA

- December 12, 2017 about 6:52 a.m.
- 2004 International school bus
  - 74 year-old driver
  - 16 year-old passenger
- 2 fatal

# ONGOING: MESQUITE, TEXAS

- October 3, 2018 about 3:56 p.m.
- 2019 IC Bus (lap/shoulder belts)
- Run-off-road, rollover with postcrash fire

Source: Star Telegram

# NTSB BOARD MEETING

**Fatal Oakland, Iowa, School Bus Fire**

Tuesday, June 18, 2019, 9:30 a.m. (EDT)
NTSB Boardroom and Conference Center
420 10th St., SW, Washington, DC

The public meeting will also be webcast at http://ntsb.windrosemedia.com/.

The public docket for this investigation is available from the NTSB website at https://go.usa.gov/xmVnE.

# 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



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# ANAHEIM, CALIFORNIA

- April 24, 2014, about 3:37 p.m.
- School bus departed roadway at about 43 mph, struck pole and trees climbing a ~30 degree embankment
- Partial roll onto embankment, sliding/lateral impact
- 5 serious injuries, including driver, 5 minor, 2 uninjured
- Lap/shoulder belts
- On-board video

# NTSB SCHOOL BUS SAFETY VIDEO

Available on the NTSB YouTube channel
https://www.youtube.com/watch?v=ksw67zFnuAE

# SAFETY RECOMMENDATIONS

To NAPT, NASDPT, NSTA:
Inform drivers of the  importance of their health for safe transportation, their responsibility to report health history, and the legal consequences of dishonesty on medical examination reports (H-16-7)

# REITERATED SAFETY RECOMMENDATIONS

To FMCSA:
Develop a comprehensive medical oversight program, including specific guidance for medical examiners (reiterating H-01-20)

To the State of California:
Develop a handout for parents and students regarding the proper use of belts; and develop training procedures to show students how to wear belts properly (reiterating H-13-32)

To NASDPTS:
Encourage members to ensure that on-board video systems have the appropriate view and are functioning properly (reiterating H-15-2)

To NAPT, NASDPT, NSTA:
Provide members with educational materials on the benefits of lap/shoulder belts, and advise them to consider the safety benefit when purchasing belt-equipped buses (reiterating H-13-36)

# HELENA, MONTANA

- November 27, 2017, about 7:13 a.m.
- 2011 Chevrolet Express school bus (lap/shoulder belt equipped)
- Helena School District (driver, adult aide, 3 students all belted)
- Stop sign intersection, left side impact


Source: Independent Record

# SPECIAL INVESTIGATION REPORT: SELECTIVE ISSUES IN SCHOOL BUS TRANSPORTATION SAFETY

## Crashes in Baltimore, Maryland and Chattanooga, Tennessee





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Crashes shared one common factor:

*Poor driver oversight by both the school districts and the contracted carriers*

# SAFETY ISSUES

- School districts' lack of oversight of student transportation providers (Baltimore, Chattanooga)
- Poor management of unsafe school bus drivers by the motor carriers and school districts (Baltimore, Chattanooga)
- Medically unfit school bus drivers (Baltimore)
- Commercial driver license fraud (Baltimore)
- Occupant protection (Chattanooga)
- Benefits of ESC, AEB and event data recorders (Baltimore, Chattanooga)

# BALTIMORE, MARYLAND

- November 1, 2016, 6:30 a.m.
- 2015 IC school bus
  - 67-year-old driver, bus aide
- 2012 Ford Mustang
  - 51-year-old driver
- 2005 New Flyer transit bus
  - 33-year-old driver,

    13 passengers




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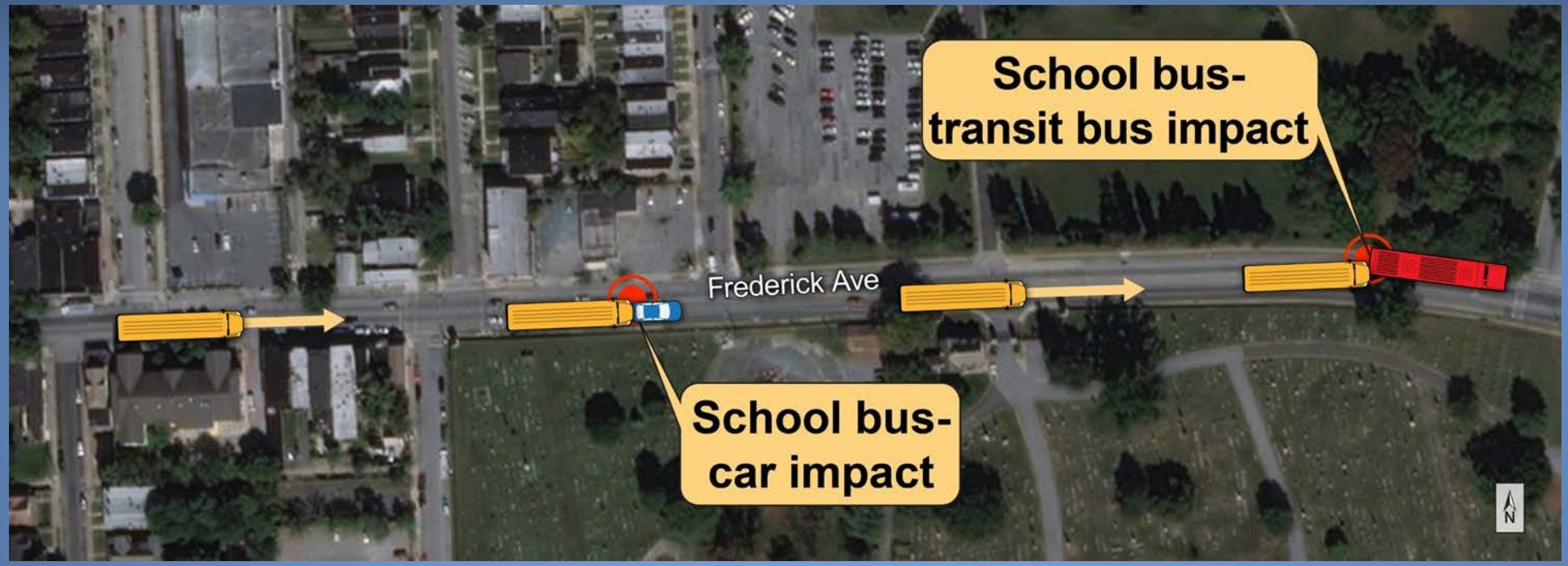
School bus-
transit bus impact
Frederick Ave
School bus-
car impact
N



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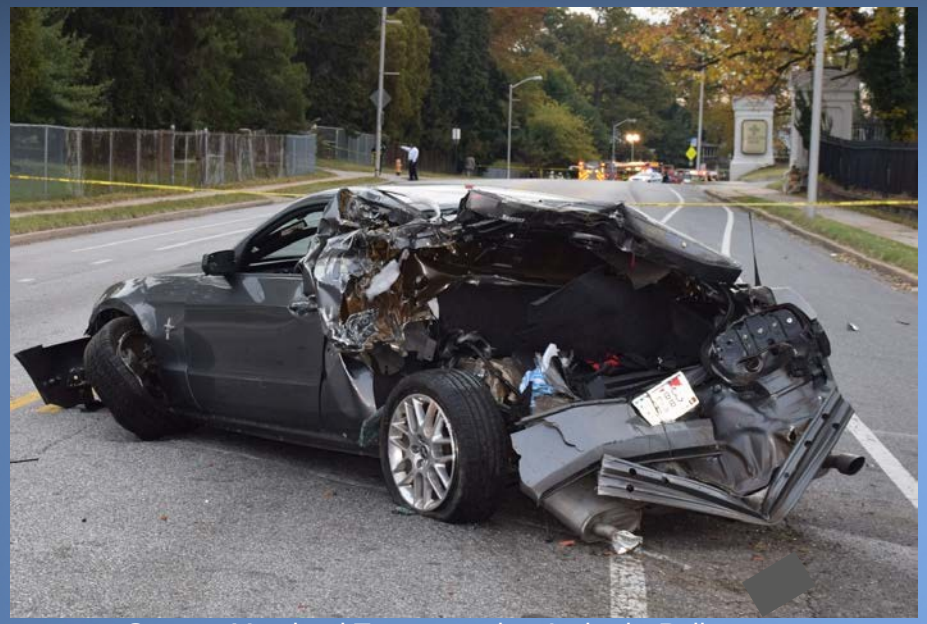
# CRASH SCENE & INJURY INFORMATION



Source: Maryland Transportation Authority Police

Source: Maryland Transportation Authority Police

- Fatalities (2 bus drivers, 4 transit passengers)
- Serious injuries (5 transit passengers)
- Minor injuries (school bus attendant, 4 transit passengers, car driver)

# BALTIMORE SCHOOL BUS DRIVER

- Seizures since childhood
  - Sudden, unpredictable, neurologic episodes
  - Loss of consciousness, uncontrolled movements
- Incapacitated by a seizure led to crash
- Denied seizures to get medical card
- Fraudulently obtained CDLs
- Additional effort needed to increase referral of medically unfit drivers to MVA

# AAAFORDABLE TRANSPORTATION

- Hired in May 2014 (left in April 2016)
- Reliable Transportation April–May 2016
  - Staff witnessed seizure
- AAAfordable rehired driver in August 2016
  - No background check
- Had seizure October 24 (1 week prior to crash)
  - Witnessed by dispatcher and co-workers (no one reported the incident)
- Dispatched for 5 days until crash without doctor's release

# BALTIMORE CITY PUBLIC SCHOOLS (BCPS)

- Heavily involved with daily operations
- Maintained all documentation
- 2008–2016 driver worked for 5 contractors
- 5 school bus crashes
  - October 2011 "*passed out*"
  - No followup or action taken

# AAAFORDABLE & BCPS OVERSIGHT

- AAAfordable allowed medically unfit driver to operate school bus
- BCPS failed to recognize driver high risk
  - Failed to follow its own SOPs
  - Crash reports incomplete
  - Lacked threshold for crashes
  - Failed to follow COMAR

# EARLY SAFETY RECOMMENDATIONS

**To the Baltimore City Public Schools:**

Request that the Maryland State Department of Education have an independent and neutral third party conduct a performance audit of your transportation department that includes a review of crash reports and of disqualifying conditions for school bus drivers under *Code of Maryland Regulations* section 13A.06.07.07. (H-17-013) (Urgent)

# EARLY SAFETY RECOMMENDATIONS

**To the Baltimore City Public Schools:**

- As soon as the performance audit referenced in Safety Recommendation H-17-13 is complete, take the corrective actions recommended to improve internal controls and ensure that all school bus drivers meet the qualification standards under *Code of Maryland Regulations* sections 13A.06.07.06–.07 and that they do not pose any safety risks. (H-17-14)

**To the Maryland State Department of Education:**

- Review and modify the *Code of Maryland Regulations* section 13A.06.07.07, "School Vehicle Driver Disqualifying Conditions and Termination," to clarify the definitions of disqualifying conditions, and to require notification to the Maryland cation of all drivers who are determined to be not qualified during pre-employment screening. (H-17-15)

# CHATTANOOGA, TENNESSEE


- November 21, 2016
- Single-vehicle school bus crash, rolled onto right side, impacted tree
- 2008 Thomas Built  school bus
  - 24-year-old driver
  - 37 students
- 6 students killed, 26 serious to minor injuries
- School bus equipped with multiple systems capable of recording and transmitting event-related data

# VIDEO ANALYSIS, CRASH SIMULATION

- Bus at 52 mph
- 30-mph speed limit zone
- On cell phone
- Excessive speed resulted in loss of control

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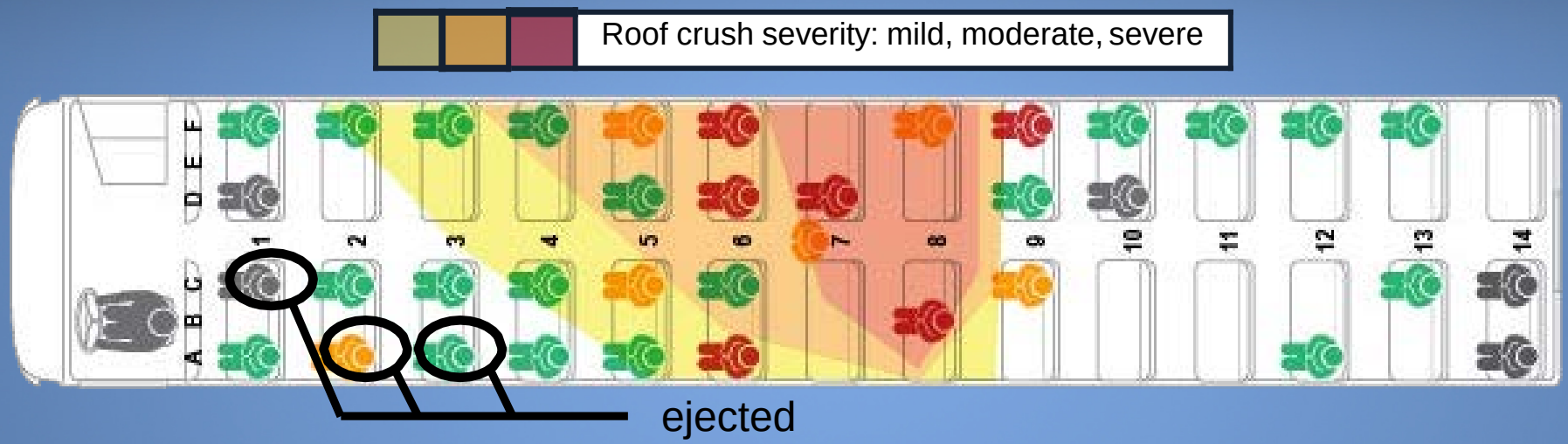
# CHATTANOOGA SCHOOL BUS




Injury severity: fatal (red), serious (orange), minor (green), none (gray)

37 passengers: 6 fatal, 6 serious, 20 minor, 5 uninjured



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# CHATTANOOGA SCHOOL BUS DRIVER

- Driver experience
  - Hired in 2016, had driven few weeks total before crash
- Job performance
  - Previous crashes, numerous complaints

| Date | Complaint | Source |
|---|---|---|
| August 11 | Speeding | Durham School Services |
| August 12 | Speeding | Durham School Services |
| August 18 | Crash in bus (not reported) | Durham School Services |
| September 20 | Crash in bus | Durham School Services |
| September 28 | Intentionally makes students fall by erratic driving | Woodmore Elementary School (parents) |
| October 27 | Speeding | Durham School Services |
| October 28 | Speeding | Durham School Services |
| November 8 | Speeding | Durham School Services |
| November 16 | Erratic driving | Woodmore Elementary School (students) |
| November 18 | Speeding | Woodmore Elementary School (principal) |

# CHATTANOOGA OVERSIGHT

- Hamilton County Dept. of Education
  - Contracted Durham but had limited oversight
  - Forwarded all complaints to Durham
- Durham School Services
  - Lacked systematic complaint tracking
  - Failed to provide adequate driver oversight
- Durham and Hamilton County School District
  - Lack of documentation and resolution
  - Failed to remove unsafe driver

# CRASH PREVENTION TECHNOLOGIES

In both the Baltimore and Chattanooga investigations we determined that crash prevention technologies could have assisted the drivers and could have mitigated or prevented these crashes.

# BALTIMORE CRASH PREVENTION

- Collision avoidance systems mitigate or prevent crashes by detecting vehicles ahead
- Automatic emergency braking intervenes regardless of driver vigilance
- *With CAS and AEB, the school buses impact with the transit bus would not have occurred*

# CHATTANOOGA CRASH PREVENTION

- Electronic stability control evaluates and intervenes in loss of control events and ensures automatic emergency braking benefits
- 2015 *FMVSS 136*
  - **excludes school buses**
- 2017 Canadian CMVSS
  - **includes school buses**
- *ESC could have assisted in maintaining control & mitigated crash severity*

# SPECIAL INVESTIGATION REPORT: SAFETY RECOMMENDATIONS

- 16 new safety recommendations
- 7 reiterated safety recommendations
- Issued to FMCSA, NHTSA, states, manufacturers, medical professionals, NASDPTS, NAPT, NSTA, ASBC related to:
  - Driver oversight
  - Driver licensing and qualifications
  - Collision avoidance technology
  - Event data recorders
  - Occupant protection
  - Medical conditions and reporting

# POSITIVE ACTIONS

- Code of Maryland Regulations modified
- Durham and National Express
  - Improved driver monitoring (camera systems, training)
  - Database for complaint resolution
- Tennessee
  - Law enacted for oversight of contracted transportation service providers by local education authorities and school districts
  - Annual training for transportation supervisors
  - Formal policy for bus safety complaint resolution
- Some states, school districts have enacted legislation requiring lap/shoulder belts on new buses and others have pending legislation

# OTHER SCHOOL TRANSPORTATION- AND BUS-RELATED INVESTIGATIONS

# ORLAND, CALIFORNIA

- April 10, 2014, about 5:40 p.m.
- 2014 Sentra motorcoach (lap/shoulder belt equipped)
- 2007 Volvo truck-tractor double trailer
- Truck and motorcoach driver and 8 motorcoach passengers died
- Passengers were not wearing available seat belts at the time of the crash

Truck-Tractor Double Trailer Median Crossover Collision with Motorcoach and Postcrash Fire
Orland, California
April 10, 2014

Simulation available on the NTSB YouTube channel
https://www.youtube.com/watch?v=j0Zjx9QiybI

# DAVIS, OKLAHOMA

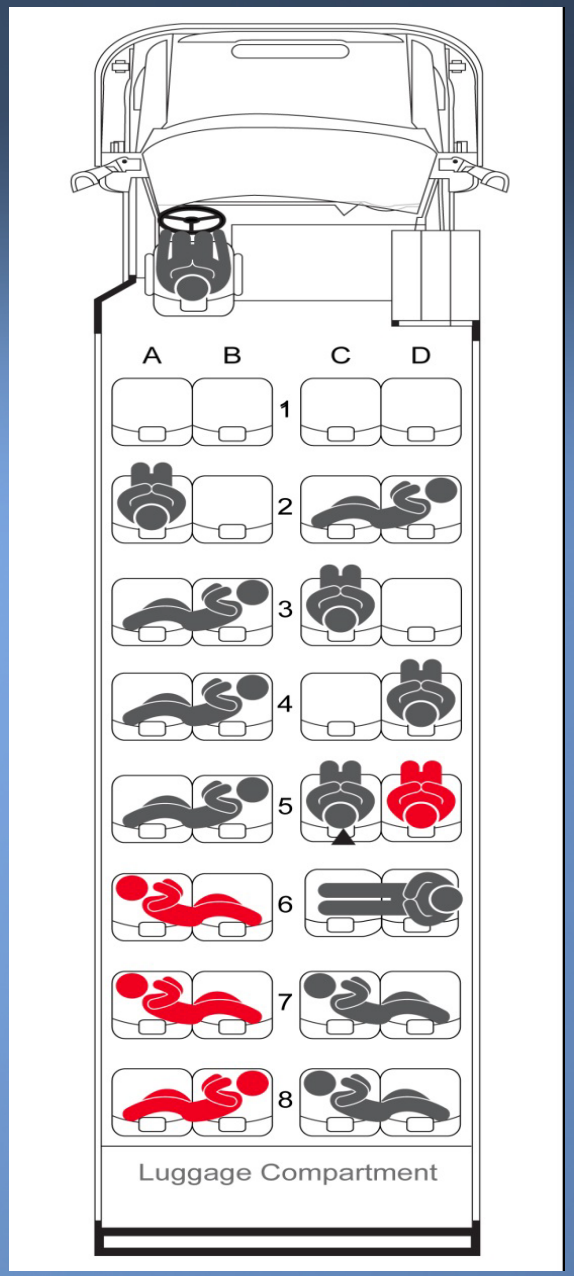
- September 26, 2014, about 9:05 p.m.
- 2013 Peterbilt truck-tractor combination unit
- 2008 Champion medium-size bus (lap belt equipped)
- 4 bus passengers died
- All 15 bus passengers were not wearing available seat belts at the time of the crash

Truck-Tractor Semitrailer
Median Crossover Collision with
Medium-Size Bus on Interstate
Davis, Oklahoma
September 26, 2014

Simulation available on the NTSB YouTube channel
https://www.youtube.com/watch?v=MGdFz_V5EwI

# SEATING CHART

- Medium-size buses
  - No federal requirements for:
    - Roof strength
    - Sidewall structure
    - Window retention
    - Occupant protection



# CONCAN, TEXAS

- March 29, 2017, about 12:20 p.m.
- 2007 Dodge Ram 3500 pickup truck
- 2004 Ford E350 Turtle Top Van Terra medium-size bus (lap/shoulder and lap belt equipped)
- The bus driver and 12 passengers died

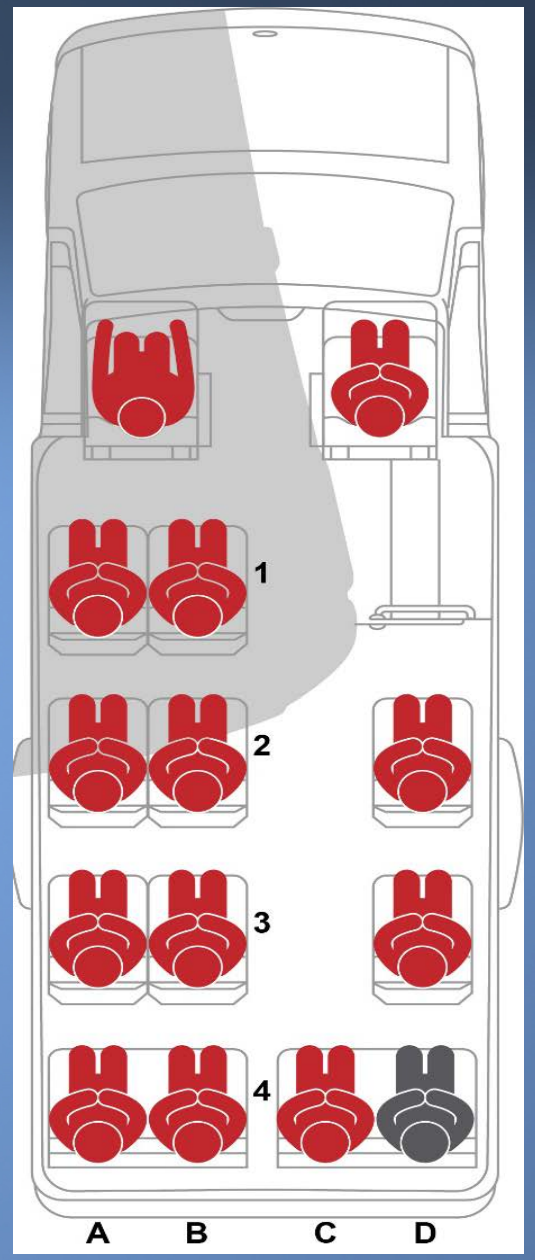
Source: Texas Department of Public Safety

Witness Video
Pickup Truck Centerline Crossover Collision
with Medium-Size Bus on US Highway 83
Concan, Texas
March 29, 2017

Video available on NTSB YouTube channel
https://www.youtube.com/watch?v=jsGsbYTwWbM

# 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



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# LOXLEY, ALABAMA

- March 13, 2018
- Motorcoach roadway departure and crash into ravine
- Transporting high school students on a return trip to Houston from Disney World in Orlando, Florida
- 1 fatality and 46 injuries

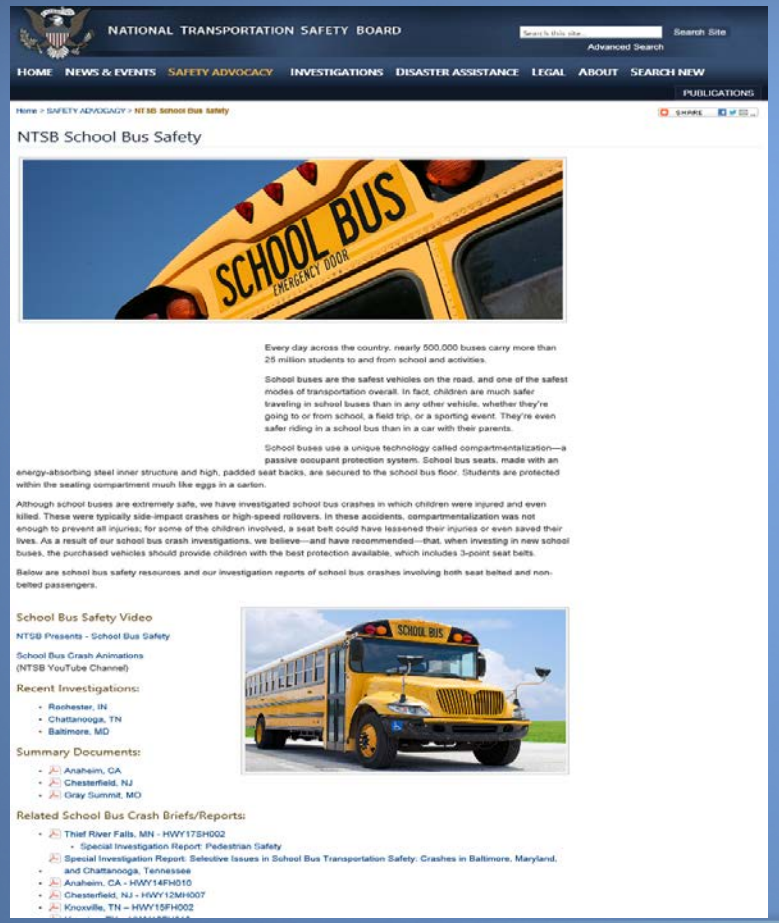
# LOXLEY, ALABAMA

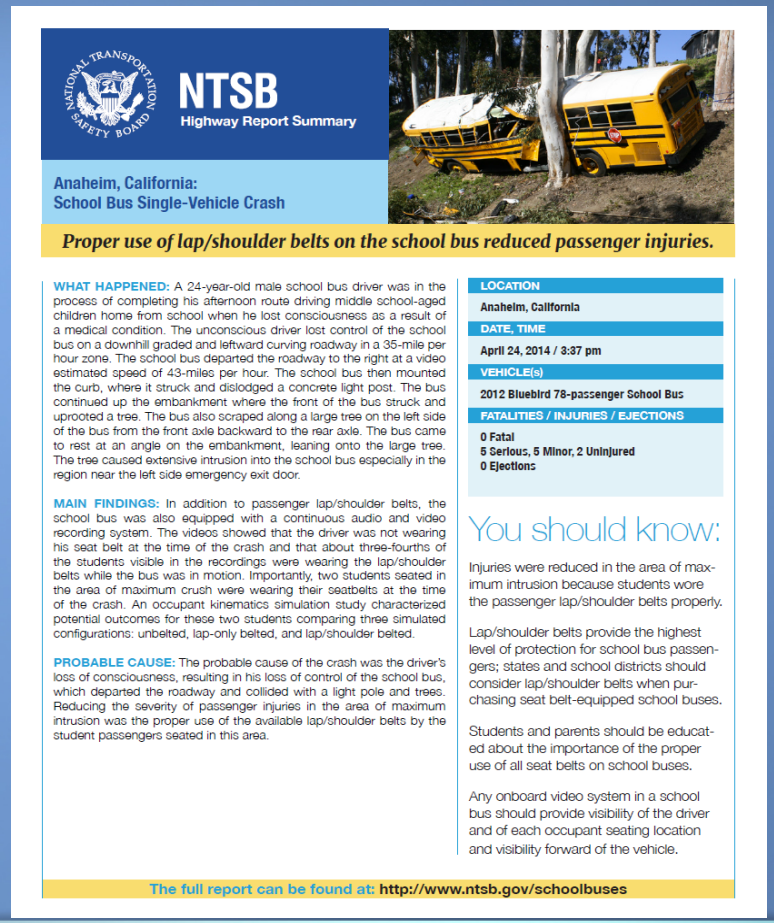
- 56-passenger motorcoach equipped with lap/shoulder belts

*44 of the passenger belts showed no evidence of use*

# NTSB SCHOOL BUS SAFETY WEB PAGE

www.ntsb.gov/schoolbuses



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# LESSONS LEARNED

- School buses are still *the safest* means of transportation to and from school
- There is always room for improvement, and more can be done
- Safety recommendations can benefit everyone, not just the recipient

***From tragedy we draw knowledge to improve the safety of us all***

# ADVOCACY DIGITAL & SOCIAL TOOLS USED

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NTSB Podcast

NTSB Blog – Safety Compass

youtube.com/user/NTSBgov

Constant Contact

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# National Transportation Safety Board