

**Crash Survivor Challenges
Evacuating a Motorcoach with
Postcrash Fire**

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2

The image is a slide with a dark blue background. At the top left is the NTSB logo and name. Below this, the title "Crash Survivor Challenges Evacuating a Motorcoach with Postcrash Fire" is written in a yellow, sans-serif font. Underneath the title, the presenter's name "Thomas Barth, Ph.D." and email address "thomas.barth@ntsb.gov" are written in white. At the bottom left corner, the number "2" is displayed in white.

Objectives

- Provide evacuation critical example with injuries and death due to fire
- Consider alternate perspectives



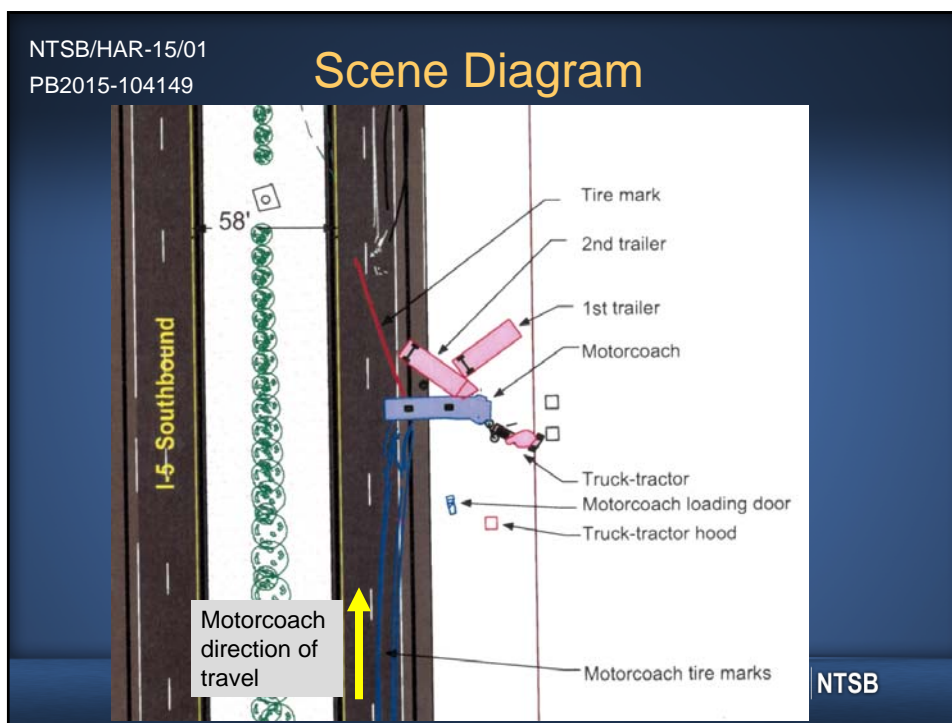
NTSB Investigation HWY14MH009

April 10, 2014 Orland California

46 students from Los Angeles to Humbolt Univ.

- Fed-Ex Tractor/Trailer crossed from southbound over median of Interstate 5 (I-5) to northbound
- Struck a car
- Struck a 2014 Setra 56 pax motorcoach
- Postcrash fire



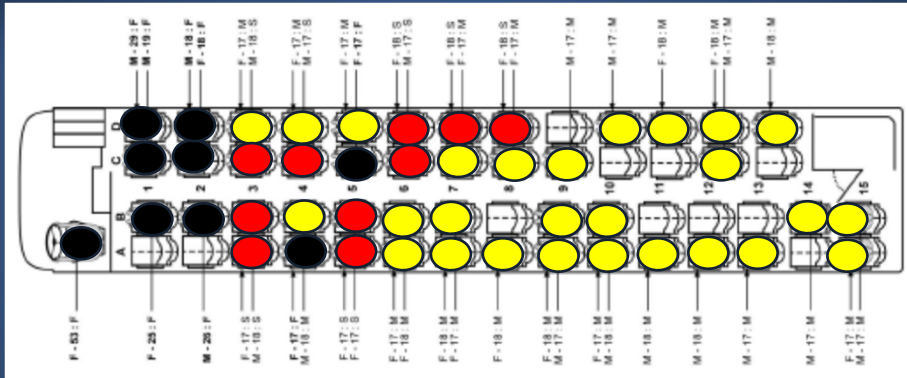


Vehicle Occupants

- **Fed-Ex Truck Driver:** Ejected and Died from Fire
- **Motorcoach Driver:** Died of blunt force trauma
- **Motorcoach Passengers**
 - 8 Fatal (6 from fire, 2 blunt force)
 - 10 Serious (all with fire and blunt force injury)
 - 27 Minor (smoke, crash, evacuation injuries)

Injury Classifications per 49CFR 830.2

Motorcoach Diagram



● Fatal ● Serious ● Minor

7

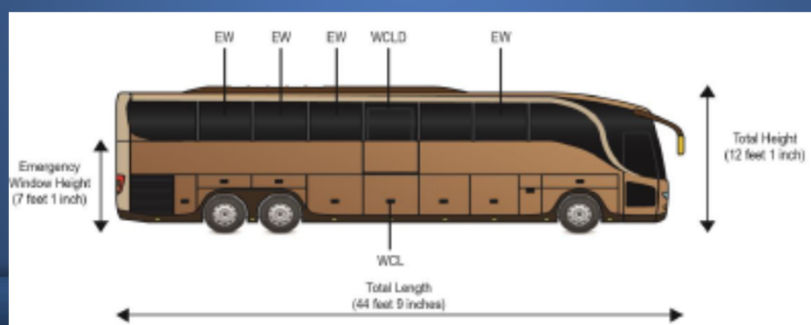


Evacuation



Emergency Exits

- Pre-trip Briefing: Video by insurance carrier
 - Includes use of loading door, exit windows, roof hatches
 - Evidence suggested **video was not shown** on this trip
- 4 Emergency Exit Windows per side
 - Base of window 7 feet from ground



Survival Factors

- **8 Fatalities**
 - 1 died after evacuating motorcoach
 - 3 found on bus, 2 were not in original seat position
 - Others died of blunt force trauma, 1 outside
- **10 Serious**
 - Acute respiratory failure, inhalation injury, burns

Smoke / Fire major factor

Timely evacuation critical

Passenger Experiences

29 of the 37 surviving students interviewed

- All used the exit windows
- ~ half not aware of exit windows prior to crash
- 5 reported opening or kicking out windows
- Most reported difficult visibility due to smoke



Photo: CHP



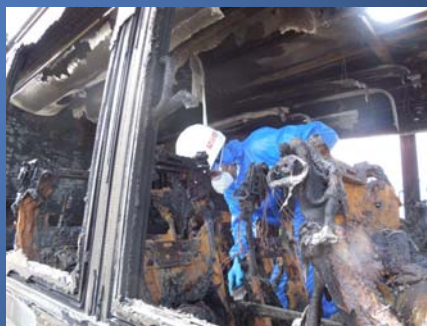
Passenger Experiences (cont.)

- Most reported following others to evacuate
 - Lines formed, some went back and forth between lines
- Concern / fear of widow height and jump
- 70% (21 of 30) attributed some injuries to evacuation
- 68% (18 of 29) attributed some injuries to crash impact



Fire

- Cause: rupture of truck side fuel tank, atomized fuel, sparks from collision or heat from exhaust components
- Contributing to Severity
 - Fire at front of motorcoach
 - Nose-down attitude of motorcoach open exits at rear (chimney effect)
 - Combustibility / toxicity of interior materials



Motorcoach vs Aircraft Flammability

- FMVSS 302 (all motor vehicles)
 - Most recent update 1972
 - small scale fire source
 - no vertical burn component (horizontal only)
 - Predates common use of plastic, carpet, plush seats
- 49 CFR 25.853 (transport aircraft)
 - Vertical burn tests, drip requirement
 - Heat release / toxicity



Recommendations

- Revise FMVSS 302
- Emergency exit path lighting, exit marking
- Require pretrip safety information and labeling
- Exit doors and windows



Photo: CHP



Observations

- Aircraft **design** regulations further evolved
 - why?
 - Fire is flight safety critical, time to land
- Aircraft **operational** rules more robust
 - why?
 - Airplane / Ships operate in non-survivable environment
- Ground vehicle fire regulations don't consider crash caused fires / high occupancy vehicles
 - Criticality of available exits – lines waiting to evacuate



Future Lessons?

- Shifts over time / lack of perspective
- Challenge existing assumptions

- Observations?
- Questions?



Thank You!



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