



National Transportation Safety Board

Truck-Tractor Double Trailer
Median Crossover Collision
With Motorcoach and
Postcrash Fire on Interstate 5
Orland, California
April 10, 2014



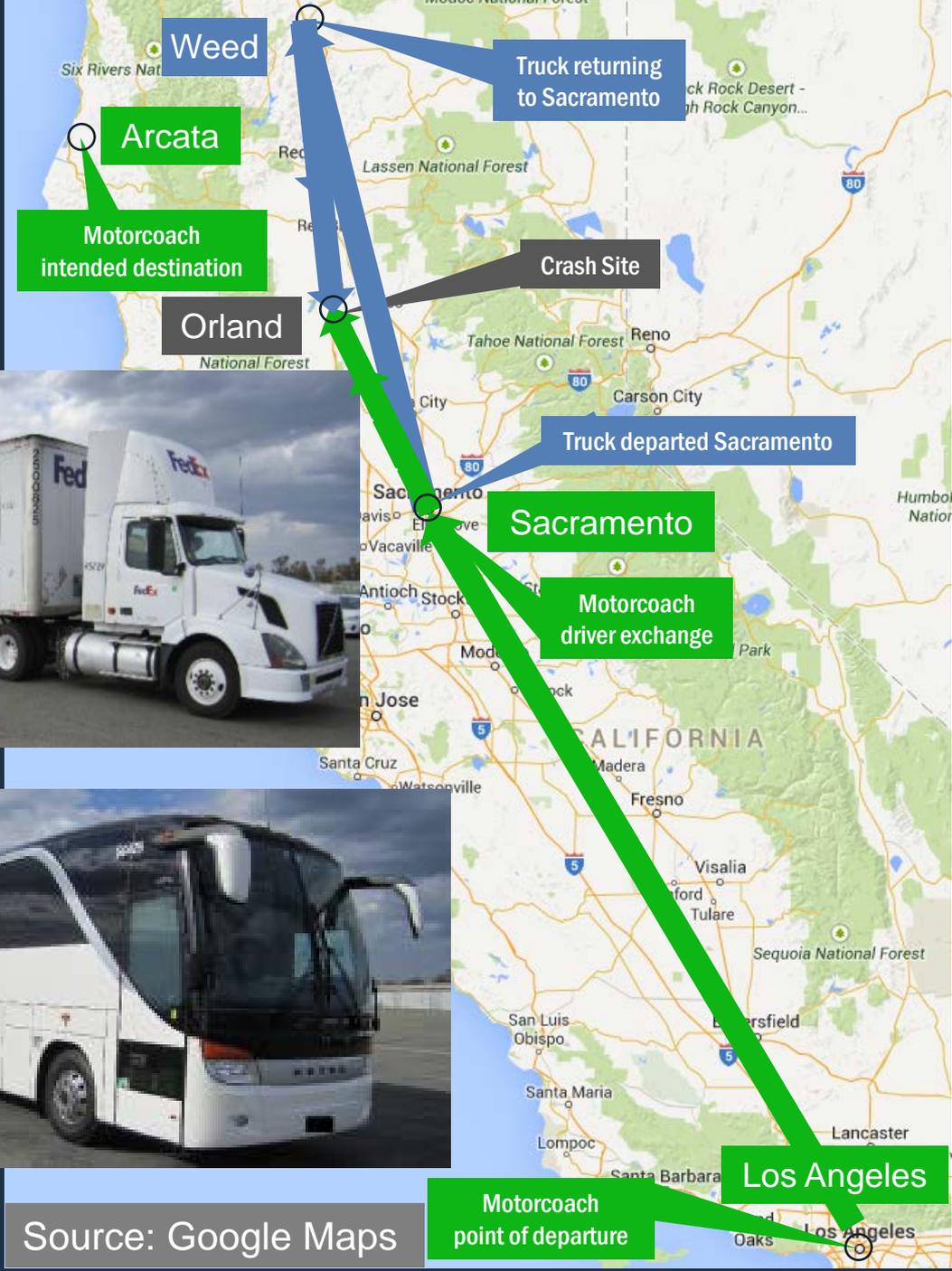
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Median Crossover Collision and Postcrash Fire on Interstate 5 Orland, California

April 10, 2014

Robert Accetta

Investigator-in-Charge



Animation





Truck-tractor

1st trailer

Motorcoach

2nd trailer



Trailer #2 Trailer #1 Truck-tractor

Truck-tractor



6
Trailer #1

Trailer #2



Passenger Car



2014 Setra Motorcoach



Right Front View



Right Rear View



Left Front View

Injury Information

Truck

- Driver — fatal

Motorcoach

- Driver — fatal
- Passengers
 - Fatal — 8
 - Serious — 10
 - Minor — 27

Passenger car

- Driver — minor
- Passenger — minor

On-Scene Staff

Mark R. Rosekind, PhD

Then-Board Member

Patrick Lally

Then-Special Assistant

Mike Fox

Motor Carrier Factors

Steve Prouty

Vehicle Factors

Ron Kaminski

Survival Factors

Tom Barth, PhD

Survival Factors

Dennis Collins

Human Performance

David Rayburn

Highway Factors

On-Scene Staff (cont.)

Robert Squire

Reconstruction

Joe Panagiotou

Fire Factors

Shane Lack

Simulation

Ben Hsu

Recorders

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TDA Specialist

Keith Holloway

Public Affairs

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Recommendations

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Audio/Visual

Mary Pat McKay

Chief Medical Officer

Parties to Investigation

- California Department of Transportation
- California Highway Patrol
- FedEx Freight, Inc.
- Silverado Stages, Inc.
- Eaton Corporation LLC
- TRW Automotive
- Volvo Group North America LLC

Safety Issues

- Fire performance standards
- Pretrip safety briefings
- Motorcoach emergency evacuation
- Heavy vehicle event data recorders



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Human Performance Factors

Dennis Collins

Overview

- Investigation exclusions
- Investigation focus areas
- Work/rest history and fatigue
- Truck driver's medical history

Investigation Exclusions

- Mechanical issues
- Road obstructions
- Vehicle interactions
- Driver distractions
- Driver qualifications



Witness Statements

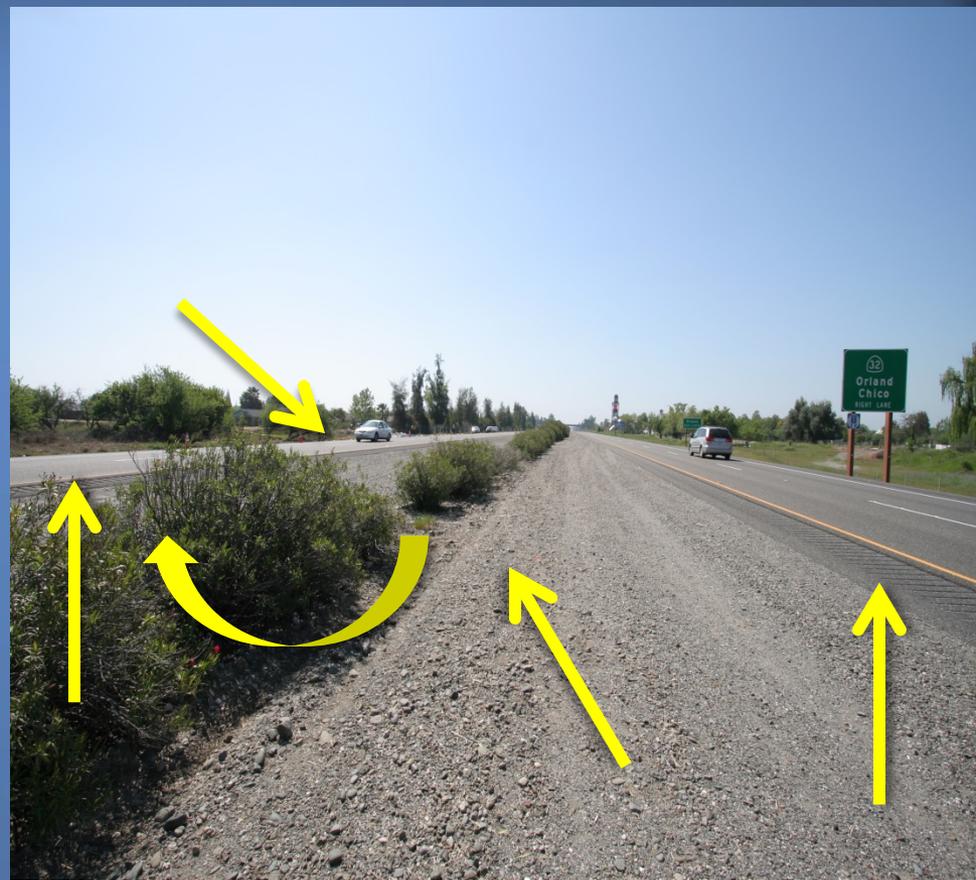
- Another FedEx driver reported of accident truck driver:
 - 2 hours prior to crash, clammy and pale
- Witnesses observed:
 - Drift into median, no brake lights
 - No counter- or evasive steering

Work / Rest History

- Time of day
- Some sleep information limited
- Adequate time available for rest/sleep
- Not on an inverted schedule
- Time awake under 12 hours

Inconsistencies With Fatigue

- No emergency braking or steering
- No reaction to impact with Nissan
- No response to vibratory or auditory cues



Medical History

- Current DOT medical certificate
- No reported illness or injury in 5 years
- Qualified by physician for standard 2-year period

**Medical Examination Report
FOR COMMERCIAL DRIVER FITNESS DETERMINATION**

649-F (8045)

1. DRIVER'S INFORMATION Driver completes this section

Driver's Name (Last, First, Middle)		Social Security No.	Birthdate	Age	Sex <input type="checkbox"/> M <input type="checkbox"/> F	New Certification <input type="checkbox"/> Recertification <input type="checkbox"/> Follow-up <input type="checkbox"/>	Date of Exam
Address		City, State, Zip Code	Work Tel. ()	M/D/Y		License Class <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> Other	State of Issue
			Home Tel. ()				

2. HEALTH HISTORY Driver completes this section, but medical examiner is encouraged to discuss with driver.

<p>Yes No</p> <p><input type="checkbox"/> Any illness or injury in the last 5 years?</p> <p><input type="checkbox"/> Head/Brain injuries, disorders or illnesses</p> <p><input type="checkbox"/> Seizures, epilepsy <input type="checkbox"/> medication _____</p> <p><input type="checkbox"/> Eye disorders or impaired vision (except corrective lenses)</p> <p><input type="checkbox"/> Ear disorders, loss of hearing or balance</p> <p><input type="checkbox"/> Heart disease or heart attack, other cardiovascular condition <input type="checkbox"/> medication _____</p> <p><input type="checkbox"/> Heart surgery (valve replacement, bypass, angioplasty, pacemaker)</p> <p><input type="checkbox"/> High blood pressure medication _____</p> <p><input type="checkbox"/> Mental disease</p> <p><input type="checkbox"/> Shortness of breath</p>	<p>Yes No</p> <p><input type="checkbox"/> Lung disease, emphysema, asthma, chronic bronchitis</p> <p><input type="checkbox"/> Kidney disease, dialysis</p> <p><input type="checkbox"/> Liver disease</p> <p><input type="checkbox"/> Digestive problems</p> <p><input type="checkbox"/> Diabetes or elevated blood sugar controlled by: <input type="checkbox"/> diet <input type="checkbox"/> pills <input type="checkbox"/> insulin</p> <p><input type="checkbox"/> Nervous or psychiatric disorders, e.g., severe depression <input type="checkbox"/> medication _____</p> <p><input type="checkbox"/> Loss of, or a threat to consciousness</p>	<p>Yes No</p> <p><input type="checkbox"/> Fainting, dizziness</p> <p><input type="checkbox"/> Sleep disorders, pauses in breathing while asleep, daytime sleepiness, loud snoring</p> <p><input type="checkbox"/> Stroke or paralysis</p> <p><input type="checkbox"/> Wasting or impaired hand, arm, foot, leg, finger, toe</p> <p><input type="checkbox"/> Spinal injury or disease</p> <p><input type="checkbox"/> Chronic low back pain</p> <p><input type="checkbox"/> Regular, frequent alcohol use</p> <p><input type="checkbox"/> Narcotic or habit forming drug use</p>
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For any YES answer, indicate onset date, diagnosis, treating physician's name and address, and any current limitation. List all medications (including over-the-counter medications) used regularly or recently.

I certify that the above information is complete and true. I understand that inaccurate, false or missing information may invalidate the examination and my Medical Examiner's Certificate.

Driver's Signature _____ Date _____

Medical Examiner's Comments on Health History (The medical examiner must review and discuss with the driver any "yes" answers and potential hazards of medications, including over-the-counter medications, while driving. This discussion must be documented below.)

Medical History (cont.)

- No personal physician
- No medication use
- No prescription records found
- Negative postcrash toxicology
- No significant findings of natural disease

Medical or Physiological Event

- Unresponsive due to unknown cause(s)
- Certain incapacitating conditions may not leave evidence
- No evidence of specific medical condition

Summary

- Truck driver unresponsive
- Due to unknown cause(s)
- Prevented control of vehicle
- Resulted in collisions



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Fire Initiation and Propagation

Joseph Panagiotou

Overview

- Fire initiation and propagation
- Passenger vehicle flammability standard (FMVSS 302)
- Improvement of FMVSS 302 is needed to increase safe evacuation time

Fire Initiation



- Nearly frontal collision
- Front of motorcoach breached
- Fuel tank rupture and fuel dispersal
- Ignition

Fire Propagation

- Nose-down orientation
- Fire in forward portion
- Opening of rear windows
- Chimney-like effect
- Burn through of roof hatches
- Rapid fire spread



Source: © Hector Amezuca/Sacramento Bee/Zuma Wire

Interior fire conditions

- Approximately 2 minutes after impact
- Smoke filled interior
- Visibility diminished and impeded evacuation
- Burn injuries, smoke inhalation
- 3 fatalities inside motorcoach



Safety Standard FMVSS 302

- Intended to reduce deaths, injuries caused by vehicle fires
- Small-scale flammability test, not real-world ignition sources
- Inadequate for today's vehicle interiors

Fire Safety Recommendation History

- Issued to NHTSA over past 40 years
- Aimed at providing sufficient emergency evacuation of vehicles
- Modern motorcoach interiors burn more easily than rail, transit bus, and aircraft interior materials
- Current motorcoach materials limit time for escape and survival

Same Flammability Requirements

4-passenger capacity



82-passenger capacity



Increased capacity = increased risk

Summary

FMVSS 302 should:

- Represent real-world fire scenarios
- Predict full-scale fire performance
- Be appropriate for evacuation time needed for high occupancy vehicles



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Survival Factors

Ronald Kaminski

Overview

Survival factors issues

- Evacuation and injuries
- Pretrip safety briefings
- Emergency lighting and signage
- Emergency exit door

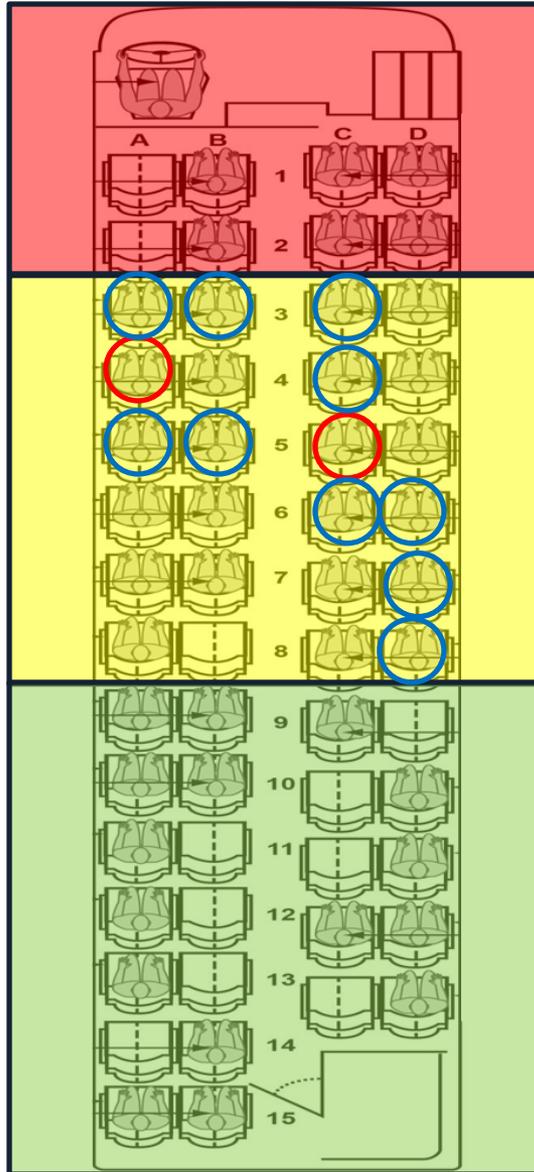
Evacuation



Source: Jeremy Lockett

Evacuation (cont.)





Pretrip Safety Briefings

- Under stress, passengers may not use most appropriate exit
- Passengers need to understand safety features and exit locations

Emergency Lighting and Signage



Emergency Lighting and Signage



Emergency Exit Door

- Standing is counter to common convention in fire situations
- Current Federal Motor Vehicle Safety Standards permit exit doors
- Secondary door allows for rapid evacuation

Emergency Exit Door



Source: Setra-Coaches.com

Summary

- Requirement for pretrip safety briefings
- Improvements in motorcoach/bus design:
 - Emergency exit windows
 - Reliable emergency lighting fixtures
 - Interior luminescent emergency signage
- Additional exit door



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Event Data Recorders

Steven L. Prouty

Overview

- Electronic engine control systems
- Data limitations from crash vehicles
- Crash survivability of recorders
- Previous EDR recommendations

Electronic Engine Control Systems

Primary Functions

- Control engine timing
- Control fuel injection
- Coordinate vehicle performance

Secondary functions

- Record diagnostic fault code data
- Record other triggered events

Crash Survivability



Crash Survivability



Event Data Recorders

- Provide comprehensive account of collision related events
- Necessary to improve
 - Vehicle compatibility
 - Crashworthiness
 - Occupant protection

EDR Recommendation History

- Crash event recording is required in other modes of transportation
- 1998 - first EDR recommendations issued
- 1999 - recommendations were made concerning requirements and standards for EDRs

Summary

- Without EDRs, critical data remains unavailable
- EDR use would improve analysis of vehicle collisions
- EDR data would advance research in commercial vehicle safety strategies



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Right Side Fuel Tank

