EMS Focus
A Collaborative Federal Webinar Series
Staying Safe on the Road: How You Can Help Make Ambulances Safer and Prevent Crashes
WHEN AMBULANCES CRASH
EMS Provider & Patient Safety

DATA COLLECTED BETWEEN 1992-2011

4,500 vehicle traffic crashes involving an ambulance per year
ESTIMATED ANNUAL AVERAGE

34% resulted in injuries

33 people killed per year

Injury Severity and Use of Safety Restraints in EMS Providers*

84% of EMS providers in the patient compartment were not restrained*

* EMS Focus
ONLY 33% of patients were secured with shoulder and lap restraints in serious crashes.

44% of patients were ejected from the cot in serious crashes.

61% restrained with lateral belts only.

38% shoulder harnesses were available but were not used.

SIT DOWN & BUCKLE UP! Secure Your Patients. They Rely on You!

This safety message brought to you by NHTSA’s Office of EMS.
Today

► Reporting vehicle and equipment defects
► Defect investigations and recalls
► Ambulance crash investigations
► Questions
Today’s Speakers

► Peter Kivett
  ▶ Safety Defects Engineer, NHTSA Office of Defects Investigation

► Harold Herrera
  ▶ Crash Investigation Specialist, NHTSA Special Crash Investigation Program

► Max Sevareid, MPH
  ▶ EMS Specialist, NHTSA Office of EMS
Office of Defects Investigation Initiation
What Can ODI Do For You

Peter Kivett
Office of Defects Investigation
AGENDA

• Mission
• Safety Defect Definition and Review
• ODI Investigation Initiation Process
Office of Defects Investigation

- Vehicle Defects A
  - Trends Analysis
- Vehicle Defects B
  - Alexander Ansley - Chief Program Support
- Vehicle Defects C
  - Recall Management
- Vehicle Defects D
  - Correspondence Research
- Bruce York - Chief Medium/Heavy Duty
  - Heavy/Medium Truck
    - Kye Bowker/Ryan Rahimpour
  - Bus
    - Ryan Rahimpour
  - RV
    - Ryan Rahimpour
  - Trailer
    - Kye Bowker/Ryan Rahimpour
  - Emergency Vehicle
    - Pete Kvetz
  - Equipment
    - Pete Kvetz
  - Adaptive Equipment
    - Pete Kvetz
  - Motorcycles
    - Pete Kvetz

EMS Focus
Office of Defects Investigation Mission
Office of Defects Investigation Mission

- Identify design or manufacturer defects relating to motor vehicle safety
- Assure that defects are remedied effectively and promptly
- Assure that non-confidential information relating to investigations and recalls is made available to the public
- www.nhtsa.gov
ODI Jurisdiction

► Vehicles licensed for road use
  ▶ Cars, motorcycles
  ▶ RVs, HD trucks, buses

► Vehicle Equipment
  ▶ Tires
  ▶ Child Restraints
  ▶ Accessories
NHTSA Consumer Vehicle Complaint Process
Risk Matrix

Risk-Based Processes for Safety Defect Analysis and Management of Recalls


<table>
<thead>
<tr>
<th>Severity Level</th>
<th>Detectability of Condition</th>
<th>Consequence of Failure</th>
<th>Frequency Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL-5</td>
<td>None/poor detectability</td>
<td>Severe or fatal injury</td>
<td>Y R R R R R</td>
</tr>
<tr>
<td>SL-4</td>
<td>Moderate injury</td>
<td></td>
<td>G Y R R R R</td>
</tr>
<tr>
<td>SL-3</td>
<td>Good/reasonable detectability</td>
<td>Severe or fatal injury</td>
<td>G G Y R R R</td>
</tr>
<tr>
<td>SL-2</td>
<td>Moderate injury</td>
<td></td>
<td>G G G Y R R</td>
</tr>
<tr>
<td>SL-1</td>
<td>Not considered</td>
<td>Minor Injury</td>
<td>G G G G Y</td>
</tr>
</tbody>
</table>

Notes:
- **Detectability:** Presence or lack of warning lights, messaging and notifications; audible warnings and abnormal noises; vehicle handling and/or performance anomalies, the presence of which would be reasonably expected to be noticeable by a typical driver or occupant.
- **Consequence:** Severe injury means AIS 3 and above injuries, including death, that typically require significant medical treatment and/or hospitalization, moderate means AIS 2 type injuries, and minor means AIS 1 or any injury allegation such as minor cuts or soft tissue.
- **Incidents:** Appear to involve a common fault condition and consequence.
- **Common Fault Condition:** Same/similar part, failure mode, and conditions leading to failure.
- **Common Fault Consequence:** Same/similar failure mode and effects caused by failure.
What is a Safety Defect

Safety-Related Defect (Pursued by ODI): Any defect in performance, design, construction, component, or material that results in an unreasonable risk of crash or an unreasonable risk of death or injury in an accident.

- A safety-related defect may exist on a vehicle even though it meets all FMVSS requirements.
- A safety-related defect includes: nonoperational and mission specific
Investigation Process

► (PE) Preliminary Evaluation

▷ Confirm complaint(s)
▷ Gather parts
▷ Work w/ industry
▷ Contact peer municipalities
▷ Review current & past precedent activity
▷ Document and summarize information gathered
▷ Influence safety recall, close or upgrade
▷ 4 months

► (EA) Engineering Analysis

▷ Testing/Survey(s)
▷ 2nd mfr response analyzed
▷ Influence safety recall or close investigation
▷ 1 year

**ODI RESUME**

**Investigation:** PE 07-343
**Subject:** 400 AMP PRIMARY FUSE CORROSION

**FAILRE REPORT SUMMARY**

<table>
<thead>
<tr>
<th>ODI</th>
<th>Manufacturer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

**Complaints:** 9
**Crashes/Flies:** 9
**Injury Incidents:** 0
**Fatality Incidents:** 0
**Other:** 0

*Description of Other: WARRANTY REPORTS*

**ACTION / SUMMARY INFORMATION**

**Action:** THIS PRELIMINARY EVALUATION IS CLOSED. WHEELED COACH HAS SUBMITTED SAFETY RECALL 07-V-004 TO ADDRESS THE PROBLEM.

**Summary:**

THE OFFICE OF DEFECTS INVESTIGATION (ODI) OPENED THIS PRELIMINARY EVALUATION ON WHEELED COACH OUT OF CONCERN ABOUT A LOSS OF POWER TO THE INTERIOR/EXTERIOR LIGHTS AND EQUIPMENT IN THE PATIENT CABIN OF THE AMBULANCE.

AN APRIL 20, 2007 A CORRECTIVE ACTION REQUEST WAS ISSUED BY WHEEL COACH CONCERNING CORROSION TO THE PRIMARY FUSE BLOCK CIRCUIT, RESULTING IN A LOSS OF POWER AND QUIETING. ODI WAS CONCERNED THE APRIL 2007 CORRECTIVE ACTION REQUEST WAS INEFFICENT. ODI OPENED THIS INVESTIGATION AND DISCOVERED THAT ALL OF THE WARRANTY CLAIMS AND COMPLAINTS WERE LOCATED IN "SALT BELT" STATES, WHICH THE AMBULANCE IS ATTRIBUTED TO WHEELED COACH FOR SALE, INCLUDING INCUMBENT WHEELED COACH.

ODI BELIEVES VOLTAGE TO THE PATIENT TRANSPORT MODULAR IS INHERENT TO THE AMBULANCE'S DESIGN. FURTHERMORE, ODI BELIEVES THIS LOSS OF POWER REPRESENTS AN UNREASONABLE RISK TO MOTOR VEHICLE SAFETY FOR THIS APPLICATION. AS THE MFG OF THE VEHICLE, AMBULANCE IS COMPROMISED AND, THEREFORE, A SAFETY RECALL REMEDY IS APPROPRIATE. WHEELED COACH HAS SUBMITTED GP-07-001 LETTER, RECALLING ALL AMBULANCES IN 24 SALT BELT STATES (PLUS WASHINGTON, DC). THIS INVESTIGATION IS CLOSED. ODI WILL CONTINUE TO MONITOR NON-SALT BELT STATES FOR ANY INDICATION THAT THE PROBLEM IS SPREADING TO THOSE REGIONS.
ODI Outreach

► Service managers
► Field Reps
► Government officials
► Fire Chiefs
► Police
► EMS

Your Complaint may be serviced/remedied by the manufacturer but your fellow colleague will not get the fix!
Example Investigations

- Issue: Wheel off event
- Alleged cause: Loose or cracked lug nut
- Result: Recall – 9,814 vehicles
- ODI prompt: 4 reports
Example Investigations

- Issue: Total loss of steering
- Cause: Drag link failure
- Result: Recall - 111,050 vehicles
- ODI prompt: 1 report
Special Crash Investigations Program

Harold Herrera
Crash Investigation Division
Team Lead
Special Crash Investigations Program
Special Crash Investigations Overview

“Rapid Response” teams for NHTSA that cover the United States

- The SCI Program was established in 1972 with 3-two person teams and contracted field offices.
- SCI has provided NHTSA with the most in-depth crash investigation data collected by the agency.
Special Crash Investigations Overview

- The SCI program investigates ~100 crashes and non-crashes annually that are of priority interest to the agency:
  - Office of Defects Investigation (ODI)
  - Research
  - Rulemaking
  - Office of Emergency Medical Services (OEMS)
  - Any other offices
  - Other Agencies

- Cases are initiated solely on Agency needs

- Cases are published and made available to the public online
SCI Published Cases

► SCI has published over 2,000 cases to the NHTSA website for public access since 1997
  ▶ Many more in paper format prior to 1997

► Over 100 cases per year are published to NHTSA website

► All personally identifiable information is redacted from all published cases!!!
SCI Ambulance Crash Investigations

- 64 total ambulance crashes investigated
  - 2001 – 2004 contracted to conduct 6 investigations for the National Institute for Occupational Safety and Health (NIOSH)
  - 2007 – current
    - Conducted 58 investigations for NHTSA’s OEMS
    - 4 closed
    - ~4 investigations annually
Selection/Inclusion Criteria

- Ambulance in traffic
- Was crash potentially survivable?
- Fatal injury in the ambulance?
- Cot retention failure
- Patient ejected?
- Incapacitating injury in patient compartment
  - Hospitalized for crash related injury
- Rollover
- Fatigue
- Others
- Ultimately, OEMS makes the call to investigate
Notification of Crashes

Notifications come from numerous sources:

- NHTSA Office of EMS
- EMS Community
- Law Enforcement
- NHTSA Regional Offices
- CISS Field Offices
- Google Alerts
- First Responder links
- Etc.
Example SCI Investigation

2009 Ford E-350 Type II Ambulance
New Mexico
July 2016
Case Overview

► 2 vehicles involved

► 2009 Ford E-350 Type II Ambulance
  - 2nd manufacturing – equipped with Endeavor model in October 2009, by Medtec Ambulance

► 2009 Dodge Ram
Case Overview

- Total of 7 occupants in ambulance
  - Driver and front row occupant (EMS student listed in EMS report as third-party ride-along) **both wearing seat belts**
  - 5 other occupants in patient compartment area:
    - Patient’s mother
    - Patient premature, unrestrained 6-week-old in a incubator that was anchored to a sled that was mounted to the cot
    - Being transported from one hospital to another for emergency surgery
    - EMT – primary patient caregiver
    - 2 nurses from hospital

None of the occupants in the patient compartment were belted
Patient Compartment
Case Overview

Scene

- 4-leg intersection
- Line of site:
  - Westbound traffic obstructed for ambulance
  - RAM was in freeway underpass
Case Overview

► Ambulance driver stated to police:
  ▶ Emergency light and siren activated
  ▶ Braked, looked left and right, sounded air horn
  ▶ Saw traffic had stopped, observed RAM slowing, proceeded into intersection with yellow traffic light

► RAM driver stated to police:
  ▶ Heard ambulance siren prior to seeing it, braked but no time to stop

► Front of RAM struck right rear of ambulance

► Impact caused ambulance to rotate CCW, rollover ¼ turn and came to rest on right side
Overview of Crash Scene
Police On-scene Images
Case Overview – Post-Crash

During the crash-rollover, the top mounted access door of the incubator came open and the 6-week-old was ejected from the incubator

- One of the nurses located the 6-week-old and began emergency breathing procedures until first responders arrived on scene

- Transferred by air to hospital in another state and admitted for emergency surgery. She expired 28 days post crash cause of death is unknown
Conclusions

► Both front occupants were wearing their seat belts – GOOD OUTCOME in a rollover crash!!!

► Although none of the rear occupants were wearing seat belts they fortunately only sustained minor/moderate injuries

Wearing seat belts has good outcome in crashes
Data and Technical Reports

Crashviewer.nhtsa.dot.gov
Data and Technical Reports

Crashviewer.nhtsa.dot.gov
Data and Technical Reports

[Image of an ambulance and a user interface for a crash viewer tool from NHTSA]
Questions?
Please submit questions through the webinar platform

Peter Kivett • peter.kivett@dot.gov
Harold Herrera • harold.herrera@dot.gov
Dr. Jon Krohmer • jon.krohmer@dot.gov
Visit SafeAmbulances.org

Safe Ambulances
Ground Ambulance Standards & EMS Safety
Visit [ems.gov](https://ems.gov) for more info on ambulance safety and other national initiatives.
Thank You