Safety & Technology Overview

September 2008

FMCSA, Office of Analysis, Research, and Technology

Presented by: Julie Lane
1. Crash Statistics
2. State Data Quality Improvement
3. Onboard Safety Systems
4. Integrated Vehicle Based Safety Systems
5. Employer Notification System
6. Smart Roadside/Wireless Roadside Inspections
Definitions

• **Cause:** Factors that *increase the risk of a crash* such as driving behavior, vehicle problems, road and weather conditions

• **Trucks:** *Large Trucks* -- Gross Vehicle Weight Rating of more than 10,000 pounds

• **Cars:** *Passenger Vehicles* -- passenger cars, pickup trucks, vans, SUVs, motorcycles
Coded Crash Variables

1. Critical Event: Makes crash unavoidable
2. Critical Reason for Critical Event: Immediate reason for critical event
3. Crash Associated Factors: All factors that might be important that were present at the time of the crash
# Critical Events

<table>
<thead>
<tr>
<th>Events</th>
<th>Trucks</th>
<th>Cars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Running out of travel lane</td>
<td>24%</td>
<td>31%</td>
</tr>
<tr>
<td>Other vehicle stopped in lane</td>
<td>24%</td>
<td>7%</td>
</tr>
<tr>
<td>Crossing through intersection</td>
<td>12%</td>
<td>9%</td>
</tr>
<tr>
<td>Traveling same direction-slowing</td>
<td>10%</td>
<td>5%</td>
</tr>
<tr>
<td>Traveling too fast</td>
<td>7%</td>
<td>6%</td>
</tr>
<tr>
<td>Turning left at intersection</td>
<td>6%</td>
<td>10%</td>
</tr>
<tr>
<td>Jackknife</td>
<td>2%</td>
<td>NA</td>
</tr>
<tr>
<td>Other</td>
<td>15%</td>
<td>22%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Source: Large Truck Crash Causation Study, 2001-2003
## Critical Reasons

<table>
<thead>
<tr>
<th>Reasons</th>
<th>Trucks</th>
<th>Cars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Performance (sleep, sick)</td>
<td>3%</td>
<td>16%</td>
</tr>
<tr>
<td>Recognition (inattention)</td>
<td>35%</td>
<td>30%</td>
</tr>
<tr>
<td>Decision (speed, aggressive)</td>
<td>42%</td>
<td>24%</td>
</tr>
<tr>
<td>Performance (overcompensate)</td>
<td>7%</td>
<td>19%</td>
</tr>
<tr>
<td>Vehicle (brakes, tires, lights)</td>
<td>8%</td>
<td>4%</td>
</tr>
<tr>
<td>Environment (roadway, weather)</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td>Unknown</td>
<td>1%</td>
<td>4%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: Large Truck Crash Causation Study, 2001-2003
### Associated Factors

<table>
<thead>
<tr>
<th>Factors</th>
<th>Trucks</th>
<th>Cars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brake problems</td>
<td>27%</td>
<td>2%</td>
</tr>
<tr>
<td>Traffic flow interrupted</td>
<td>25%</td>
<td>25%</td>
</tr>
<tr>
<td>Stop required before crash</td>
<td>21%</td>
<td>16%</td>
</tr>
<tr>
<td>Unfamiliarity with roadway</td>
<td>19%</td>
<td>10%</td>
</tr>
<tr>
<td>Inadequate surveillance</td>
<td>16%</td>
<td>14%</td>
</tr>
<tr>
<td>Traveling too fast for conditions</td>
<td>15%</td>
<td>11%</td>
</tr>
<tr>
<td>Illegal maneuver</td>
<td>12%</td>
<td>18%</td>
</tr>
<tr>
<td>Felt under work pressure</td>
<td>10%</td>
<td>3%</td>
</tr>
<tr>
<td>Distraction (Internal or External)</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Inattention</td>
<td>9%</td>
<td>9%</td>
</tr>
<tr>
<td>Fatigue</td>
<td>7%</td>
<td>15%</td>
</tr>
<tr>
<td>False Assumption</td>
<td>6%</td>
<td>3%</td>
</tr>
<tr>
<td>Tire problems</td>
<td>6%</td>
<td>3%</td>
</tr>
</tbody>
</table>
## Associated Factors

<table>
<thead>
<tr>
<th>Factors</th>
<th>Trucks</th>
<th>Cars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Following too close</td>
<td>5%</td>
<td>1%</td>
</tr>
<tr>
<td>Overweight</td>
<td>5%</td>
<td>NA</td>
</tr>
<tr>
<td>Aggressive Driving</td>
<td>5%</td>
<td>9%</td>
</tr>
<tr>
<td>Misjudgment of gap/speed</td>
<td>4%</td>
<td>4%</td>
</tr>
<tr>
<td>Jackknife</td>
<td>4%</td>
<td>NA</td>
</tr>
<tr>
<td>In hurry prior to crash</td>
<td>2%</td>
<td>4%</td>
</tr>
<tr>
<td>Upset prior to crash</td>
<td>2%</td>
<td>5%</td>
</tr>
<tr>
<td>Illness</td>
<td>1%</td>
<td>8%</td>
</tr>
<tr>
<td>Cargo Shift</td>
<td>1%</td>
<td>NA</td>
</tr>
<tr>
<td>Illegal drugs</td>
<td>0.4%</td>
<td>7%</td>
</tr>
<tr>
<td>Alcohol use</td>
<td>0.3%</td>
<td>9%</td>
</tr>
</tbody>
</table>

Source: Large Truck Crash Causation Study, 2001-2003
Top 10 “Causative” Factors – Trucks

- Overweight
- Making illegal maneuver
- Inadequate surveillance
- Traveling too fast for conditions
- Inattention
- Following too close
- Misjudgment of gap or other’s speed
- Stop required before crash
- External distraction
- Brake problems
Top 10 “Causative” Factors - Cars

- Making illegal maneuver
- Misjudgment of gap or other’s speed
- Alcohol use
- Fatigue
- Illness
- Inattention
- Internal distraction
- Inadequate surveillance
- Illegal drugs
- Too fast for conditions
Summary

- Plenty of blame for large trucks, buses, and passenger vehicles
- “Causative” factors lie mainly with drivers
- Truck drivers in better physical shape than passenger vehicle drivers
- Truck drivers make more mistakes than passenger vehicle drivers
- Vehicle issues secondary
Strategies to Explore

- Focus more on drivers during, roadside inspections, compliance reviews, outreach
- Promote innovated safety technologies
- Enhance and streamline information sharing
- Focus on data quality
SaDIP

- Quality data always a priority for FMCSA
- Good data helps measure program effectiveness
- Helps identify which motor carriers to target for enforcement actions
- Identifies safety areas to address in our strategic planning
FMCSA’s Comprehensive State Data Quality Program

1. DataQs
2. Ongoing Evaluation of State Safety Data Quality
3. Monthly Monitoring of State Data Quality
4. UMTRI Off-site Analysis of State Crash Data
5. On-site State Data Quality Reviews
6. Training, Analysis and Improvement of State PARs
7. Safety Data Improvement Funding
DataQs

• It is:
  – A single location for data challenge entry and response
  – A web-based interface to view the status of data challenges and supporting documentation through-out the challenge process
  – A support tool that assists FMCSA and States in generating responses

• It is not:
  – A change in either the State or FMCSA data correction guidelines
  – A system that allows or requires FMCSA to intervene in the State data correction process

https://dataqs.fmcsa.dot.gov
CMV Crash Data Collection Training

- Comprehensive training class on the collection of data elements recorded for CMV-involved accidents
- Training is tailored to each States’ Police Accident Report Form (PAR)
- No cost to the State
FMCSA State Data Quality Review Program

• FMCSA team goes on-site to a State to:
  – Review a State’s crash and roadside inspection collection and reporting processes
  – Work with the States to identify areas for improving the data quality, and recommend areas for improvement
Onboard Safety Systems

- FMCSA has established a strong emphasis on safety technologies
- Advancement of technologies is one of Administrator Hill’s top priorities
- One way to save lives and reduce the number of injuries on the nation’s highways is through the expanded use of onboard safety systems
Onboard Safety Systems

On-board Safety Systems Guide
- On-board Brake Stroke Monitoring Systems
- Collision Warning Systems with Adaptive Cruise Control
- Lane Departure Warning Systems
- Rear Object Detection Systems
- Side Collision Warning Systems
- Vehicle Stability Systems
- Tire Pressure Monitoring Systems

On-board Security Systems Guide
- Wireless Mobile Communications
- Untethered Trailer Tracking Systems
- Vehicle Disabling Systems

http://www.fmcsa.dot.gov/facts-research/art-productguides.htm
Exploring New Safety Technologies

- Develop future testing plans for more rigorous evaluations in partnership with carriers
  - Real world “before and after” crash data analyses
  - Field tests of new/next generation safety technology
    - Address crash problems
    - Improve testing, data collection, and results
    - Address industry deployment concerns
What is IVBSS?

- UMTRI-led cooperative agreement with U.S. DOT
  - National Highway Traffic Safety Administration (NHTSA) and Federal Motor Carrier Safety Administration (FMCSA)
- Develop integrated crash warning systems in light vehicles and heavy trucks to estimate safety benefits and driver acceptance
- 4-year, 2-phase $31.6M program
  - $25M from U.S. DOT, $6.1M from the partners
IVBSS Phase I and II

• Phase I (years one and two)
  – identify crash problem (develop scenarios)
  – develop functional requirements and system performance guidelines
  – develop and conduct objective test procedures (on-road and test track)

• Phase II (years three and four)
  – Build vehicle fleets and conduct extended pilot test
  – conduct field operational test of 10 trucks (International 8600 Series)
The Integration Challenge

• IVBSS evaluates integration from a variety of perspectives:
  – Enhanced performance of any one subsystem
  – Enhanced safety with multiple threats
  – Benefits of a fully integrated driver-vehicle interface
  – The role of the surrounding environment on a driver’s decision to perform certain actions
Program Status

• Completed Phase I
  – HT systems passed verification tests
• Public meeting on results in April 2008
• Phase II kickoff meeting in June 2008
Employer Notification System

• FMCSA research indicates that truck and bus drivers with past convictions are statistically more likely to be involved in future crashes
• Employers are not always notified about these convictions and are unable to take immediate and appropriate corrective action with drivers
• FMCSA requires:
  – carriers to check driver history annually
  – drivers to report Commercial Drivers’ License (CDL) status changes within 30 days and suspensions within one day
Addressing the Problem

- Employer notification programs:
  - Proactively notify a carrier about the driving record of its drivers
  - Allow the carrier to have real time updates of its drivers’ CDL status
  - Streamlines a carrier’s ability to oversee its drivers
  - Done on a State level and offered by private companies
ENS Phase 1: Feasibility and Cost Benefits

- Completed in September 2004
- A national system would be feasible, cost beneficial and provide safety benefits
- Drivers with convictions in the past year are **37% more likely** to be involved in crashes during the year following a conviction than are drivers with no convictions
• At a minimum, 50% of drivers may not notify employers of convictions within the required 30-day period

• The motor carrier industry relies on the pulling of DHRs to assess driver CDL status
Anticipated Benefits

- Improved commercial vehicle safety
- Improved monitoring and information exchange between States and carriers concerning CDL status
- Increased efficiency and cost savings for carriers
• Many carriers want National system
• States recognize benefits
  – Some require funding to integrate/support
  – Some require legislative changes
• Drivers have interest in system
  – Alerts them to unknown problems
  – May need ability to un-enroll themselves
Using interoperable technology and improved data sharing to improve safety, security, operational efficiency, and mobility on the nation’s freight transportation system
• Motor Carrier safety is improved through dramatic increases in roadside safety inspections due to wireless inspections using proven technologies and processes.
• Driver and vehicle safety assessments occur frequently enough to ensure compliance while minimizing disruptions to safe and legal motor carrier transportation.
• To Demonstrate and Measure government and industry benefits of a Wireless Roadside Inspection network across a multi-state region to enable a “go/no go” decision for nationwide deployment.
Opportunities for Technology

- Analysis of historical inspection data reveals that a large portion of significant “defects” are limited to a few items.
- With the exception of load-securement, most of the key vehicle and operator condition criteria lend themselves to onboard electronic monitoring and diagnostic assessment.

<table>
<thead>
<tr>
<th>Driver Violations</th>
<th>% Driver OOS Violations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logbook</td>
<td>40.0%</td>
</tr>
<tr>
<td>HOS</td>
<td>28.7%</td>
</tr>
<tr>
<td>CDL</td>
<td>19.4%</td>
</tr>
<tr>
<td>Total</td>
<td>88.1%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vehicle Violations</th>
<th>% Vehicle OOS Violations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brakes</td>
<td>41.2%</td>
</tr>
<tr>
<td>Lighting</td>
<td>16.6%</td>
</tr>
<tr>
<td>Tires</td>
<td>9.4%</td>
</tr>
<tr>
<td>Load Securement</td>
<td>15.7%</td>
</tr>
<tr>
<td>Total</td>
<td>82.9%</td>
</tr>
</tbody>
</table>
Smart Roadside/Wireless Roadside Inspections Cont.

• Demonstration of real-time and automated safety compliance checks
  – Driver data (ID, license status, log info)
  – Truck & bus data (lights, brakes, tires)
  – Slow & highway speeds
  – Fixed & mobile inspection units

• Program Status
  – 2005-7: Proof-of-concept test: successful
  – 2008-11: Pilot test phase
    • Multiple comm. paths
    • Back office integration
    • Interface refinement
    • Draft performance specifications
## Estimated Benefit-Cost Ratio (over a 10-year period)

### Annual Benefits

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Annual Lives Saved</td>
<td>253</td>
</tr>
<tr>
<td>Annual Injuries Prevented</td>
<td>6,192</td>
</tr>
<tr>
<td>Total Annual Benefits ($)</td>
<td>$1.7B</td>
</tr>
</tbody>
</table>

### Annualized Costs

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Government—Facility, Equipment, IT, Communications Capital Costs (Amortized over 10 years)</td>
<td>$22M – $34M</td>
</tr>
<tr>
<td>Government—Facility, Equipment, IT, Communications O&amp;M Costs</td>
<td>$23M – 42M</td>
</tr>
<tr>
<td>Industry—Annual Incremental CMV Costs (Based on 420,000 units/yr) ($533 - $940/CMV)</td>
<td>$224M – $395M</td>
</tr>
<tr>
<td>Total Annualized Cost</td>
<td>$269M – $471M</td>
</tr>
</tbody>
</table>

### Benefit/Cost Ratio

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>High – Low</td>
<td>6.17:1 – 3.51:1</td>
</tr>
<tr>
<td>Average</td>
<td>4.84 : 1</td>
</tr>
</tbody>
</table>
Points of Contact

- LTCCS – Ralph.Craft@dot.gov
- SaDIP – Betsy.Benkowski@dot.gov
- Onboard SS – Amy.Houser@dot.gov
- IVBSS – Chris.Flanigan@dot.gov
- ENS – Chris.Flanigan@dot.gov
- Smart Roadside – Julie.Lane@dot.gov; Jeff.Loftus@dot.gov (WRI)