A Guide to Effectively Implement Safety Monitoring Technologies

Matt Camden
Research Associate
Virginia Tech Transportation Institute

Fleet Safety Conference, July 2016
• Studies sponsored by the Federal Motor Carrier Safety Administration and the National Surface Transportation Safety Center for Excellence

• Opinions do not reflect those of any government agency
Outline

• Large truck crash causation
• Onboard safety monitoring systems (OSMS) overview
• Effectiveness of OSMSs
• Implementation of OSMSs
• Final thoughts
Large Truck Crash Causation

- Crashes involving large trucks constitute a significant risk

- Driver behaviors are the primary contributing factor in crashes
  - Decision errors (e.g., following too close)
  - Recognition errors (e.g., internal distraction)
  - Performance errors (e.g., poor direction control)
  - Non-performance errors (e.g., asleep)
Leading vs. Trailing Indicators

- At-Risk Behavior
- Near Miss
- Minor Crash
- Serious Injury Crash
- Fatal Crash

Diagram illustrating the hierarchy of transportation incidents from At-Risk Behavior to Fatal Crash.
Behavioral Approaches

• Behavioral approaches to reduce risky behavior have a proven track record

• Most prior work in settings where employees can be directly observed
  – Difficult with truck drivers
    • Lone workers
    • Limited accountability
    • Accuracy
    • Dangerous

• Missing an objective, reliable way to observe driver behavior
Onboard Safety Monitoring Systems (OSMS)

• Provide continuous objective measure of driver behavior
  – Can be used to provide feedback
  – Identify risky drivers

• Technology alone insufficient to alter driver behavior

• Combination of OSMS and behavioral safety techniques most powerful
OSMS Evaluations

- OSMS more prevalent
- Claims as to the effectiveness of these safety programs
- Need for independent evaluations
  - 2 studies
  - In-vehicle video technology
  - Performance management software
  - Driver counseling
OSMS Event Recorders

- Placed on truck’s windshield
- 2 cameras
- 3 accelerometers
- Record in constant loop
  - Trigger events
  - Saves 8-15 sec before, 4-15 sec after
- Event status light
Study 1: Assessment of an OSMS using a Field Operational Test
Study 1: Results
Study 1: Results
Study 1: Results
Study 1: Results
Study 1: Conclusions
Studies 2: Evaluating Safety Benefits of a Low-Cost OSMS

• Install DriveCam Event Recorder in 2 fleets
  – 100 drivers
  – 17 weeks

• Driver Coaching
  – Manager reviews events
  – Driver and manager watch event
  – Manager explains viewpoint
    • Stay positive
  – Determine follow-up steps
    • Training, reward, follow-up evaluation, etc.
Carrier A Results

[Graph showing safety-related events per 10,000 miles traveled, with baseline and intervention periods.]
Carrier A: Coaching vs. No Coaching
Carrier B Results

Mean = 4.02

Mean = 1.93
Adoption Success vs. Failure

<table>
<thead>
<tr>
<th>Carrier A Pre-intervention</th>
<th>Carrier B Pre-intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Top-down decision</td>
<td>• Top-down decision</td>
</tr>
<tr>
<td>• Information/education campaign</td>
<td>• Information/education campaign</td>
</tr>
<tr>
<td>• Mandatory in-person driver meeting</td>
<td>• Non-mandatory in-person meeting</td>
</tr>
<tr>
<td>• Safety manager and lead researcher available</td>
<td>• Lead researcher available for questions</td>
</tr>
<tr>
<td>• Seasoned and respected manager</td>
<td>• Green safety manager</td>
</tr>
<tr>
<td>• 46 drivers agreed to complete questionnaires</td>
<td>• 30 drivers agreed to complete questionnaires</td>
</tr>
</tbody>
</table>
## Adoption Success vs. Failure: Driver Opinions

<table>
<thead>
<tr>
<th>Item</th>
<th>Carrier A</th>
<th>Carrier B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reviewed video during a</td>
<td>80%</td>
<td>7%</td>
</tr>
<tr>
<td>How clearly was the root cause identified</td>
<td>Moderately Clear</td>
<td>Very Unclear</td>
</tr>
<tr>
<td>Identified way(s) to prevent future events</td>
<td>90%</td>
<td>7%</td>
</tr>
<tr>
<td>Coaching was positive</td>
<td>Positive</td>
<td>Moderately Negative</td>
</tr>
<tr>
<td>How likely are you to use the information learned in the coaching session</td>
<td>Moderately Likely</td>
<td>Very Unlikely</td>
</tr>
<tr>
<td>Length of coaching session</td>
<td>10 min</td>
<td>10 min</td>
</tr>
<tr>
<td>Acts of sabotage</td>
<td>4 in Intervention Phase</td>
<td>278 (2 in Baseline and 276 in Intervention)</td>
</tr>
</tbody>
</table>
Success vs. Failure: Summary of Back Office Approach

**Carrier A**
- Reviewed videos
- Fact-finding
- Coaching in a timely manner (5.8 days)
- Sabotage dealt with immediately
- Overall impression positive

**Carrier B**
- No review of video
- Fault-finding
- Coaching not in a timely manner (10.1 days)
- Sabotage not addressed
- Overall impression negative
What Led to Success and Failure

• Green vs. experienced safety manager
  – Trust
  – Rapport

• Buy-in vs. skepticism
  – Good rollout
  – “Let’s give this a try”

• Management’s commitment
  – Followed procedures
Research Conclusions

• Combination of OSMS and back-office approach affected the improvement in safety
  – Not training
  – Not presence of event recorder
  – Not increased attention to safety

• Need to create a back-office approach to support the implementation of OSMSs
STRATEGIES TO IMPLEMENT AN OSMS PROGRAM
Steps to Successfully Implement an OSMS Program

1. Develop a positive safety culture
2. Assemble OSMS Safety Program Committee
3. Benchmark risky driving
4. Evaluate available OSMS devices
5. Develop performance measures
6. Develop awareness and accountability
7. Implement
8. Monitor and evaluate
Step 1: Develop Positive Safety Culture

- Safety Culture
- Improved Safety Performance
- Mitigation of Unsafe Behavior
- Safety Programs and Countermeasures
How to Develop a Positive Safety Culture?

• Top management “buy-in”

• Build trust
  – Employee involvement
  – Seek feedback
  – Actively listen
  – Provide opportunities for choice
  – Demonstrate that safety is a value
  – Commit to reducing your own risky driving
Step 2: Assemble Program Steering Committee

• OSMS Program Steering Committee
  – Develop and oversee program, support, and evaluation
  – All categories of employees

• Define roles and responsibilities
  – Management
  – Drivers
Step 3: Benchmarking Risky Driving

• Evaluate the current state of risky driving in your fleet

• Identify the following
  – 3 most frequent risky driving behaviors
  – Other severe risky behaviors
  – Frequency compared to industry
  – Management’s response
  – Contributing factors
Step 4: Evaluate Available OSMS Devices

- Review currently available technologies
  - What are their capabilities?
  - Capture data on necessary behaviors?
  - Cost?
  - Compatibility?
  - Additional benefits?
  - ROI information?

- Contact vendors
  - Technical/training support?
  - Price reductions?
  - System life span?
  - Ability to customize software?
Pilot Test OSMS Systems

- Select one or two OSMSs to pilot test
- Select drivers and trucks
- Perform regular activities and collect data
- Evaluate performance of OSMS
  - Drivers’ evaluations?
  - Track necessary behaviors?
  - Experience with the vendor/software?
  - Additional services/tools needed?
  - Implementation process?
- Select OSMS or test another system
Step 5: Develop Performance Measures and Timeline

• Is the program working?

• Process measures
  – Focus on behavior
  – Use for feedback and incentives
  – Ex: incidences of speeding, seat belt use, coaching sessions, safety alerts, etc.

• Outcome measures
  – Outcome of behavior
  – Use for overall system effectiveness
  – Ex: number of preventable crashes, crash-free miles, injuries, etc.
Step 6: Develop Awareness and Accountability

• Educate and train all employees
  – Seminars, newsletters, meetings, bulletins
  – Reasons for the OSMS program
  – System functionality
  – Driver coaching
  – Rewards and incentives
Goal-Setting

**S**pecific behavior targeted

**M**otivationally effective

**A**ttainable (challenging but achievable)

**R**elevant to drivers’ lives, performance, & safety

**T**rackable (can be measured and recorded)
Driver Accountability

• “Other-directed” accountability to “self-directed” accountability
  – Encourage and recognize participation
  – Consider factors influencing decisions
  – SMART goals
  – Provide feedback
  – “fact-finding” vs. “fault-finding”
  – Incorporate driver feedback/suggestions
Step 7: Implement

• Rollout the OSMS

• Continued support
  – Attendance at meetings
  – Ongoing communication
  – Provide feedback
Step 8: Monitor and Evaluate

• Regularly review data
  – Operational changes
  – Staffing/scheduling changes
  – Data suggest safety not improved
  – New technologies/task are added

• Consider:
  – Are procedures working?
  – New risky behaviors?
  – Safety now vs. before?
Evaluate the OSMS Program

- Collect Data
- Evaluate Program
- Identify Operational Changes
- Improve Effectiveness
- Emerging Risky Behaviors
Implementation Summary

• Careful consideration is required
• Implementation takes time
• Expect resistance initially
• Maintain communication
• Continued evaluation
Final Thoughts

• OSMSs can help improve driver safety
• OSMSs are only one tool in the toolbox
• Importance of safety culture
Questions?

Matt Camden
mcamden@vti.vt.edu