FMCSA’s Automated Vehicle Research

Part I: Accelerating the Adoption of ADAS and ADS
Part II: Automated CMV Evaluation Program

2020 Transportation Research Board 99th Annual Meeting
Federal Motor Carrier Safety Administration
Analysis, Research, and Technology Forum
January 14, 2020
VISION

Commercial motor vehicles (CMVs) equipped with automated driving systems (ADS) will improve safety, prevent crashes, and efficiently move passengers and commerce.

MISSION

Working closely with other USDOT modes, States, industry stakeholders, and automated vehicle technology implementers, lead research efforts to enable the safe introduction of ADS-equipped CMVs to the Nation’s transportation system.
FMCSA’s AV Research Program

Traditional R&T Projects
- Literature Reviews
- Industry Outreach
- Technology Advancement
- Analysis of new & existing data

Research, Development & Testing through our ACE Program
- Hands on software development and use-case testing
- Multi-modal partnership with Government and Academia
FMCSA’s Research and Technology (R&T) Program focuses on driver, carrier, and vehicle safety.

FMCSA seeks to enable industry’s development and implementation of automated vehicles by:

- **Conducting research** to inform safety equivalency decisions for waivers, exemptions, and pilot programs.
- Identifying **best practices** for industry’s use of automated CMVs.
- **Promoting safe operation** of automated CMVs.
Part I:
Accelerating the Adoption of Advanced Driver Assistance Systems (ADAS)

Phase I
Project Overview

GOAL
To accelerate the adoption of ADAS by the trucking industry to encourage the potential for ADAS to reduce fatalities and prevent injuries and crashes.

OBJECTIVES
- Conduct a national outreach campaign to determine the technical and market barriers to nationwide adoption of ADAS.
- Development of outreach materials for fleets, to include training materials for drivers and maintenance personnel
- Conduct data collection and analysis to evaluate the effectiveness of outreach efforts and deployment rates.
Background: 2017 AAA Study

<table>
<thead>
<tr>
<th>Technology</th>
<th>Avoided Annually (estimated):</th>
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<tbody>
<tr>
<td></td>
<td>Fatalities</td>
</tr>
<tr>
<td>Automatic Emergency Braking</td>
<td>55</td>
</tr>
<tr>
<td>Air Disc Brakes</td>
<td>37</td>
</tr>
<tr>
<td>Lane Departure Warning</td>
<td>115</td>
</tr>
<tr>
<td>Video-Based Onboard Safety Monitoring</td>
<td>293</td>
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</tbody>
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*From “Leveraging Large-truck Technology and Engineering to Realize Safety Gains”*

–AAA Safety Foundation, 2017
Focused Recommendations from the AEB Study:

1. Work with industry to inform fleets about potential liability due to deleting standard safety technology on new vehicle purchase.

2. Develop and disseminate tools to assist fleets’ ROI calculations.

3. Encourage industry to develop standards for training and data use.

4. Encourage industry to provide recommended practices or guidance on AEB functions/interfaces to improve consistency.
Originally Selected ADAS Technologies

- Video-based On-Board Safety Monitoring
- Lane Departure Warning
- Automatic Emergency Braking
- Air Disc Brakes
Additional ADAS Considerations

- Adaptive Cruise Control
- Blind Spot Warning
- Collision Mitigation System
- Active Turning Assist
- Blind Spot Detection
- Active Electric Steering
- Lane Keep Assist
- Camera Monitoring System
## Final Categorization of Technologies

<table>
<thead>
<tr>
<th>Active Braking Systems</th>
<th>Active Warning Systems</th>
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</thead>
<tbody>
<tr>
<td>– Automatic emergency braking</td>
<td>– Lane departure</td>
</tr>
<tr>
<td>– Air disc brakes</td>
<td>– Forward collision</td>
</tr>
<tr>
<td>– Adaptive cruise control</td>
<td>– Blind spot detection</td>
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<table>
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<tr>
<th>Active Steering Systems</th>
<th>Camera Monitoring Systems</th>
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<tr>
<td>– Lane keep assist</td>
<td>– In-cab facing driver training</td>
</tr>
<tr>
<td>– Lane centering</td>
<td>– Forward facing event recording</td>
</tr>
<tr>
<td>– Adaptive steering control</td>
<td>– Side rear-view for mirrors</td>
</tr>
</tbody>
</table>
Approach

Project based on recommendations from AEB final report and support of external stakeholders to accelerate adoption of ADAS

- **During first year:**
  - Establish baseline adoption rates of subject ADAS in new trucks (Class 7 & 8)
  - Develop outreach and educational materials targeted to large and small fleets
- **During second year:**
  - Promote ADAS safety benefits, return on investment, and recommended O&M practices at conferences & workshops
  - Measure ADAS adoption rates in new truck sales
  - Quantify safety benefits, effectiveness of education/outreach
  - Summarize results in a report
Co-Principal Investigators:
Noblis & ATRI

Task Leads and Technical Subject Matter Expertise:
- ATA
- Kittelson & Associates
- TMC
- eContent Consulting
- OOIDA
- Global-5
- VTTI

Federal Team
Jeff Loftus, FMCSA, Project Manager
Kevin Dopart, ITS-JPO, Task Order Contracting Officer Rep.
FMCSA’s Automated CMV Evaluation (ACE) Program
ACE Program Overview

- Multi-faceted research, development, and test program
- Utilization of FHWA-developed open-source software
- Testing of actual vehicles at various locations
- Government, Academic, & Industry Partnerships
CARMA Solution

Advancing Cooperative ADS research with FHWA and FMCSA fleet and partnerships

- Expand cooperative automation capabilities.
- Develop proofs of concept to support TSMO use cases.
- Collaborate with Infrastructure Owner-Operator (IOO)/Original Equipment Manufacturer (OEM) community.

- Leverage Autoware open-source software (OSS) development.
- Enable ADS level 2–3 capabilities.
- Engage ADS community.
Government Partners

US Department of Defense
- Aberdeen Test Center
- Combat Capabilities Development Command Ground Vehicle Systems Center

US Department of Energy
- Oak Ridge National Laboratory

US Department of Transportation
- Federal Highway Administration
- Maritime Administration
- National Highway Traffic Safety Administration
Current Program Activities

Completed Activities

- Automated Truck Safety Research Plan
- Verification testing of hardware completed (1 of 4 trucks)
- Awarded task order on cybersecurity

Upcoming Activities

Spring 2020
- Complete Hardware and Software Installation on Trucks for Level 2 Capabilities
- Draft Concept of Operations for Port Drayage Demonstration

Summer 2020
- Calibration and testing of platooning capabilities

Fall 2020
- ITS World Congress
Automated Truck Safety Research Plan

- Literature Review
- Stakeholder Outreach
- Development of Test Scenarios and Test Cases
- Software Application Development
- Conduct Test Events & Analyze Data
Research Focus Areas

Roadside Inspections of ADS-Equipped CMVs

CMV ADAS and ADS Performance Measures of Safety Effectiveness

CMV Platooning

CMV Driver Readiness for Advanced Technologies

CMV Cybersecurity
Program Focus Areas

- Truck Platooning
- Roadside Inspection / Enforcement
- Port Drayage
- Emergency Response
- Work Zones

FY20
FY21
FY22
Contact Information

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