Overview of Automated Vehicle Research Activities
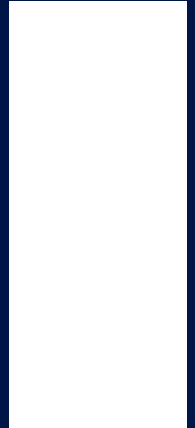
ART Forum

March 23, 2022

U.S. Department of Transportation

Federal Motor Carrier Safety Administration

FMCSA's Role in Automated CMVs

- **Conduct research** to inform safety equivalency decisions for waivers, exemptions, and pilot programs

- **Focus scope of research** on the intersection of automated CMVs and public safety officials

- **Identify best practices** for industry's use of automated CMVs

- **Remove regulatory barriers** to the operation of automated CMVs

- **Promote safe operation** of automated CMVs

ADAS RESEARCH

Tech-Celerate Now Overview

GOAL

- Accelerate the adoption of advanced driver assistance systems (ADAS) by the trucking industry 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

APPROACH

- Two-year effort to accelerate the voluntary adoption of ADAS by trucking fleets

- 2020 Objectives:
  - Establish baseline adoption rates
  - Develop outreach and educational materials

- 2021 Objectives:
  - Promote ADAS safety benefits, ROI and O&M practices
  - Measure ADAS adoption rates in new truck sales
  - Quantify safety benefits, effectiveness of education/outreach
  - Summarize results in a report

ADAS Crash Safety Analyses via Onboard Safety Monitoring Data

- FMCSA recently awarded a 48-month research project to the Virginia Tech Transportation Institute (VTTI)

- FMCSA Lead: Brian Routhier

- Objectives:
  - Develop empirical CMV ADAS safety effectiveness data
  - Analyze four years of crash and near data (SmartDrive)
  - 12,000 crashes and 12,000 near crashes

- Preliminary results from first two years of data
  - 85 fleets and 44.5K trucks in year 2018-2020 data.
  - 9 fleets have more than 1,000 trucks which account for 57% of the data.
 - The two largest fleets have approximately 6K trucks each

ADS RESEARCH

Automated CMV Evaluation (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 and industry partnerships

ACE
Automated Commercial
Motor Vehicle Evaluation

Focus Areas
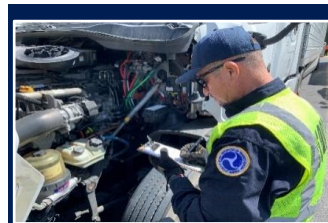
| Roadside Inspection / Enforcement | Port Drayage | Emergency Response | Work Zones |

| FY20 | FY21 | FY22 |

Automated CMV Inspection Demonstrations and Evaluations

- In August, FMCSA awarded a 24-month research project to a team led by toXcel
  - Incorporates input from the CVSA ADS Work Group
  - Period of performance runs through July 2023
  - FMCSA Lead: Tom Kelly

- Objective:
  - Explore and prototype processes, communication methods, and inspection technologies to facilitate electronic safety inspections of C-ADS-equipped CMV operations
  - Applicable to the roadside, at borders, and in other fixed enforcement locations.

- Research Team

Human Factor in ADS-equipped Commercial Motor Vehicles

- FMCSA recently awarded a 48-month research project to the Virginia Tech Transportation Institute (VTTI)
  - Partnered with Deloitte
- FMCSA Lead: Terri Hallquist
- Objectives:
  - Quantify the effect of distraction on CMV drivers in L2 CMVs
  - Quantify the effect of transfer of control in L3 CMVs
  - Develop and evaluate a training program to address causal factors
- Approach: Simulator-based studies and training program

Safety Impacts of Human-ADS Team Driving Applications

- 48-month research project led by VTTI
  - Team includes Deloitte and ADS industry SME Consultant

- FMCSA Lead: Brian Routhier

- Objectives:
  - Generate data to support policy decisions on HOS relief requests under 49 C.F.R. §381
  - Assess the safety benefits/disbenefits of human-ADS teaming scenarios
  - Investigate existing and future human-ADS integration models
    - Human/ADS driving team issues such as fatigue, alertness, and distraction
    - Driver re-engagement during ADS disengagement or remote operator control
    - Fleet acceptance

- Approach: Simulator-based studies augmented with in-vehicle testing in controlled environment

Work Zone Safety

- Collaborating with modal partners and external stakeholders to understand the impact of ADS-equipped on current best practices and voluntary consensus standards

- Initiated research with FHWA in 2021 to address initial research questions
    - Focused on work zone data exchange
    - Demonstration planned in April 2021

Emergency Response

- Collaborating with modal partners and external stakeholders to understand the impact of ADS-equipped on current best practices and voluntary consensus standards
- Areas of interest include
  - Ensuring safe navigation of ADS vehicles around incidents and hazards
  - Challenges related to incidents involving ADS vehicles
- Initiated research with FHWA in 2021 to address initial research questions
  - Focused on identification of emergency response vehicles
  - Demonstration date TBD

Automated Traffic Warning Device Deployment System

- FMCSA recently completed this Phase I Small Business Innovative Research (SBIR) Project on a proof of concept of an Automated Traffic Warning Device Deployment System
    - Awarded to Creare LLC
- FMCSA Lead: Nicole Michel
- Objectives:
    - Develop an automated marker deployment system for autonomous Commercial CMVs
    - Develop concept for traffic warning device (triangle) design and deployment
    - Demonstrate proof of concept for system's ability to navigate and locate trailer position, line markers, and environmental obstacles
- Approach: SBIR Phase I feasibility study

Using systems modeling to identify research needs and potential FMCSR changes resulting from emerging ADS business cases

- FMCSA IAA with the U.S. DOT Volpe Center (March 2021-February 2022)

- FMCSA leads: Jeff Loftus, Tom Kelly

- Objectives:
  - Identify research gaps to help FMCSA prepare for automated trucking
  - Develop a systems model based on a review of ADS business models and workshops with five FMCSA divisions
  - Tie recommendations to particular causal loops and scenarios
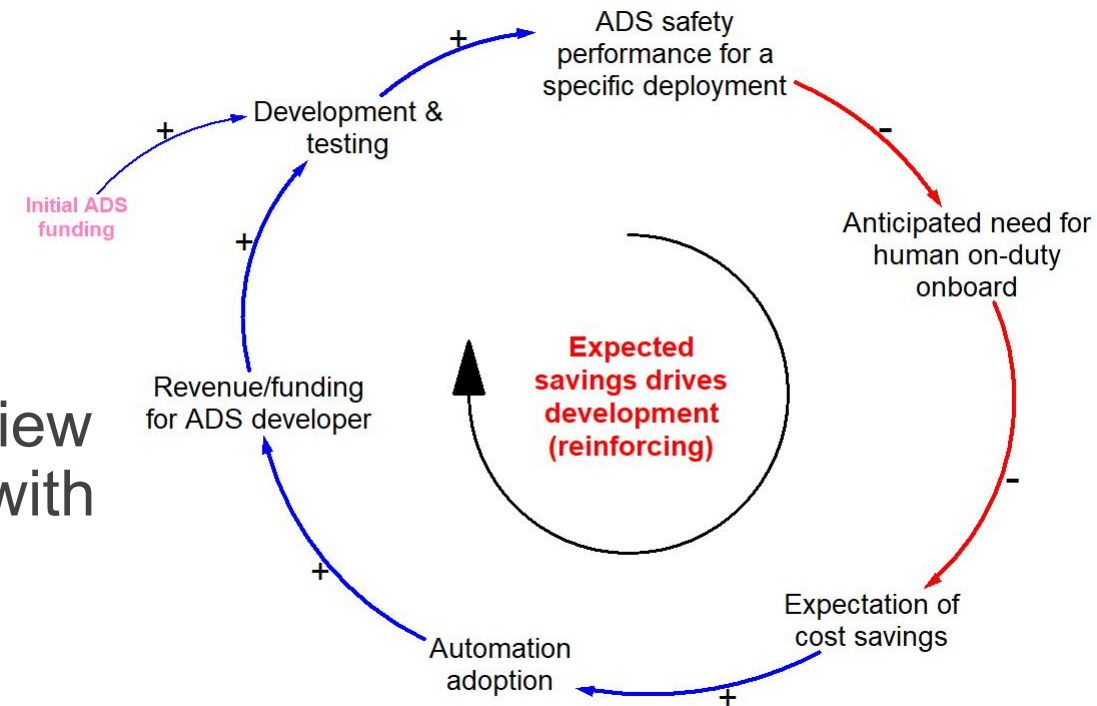
One loop in the draft model
Image source: Volpe Center

- Approach: Development of causal loop diagrams based on qualitative data

Questions?

THANK YOU

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