

# **Federal Highway Administration Cooperative Automated Vehicle (CAV) Update**

**AASHTO Committee on Traffic Engineering**

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**Federal Highway Administration**

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**Denver, Colorado**



U.S. Department of Transportation  
**Federal Highway Administration**

# USDOT Strategic Plan for FY 2018-2022



- **Safety**

- **Infrastructure**

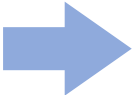
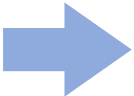
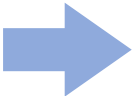
- Integrating Automated Vehicles into roadway environment

- **Innovation**

- Development of Automated Vehicle roadway integration innovation
- Deployment of Automated Vehicle roadway integration innovation

- **Accountability**

# USDOT Activities in Automation

Event	Date	Summary/Outcomes
 <b>USDOT releases <i>Automated Driving Systems (ADS) 2.0: A Vision for Safety</i></b>	September 12, 2017	<ul style="list-style-type: none"> <li>Replaces the 2016 Federal Automated Vehicles Policy.</li> <li>More information on ADS 2.0 is available on the NHTSA website: <a href="https://www.nhtsa.gov/technology-innovation/automated-vehicles">https://www.nhtsa.gov/technology-innovation/automated-vehicles</a>.</li> </ul>
<b>Roundtable on Data for Automated Vehicle Safety</b>	December 7, 2017	<ul style="list-style-type: none"> <li>Demonstrated multimodal alignment around “One DOT” approach to Federal automated vehicle policy.</li> <li>Brought together over 60 participants from government, private sector, nonprofit organizations, universities, research centers.</li> <li>Gathered feedback on USDOT’s Guiding Principles and Draft Framework.</li> <li>Coordinated with FHWA Work Zone Data Initiative.</li> </ul>
 <b>Automated Vehicles 3.0 announced</b>	January 10, 2018	<ul style="list-style-type: none"> <li>Secretary Chao announced work on a follow-up Automated Vehicles 3.0 document, with a release date in 2018.</li> </ul>
<b>Public Listening Summit on Automated Vehicle Policy</b>	March 1, 2018	<ul style="list-style-type: none"> <li>Stakeholder engagement summit with senior leadership at USDOT.</li> <li>Focused on key cross-modal issues important to successful integration of automated vehicles.</li> </ul>
 <b>National Dialogue Launch Webinar</b>	May 8, 2018	<ul style="list-style-type: none"> <li>Introductory webinar introducing the National Dialogue.</li> <li>360+ attendees.</li> <li>Recording: <a href="https://connectdot.connectsolutions.com/p52h2c59wp92/">https://connectdot.connectsolutions.com/p52h2c59wp92/</a>.</li> </ul>

# USDOT Activities in Automation (continued)

## Modal Requests for Information and Comments on Automation

USDOT Modal Administrations released Requests for Information (RFIs) and Requests for Comment (RFCs) regarding automation and the specific areas of interest for their modes. These RFIs and their responses are posted on the *Federal Register*.

- **Federal Highway Administration RFI on the Integration of Automated Driving Systems (ADS) into the Highway Transportation System** – Closed March 5, 2018
- **Federal Motor Carrier Safety Administration RFC Concerning Federal Motor Carrier Safety Regulations Which May Be a Barrier to the Safe Testing and Deployment of ADS-Equipped Commercial Motor Vehicles on Public Roads** – Closed May 10, 2018
- **Federal Railroad Administration RFI on Automation in the Railroad Industry** – Closed May 7, 2018
- **Federal Transit Administration (FTA) RFC on Automated Transit Buses Research Program** – Closed March 2, 2018
- **FTA RFC on Removing Barriers to Transit Bus Automation** – Closed March 2, 2018
- **National Highway Traffic Safety Administration RFC on Removing Regulatory Barriers for ADS** – Closed March 20, 2018
- **Pipeline and Hazardous Materials Safety Administration RFI on Regulatory Challenges to Safely Transportation Hazardous Materials by Surface Modes in an Automated Vehicle Environment** – Closed May 7, 2018

# FHWA Request for Information (RFI)

1. FHWA released a RFI on the Integration of Automated Driving Systems into the Highway Transportation System.
2. The purpose is to obtain input from a range of stakeholders on a variety of issues related to enabling safe and efficient automation on roadways, such as:
  - ☐ Infrastructure and roadway requirements
  - ☐ Research areas and priority issues
  - ☐ Data needs
  - ☐ Planning and investment
  - ☐ and others.....

# RFI Responses: Key Themes

1. Greater **uniformity and quality** in road markings and traffic control devices would enable automation.
2. All commenters suggested that **FHWA take a leadership role** in convening stakeholders to encourage collaboration.
3. Certain **data elements** around the roadway environment are useful for industry and State and local DOTs to share and could improve automation operations.
4. Conducting **pilots and supporting pilot testing** are important for facilitating learning, collaboration, and information sharing.
5. Uncertainty in **infrastructure investment** and allocation of **limited resources** is a key concern for State and local agencies.



# National Dialogue on Highway Automation

Stakeholder engagement activities to discuss the role of FHWA in automation and explore issues of concern to FHWA and its stakeholders.

## Goals:

1. Focus attention on highway automation readiness.
2. Catalyze nationwide engagement.
3. Evolve the national highway automation community.
4. Complement related USDOT summits and initiatives.



# National Dialogue: Focus Areas

**Planning and Policy:** Explores relevant issues for the planning and policy community, such as travel demand changes from automation, land use implications, infrastructure systems funding, right-of-way use, automation legislation, and other topics.

**Digital Infrastructure and Data:** Considers strategies for broader integration of sensing, communications, analytics, and decision support technologies and systems. Includes data requirements and needs of automated vehicles (e.g., digital work zone maps, road closures, etc.) as well as collaboration between public agencies and industry for data sharing and safety.

**Infrastructure Design and Multimodal Safety:** Covers transportation infrastructure design requirements, standardization, and consistency for automation. They will highlight topics where automation technology developers and public agencies require collaboration to plan for locations where existing roadway infrastructure, road conditions, design features, and environments could lead to potential safety hazards.

**Operations:** Surveys the range of operations challenges from highway automation and initiate a discussion on what further research is necessary to address them. These challenges may include incident management and system inefficiency that may have implications on traffic patterns and roadway capacity.

**Freight:** Deals with truck platooning applications and automated truck freight delivery issues. It will cover possible implications on traffic patterns and operations, as well as potential infrastructure considerations.



# National Dialogue: Tentative Schedule

No	Month	Event	Location
1	June 7	<b>National Dialogue Launch Workshop</b>	Cobo Center, Detroit, MI
2	June 26-27	<b>National Workshop 1</b> Planning and Policy Considerations for Highway Automation	Science History Institute Philadelphia, PA
3	July 12	<b>Automated Vehicle Symposium</b> FMCSA-FHWA Truck Automation Listening Session	San Francisco, CA
4	Week of July 30	<b>National Workshop 2</b> Digital Infrastructure and Data Considerations for Highway Automation	Seattle, WA
5	Week of September 5	<b>National Workshop 3</b> Freight Considerations for Highway Automation	Chicago, IL
6	TBD	<b>National Workshop 4</b> Multimodal Safety and Infrastructure Design Considerations for Highway Automation	Austin, TX
7	October 24-25	<b>National Workshop 5</b> Operations Considerations for Highway Automation	Phoenix, AZ

# Cooperative Automated Driving Systems Research (CADS)

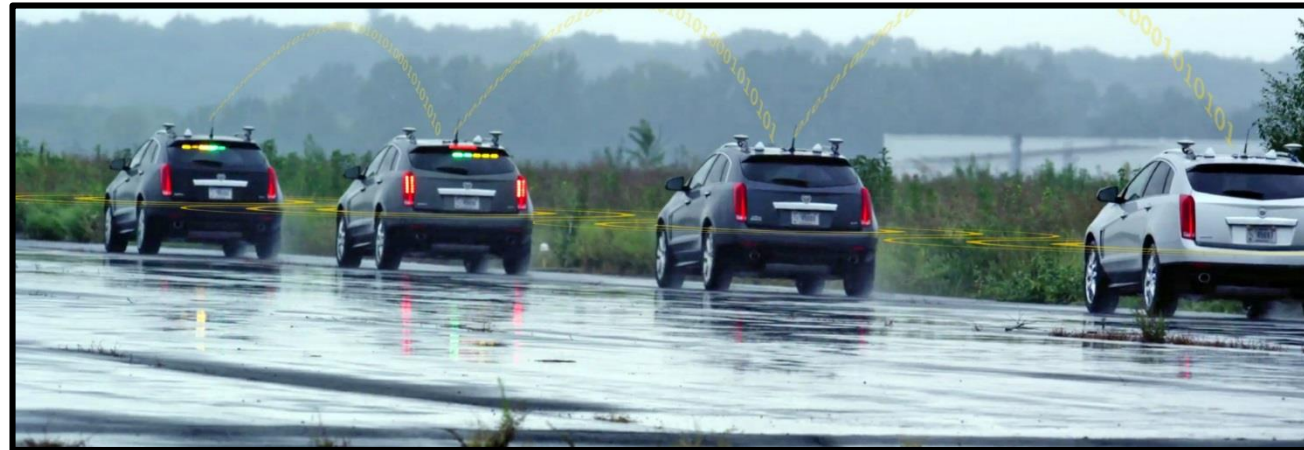


**Research Focused  
on Arterial  
and Freeways**

***Arterial system V2I -  
reduces fuel consumption  
at intersections  
by 20%.***



***Truck platooning - 10% fuel savings***



***Light vehicle platooning - doubles lane capacity***

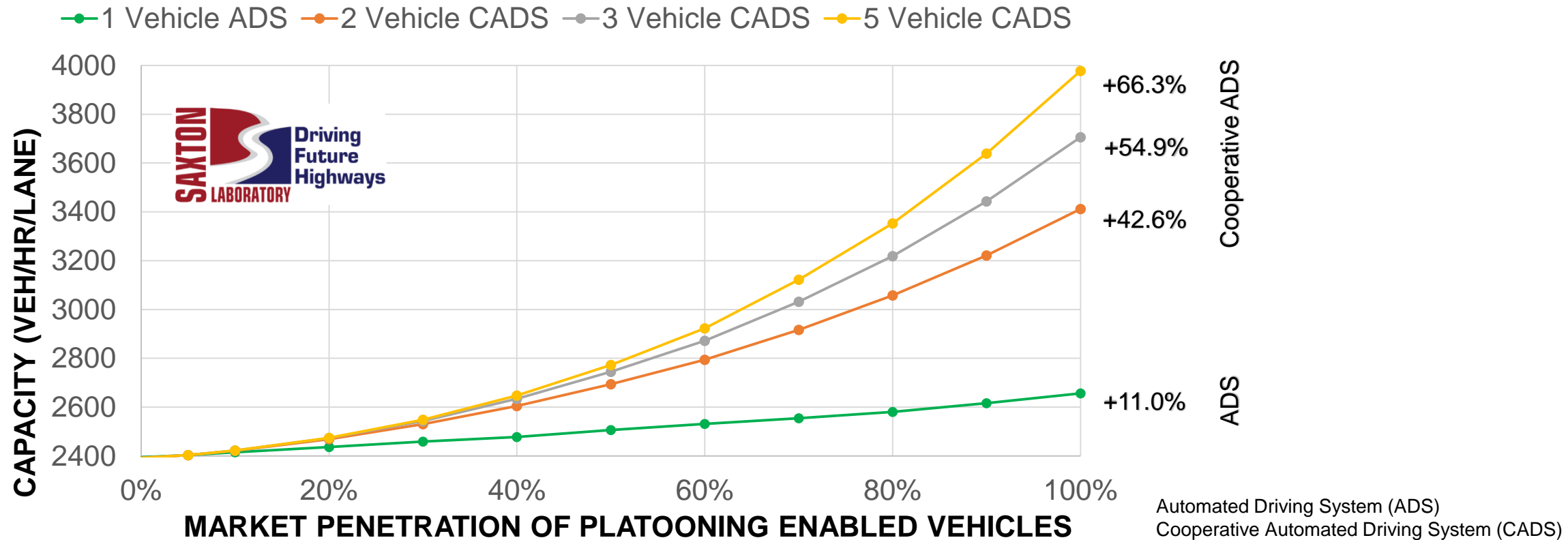


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# Cooperative Automated Driving Technology

## Single vehicle ADS vs Multi-Vehicle CADS: Platooning (SAE Level 1)

### Preliminary Results and Benefits



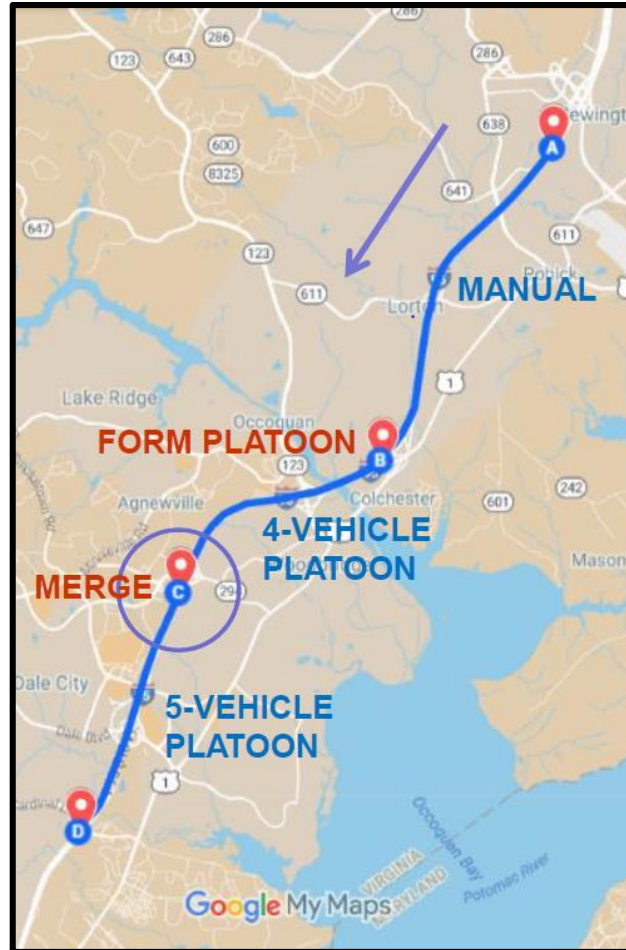
Bujanovic, P., Lochrane, TWP. "Finding Capacity Impacts and Passenger Car Equivalents of Platooning Enabled Vehicles on Basic Segments" *ASCE Journal of Transportation Engineering Part A: Systems*, accepted for publication.



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# Cooperative Automated Vehicle (AV) Testing with Virginia DOT and Transurban

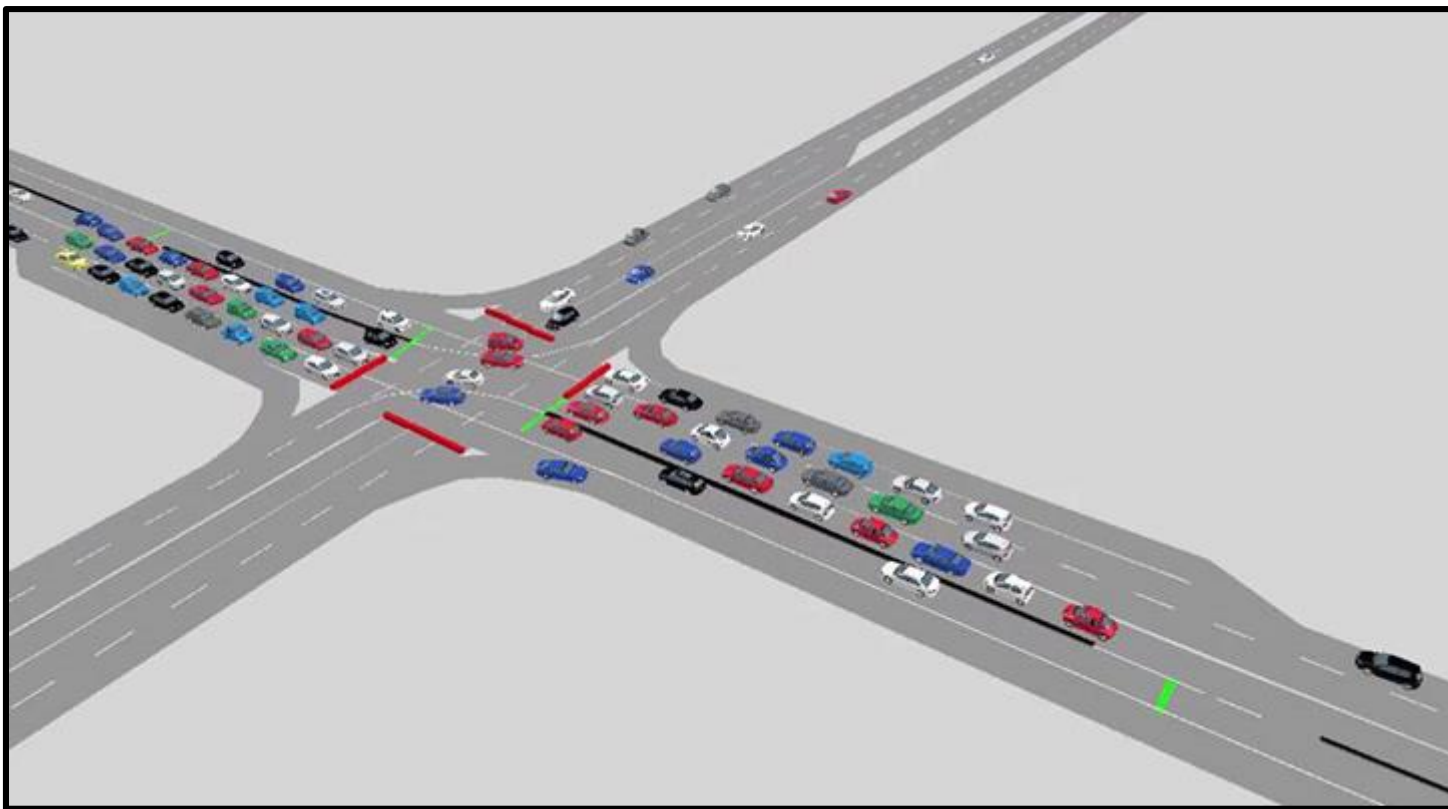


## Objective:

Investigate the combination of speed harmonization, vehicle platooning, and cooperative merging at an entrance ramp for a single-lane, managed facility with access limited to cooperative automated vehicles.

Google Maps Images of the  
Sites for the Cooperative  
Automated Vehicle Testing

# Modeling and Automated Vehicles

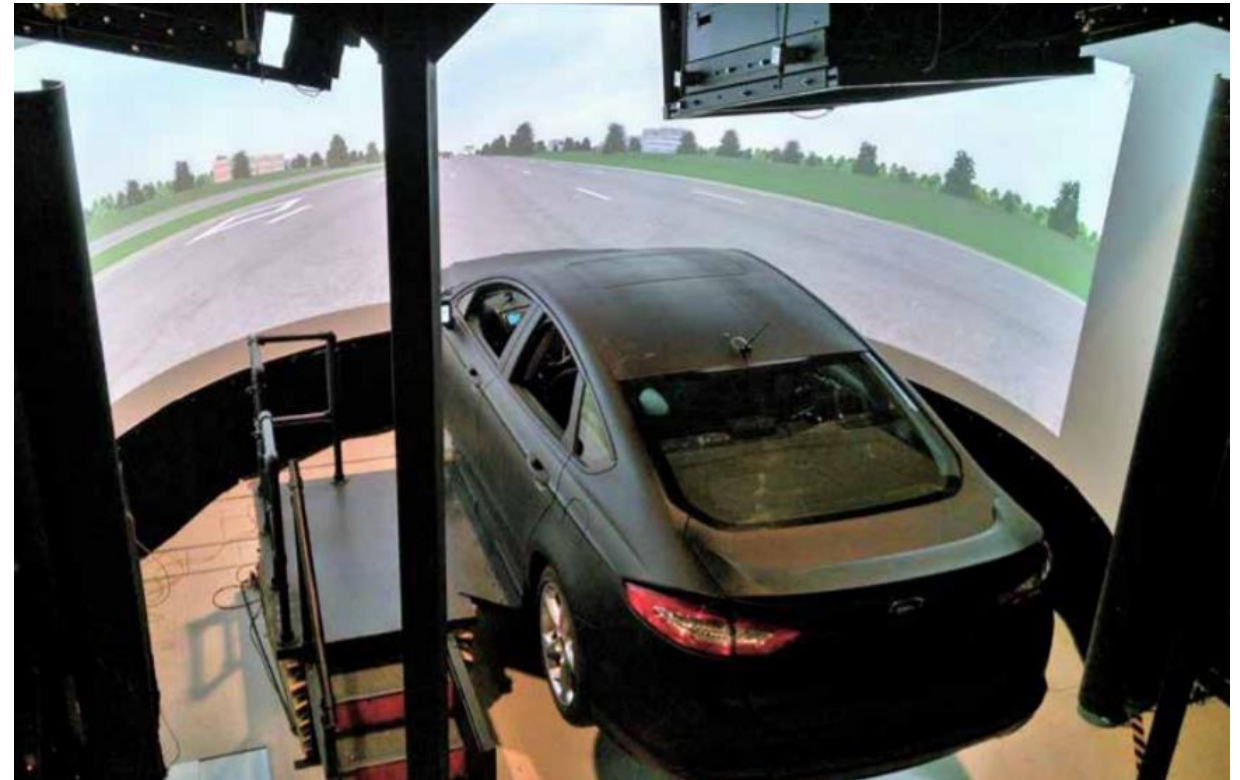


Modeling provides an economic and efficient way to analyze different AV scenarios.

# Human Factors Research

- Human factors issues associated with cooperative adaptive cruise control (CACC).
- Results suggest CACC has strong potential to improve driver safety by reducing the risk of forward collisions in an extreme braking event.

The Highway Driving Simulator



# FHWA - Office of Transportation Policy Studies

## Scenario Planning for Connected and Automated Vehicles: 2017-2018

Purpose: To equip agencies with information and tools to consider the uncertainties of CV/AV deployment.

- Created scenarios of potential CV/AV deployment.
- Conducted workshops to refine test scenarios.
- Assessed overarching scenario impacts and implications.



# FHWA - Office of Transportation Policy Studies (continued)

- **Transportation Symposium Series**

- Provides a formalized information resource for FHWA to gain insight and perspectives on key transportation policy questions from experts from associations, industry, academia, and government during day-long discussions.

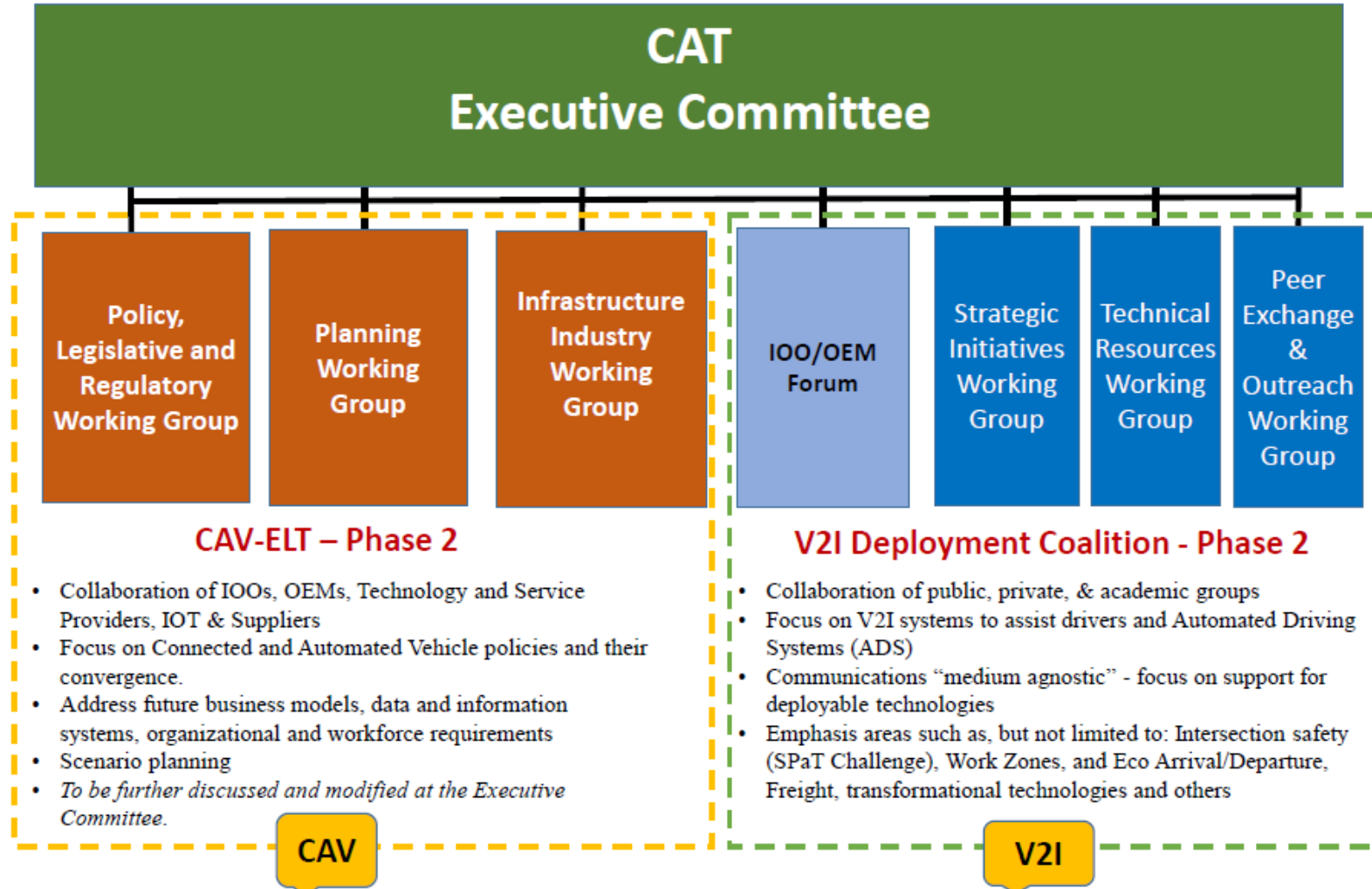
- **Access to Smart City Transportation Symposium: 2017**

- Purpose: To address policy solutions to transportation challenges and how smart technology will change the transportation landscape.
- Addressed societal issues related to the implementation of smart systems, as well as governmental and institutional roles and responsibilities.

- **Transportation Data Policy and Governance Symposium: 2018**

- Purpose: To identify emerging challenges and opportunities for government to use transportation data for sound policy, planning, investment, and system management.
- Discussed the current and evolving role of data in FHWA's mission and how to help transportation agencies access, analyze, and apply data to strategic and performance objectives.

# Cooperative Automated Transportation (CAT) Coalition



# FURTHER INFORMATION...

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