THE EASTERN TRANSPORTATION COALITION

CONNECTING FOR SOLUTIONS

All things ADAS (Advanced Driver Assist Systems)

State Projects, Outreach and the State of the Industry

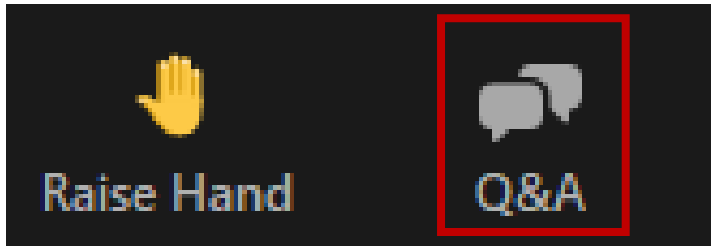
September 27, 2022

Welcome!

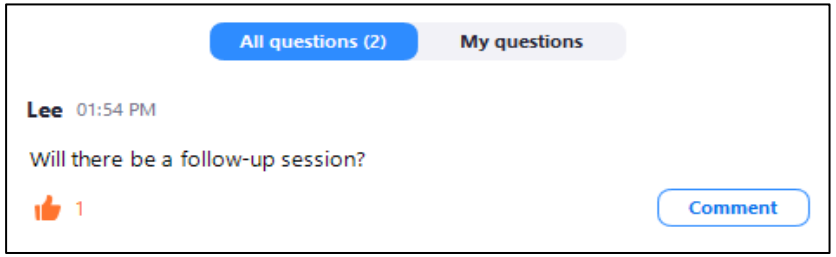
- We are using Zoom **Webinar**
- **AUDIO (Computer):** Use your computer speakers and microphone by clicking the “Join Audio” button at the bottom left of the screen. You will be muted.
- **Alternate Audio (Phone):** Call into the meeting by dialing the phone number based on your location (provided in the confirmation email) and enter the Meeting ID at the prompt. You will be muted.
- **This web meeting is being recorded.**
- **Questions** with the audio or web? Please contact Esther via email (ekleit@kmjinc.com)
- The **Chatbox** is not available to participants. Please use the **Q&A box** for questions to the presenters

Asking Questions in the Q&A Box

- Click on the Q&A icon at the bottom of your screen



- The questions in the Q&A box will be monitored and answered at the end of the meeting
- You can keep track of your questions in the “My Questions” tab in the Q&A box



Asking Questions Verbally

- Please raise your hand *(click on the hand icon at the bottom of the screen)*, and a host will unmute you.

- Please give your name and agency before asking your question
- **Please mute yourself when you are finished asking a question**

Welcome, Introductions & Overview

Lisa Miller, Innovation Program Associate
The Eastern Transportation Coalition

17 States + D.C.

In the Corridor

For over 25 years, the Coalition has brought together public agencies across state lines and modes to work together to address pressing challenges.

Connecting for Solutions

More than I-95:

What We Do

In short, the Coalition helps agencies tackle the sticky issues and get solutions across the finish line.

1

PEOPLE

- Create a forum for public agencies to address transportation issues of common interest
- Establish a key network of transportation professionals
- Provide training (e.g., Freight Academy)

2

TOOLS & DATA

Support data acquisition and tool development

3

RESOURCES

- Compete for grants
- Extension of agency staff
- Partner with FHWA to explore policy implementation

THE COALITION STRUCTURE

EXECUTIVE BOARD
DOT CEOs

COALITION STAFF

STEERING COMMITTEE & CO-CHAIRS

PROGRAM TRACK COMMITTEES

TRANSPORTATION SYSTEMS MANAGEMENT & OPERATIONS

VPP MARKETPLACE

DATA TOOLS & USER GROUPS

TRAVELER INFORMATION

TRAFFIC INCIDENT / EVENT MANAGEMENT

OPERATIONS ACADEMY

FREIGHT

FREIGHT PLANNING

FREIGHT DATA & PERFROMANCE

TRUCK PARKING

FREIGHT ACADEMY

INNOVATION IN TRANSPORTATION

CONNECTED VEHICLES

MBUF

TOLLING RECIPROCITY

ELECTRIC VEHICLES

Coalition Events

Previous Events:

✓ RITIS User Group Web Meeting - July 28, 2022

✓ Electric Vehicle Working Group Meeting - Sept. 15, 2022

✓ Travel Information Committee Meeting: Scenario Planning & Info Updates - Sept. 22, 2022

✓ Transportation Data Marketplace: Waypoint, Origin-Destination, and Freight Vendor Forums - Aug. & Sept. 2022

Upcoming Events

- Fall CAV Working Group Meetings/Field Tour - *(invite only)* - Oct. 11, 2022
- Transportation Data Marketplace - Validation Tech Advisory Committee *(invite only)* - Oct. 11, 2022
- Potomac HOGs Exchange (In Person) *(invite only)* - Oct. 18, 2022
- RITIS User Group Web Meeting - Oct. 20, 2022
- Del-Val HOGs Exchange (In Person) *(invite only)* - Nov. 2, 2022
- Automated Traffic Signal Performance Measures (ATSPM) Webinar - Nov. 9, 2022
- Fall CAV Working Group Meetings/Field Tour - *(invite only)* - Nov. 29, 2022

Agenda

Topic	Speaker
Welcome & Update by the Eastern Transportation Coalition Framing the Discussion	Lisa Miller, Innovation Program Associate, The Eastern Transportation Coalition
How Maryland DOT is Leading the Way with ADAS Outreach	Chrissy Nizer, Administrator Maryland DOT Motor Vehicle Administration
The Importance of Explaining ADAS for Consumer Awareness	Kathleen Rizk, Senior Director, UX Benchmarking and Technology JD Power
CAV at KYTC - Incorporating ADAS Data	Shane McKenzie, CAV Engineer Kentucky Transportation Cabinet
State of the Industry for ADAS	Steve Kuciemba, National ITS/CAV Practice Leader WSP
Q&A/Discussion	Lisa Miller

Introductions

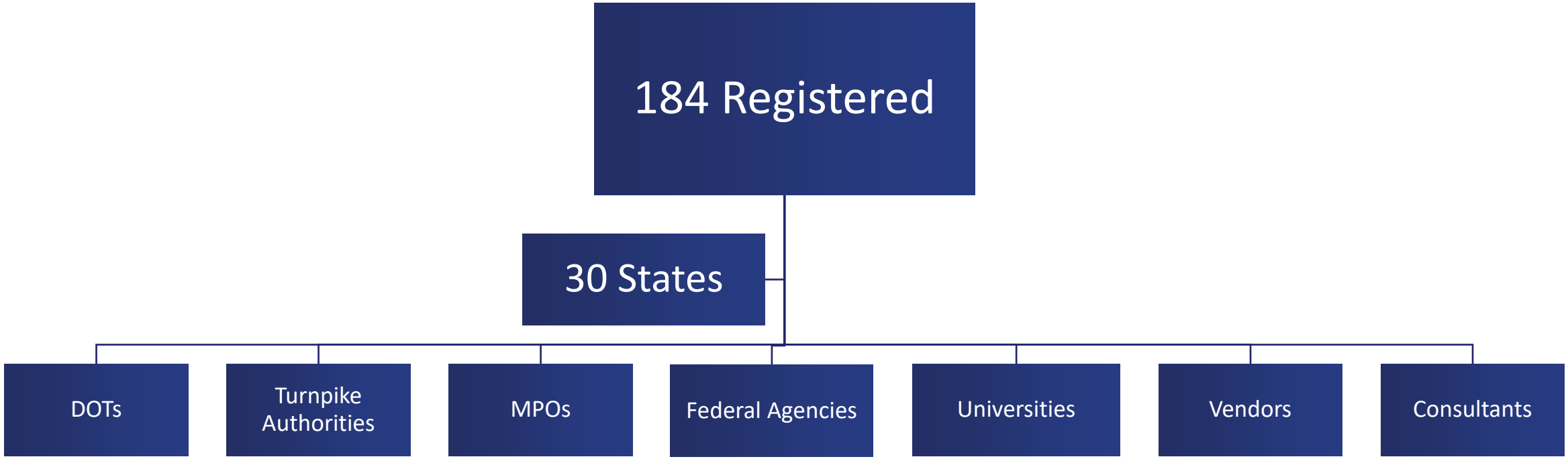
Chrissy Nizer Administrator
Maryland DOT
Motor Vehicle Administration

Kathleen Rizk
Senior Director, UX Benchmarking and Technology
JD Power

Shane McKenzie
CAV Engineer
Kentucky Transportation Cabinet

Steve Kuciemba
National ITS/CAV Practice Leader
WSP

The Eastern Transportation Coalition Sponsored Event



Framing the Discussion

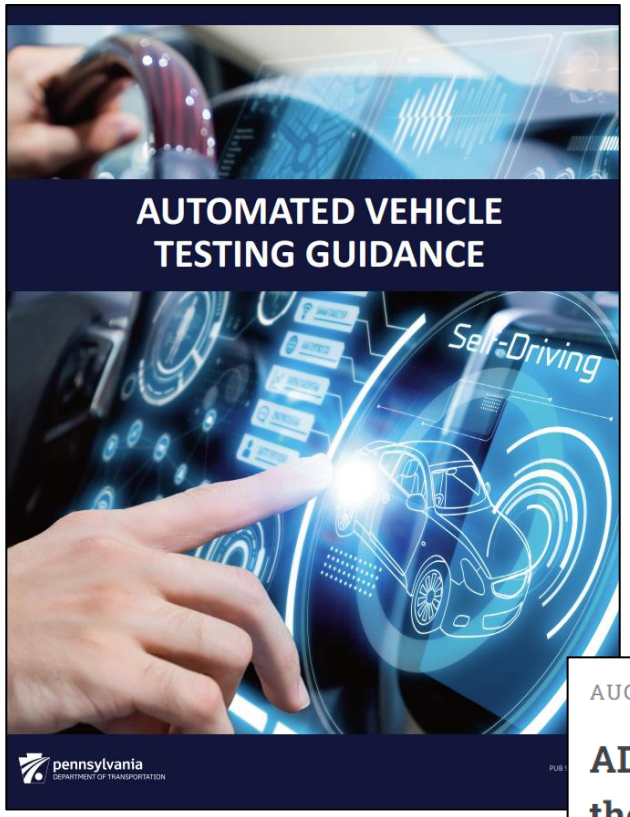
What is ADAS? ADS?

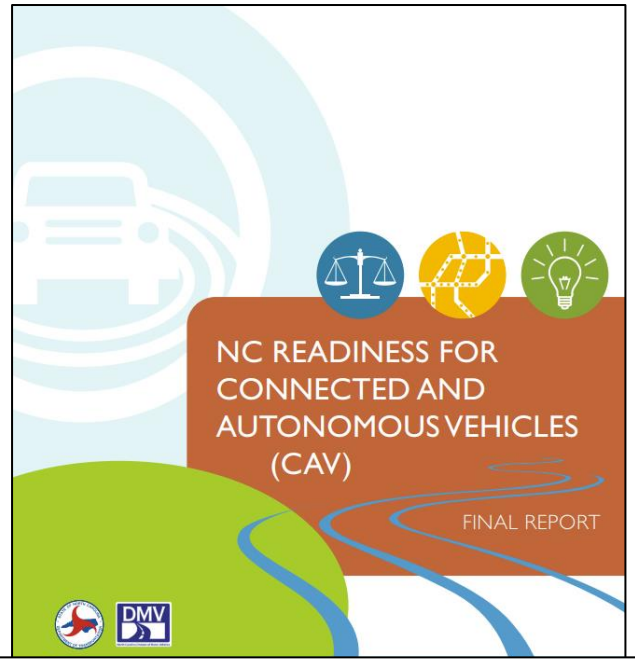
Advanced driver-assistance systems (ADAS), are technological features that are designed to increase the safety of driving a vehicle.

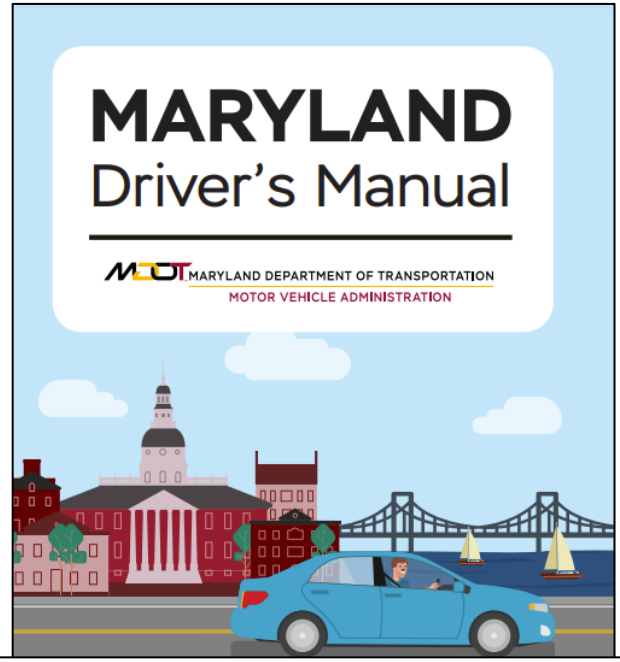
- **Adaptive Cruise Control**
- **Anti-lock Brakes**
- **Forward Collision Warning**
- **High Beam Safety System**
- **Lane Departure Warning**
- **Traffic Signals Recognition**
- **Traction control**

Automated Driving Systems (ADS) – A vehicle being able to operate without a human driver.

Coalition Member Work with ADAS







AUGUST 11, 2022 - MOUNT PLEASANT, PA

ADVISORY - PennDOT, Pa. Turnpike, RIDC of Southwestern PA to Collaborate on State-of-the-Art Safety, Training and Research Facility

Pennsylvania Department of Transportation (PennDOT) Secretary Yassmin Gramian announced that the department, the Pa. Turnpike Commission, and the Regional Industrial Development Corporation (RIDC) of Southwestern PA are partnering on site planning and design for the Pennsylvania Safety, Transportation and Research Track, or PennSTART -a state-of-the-art facility envisioned to benefit emergency responders, transportation technology companies, and research institutions while supporting the local economy.

Why is ADAS important?

“People are ready to embrace new vehicle technology, especially if it will make driving safer. Consumers are clear about what they want and if automakers seize the opportunity to provide a better experience now, it will pave the way for the vehicles of tomorrow.”- Greg Brannon, AAA

ADAS in the news

Tesla's 'full self-driving' feature may have finally met its match

By Matt McFarland, CNN Business

Updated 3:24 PM EDT, Mon August 15, 2022

Using self-driving vehicles ...	More likely to use	No difference	Less Likely to Use
As an alternative to public transportation	21%	42%	18%
As an alternative to using a ride-hailing service	19%	41%	19%

National CAV Day – October 8!

https://mva.maryland.gov/safety/Pages/MarylandCAV.aspx

How Maryland DOT is Leading the Way with ADAS Outreach

Chrissy Nizer, Administrator
Maryland DOT, Motor Vehicle Administration

MARYLAND DOT:
LEADING THE WAY WITH ADAS EDUCATION

September 27, 2022

Chrissy Nizer, Administrator

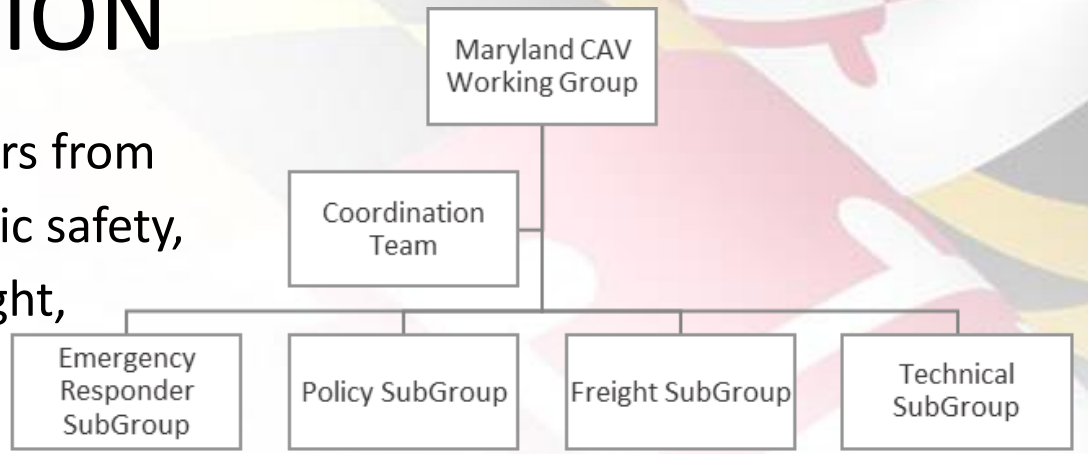
Maryland Department of Transportation

Motor Vehicle Administration

MARYLAND DEPARTMENT OF TRANSPORTATION

EMBRACING CAV COLLABORATION

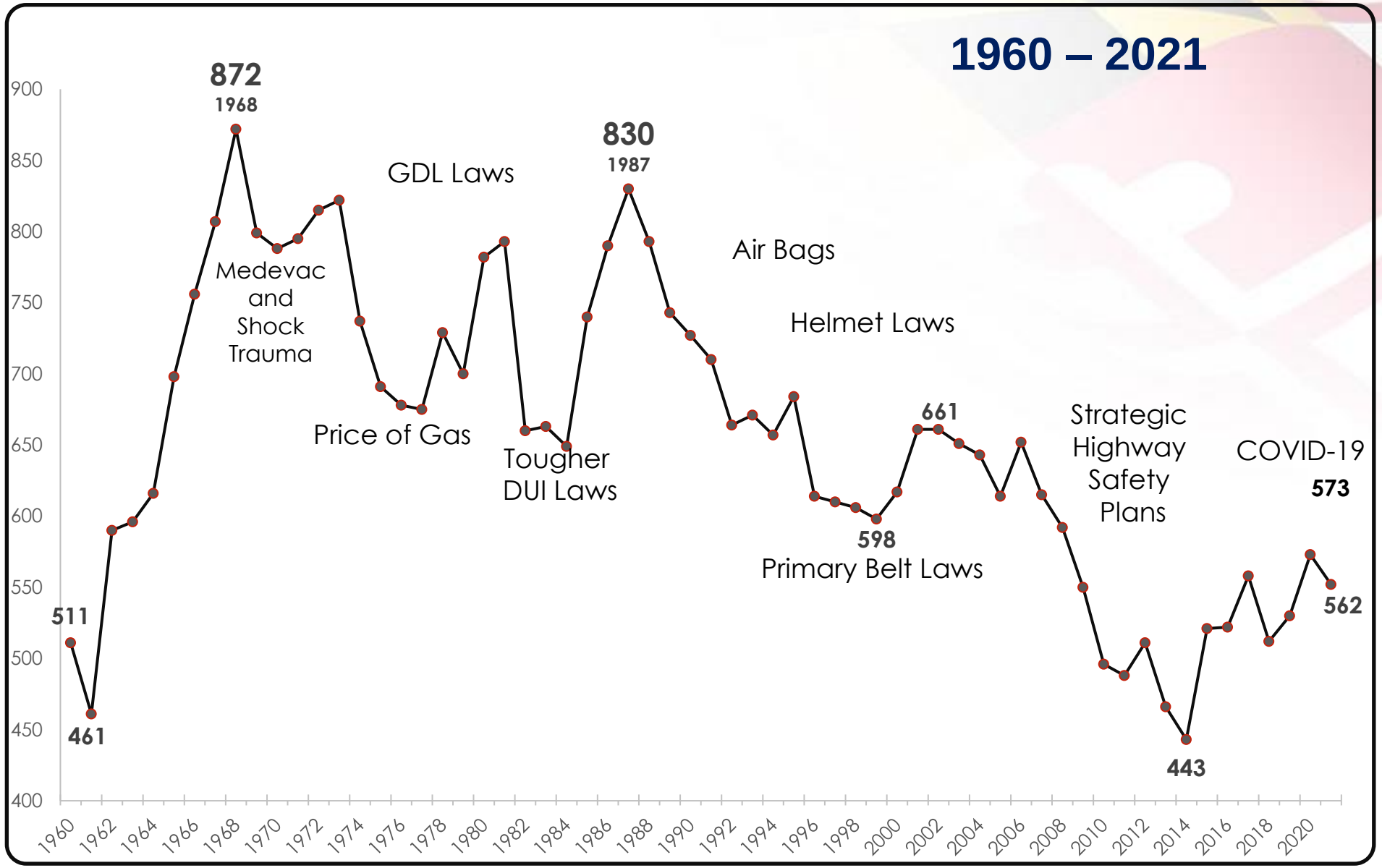
- Maryland CAV Working Group: diverse group of stakeholders from industry, highway safety, all levels of gov't agencies, IT, public safety, elected officials; subgroups for emergency responders, freight, policy, & tech.
- Maryland CAV Strategic Framework: guidance w/core values & key focus areas; call to action for all stakeholders.
- Encouraging research, testing, & deployment via Expression of Interest, Highly Automated Vehicle permit processes for on-road testing, Personal Delivery Device approval under the pilot program; and truck Platooning operations.
- Potential testing sites & CV readiness with detailed specs at Maryland Locations to Enable Testing (LETS CAV).



HOW DOES ADAS FIT INTO HIGHWAY SAFETY?

- Potential to **prevent roughly 40% of all crashes** involving passenger vehicles
- National studies estimate a savings of **37% of all injuries** and **29% of all fatalities**
- That's 4 out of every 10 crashes never happening from proper use of ADAS technology!
- Maryland has worked to intentionally integrate CAV into major planning documents – including the Strategic Highway Safety Plan.
- The SHSP's approach to traffic safety takes into consideration the continued development and enhancement of ADAS and the introduction of higher level vehicle technology on Maryland roads.
- Incorporating CAV into these plans is relevant to **moving forward on action** – paving the way for exploration of policy scenarios, detailing potential use cases, and providing for future funding.

HISTORICAL TRENDS: TRAFFIC FATALITIES ON MD ROADS



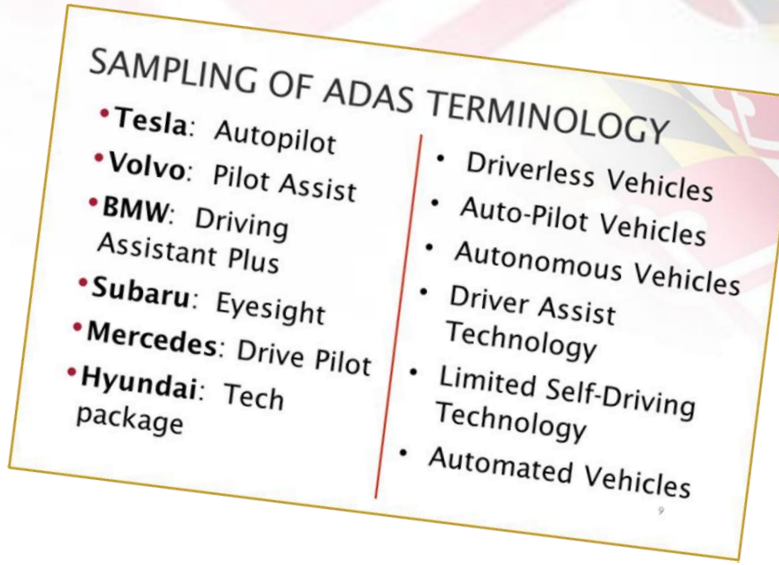
IMPERATIVE TO ENCOURAGE USE / PROPER USE

Proliferation on Roadways

- Even 4 years ago AAA estimated that 93% of new vehicles in the US have ADAS
- Now, model year 2023 – almost every new vehicle sold in the U.S. will come with AEB / automatic emergency braking technology.

Challenges on Education

- Safety features **different** brand names **among OEMs**
- Phrasing may lead to **over-reliance**
- Not always clear to driver when systems **disengaged/disabled**



Messaging

- State DOTs / DLAs are key partners for ADAS education public
- Other partners include manufacturers, dealerships, driver's ed schools, insurance companies, repair shops, other agencies, traffic safety advocates, and associations.
- Bottom line …While this technology may one day lead to fully self-driving vehicles, you, as the driver, are still responsible for safely operating your vehicle at all times.

SAMPLING OF MARYLAND ADAS PROJECTS

- Maryland Driver's Manual updated with ADAS information and the first state to have any substantial information on ADAS in Driver's Manual for novice drivers!
- Participated in NHTSA project w/ADTSEA to develop 3-module workshop for driver education instructors
- Offering this ADAS workshop to Maryland driver's ed instructors in October; approved for 4.5 hours professional development to encourage participation
- Engaged MD law enforcement in National Law Enforcement Liaison Program (NLELP) on **ADAS** – how to inform & influence communities they serve
- Focus on ADAS for first-ever CAV Day on October 8th; social media toolkit and graphics available for partner use

PROJECTS IN PLANNING AND/OR DEVELOPMENT

- Questions being added on ADAS to licensing practice test & knowledge test
- Rookie Driver handbook
- Driver's education curriculum
- Collaboration on national efforts – TETC & PAVE ADAS toolkit
- Anticipated RFP in October from TRB, BTSCRP-26 research project for unified and effective education framework, *Determining the State of Knowledge, Opportunities Outreach, and Data-driven Tools for Consumer Education of Advanced Driver Assistance Systems (ADAS)*
- ADAS follow-up with CAV Working Group / Fall Workshop to develop action items

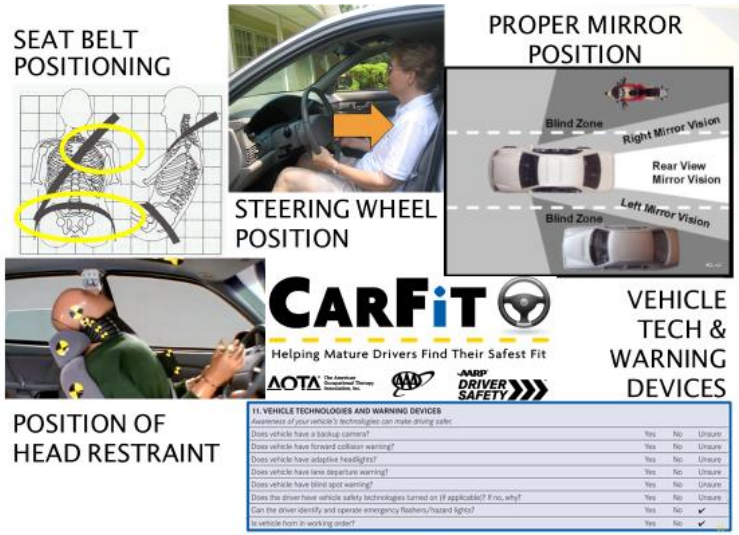
RESPONSES / IDEAS FOR ADAS EDUCATION

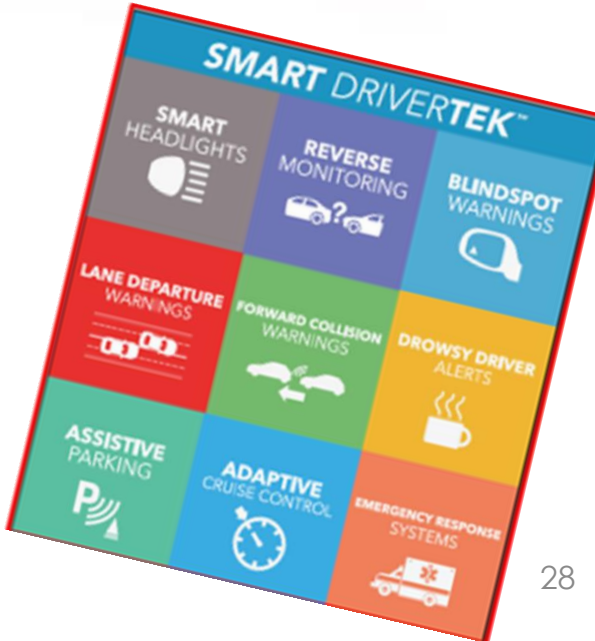
(from Maryland CAV Working Group Participants at the 8/10/22 Meeting)

- **How to get the word out?** incorporating in public safety campaign, newsletters, posters, handouts; highlight safety success stories; webinars; committee of speakers; social media; collaboration with many organizations
- **Who needs to be educated?** educate internal staff, first responders, dealerships, manufacturers, drivers/consumers, technicians (repair)
- **What education needs to be conveyed?** appropriate terminology; capabilities of tech; differences of active vs. alerts/warnings for ADAS; differences of ADAS v. ADS; awareness of tech and benefits; staying in control of the vehicle

PRIMARY RESOURCES AND MODELS

- National Safety Council - *My Car Does What* www.MyCarDoesWhat.org
- AARP (with The Hartford/MIT Age-Lab) - *SmartDriver Tek*
- Insurance Institute Highway Safety iihs.org/iihs/ratings/crash-avoidance-features
- NHTSA nhtsa.gov/equipment/driver-assistance-technologies
- Traffic Safety Education Foundation - *Vehicle Driver Aid Technology Today (VDATT)* videos
- Enhanced CarFit program (AAA, AARP, and AOTA) car-fit.org
- Common taxonomy: JD Powers, Consumer Reports, AAA, PAVE, National Safety Council, and SAE
- FMCSA - *TechCelerate* program for ADAS on trucks
- AAMVA – guidance





Thank You !

Christine Nizer, Administrator
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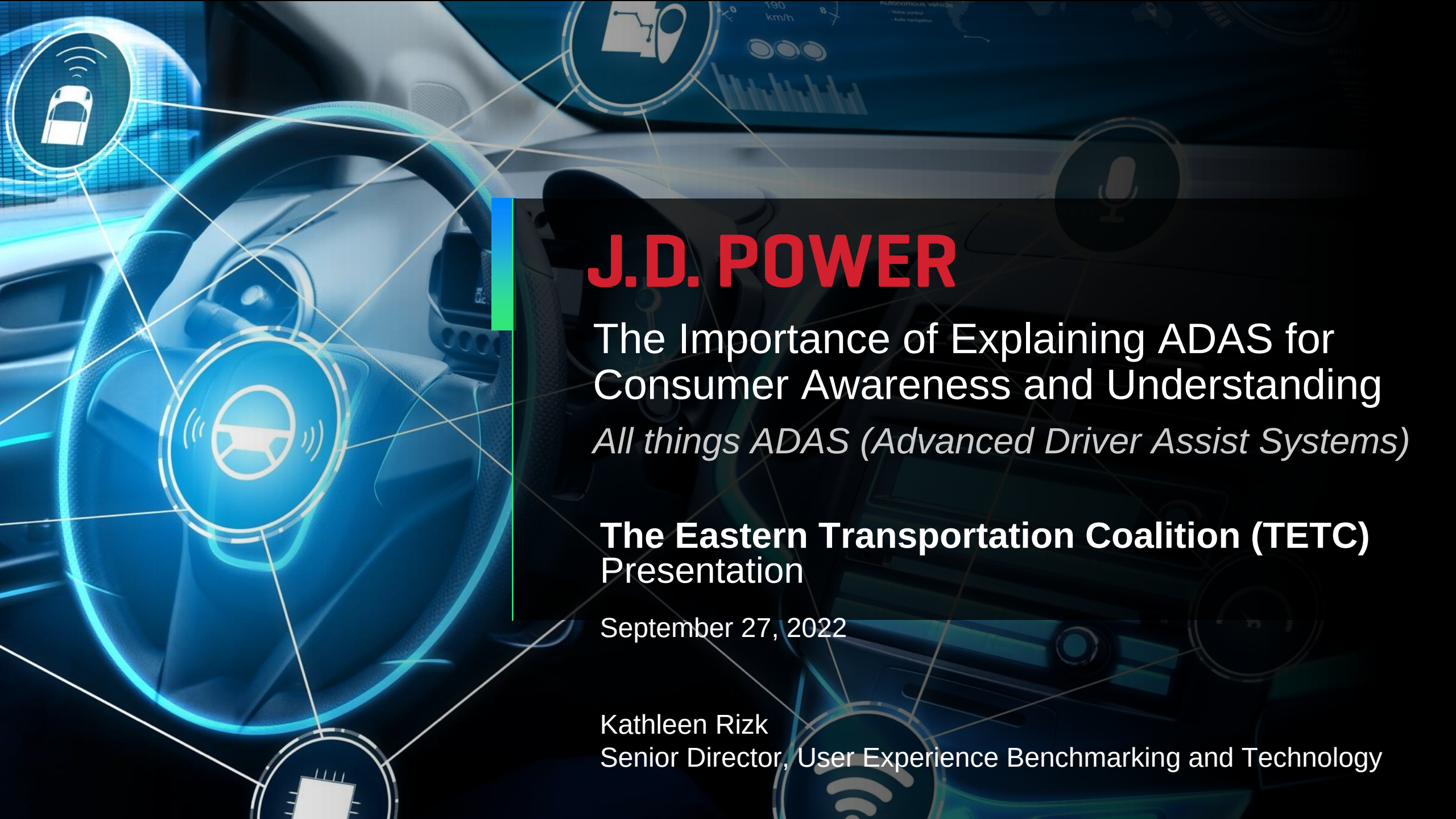
cnizer@mdot.maryland.gov

CAV Actions in Maryland:
https://mva.maryland.gov/safety/Pages/MarylandCAV.aspx

E-Mail: CAVMaryland@mdot.state.md.us

The Importance of Explaining ADAS for Consumer Awareness

Kathleen Rizk, Senior Director, UX Benchmarking and Technology
JD Power



J.D. POWER

The Importance of Explaining ADAS for Consumer Awareness and Understanding

All things ADAS (Advanced Driver Assist Systems)

The Eastern Transportation Coalition (TETC)
Presentation

September 27, 2022

Kathleen Rizk
Senior Director, User Experience Benchmarking and Technology

J.D. Power is a leading global data & analytics and consumer insights company

175
Annual Benchmark Studies

Featured in **THOUSANDS** of commercials Receiving **BILLIONS** of impressions

91%
Of consumers recognize the J.D. Power Award*

53 Years
of Experience & Brand Recognition Consumer Trust

More than **3 in 4** consumers say that **J.D. Power has "deep industry expertise."**[1]

More Than **5,000,000** Consumers Surveyed Annually

Consumers say they use J.D. Power reviews and ratings because they are **trustworthy, reliable, honest, clear** and **accurate****

20 Countries in which studies are fielded

*Based on J.D. Power U.S. Award Program Usage and Awareness Research conducted by Kantar in March 2020; results based on 2,000 online interviews conducted with adults 18 years+, with shared/sole responsibility in household purchase decisions.
**Based on consumer evaluations of J.D. Power as a company that provides ratings/reviews of products and services. Results based on sample representative of U.S. Census by gender, state, age and income during Jan-Mar '20, 95% confidence level utilized.

Consumer Education on ADAS Features

Consumer understanding of Advanced Driver Assistance Systems (ADAS) is critical for safety reasons and acceptance of higher-level automation as the auto industry moves towards fully automated, self-driving vehicles.

Consumer Education of ADAS Features is the Building Block for Road Safety and Acceptance of Higher Levels of Automation

For safety reasons consumers need to understand:

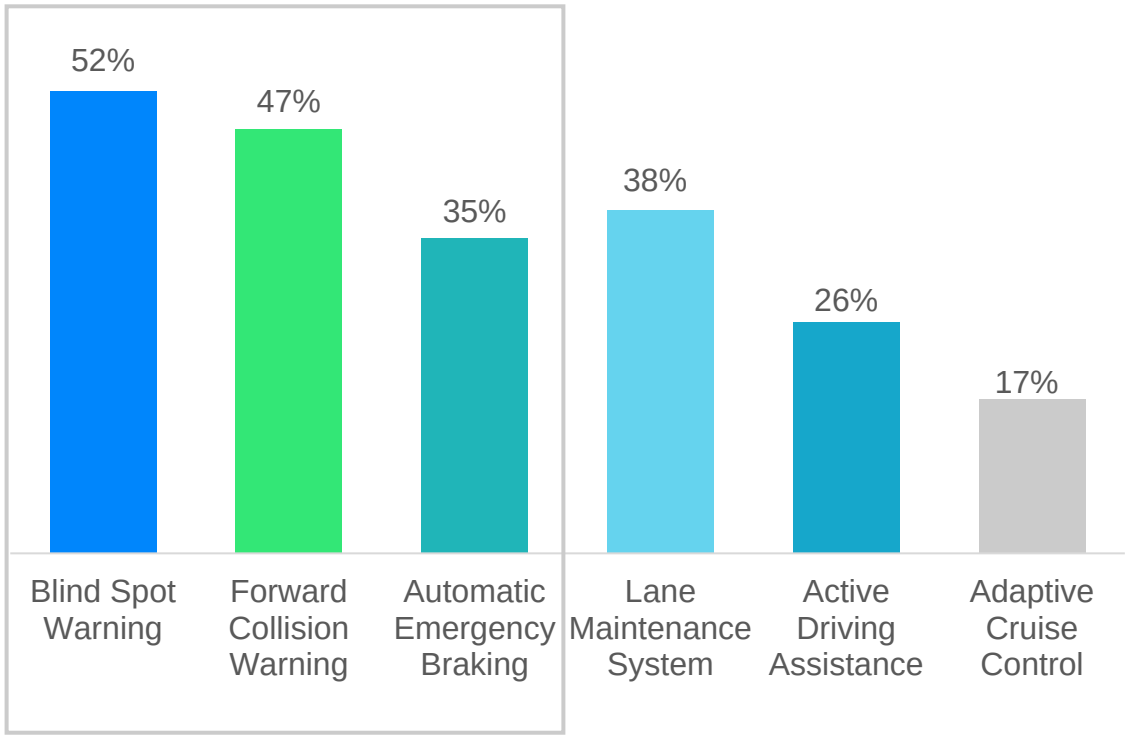
1. What its capability is
2. What state the system/feature is in
3. What the driver's role is

*SAE J3016: Taxonomy and Definitions for Terms Related to On-Road Motor Vehicle Automated Driving Systems.

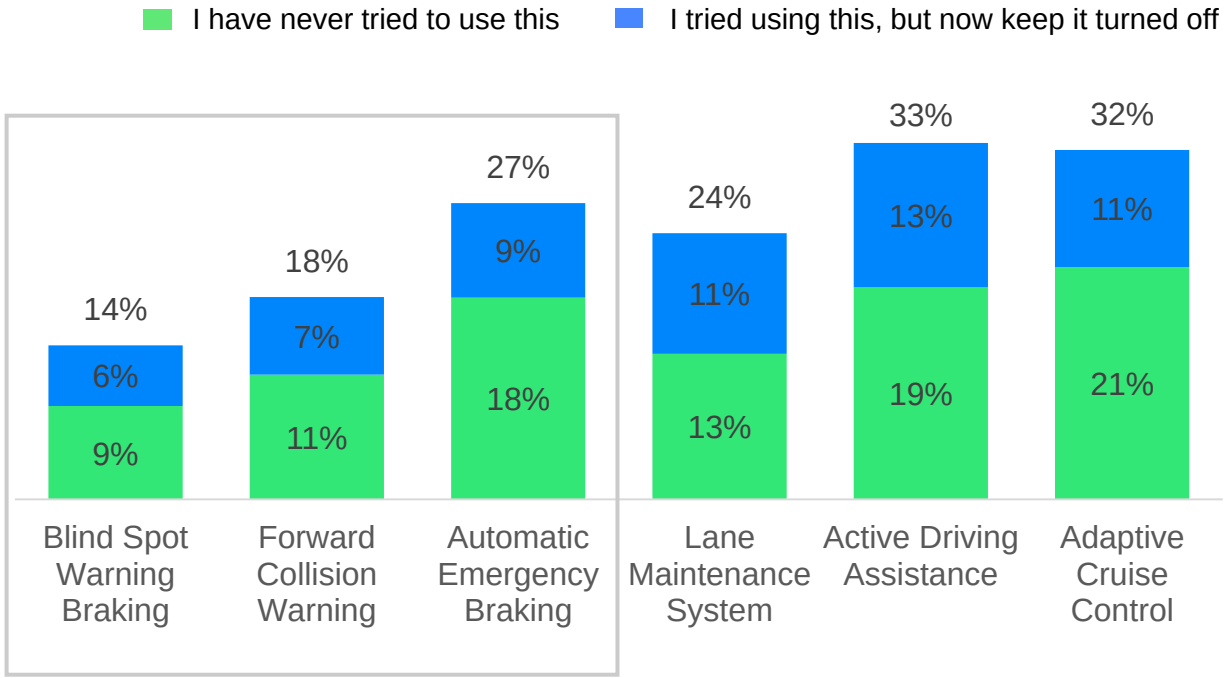
ADAS feature usage every time the vehicle is driven is limited; automation/intervention features have a higher level of non-usage among owners in both the U.S. than features that just provide a warning

ADAS Feature Usage

All the Time / Every Time Drive



Don't Use



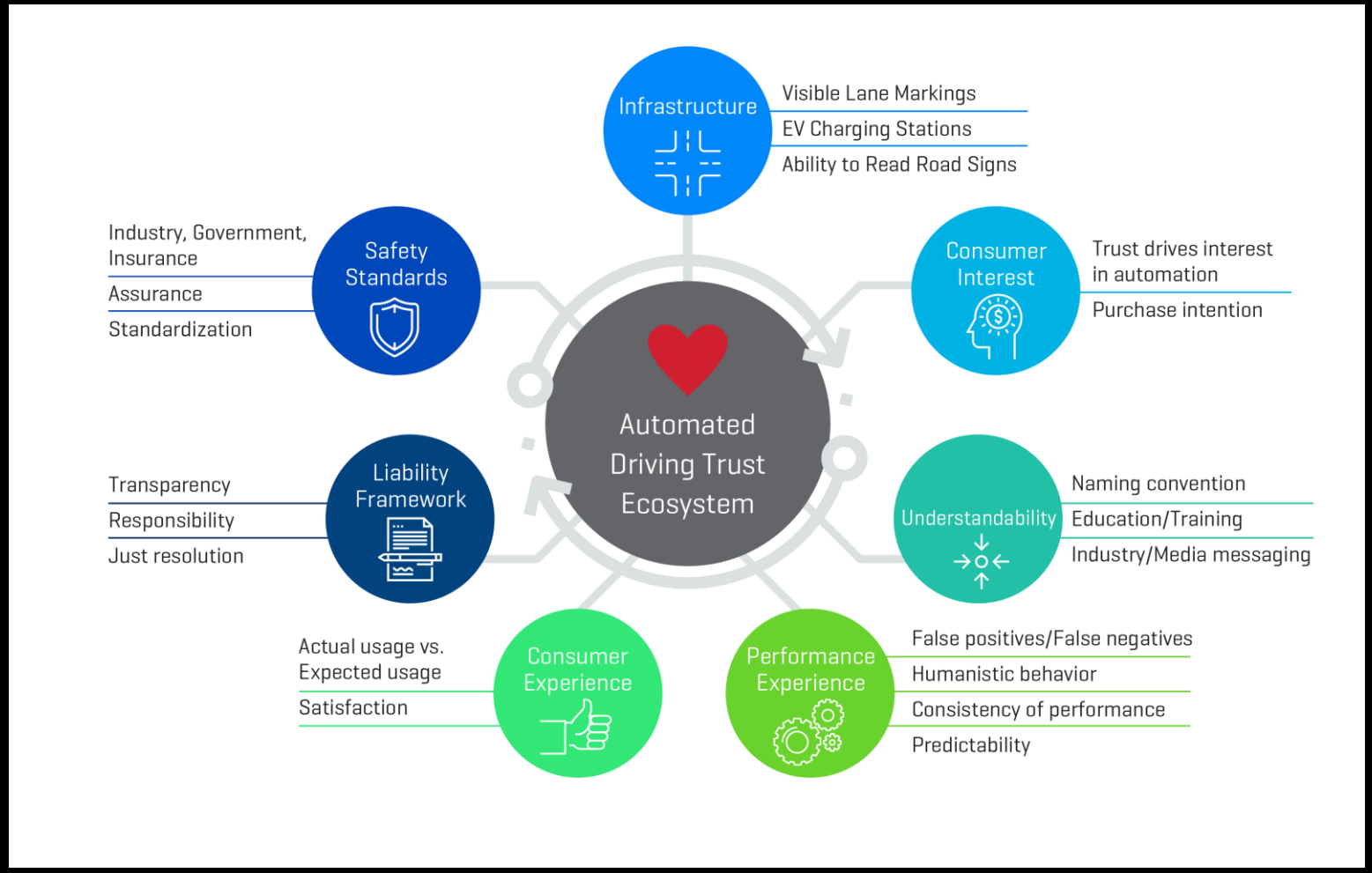
Source: 2022 J.D. Power U.S. Mobility Confidence Index Study

Trust is a checkpoint in the various stages of the ecosystem all of which impacts the consumer's automated driving experience

It is essential the industry recognizes the importance of a positive experience during an owner's first introduction to these lower-level automated technologies.

Trust is fragile. In the development of fully automated, self-driving vehicles, trust will be earned through repeated positive experiences with low-levels of automation.

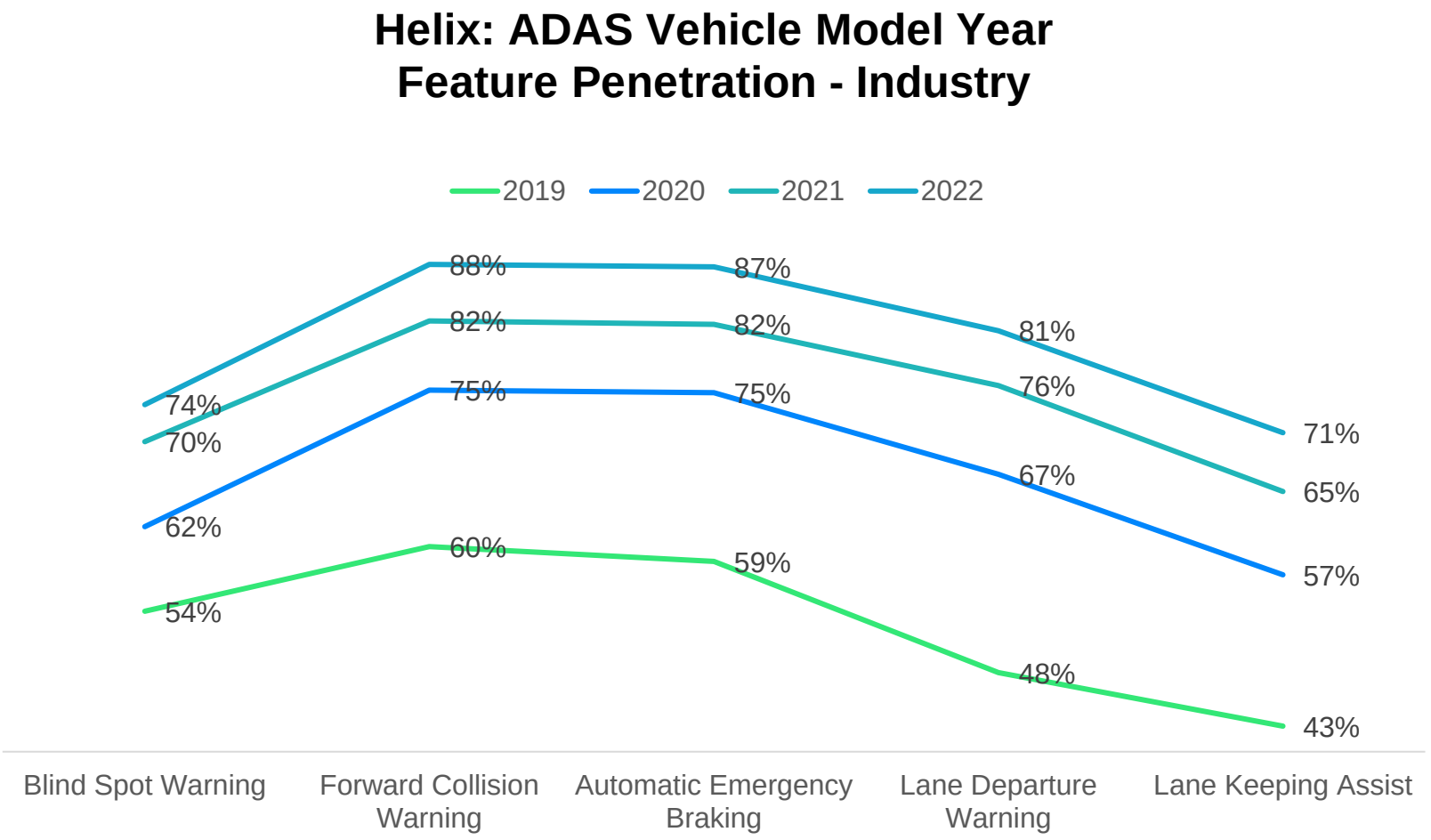
Automated Driving Trust Ecosystem



Source: J.D. Power's U.S. Tech Experience Index Study (TXI).

As ADAS features become more prevalent, consumer-reported problems continue to rise with a total of 23.1 PP100 reported in J.D. Power's 2022 Initial Quality Study[SM]

As penetration increases for ADAS technologies, so does the number of consumer-reported problems, which should sound warning bells for OEMs, suppliers, and government agencies, as these features comprise some of the building blocks of fully automated, self-driving vehicles.



Source: Powered by J.D. Power's Helix Configuration Analytics

IQS captures the problems customers are having with their vehicle. They are reported in terms of PP100, which means problems per 100 vehicles. To calculate this figure, the total number of problems reported for the model are divided by the number of returns for the model and multiplied by 100.

Consumer comprehension of ADAS features is very low

- Adding to the confusion is the fact that the terminology used by automakers to describe the ADAS features varies widely, and often seems to prioritize marketing over clarity.
- Leaders in consumer advocacy, traffic safety, and industry advice, four organizations—AAA, Consumer Reports, J.D. Power, National Safety Council, PAVE, and SAE—have come together to adopt standardized naming for advanced driver assistance technology in an effort to reduce confusion.

– *Clearing the Confusion – Common naming for Advanced Driver Assistance Systems*

ADAS FEATURE	# OF UNIQUE NAMES
Automatic Emergency Braking	40
Adaptive Cruise Control	20
Surround-View Camera	20
Lane Keeping Assistance	19
Blind Spot Warning	19
Automatic High Beams	18
Rear Cross Traffic Warning	15
Driver Monitoring	13
Semi-Automated Parking Assist	12
Forward Collision Warning	8
Night Vision and Pedestrian Detection	5

Source: AAA 2019 Automotive Engineering Terminology Review of 34 brands sold in the U.S.

Clearing the Confusion:
Common naming for Advanced Driver Assistance Systems

COLLISION WARNING	
Blind Spot Warning	Detects vehicles in the blind spot while driving and notifies the driver to their presence. Some systems provide an additional warning if the driver activates the turn signal.
Forward Collision Warning	Detects a potential collision with a vehicle ahead and alerts the driver. Some systems also provide alerts for pedestrians or other objects.
Lane Departure Warning	Monitors vehicle's position within the driving lane and alerts driver as the vehicle approaches or crosses lane markers.
Parking Collision Warning	Detects objects close to the vehicle during parking maneuvers and notifies the driver.
Rear Cross Traffic Warning	Detects vehicles approaching from the side at the rear of the vehicle while in reverse gear and alerts the driver. Some systems also warn for pedestrians or other objects.

COLLISION INTERVENTION	
Automatic Emergency Braking	Detects potential collisions with a vehicle ahead, provides forward collision warning, and automatically brakes to avoid a collision or lessen the severity of impact. Some systems also detect pedestrians or other objects.
Automatic Emergency Steering	Detects potential collisions with a vehicle ahead and automatically steers to avoid or lessen the severity of impact. Some systems also detect pedestrians or other objects.
Lane Keeping Assistance	Provides steering support to assist the driver in keeping the vehicle in the lane. The system reacts only when the vehicle approaches or crosses a lane line or road edge.
Reverse Automatic Emergency Braking	Detects potential collisions while in reverse gear and automatically brakes to avoid or lessen the severity of impact. Some systems also detect pedestrians or other objects.

DRIVING CONTROL ASSISTANCE	
Adaptive Cruise Control	Cruise control that also assists with acceleration and/or braking to maintain a driver-selected gap to the vehicle in front. Some systems can come to a stop and continue while others cannot.
Lane Centering Assistance[NEW]	Provides steering support to assist the driver in continuously maintaining the vehicle at or near the center of the lane.
Active Driving Assistance[1]	Simultaneous use of **Lane Centering Assistance** and **Adaptive Cruise Control** features. The driver must constantly supervise this support feature and maintain responsibility for driving.

[1] Classified as Level 2 Driving Automation by SAE J3016

Version 07-2022

PARKING ASSISTANCE	
Backup Camera	Displays the area behind the vehicle when in reverse gear.
Surround View Camera	Displays the immediate surroundings of some or all sides of the vehicle while stopped or during low speed maneuvers.
Active Parking Assistance	Assists with steering and potentially other functions during parking maneuvers. Driver may be required to accelerate, brake, and/or select gear position. Some systems are capable of parallel and/or perpendicular parking. The driver must constantly supervise this support feature and maintain responsibility for parking.
Remote Parking Assistance[1]	Without the driver being physically present inside the vehicle, provides steering, braking, accelerating and/or gear selection while moving a vehicle into or out of a parking space. The driver must constantly supervise this support feature and maintain responsibility for parking.
Trailer Assistance	Assists the driver with visual guidance while backing towards a trailer or during backing maneuvers with a trailer attached. Some systems may provide additional images while driving or backing with a trailer. Some systems may provide steering assistance during backing maneuvers.

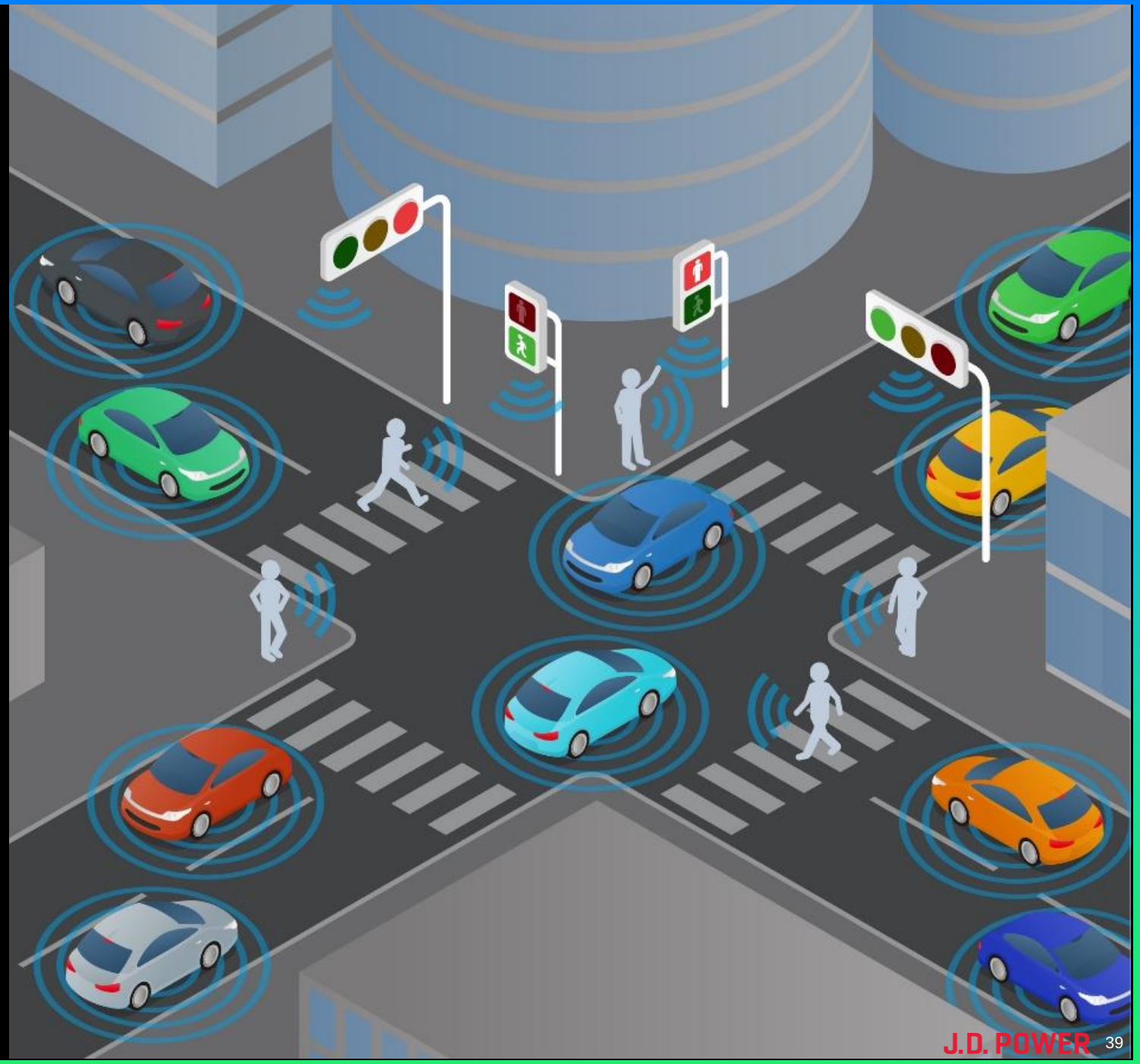
DRIVER MONITORING	
Indirect Driver Monitoring System[NEW]	Observes vehicle states, motions and/or driver performance indicators to estimate driver distraction, inattention, or misuse. This may include monitoring steering wheel input, vehicle sway within the lane, or a combination of other factors monitored by the vehicle systems. Some systems may provide a warning to the driver and/or limit the use of other features.
Direct Driver Monitoring System[NEW]	Detects the driver's eye and/or head movement to estimate where the driver is looking. Some systems may provide a warning to the driver and/or limit the use of other features.
Driver Re-engagement System[NEW]	A series of escalating warnings and interventions attempting to engage an unresponsive driver. If the driver does not respond, the system brings the vehicle to a full stop while maintaining steering control. Some systems may steer the vehicle to the side of the road and/or make an emergency call if the driver fails to respond.

OTHER DRIVER ASSISTANCE SYSTEMS	
Automatic High Beams	Switches between high and low beam headlamps automatically based on lighting and traffic.
Head-Up Display	Projects information relevant to driving into the driver's forward line of sight.
Night Vision	Improves forward visibility at night by projecting enhanced images on instrument cluster or head-up display.

[1] Classified as Level 2 Driving Automation by SAE J3016

Last Modified 07/25/22

More and more ADAS and CV2X features are being integrated into vehicles, heightening the need for driver education



Consumer misunderstanding of ADAS technologies has multiple points of imprecision

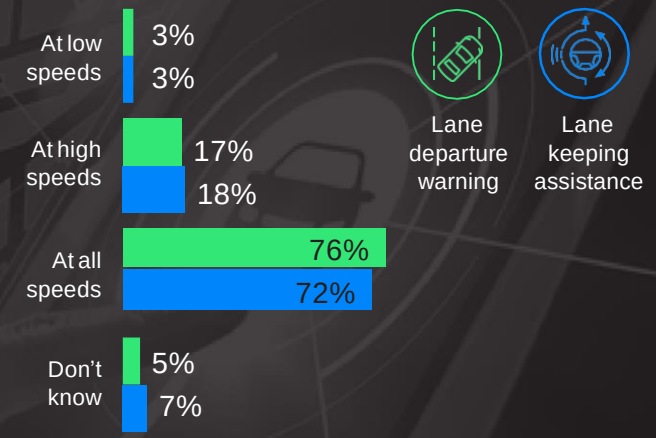
SPEED REQUIREMENT

Over 70% inaccurately believe that the Lane Departure Warning and Lane Keeping Assistance features work at all speeds, when in reality, they begin operating at speeds between 30 mph–45 mph.

FEATURE REACTION

Less than 30% comprehend that the vehicle's reaction to going over the lane markings is to provide an alert/warning.

MY VEHICLE'S LANE FEATURE OPERATES



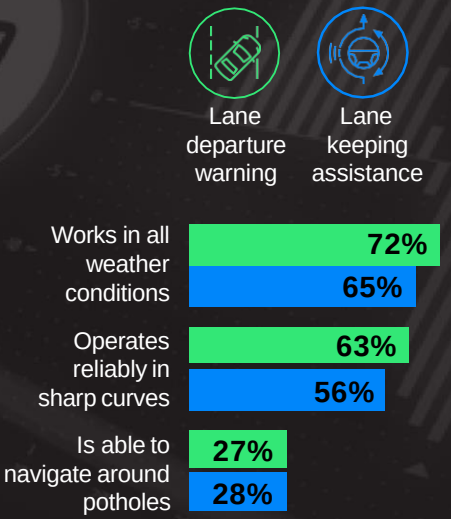
WARNING PROVIDED: REACTION OF FEATURE IF THE LANE MARKINGS ARE NO LONGER VISIBLE

Feature will alert you if you cross either of the lane markings that your vehicle is traveling within

FEATURE CAPABILITY

All of the statements below are false for the vehicles tested, demonstrating the consumer misconception regarding the capability of the technologies.

MY VEHICLE'S LANE FEATURE...
(% TRUE RESPONSE)



Source: J.D. Power and MIT AVT 2019 Lateral Support Study.
N = 767, which was comprised of 2018 and 2019 Model Year vehicles offering both Lane Departure Warning and Lane Keeping Assistance features as standard.

Today's driver assistance features are at a level where they are meant to do just that – ASSIST

BUT some consumers think that one or more fully automated, self-driving vehicles are already available today.

Non-Intended Uses

- Customers' lack of understanding of when/how the features should be used, can result in ADAS features being used in non-intended situations.
- Use of the technology in non-intended circumstances can result in a potentially risky situation.

Too Much Reliance

- There is also growing concern regarding some consumers placing too much confidence/reliance in the capability of the ADAS system at this early stage, when it is only meant to be a means of support for the driver.

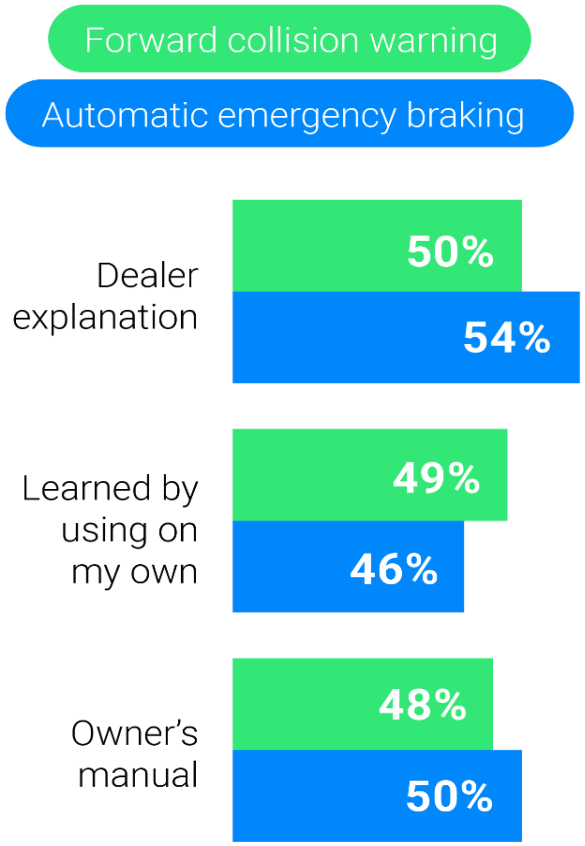
What comes to mind when saying "fully automated, self-driving"?

Source: 2021 J.D. Power U.S. Mobility Confidence Index Study

Traditional methods for educating consumers on vehicle technologies are less effective

- Consumers' knowledge of how to use the complicated ADAS technologies has primarily been self-taught or learned through a quick demonstration at the dealership by a salesperson who may or may not know how the feature works.
- While these same approaches to learning have been successfully used for years as a means of educating users about less elaborate vehicle features, the integration of new, more complex technologies into the vehicle has proven these learning methods to be less effective for many users.

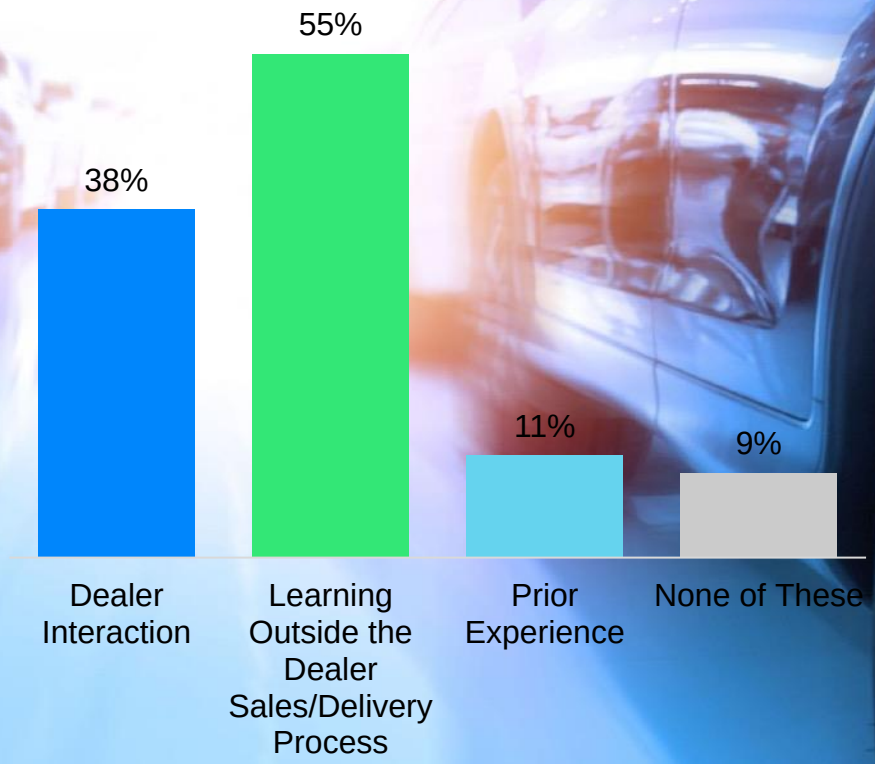
ADAS TECHNOLOGY LEARNING PROCESS*



*Multiple response possible
Source: J.D. Power and MIT AVT 2019 Forward Collision Study.
N = 1,410, which was comprised of 2018 and 2019 Model Year vehicles offering both Forward Collision Warning and Automatic Emergency Braking features as standard.

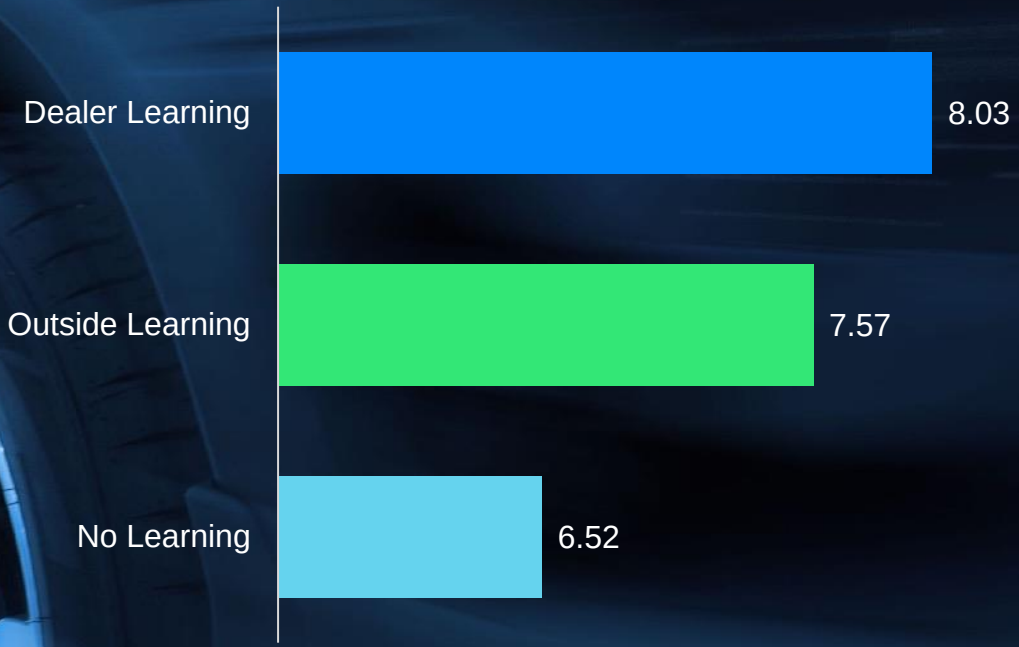
Automatic Emergency Braking - Industry

Technology Learning Method



Difference in Ability to Learn/Understand Satisfaction

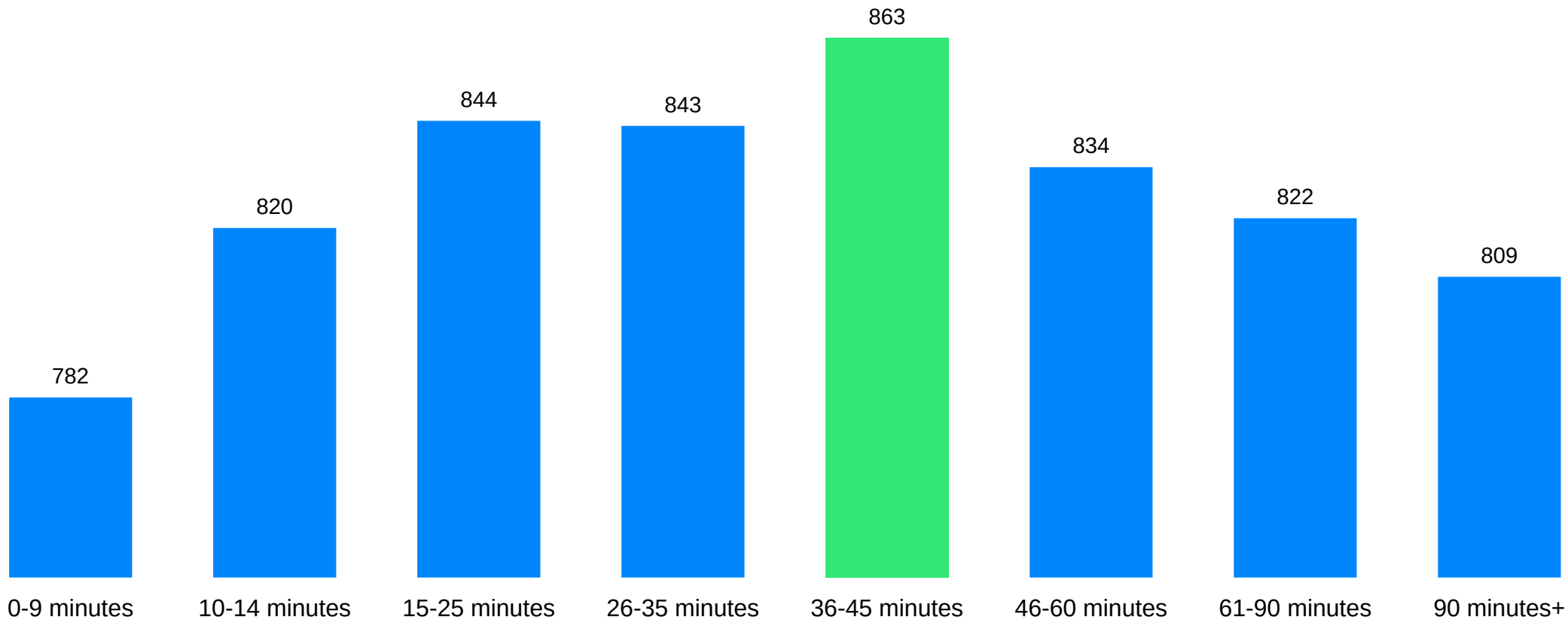
When Owners Learn From Dealer vs. Outside Learning



Source: J.D. Power 2021 U.S. Tech Experience Index (TXI) Study℠

Dealer learning can help but there is not enough time at delivery to explain ADAS technologies, which is complicated by limited user retention

Delivery Satisfaction by Delivery Time - Industry



Source: J.D. Power 2019 Sales Satisfaction Index Study (SSI)

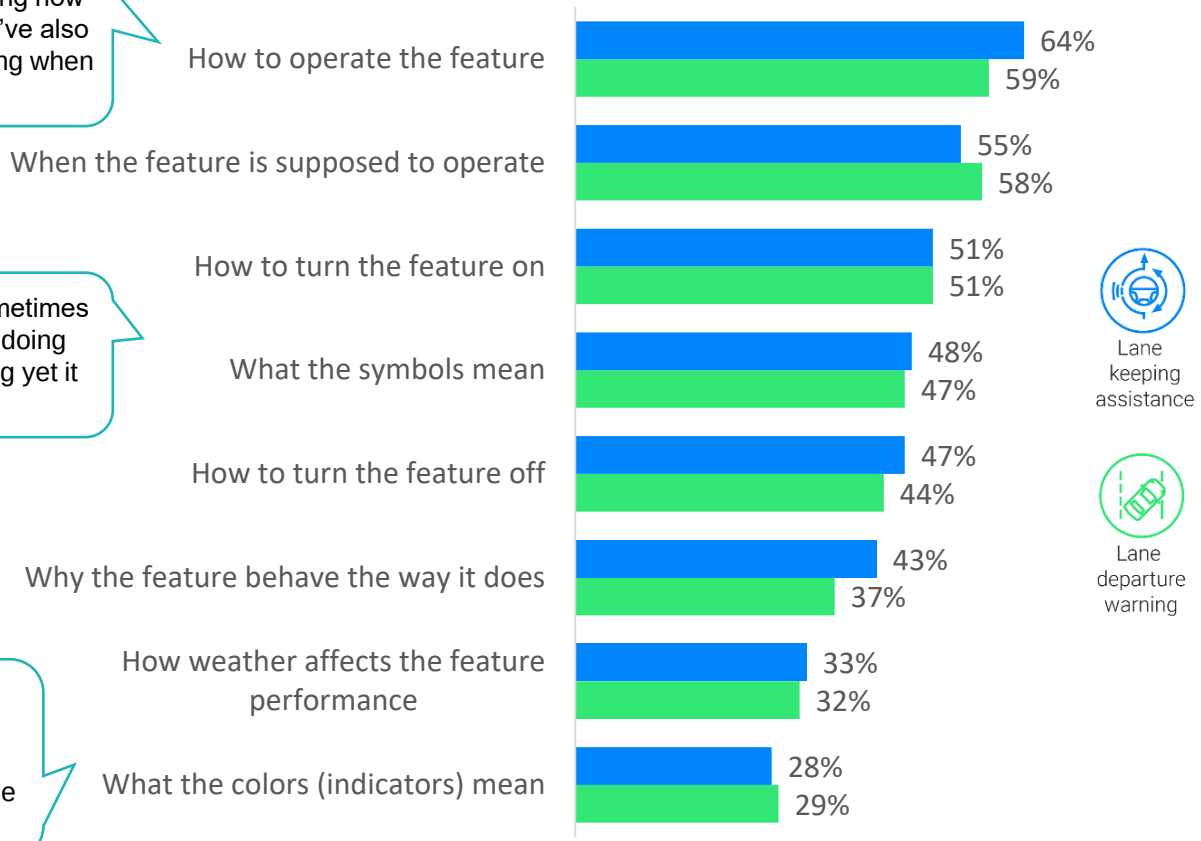
Consumers want and need more training on ADAS features

Type of Additional Information Consumers are Seeking to Learn

"I've had difficulty in learning how to best utilize the feature. I've also had difficulty in remembering when it is on or off."

"When it is turned on…sometimes it is greyed out. I am not doing anything when I am driving yet it greys out."

"Don't totally understand when the indicator goes green why? When the indicator goes white (on the lane drifting)."



Most users do not learn enough about these complex systems despite efforts to learn from the dealer or by themselves from tools provided.

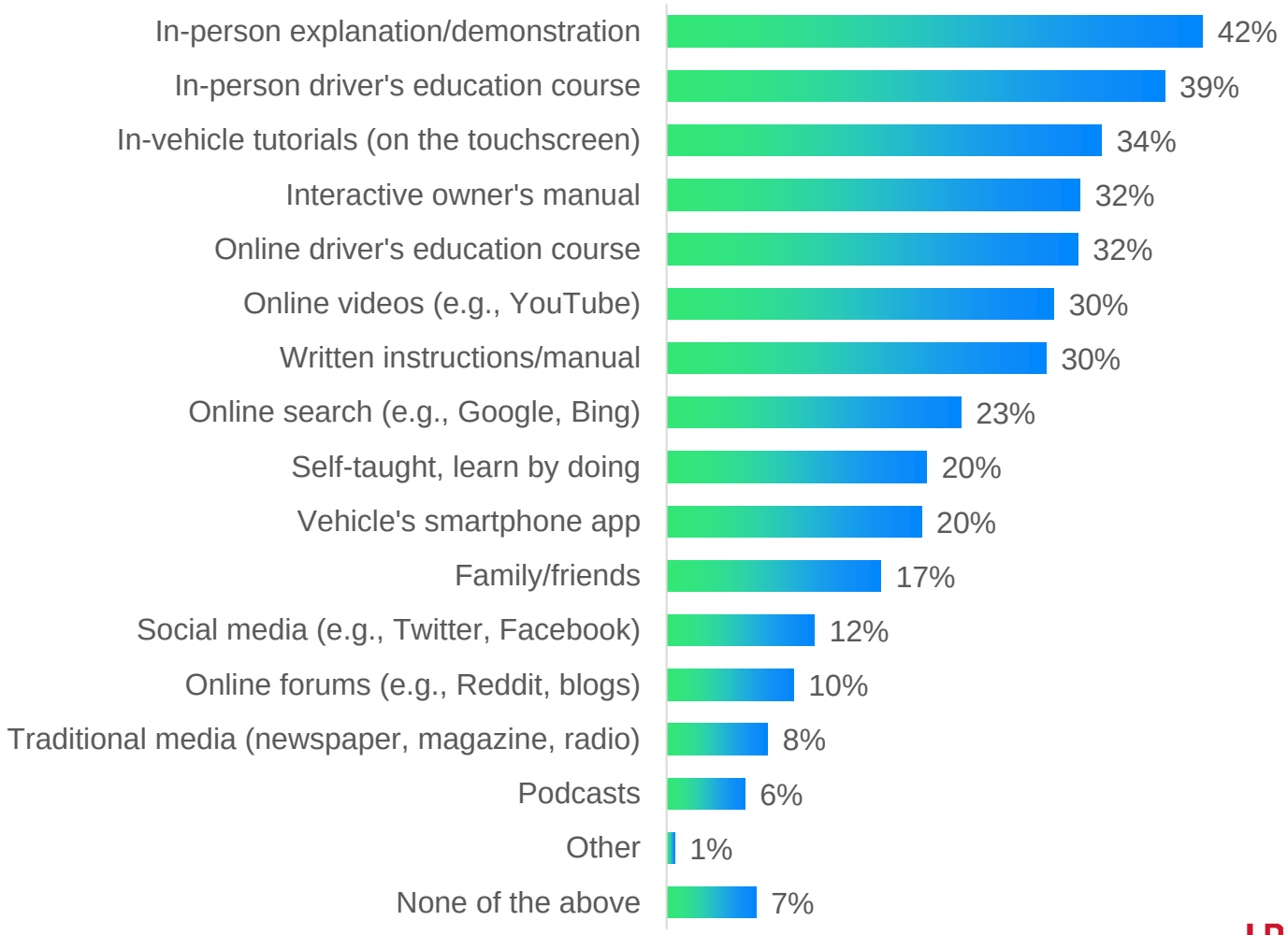
More knowledge is both wanted, and needed, as misunderstanding of the ADAS capabilities is prevalent, and impacts consumer trust, frequency of usage, and overall satisfaction.

Users are seeking more knowledge on the basics of what, when, why, and how the ADAS feature operates.

Source: J.D. Power and MIT AVT 2019 Lateral Support Study.
N = 767, which was comprised of 2018 and 2019 Model Year vehicles offering both Lane Departure Warning and Lane Keeping Assistance features as standard.

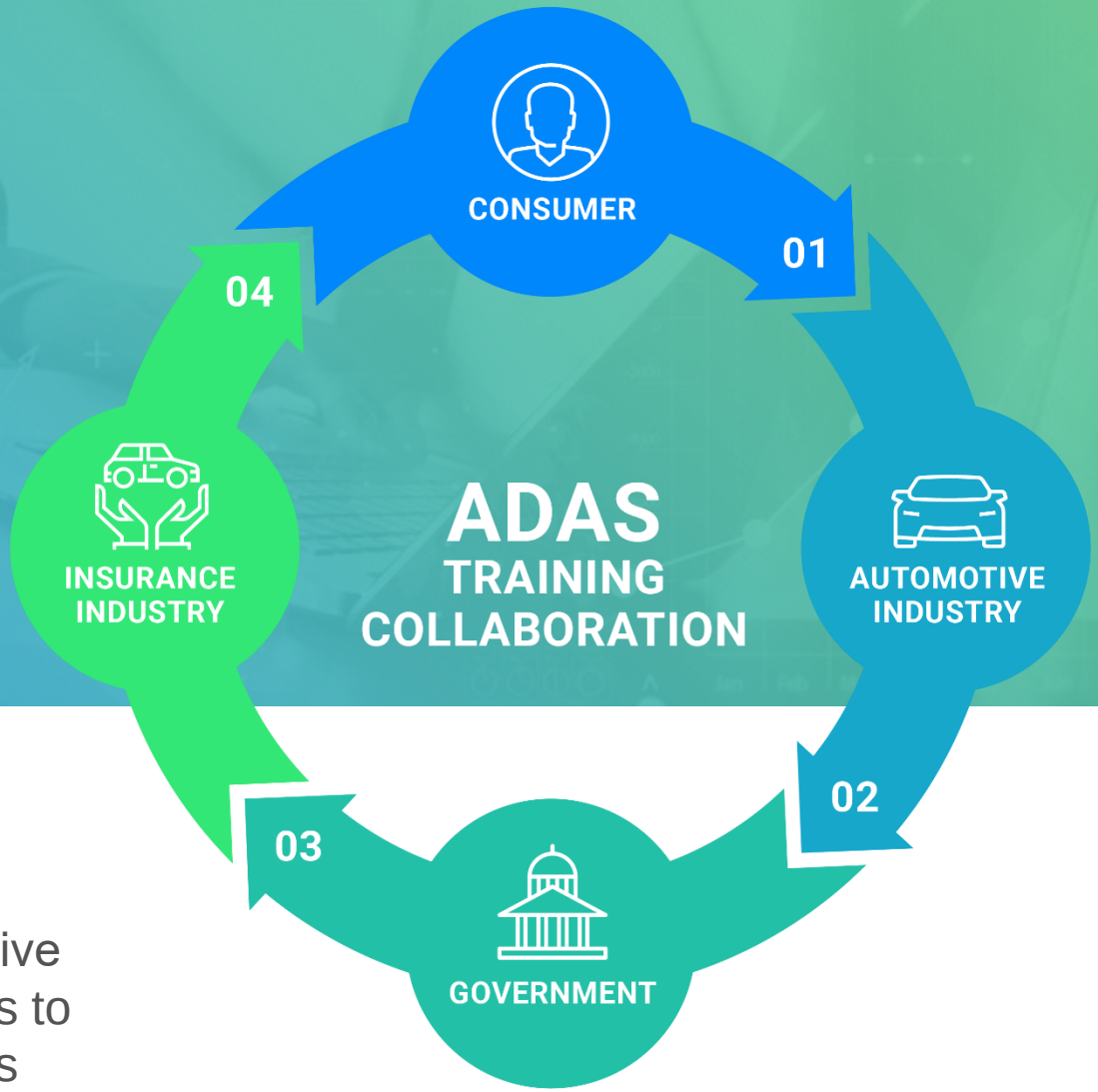
U.S. Learning Preferences for Lower Automation

Vehicles that don't require a human operator are not expected to be commercially available for some time. Until then, as vehicles become more automated, users will likely need to learn more about what new technologies can and cannot do. With that in mind, how would you prefer to learn how to utilize the vehicle safely and responsibly?



Source: 2022 J.D. Power U.S. Mobility Confidence Index Study

Collaboration Drives Success in Educating Consumers



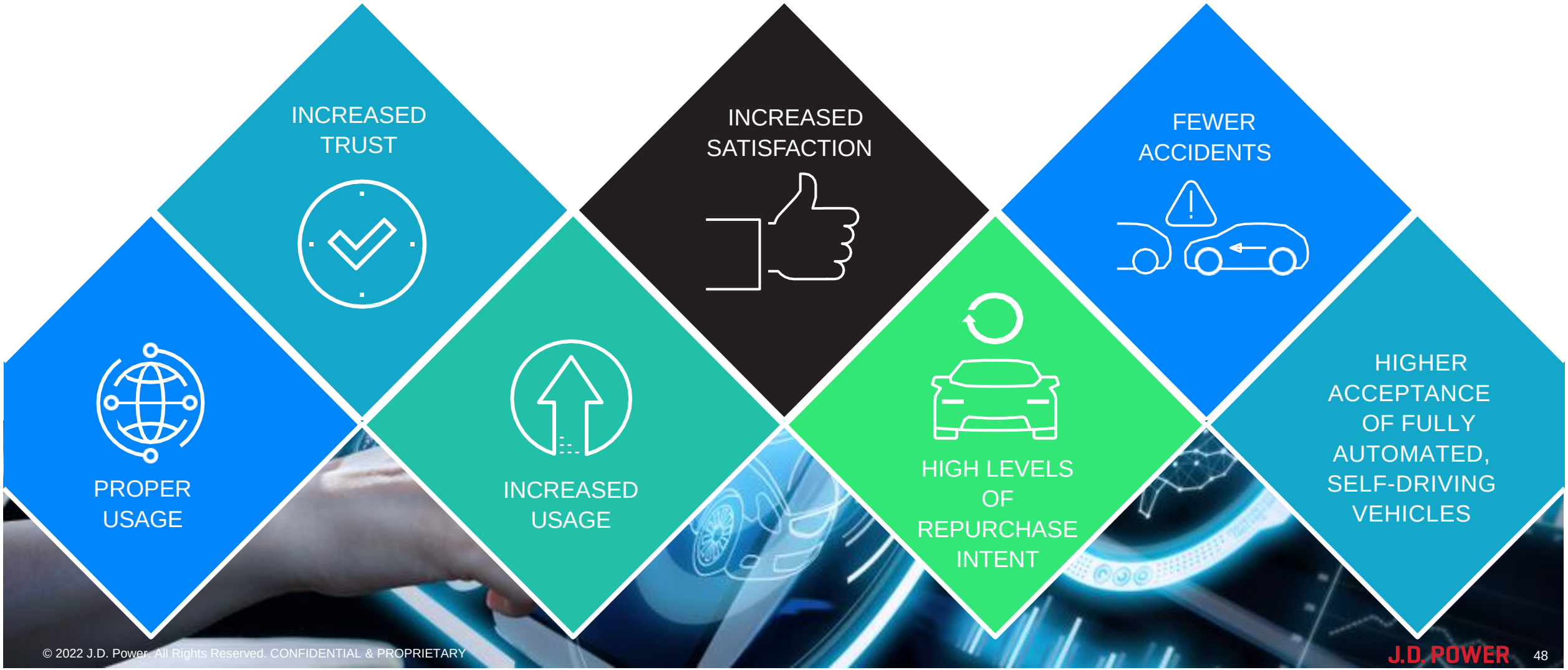
No single source will prove successful in educating consumers on ADAS and fully automated, self-driving vehicles.

It is in everyone's collective interest to get consumers to use these ADAS features properly and build their reliance on them.

Doing so will improve road safety and inspire the next evolution or what the automotive industry will call the next level of automation.

Benefits

A better user understanding of the various ADAS features can lead to:



J.D. POWER

Thank You

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J.D. POWER

CAV at KYTC - Incorporating ADAS Data

Shane McKenzie, CAV Engineer
Kentucky Transportation Cabinet

Prepared for:
TETC CAV Working Group
Fall 2022 Webinar

TEAM KENTUCKY
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CAV at KYTC – Incorporating ADAS Data

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To Inform Decision Makers about Public Opinion

To Inform Capacity Models for Long Range Planning

From a statewide AV Acceptance Study

Notable findings related to ADAS

….for simulated driving under Level 2 ADAS, the increase of AV acceptance was higher than the increase of AV acceptance from watching the AV introduction video only (by 24.2 %)

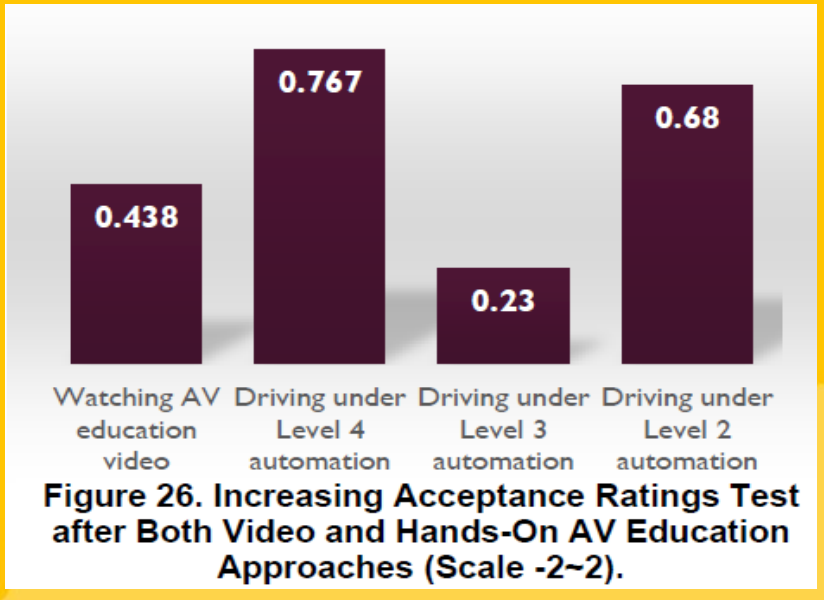


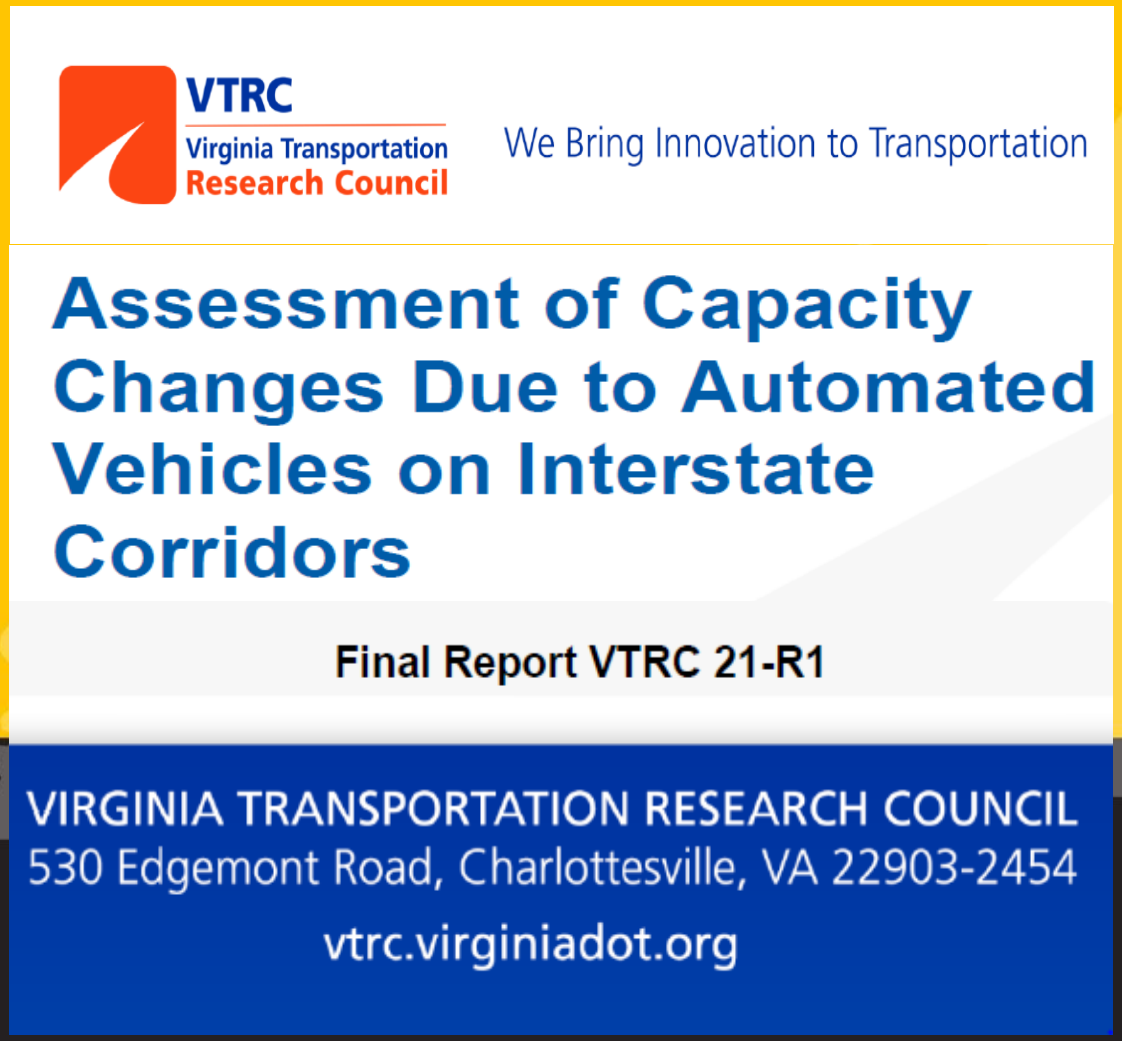
Figure 26. Increasing Acceptance Ratings Test after Both Video and Hands-On AV Education Approaches (Scale -2~2).

TEAM KENTUCKY
TRANSPORTATION CABINET

…compared with having no automation, simulated traffic conflicts per minute were significantly reduced at all levels:

Results from this study can help to inform decision makers.

From an Interstate Capacity with AVs Study



Notable findings related to ADAS

AVs may… follow at shorter than recommended time headways.

The ACC feature in a 2017 Audi Q7 can be set to the following time gap of 1 second (Audi AG, 2016)

Table 3. Examples of Car-Following Headways

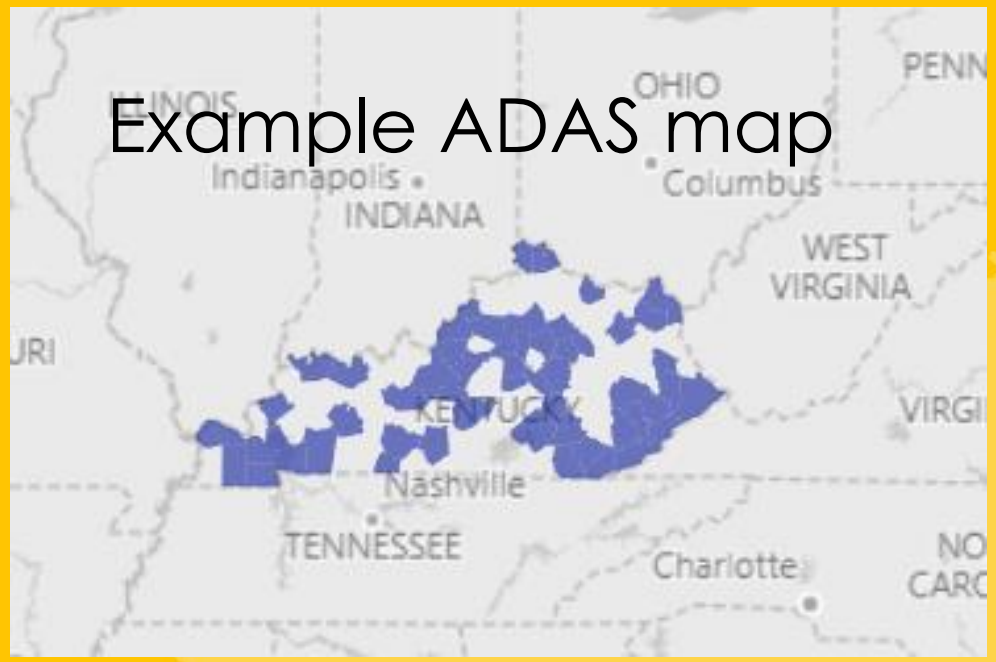
Citation	Headway at 65 mph (s)	Notes[a]
Le Vine et al. 2017	0.6-2.6	Requires adherence to Assured Clear Distance Ahead doctrine. See citation and Table 10 for parameters and assumptions.
International Organization for Standardization 2010	1.0	Minimum allowable headway for the ACC system.
	1.7	Minimum default headway for the ACC system.
	2.4	Maximum default headway for the ACC system.
Audi AG 2016	1.2	Minimum headway setting for 2017 Audi Q7's ACC system.
	2	Recommended headway setting for 2017 Audi Q7's ACC.
Virginia Department of Motor Vehicles 2018	4	Recommended headway, not specified in the Code of Virginia.

ACC = adaptive cruise control.

[a] Time gaps have been converted to headways by adding 0.2 seconds, i.e., the time required for a vehicle to travel 19 ft (the length of a vehicle) at 65 mph.

Table 15. The Simulation-Based Capacities With Heavy Vehicles (veh/hr)								
Market Penetration (%)			Passenger Vehicles		5% HV		10% HV	
LV	AV	CAV	Basic	Merging	Basic	Merging	Basic	Merging
100	0	0	2286	1753	2209	1893	2125	1829
80	20	0	2410	1863	2300	1954	2190	1897

From vehicle registration and VIN decoding



name	groupname	description
Adaptive Cruise Control (ACC)	Active Safety System / Maintaining Safe Distance	ACC automatically adjusts the vehicle speed to keep a pre-set distance from the vehicle in front of it.
Lane Keeping Assistance (LKA)	Active Safety System / Lane and Side Assist	An LKA system prevents a driver from unintentionally drifting out of the intended travel lane….

Results from this work can inform capacity models for long range planning efforts.

State of the Industry for ADAS

Steve Kuciemba, National ITS/CAV Practice Leader
WSP

State of the Industry for ADAS

Steve Kuciemba
National ITS/CAV Practice Leader
WSP USA

THE EASTERN TRANSPORTATION COALITION

Webinar

"All Things ADAS"

Sep 27, 2022

ADAS is Here Today!

- Adaptive Cruise Control
- Blind Spot Warning
- Forward Collision Warning
- Lane Departure Warning
- Lane Keeping Assist
- Night Vision Assist
- Parking Assist
- Pedestrian Detection
- Speed Sign Recognition
- Traffic Jam Assist

ADAS is Here Today!

- Ford – Blue Cruise
- GM – Super Cruise
- Honda – Sensing Suite
- Nissan/Infinity – ProPILOT
- Stellantis – AutoDrive
- Tesla – Autopilot and FSD
- Toyota – Safety Sense
- Volvo – Pilot Assist

ADAS Myths

Myth: ADAS is nothing more than a step along the path to full automation

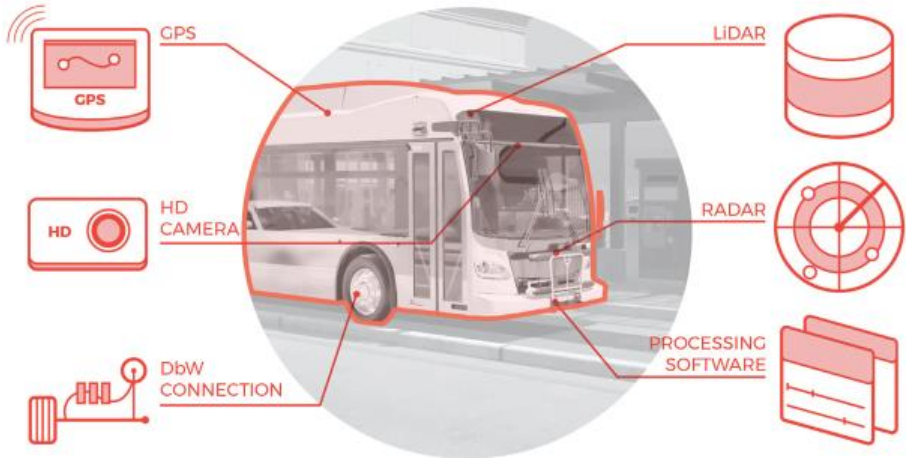
Fact: ADAS has many applications across many different vehicle types and will be here for the long term.

Certain ADAS applications will still be necessary whether a human is operating the vehicle - or a computer is operating the vehicle.

ADAS is More Than Just Cars

Safety, Safety, Safety!

- Passenger Buses
- Freight Trucks
- Maintenance Vehicles
- Government Fleets
- Specialty Vehicles



ADAS Myths

Myth: ADAS will be incorporated by industry, all the public agencies need to do is keep the roads “in a state of good repair”

Fact: The days of “you build cars, and we build roads” are history – the future success of transportation is dependent upon collaborative dialogue between IOOs and OEMs.

Steps the IOOs take today can not only help human drivers, but enhance the effectiveness of existing and future ADAS/ADS technology on vehicles.

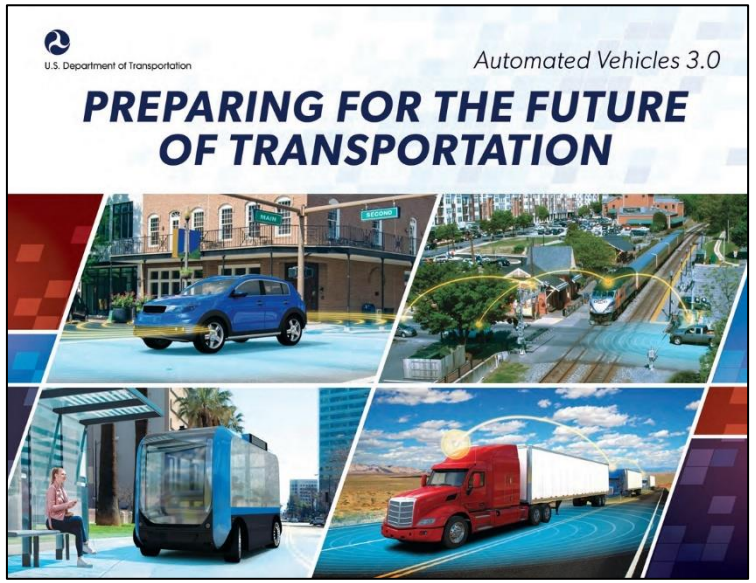
State & Local Roles/Responsibilities

USDOT AV 3.0

"States may want to assess roadway readiness for automated vehicles, as such assessments could help infrastructure for automated vehicles, while improving safety for drivers today…..There is general agreement that greater uniformity and quality of road markings, signage, and pavement condition would be beneficial for both human drivers and automated vehicles."

USDOT has also advocated for additional Awareness & Education

- Engaging with citizens
- Incorporating into driver training
- Adopt common terminology
- Provide guidance, information, and training to prepare the transportation workforce and the general public



October 2018

State & Local Roles/Responsibilities

Commercial Vehicle Enforcement

- Understand implications of roadside inspection concerning sensors
- Work with industry on identification of truck platooning operations

Transit Agencies

- Collaborate with Bus OEMs toward uniformity of ADAS interface/services
- Take the opportunity to incorporate ADAS into all new bus purchases

Sample Research

- *NCHRP 20-102(06) - Evaluation Of The Effects Of Pavement Marking Characteristics On Detectability By ADAS Machine Vision, May 2018*
- *AP-R633 (AustRoads) - Implications of Pavement Markings for Machine Vision, Sept 2020*
- *Purdue University - Prioritizing Roadway Pavement Marking Maintenance Using Lane Keep Assist Sensor Data, Sept 2021*

- Pavement markings specifically designed to deliver greater contrast on any road surface (from black asphalt to gray concrete) are easier to see for both people and machines, and will help enhance road safety
- Road agencies should improve design guidelines for continuity lines, exit ramps and intersections, to consider the needs of both humans and machine vision

MUTCD Changes

- MUTCD Update effective 06 September 2022
- Will provide a new minimum standard for pavement marking retroreflectivity – previous standard was to simply “be visible at night” but with no agreed-upon minimum level.
- The final rule also requires state and local agencies or officials to implement a method within four years for maintaining pavement marking retroreflectivity at or above minimum levels.
- Pavement marking improvements are eligible for up to 100% Federal-aid funding.

ADAS Myths

Myth: ADAS is now a mature technology

Fact: ADAS is still growing and evolving. Industry standards are being developed in parallel to applications and services being offered to consumers; sensor technology is rapidly increasing in reliability and accuracy, but still in its early stages; vehicles are subjected to much more extreme environmental and operational conditions that most of our other consumer electronics – yet our expectations are the same.

The Industry is Still Growing

How vehicle sensors and cameras “see” and “interpret” the information is not industry standard - and some of it may never be.

1. Different combinations of radar, LiDAR, and cameras based on the manufacturer and vehicle type
2. Calibration for sensors and cameras can differ by manufacturer
3. Algorithms that take the input and turn it into actionable information can vary by manufacturer
4. ADAS features require active driver engagement, but not all manufacturers have incorporated a driver monitoring system yet

Four possible fault-points in the safety chain – one failure and it creates a false sense of security where an ADAS doesn’t function properly and the driver won’t be aware.

Example: Critical Fault Chain

Calibration for sensors and cameras can differ by manufacturer

- After a critical vehicle part has been repaired (either due to crash or malfunction), will the sensor operate as it was when it left the showroom floor?
- Two types of ADAS Calibration – static (fixture in shop), dynamic (driving). For static, each OEM has different fixtures for calibration. For dynamic, can take 15+ minutes, can be impacted by weather, special tools may be required
- Windshield-mounted camera: 88% of 2022 vehicles have a front facing camera in the windshield tied to ADAS – in 2013 that number was 3.9%. Has completely changed the complexity of changing windshields.

Solution: aggressive education and awareness for vehicle maintenance of all vehicle types

What's Next in our Preparation for Automated Driving Systems (ADS)

- Vehicle Connectivity
  - Preparing the infrastructure for a likely re-emergence V2X
  - Preparing agency fleet vehicles for V2X
- Continued Dialogue with ADAS and ADS Industry
  - Keeping the conversation between IOOs and OEMs current and energized
  - Incorporating CAV into future policy, LRTP, and workforce discussions
- Engagement in Regulatory Evolution
  - Support a national framework for regulatory consistency across jurisdictional boundaries in parallel to advancing your own agency's regulatory needs

Thank You!

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Questions and Discussion

Lisa Miller, Innovation Program Associate
The Eastern Transportation Coalition

Wrap Up

Meeting information & presentations will be posted to The Eastern Transportation Coalition website.
Participants will receive a link to the presentations after they are posted.

THE EASTERN TRANSPORTATION COALITION

CONNECTING FOR SOLUTIONS

THANK YOU!

For Questions or Additional Information, please contact:

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