Autonomous Vehicles

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Introduction to AAMVA

OUR MISSION

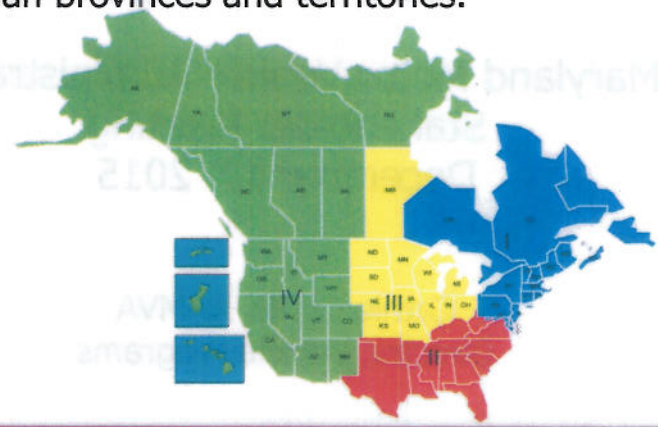
serve North American motor vehicle & law enforcement agencies to accomplish their missions

OUR VISION

safe drivers
safe vehicles
secure identities
saving lives!

Introduction to AAMVA

Members: U.S. states plus American Samoa, D.C., Puerto Rico, Guam and Virgin Islands. All Canadian provinces and territories.



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Introduction to AAMVA

Support MVAs and Law Enforcement agencies by:

- Developing Best Practices, white papers, reports
- Research
- Connections to other jurisdictions and federal partners
- Provide information on emerging issues

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Introduction to AAMVA

One of our top priorities is preparing our members for the impact of automation in vehicles.

1. What are automated, autonomous and connected vehicles?
2. Why should we be engaged and how will state government be impacted?
3. What is AAMVA doing to help the Motor Vehicle and Law Enforcement agencies prepare for these vehicles?

1. What are automated, autonomous and connected vehicles?

You will hear these terms used many different ways by the media, researchers, government and industry:

Driver Alert Warnings
Driver Assist Technology
Limited Self-Driving Technology
Automated Vehicles
Driverless Vehicles
Auto-Pilot Vehicles
Autonomous Vehicles
Connected Vehicles

NHTSA defines levels of Autonomous Vehicles

- Level 0 - No Automation

Driver is in complete control, may have some support/convenience systems. In vehicles today.

- Level 1 – Function Specific Automation

May have multiple systems to provide driver support and crash avoidance but does not replace driver. In vehicles today.

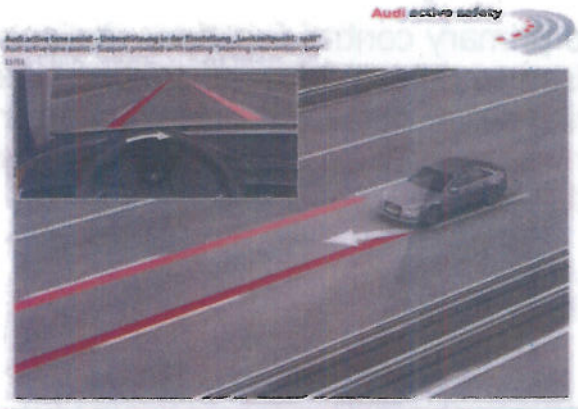
Level 2 Combined Function Automation

At least two primary control functions designed to work in unison to relieve driver of control in certain limited driving situations. Driver must monitor roadway. In some vehicles today. Will see in more models in the next few years.

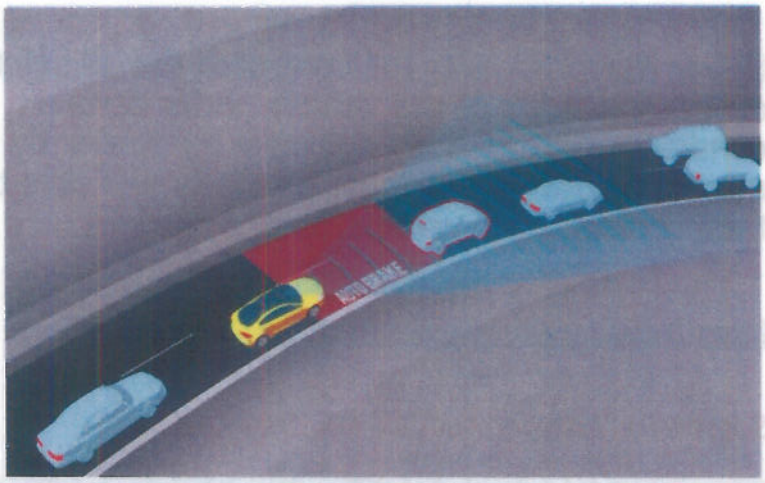
Examples of Driver Alerts and Warnings:

Forward Collision Warning
Emergency Electronic Brake Light
Blind Spot Warning
Lane Change Warning
Do Not Pass Warning
Curve Speed Warning

Example: Lane departure warning system



Forward Collision Warning Systems



Examples of Driver Assist Technology:

Automatic Emergency braking
Adaptive Cruise Control
Lane Keeping Assist
Automatic Parking

Level 3 Limited Self-Driving Automation

Driver may turn over full control of the all safety-critical functions of the vehicle under certain conditions. Driver does not have to constantly monitor roadway but must be ready and able to take control. In development and testing.

https://www.youtube.com/watch?v=0D0ZN2tPihQ

Search YouTube for Audi A7 self-driving vehicle

Level 4 Full Self-Driving Automation

Driver inputs destination and navigation but is not expected to be available for control at any time. In early stages of development and testing.

https://www.youtube.com/watch?v=CqSDWoAhvLU

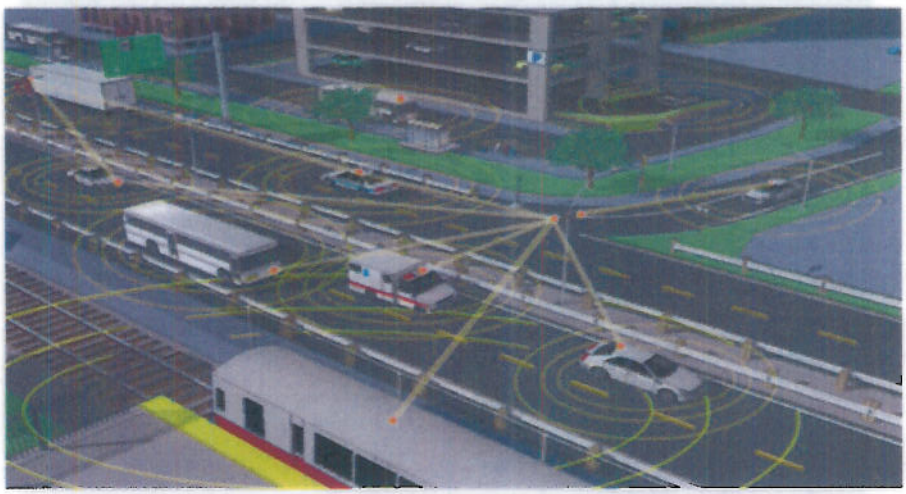
Search YouTube for Google self-driving vehicle

NHTSA Levels of Automation

Level	Example Systems	Driver Roles
0	No automation	In full control
1	Adaptive Cruise Control, OR Lane Keeping Assistance	Must control other function, and still continuously monitor driving environment
2	Adaptive Cruise Control AND Lane Keeping Assistance	Must still continuously monitor the driving environment (system nags driver to ensure they are paying attention)
3	Highway driving pilot; Valet parking in garage	May read a book, text, watch a movie, but must still be prepared to intervene when needed
4	Automated taxi (even for children); Car-share repositioning system	No driver needed

Connected Vehicle

Networked wireless communications among vehicles, the infrastructure, and passengers' personal communications devices.



Connected Vehicle
Vehicle to Infrastructure (V2I)

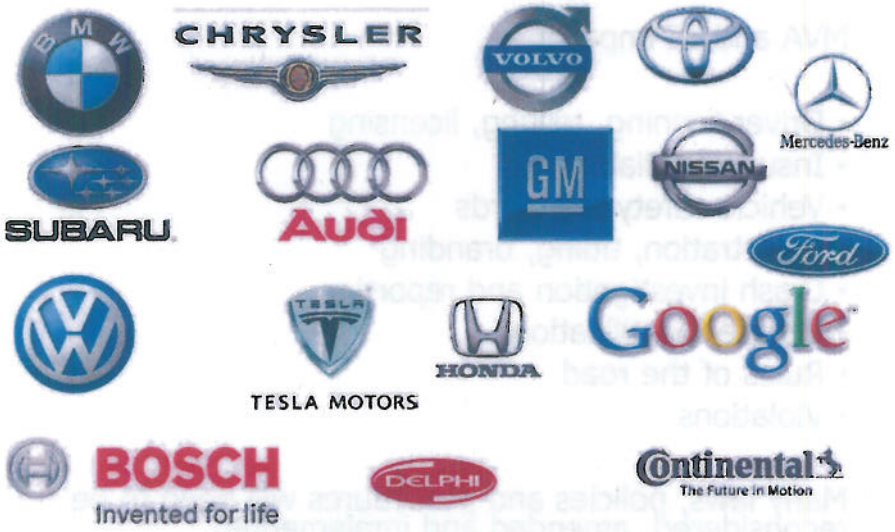
Vehicle to Vehicle (V2V)

SAE Levels of Vehicle Automation

SAE level	Name	Narrative Definition	Execution of Steering and Acceleration/ Deceleration	Monitoring of Driving Environment	Fallback Performance of Dynamic Driving Task	System Capability (Driving Modes)
Human driver monitors the driving environment						
0	No Automation	the full-time performance by the human driver of all aspects of the dynamic driving task, even when enhanced by warning or intervention systems	Human driver	Human driver	Human driver	n/a
1	Driver Assistance	the driving mode-specific execution by a driver assistance system of either steering or acceleration/deceleration using information about the driving environment and with the expectation that the human driver performs all remaining aspects of the dynamic driving task	Human driver and system	Human driver	Human driver	Some driving modes
2	Partial Automation	the driving mode-specific execution by one or more driver assistance systems of both steering and acceleration/ deceleration using information about the driving environment and with the expectation that the human driver performs all remaining aspects of the dynamic driving task	System	Human driver	Human driver	Some driving modes
Automated driving system ("system") monitors the driving environment						
3	Conditional Automation	the driving mode-specific performance by an automated driving system of all aspects of the dynamic driving task with the expectation that the human driver will respond appropriately to a request to intervene	System	System	Human driver	Some driving modes
4	High Automation	the driving mode-specific performance by an automated driving system of all aspects of the dynamic driving task, even if a human driver does not respond appropriately to a request to intervene	System	System	System	Some driving modes
5	Full Automation	the full-time performance by an automated driving system of all aspects of the dynamic driving task under all roadway and environmental conditions that can be managed by a human driver	System	System	System	All driving modes

2. Why should we be engaged and how will state government be impacted?

Global Perspective



Benefits:

- Without driver error, there is likely to be fewer crashes.
- The mobility of the young, the elderly, and the disabled will be increased.
- Traffic flow could be more efficient and congestion decreased.
- Vehicle occupants could spend travel time engaged in other activities, so the costs of travel time and congestion could be reduced.
- Fuel efficiency may be increased and alternative energy sources facilitated.

MVA and LE impacts

- Driver training, testing, licensing
- Insurance, liability
- Vehicle safety standards
- Registration, titling, branding
- Crash investigation and reporting
- Vehicle identification
- Rules of the road
- Violations

Many laws, policies and procedures will need to be reconsidered, amended and implemented.

Testing the Technology

Manufacturers are testing these vehicles on closed courses and on public roads.

States are starting to regulate the testing of these vehicles.

CA, NV, FL, MI, DC, have passed legislation to regulate the testing.

A couple of other states are managing the testing through non-legislative manners.

3. What is AAMVA doing to help the Motor Vehicle and Law Enforcement agencies prepare for these vehicles?

Autonomous Vehicles

- Autonomous Vehicle Information Sharing Group
- Best Practices for the Regulation of Autonomous Vehicles

AV Information Sharing Group

- Informal group that met monthly for a year to learn more about AVs.
- Developed an AV Information Library on AAMVA's website to store information on AVs.
- Developed an analysis of current AV state laws.
- Identified the program areas such as operator training, testing and licensing, vehicle registration and title, data privacy and security concerns, consumer safety and other areas of concern to the DMVs and LE agencies.
- Currently meeting quarterly.

Autonomous Vehicles Working Group

Autonomous Vehicle Working Group

- Work with the AAMVA jurisdictions, law enforcement, federal agencies and other stakeholders to gather, organize and share information with the AAMVA community related to the development, design, testing, use and regulation of autonomous vehicles and other emerging vehicle technology.
- Based on the group's research, a guide to assist member jurisdictions in regulating autonomous vehicles will be developed by fall 2016 to assist with states adopting uniform regulations.
- Funded by NHTSA
- Identify a path forward as this is a 2 year project, ending in the fall of 2016 as we know the technology will continue to emerge.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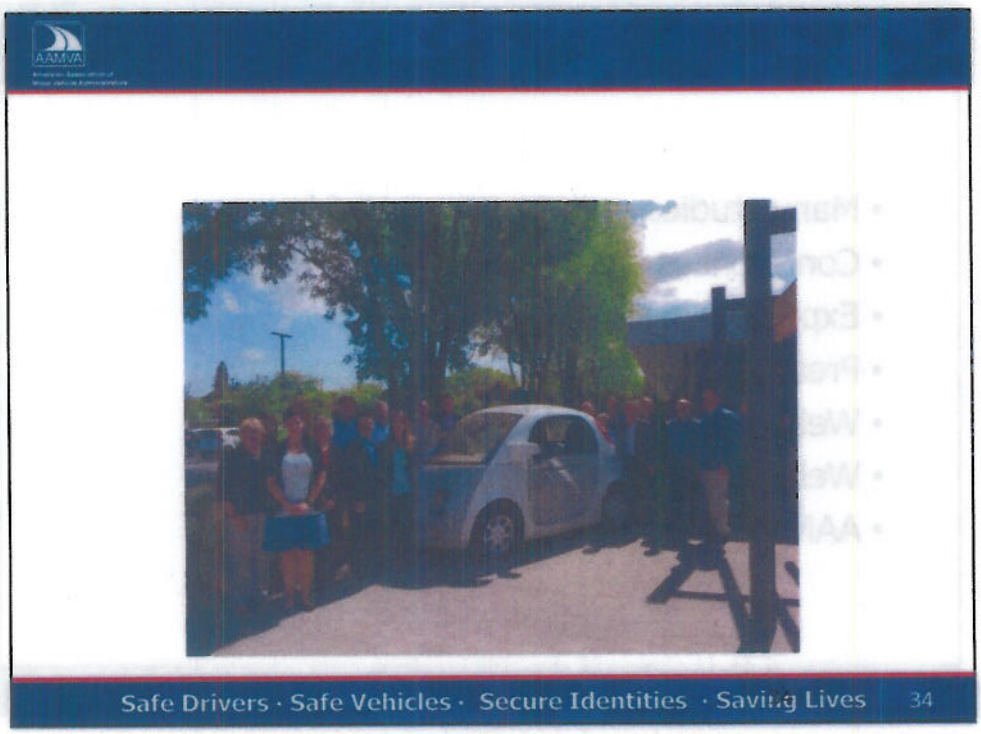
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Additional Efforts

Working closely with many other organizations and agencies to keep them informed of AAMVA's efforts and to understand and/or participate in their projects and related efforts:

Several Universities - involved in law, ethics and human factor research.

US DOT, NHTSA, FMCSA

AASHTO

ULC

TRB

NCSL

SAE

Insurance Industry

Many more

Resources

- Many studies and reports available
- Conferences and summits
- Experts in many areas
- Presentations
- Webinars
- Websites – mycardoeswhat.org
- AAMVA's website – AV Library

Questions?

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