What Happens When the Driver Is a Robot?  
Autonomous Vehicles, Human Behavior & Safety  
OHS-06  
March 27, 2017

Brian Ursino, AAMVA, Director of Law Enforcement
Founded in 1933, the American Association of Motor Vehicle Administrators (AAMVA) represents the Motor Vehicle and State Police/Highway Patrol and Provincial Police Administrators of all 69 states, provinces and territories of the U.S. and Canada.
Among AAMVA’s top priorities is helping our members prepare for new technologies expected by drivers such as:

Mobile Drivers Licenses...

...and Automated Vehicles
## Automated & Autonomous Vehicles – SAE Levels

<table>
<thead>
<tr>
<th>SAE level</th>
<th>Name</th>
<th>Narrative Definition</th>
<th>Execution of Steering and Acceleration/Deceleration</th>
<th>Monitoring of Driving Environment</th>
<th>Fallback Performance of Dynamic Driving Task</th>
<th>System Capability (Driving Modes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No Automation</td>
<td>the full-time performance by the human driver of all aspects of the dynamic driving task, even when enhanced by warning or intervention systems</td>
<td>Human driver</td>
<td>Human driver</td>
<td>Human driver</td>
<td>n/a</td>
</tr>
<tr>
<td>1</td>
<td>Driver Assistance</td>
<td>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 perform all remaining aspects of the dynamic driving task</td>
<td>Human driver and system</td>
<td>Human driver</td>
<td>Human driver</td>
<td>Some driving modes</td>
</tr>
<tr>
<td>2</td>
<td>Partial Automation</td>
<td>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 perform all remaining aspects of the dynamic driving task</td>
<td>System</td>
<td>Human driver</td>
<td>Human driver</td>
<td>Some driving modes</td>
</tr>
<tr>
<td>3</td>
<td>Conditional Automation</td>
<td>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</td>
<td>System</td>
<td>System</td>
<td>Human driver</td>
<td>Some driving modes</td>
</tr>
<tr>
<td>4</td>
<td>High Automation</td>
<td>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</td>
<td>System</td>
<td>System</td>
<td>System</td>
<td>Some driving modes</td>
</tr>
<tr>
<td>5</td>
<td>Full Automation</td>
<td>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</td>
<td>System</td>
<td>System</td>
<td>System</td>
<td>All driving modes</td>
</tr>
</tbody>
</table>

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AAMVA is adopting classification terms similar to SAE:

<table>
<thead>
<tr>
<th>Level</th>
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</tr>
</thead>
<tbody>
<tr>
<td>0</td>
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</tr>
<tr>
<td>1</td>
<td>Driver Assistance</td>
</tr>
<tr>
<td>2</td>
<td>Partial Automation</td>
</tr>
<tr>
<td>3</td>
<td>Conditional Automation</td>
</tr>
<tr>
<td>4</td>
<td>High Automation</td>
</tr>
<tr>
<td>5</td>
<td>Full Automation</td>
</tr>
</tbody>
</table>

The term Highly Automated Vehicles (HAV) has recently emerged which includes SAE Levels 3, 4 and 5.
Levels 0 – 3 are in vehicles available today ... 

**Level 0 – No Automation**

The human driver does everything.

**Level 1 – Driver Assistance**

An automated system on the vehicle can sometimes assist the human driver conduct one or more driving tasks.

**Level 2 – Partial Automation**

An automated system on the vehicle can conduct some parts of the driving task, while the human continues to monitor the driving environment and performs the rest of the driving tasks.
HAVs in testing and development today ...

Level 3 – Conditional Automation

An automated system can conduct some parts of the driving task and monitor the driving environment in some instances, but the human driver must be ready to take back control when the automated system requests.

Level 4 – High Automation

An automated system can conduct the driving task and monitor the driving environment, and the human need not take back control, but the automated system can operate only in certain environments and under certain conditions.

Level 5 – Full Automation

The automated system can perform all driving tasks, under all conditions that a human driver could perform.
Published September 2016 and can be found at www.transportation.gov/AV

**Section 1 – Vehicle Performance Guidance for Automated Vehicles** (outlines best practices for safe pre-deployment development and testing prior to commercial sale; sets USDOT expectations of industry).

**Section 2 – Model State Policy** (recognizes states’ sovereignty while encouraging a consistent national framework rather than a patchwork of inconsistent laws. References partnership with AAMVA).
Section 3 – NHTSA’s Current Regulatory Tools (being expanded to include streamlined review and exemption request processes).

Section 4 – New Tools and Authorities (Identifies potential new tools, authorities and regulatory structure to enable safe and expeditious deployment of new technologies).
Federal Automated Vehicles Policy

Section 2 – Model State Policy (cont.)

Federal responsibilities include:

- Setting safety standards for new motor vehicles and motor vehicle equipment;
- Enforcing compliance with the safety standards;
- Investigating and managing the recall and remedy of non-compliances and safety-related motor vehicle defects on a nationwide basis;
- Communicating with and educating the public about motor vehicle safety issues and;
- Issuing guidance to achieve national safety goals.
State responsibilities include:

- Licensing (human) drivers and registering motor vehicles in their jurisdictions;
- Enacting and enforcing traffic laws and regulations;
- Conducting safety inspections, when States choose to do so; and
- Regulating motor vehicle insurance and liability.
Uniform guidelines for Highly Autonomous Vehicle deployment and operation will provide certainty for OEMs, aid in the quick and efficient deployment of these vehicles, and enhance traffic safety.
The AVWG has three sub-groups focusing on issues impacting:

- **Drivers: Licensing & Testing;**
- **Vehicles: Titling & Registration;** and
- **Law Enforcement: Concerns & Challenges**
Concurrent with the development of the Federal Automated Vehicles Policy, the AAMVA Autonomous Vehicle Working Group was and is working on completing “Guidelines for the Regulation of Highly Automated Vehicles” ...

This is a final piece of work that will provide the states a companion document in support of the USDOT Model State Policy to help implement the model state policy from a state perspective.

* Anticipate publishing in 2017
The **Guidelines for the Regulation of Highly Automated Vehicles** may include the following general topical areas:

- Administration
- Testing Vehicles on Public Roadways
- Jurisdictional Permission to Test (Permitting Process)
- Testing by Manufacturers
- Driver Training & Examination Considerations for Deployed Vehicles
- Registration and Title Considerations for Deployed Vehicles
- **Law Enforcement Considerations for Deployed Vehicles**
Law Enforcement Considerations for Deployed Vehicles

- Crash and Incident Reporting
- Criminal Activities
- Distracted Driving
- Enforcement/Penalties
- First Responder Safety
- Law Enforcement and First Responder Training
- Vehicle Response to Emergency Vehicles, Manual Traffic Controls, and Atypical Road Conditions
- System Misuse and Abuse
- Vehicle Identification
- Violation Codes Programming
- Rules of the Road
For purposes of the AAMVA Report, crash investigation relates to investigating crashes between Autonomous Vehicles (AVs) and other vehicles, persons, animals, or objects whether or not the AV is responsible.

The U.S. Department of Transportation provides Minimum Model Uniform Crash Criteria (MMUCC) crash report guidance to the states. AAMVA is on the MMUCC Committee which is currently developing the Fifth Edition for publication in 2017 to include AV data elements. (Fourth Edition was published in 2012)
Traffic safety is often dependent on the ability of a driver to recognize and respond appropriately to a wide variety of hazards in an ever-changing roadway environment. These hazards include, but are not limited to both moving and stopped emergency vehicles, emergency workers and other pedestrians manually directing traffic, changing traffic patterns or conditions in roadway construction and maintenance zones, crash scenes, road debris or other obstructions.

The NHTSA Federal Automated Vehicles Policy refers to such vehicle operational functions as Object and Event Detection and Response (OEDR). OEDR refers to the detection by the driver or Highly Automated Vehicle (HAV) system of any circumstance that is relevant to the immediate driving task, as well as the implementation of the appropriate driver or HAV system response to the circumstance.
Concern For Connected Vehicle Hackings Prompts Federal Study

January 25, 2017: A bipartisan bill prescribing a Highway Traffic Safety Administration study on cyber security in connected vehicles entered consideration in the House of Representatives. In partnership with the Federal Trade Commission, the Defense Department, and others, the study would create a standard for isolating vehicle software systems, storing system data, and preventing data breaches.

AAMVA is tracking this bill as it moves through the legislative process.
Issue: Should HAV’s strictly adhere to Rules of the Road?

Issue: In general, many traffic laws are similar from jurisdiction to jurisdiction. However, there are also many traffic laws that are jurisdiction specific.
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