

Vehicle Automation Levels

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 <i>human driver</i> of all aspects of the <i>dynamic driving task</i> , even when enhanced by warning or intervention systems	Human driver	Human driver	Human driver	n/a
1	Driver Assistance	the <i>driving mode</i> -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 <i>human driver</i> perform all remaining aspects of the <i>dynamic driving task</i>	Human driver and system	Human driver	Human driver	Some driving modes
2	Partial Automation	the <i>driving mode</i> -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 <i>human driver</i> perform all remaining aspects of the <i>dynamic driving task</i>	System	Human driver	Human driver	Some driving modes
Automated driving system ("system") monitors the driving environment						
3	Conditional Automation	the <i>driving mode</i> -specific performance by an <i>automated driving system</i> of all aspects of the dynamic driving task with the expectation that the <i>human driver</i> will respond appropriately to a <i>request to intervene</i>	System	System	Human driver	Some driving modes
4	High Automation	the <i>driving mode</i> -specific performance by an automated driving system of all aspects of the <i>dynamic driving task</i> , even if a <i>human driver</i> does not respond appropriately to a <i>request to intervene</i>	System	System	System	Some driving modes
5	Full Automation	the full-time performance by an <i>automated driving system</i> of all aspects of the <i>dynamic driving task</i> under all roadway and environmental conditions that can be managed by a <i>human driver</i>	System	System	System	All driving modes

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Potential Benefits & Consequences of Driverless Cars

- Crash reduction
 - 94% of crashes tied to human choice or error
 - Benefits depend on level of automation
 - One third reduction in crashes with level 0 and 1 automation (forward collision & lane departure warning, blind spot assist, adaptive headlights)
 - Transition to Level 4 or 5 automation (driver attention not required) could help reduce the number of impaired driver related crashes (cause for 39% of fatalities)
 - Benefits drivers/passengers of AVs and other highway system users
- Personal mobility improvements for persons with disabilities, older people, younger people
- Potential reduction in driver costs
- Opportunity to reduce parking in downtowns and other built-up areas → reduced development costs
- May continue to support dispersed land use pattern
- Could be a competitor for transit, or may be integrated and support transit
- Effect on vehicle miles travelled uncertain
- More efficient use of existing highway capacity → reduce need for new capacity in some cases
- May facilitate conversion to electric vehicles → emission reduction & transportation fund impacts

Division of State and Federal Responsibilities

- Federal Government (NHTSA) is responsible for regulating motor vehicles and motor vehicle equipment -> targeted at manufacturers
- State government (and local governments) is responsible for regulating drivers which involves licensing “human” drivers, vehicle registrations, establishing and enforcing traffic laws, regulating motor vehicle insurance and liability
- States may also choose to require safety inspections
- Expect that Federal/State responsibilities will stay the same

State Policy Purpose

- Avoid patchwork of non-consistent regulations,
- Ensure safe deployment of new technology
- Avoid delaying deployment of lifesaving technology
- Make sure VT is positioned to take advantage of new technologies – let’s not fall behind

Topics for VT’s Automated Vehicle Committee

1. Determine statutory requirements to implement a framework and regulations around:
 - Licensing/registration
 - Driver education and training
 - Insurance and liability
 - Enforcement of traffic laws/regulations
 - Administration of motor vehicle inspections
2. Establish process for manufacturers or other entities to apply for and test AVs on Public Roadways
3. Establish process for deployment of AVs by the public
4. Law Enforcement Considerations
 - How to limit driver distractions for semi-automated vehicles
 - Emergency response protocols
5. Liability and Insurance
 - Who should carry motor vehicle insurance (owner, operator, passenger, manufacturer, etc.)
6. Transportation infrastructure requirements
7. Explore broader policy issues

Common Issues Addressed by Other States in Executive Orders and Legislation

- Should an operator be physically present (and in driver’s seat) and ready to take over during testing?
- Should special rules be developed to ensure safe testing and operation?
- Should there be special training and certifications required for operators of AVs?
- How to regulate conversion of conventional vehicles into autonomous vehicles. Limit to recent models?
How to address the liability of the original manufacturer of a converted vehicle.
- Should hand-held devices be allowed for use in a legally operating autonomous vehicle?
- Should local governments be able to ban AVs on local roads?
- Should VT identify Autonomous Vehicle Corridors?