## Automated Vehicles Overview

Automated vehicles are equipped with an automated driving system (ADS) that enables them to operate with little to no human assistance, with the use of cameras, radar, lidar (image sensing), GPS, and computer vision to sense their surroundings. ADS can carry out the real-time dynamic driving tasks required to operate a vehicle in on-road traffic. There are five levels of automation, and a permit from the Vermont Traffic Committee is required to test vehicles on state and town highways with level 3, 4, or 5 automation (the most highly automated).

1 Driver Assistance
2 Partial Automation
3 Conditional Automation
4 High Automation
5 Full Automation
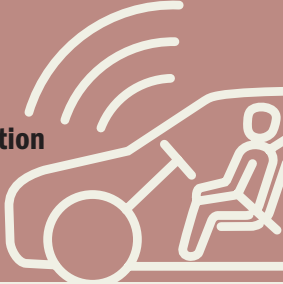
The Systems Behind Autonomous Vehicles

CAMERAS
Provide a 360-degree view to detect traffic lights and road signs

LIDAR
Laser scanner used to map surroundings in high definition

ARTICULATING RADARS
Scan a wide field to monitor position of vehicles, pedestrians, objects

SHORT-RANGE RADAR
Detects objects, pedestrians, vehicles near the car

LONG-RANGE-RADAR
Measures speed of traffic down the road

VEHICLE LOCATION
Information gathered from sensors plus GPS data determine the vehicle's precise location

HIGH-SPEED PROCESSORS
Crunch data from sensors to direct the cars movements.

Questions? Reach out!

Joe Segale, PE/PTP
Policy, Planning and Research Bureau Director
Vermont Agency of Transportation
802-477-2365
joe.segale@vermont.gov

YOUR GUIDE TO
Automated Vehicle Testing in Vermont

VERMONT
AGENCY OF TRANSPORTATION

Overview of the VT Automated Vehicle Testing Act

The Automated Vehicle Testing Act ("the Act") became law in June 2019 (24 VSA Chapter 41) and creates a permitting process to allow the testing of automated vehicles, often referred to as self-driving cars, on state and town highways in Vermont. A testing permit is required from the Traffic Committee, whose members are the Secretary of Transportation, Commissioner of Motor Vehicles, and Commissioner of Public Safety. The Traffic Committee is authorized to issue testing permits for the state highway system, class 1 town highways which are the continuation of US and state numbered routes through municipalities, and class 2, 3, and 4 town highways in municipalities that have pre-approved testing on their roads.

Why Allow Testing on Vermont's State and Town Highways?

Opinions vary about the time it will take for automated vehicles to be deployed and in use by the general public. One forecast suggests that vehicles with some level of automation will increase to 40-60% of all vehicles on the road by 2050[1]. A more assertive forecast suggests that 95% of passenger miles travelled will be in automated vehicles by 2030[2]. Vermont needs to prepare for automated vehicles, which have the potential to improve safety, increase mobility for people who cannot currently drive, and reduce travel costs for Vermont households, businesses, and visitors. Like computers and smart phones, automated vehicles will become increasingly important to our economic vitality. Testing in Vermont will help build public confidence that automated driving systems are feasible in our rural, cold, hilly state, and along our famous "dirt" roads. Testing will also provide an opportunity for law enforcement, emergency responders, road crews, engineers, transit operators, and other stakeholders to learn and gain experience with the technology.

What would testing look like?

Testers may evaluate private passenger vehicles, ride-for-hire services similar to Uber or Lyft, shuttles, buses, delivery vehicles, or trucks. The testing could be limited to a specific geographic area such as a college campus, resort, downtown, or office park. Testing may be limited to specific roads, types of roads, and paved and/or gravel surfaces. Certain weather conditions, daylight hours, or other conditions may also be defined. Testing is underway or complete in approximately 30 cities across the United States and 100 cities worldwide[3].

Little Roady autonomous shuttle project operated by RI DOT

Snow and pedestrian testing in Minnesota by MN DOT

State Role in Automated Vehicles Testing Permit

- The Agency of Transportation (AOT) will administer the permitting process and is required to publish an automated vehicle testing permit application and guideline by January 2021.

- The Traffic Committee is required to conduct a hearing per Vermont's Open Meeting Law before deciding on an Automated Vehicle Testing Permit application. Municipalities where testing is proposed must be notified 60 days prior to the hearing.

- AOT is required to maintain and publish in the guideline a list of municipalities that have pre-approved testing on class 2, 3, and 4 town highways.

Municipal Role in Automated Vehicles Testing Permit

- Local legislative bodies determine if they want to allow testing of automated vehicles on their class 2, 3, and 4 town highways. The decision to pre-approve testing must be made at a duly warned meeting of the Selectboard, City Council, or Village Trustees.

- Municipalities can identify specific class 2, 3, or 4 town highways to include or exclude in testing.

- Municipalities can revoke or modify the conditions of their approval at any time by submitting a letter to the Vermont Secretary of Transportation.

Other Sources of Information

Automated Driving Systems: A Vision for Safety 2.0, September 12, 2017, National Highway Traffic Safety Administration

Preparing for the Future of Transportation: Automated Vehicles 3.0 (AV 3.0), October 2018, US Department of Transportation

National League of Cities Autonomous Vehicle Pilots Across America, 2018. https://www.nlc.org/sites/default/files/2018-10/AV%20MAG%20Web.pdf

National Association of Counties. Connected and Automated Vehicle Tool Kit. https://www.naco.org/resources/featured/connected-autonomous-vehicles-toolkit#link-1

---

[1] "Preparing for Automated Vehicles: Traffic Safety Issues for States". Governor's Highway Safety Association
[2] "Rethinking Transportation 2020-2030 The Disruption of Transportation and the Collapse of the Internal-Combustion Vehicle and Oil Industry", RethinkX, May 2017
[3] Bloomberg Philanthropes Initiative on Cities and Autonomous Vehicles https://avsincities.bloomberg.org/