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Autonomous Vehicles: Emerging Policy Issues

Introduction

The advent of autonomous vehicles is often discussed in the context of safety. While many new technologies already are making vehicles safer, auto manufacturers view them as building blocks to vehicles that can travel and park themselves without a driver's intervention. Autonomous vehicles (AVs) may transform expectations of mobility by raising new possibilities for millions of people, including the disabled, elderly, youth, and people who do not own a car. In addition to broadening the population served, AVs could bring lower accident rates and make travel more efficient than traditional motor vehicles. How quickly AVs will evolve will ultimately depend on the choices federal, state, and local governments make to encourage their use and application.

Vehicle Automation Accelerates

Many new technologies, whether mandated by federal regulators or developed by automakers, have translated incrementally into safer motor vehicles. The introduction of new vehicle technologies has accelerated in the past decade, moving toward much more vehicle automation and a long-term goal of a fully autonomous vehicle. Congress and federal regulators are considering how to encourage such advancements. They generally recognize that the traditional regulatory process is long and could adversely affect innovation and the introduction of these technologies.

A range of advanced driver assistance systems is being introduced to motor vehicles, many of them bringing automation to vehicular functions once performed only by the driver. These features automate lighting and braking, connect the car and driver to the Global Positioning System (GPS) and smartphones, and keep the vehicle in the correct lane. Mary Barra, chairman and CEO of General Motors, has observed that "the auto industry will change more in the next five to 10 years than it has in the last 50." There are three forces driving motor vehicle innovation:

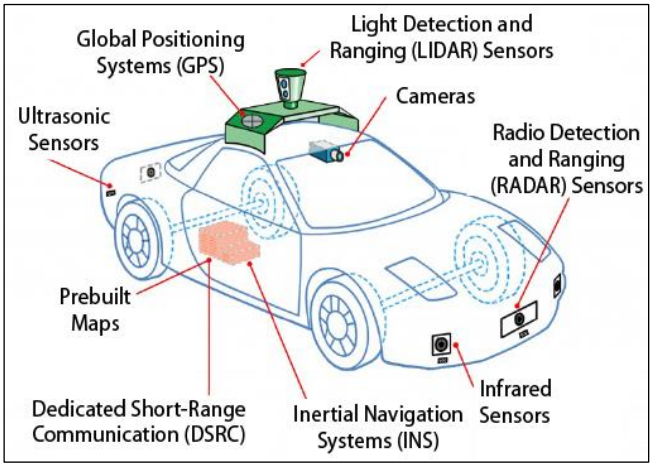
- technological advances enabled by new materials and more powerful, compact electronics;
- consumer demand for telecommunications connectivity and new types of vehicle ownership and ridesharing; and
- regulatory mandates pertaining to emissions, fuel efficiency, and safety.

Increasingly, such innovations are being combined as manufacturers produce vehicles with higher levels of automation. Vehicles do not fall neatly into two categories of "automated" and "nonautomated," because all of today's motor vehicles have some element of automation. The Society of Automotive Engineers International (SAE), an international standards-setting organization, has developed six categories of vehicle automation—ranging from a human driver doing everything to automated systems performing all the tasks a driver does. This classification system has been adopted by the U.S. Department of Transportation (USDOT) to foster standardized nomenclature to aid clarity and consistency in discussions about growing vehicle automation and safety.

All vehicles sold today are in the lowest two tiers of SAE's automation rating system. Views differ as to how long it may take for full automation to become standard, with some forecasting market-ready AVs in five years. Others argue that it will take much longer, as more testing, regulation, and policy work should be done before AVs are widely deployed.

Technologies that could guide an AV (**Figure 1**) include a wide variety of electronic sensors that would determine the distance between the vehicle and obstacles; detect lane markings, pedestrians, and bicycles; park the vehicle; GPS, Inertial Navigation System, and a system of built-in maps to guide the vehicle direction and location; cameras that provide 360-degree views around the vehicle; and Dedicated Short-Range Communication (DSRC) to monitor road conditions, congestion, crashes, and possible rerouting. These technologies are being adapted separately, while manufacturers learn how to combine them in vehicles that could safely transport passengers without drivers.

Figure 1. Autonomous Vehicle Technologies



Source: CRS, based on "Autonomous Vehicles" fact sheet, Center for Sustainable Systems, University of Michigan.

Educating the public about AVs appears to be a major element in determining their eventual success. A 2015 Boston Consulting Group survey found that less than half of respondents would buy a fully autonomous vehicle, but 55% are interested in a partially autonomous vehicle;

respondents showed no clear preferences for specific features.

Policy Issues That May Affect AV Deployment

Uncertainty over the delivery timeline and technologies that may be used in AVs have led state and federal governments so far to allow a wide range of innovation while providing recommendations—not binding rules—for AV development. In September 2016, USDOT issued its *Federal Automated Vehicles Policy*, which lays the foundation for current and future regulation, including

- a set of guidelines outlining best practices for AV design, testing, and deployment;
- a Model State Policy that seeks to identify where new AV-related issues fit in the current federal and state regulatory structures;
- a streamlined review process to expedite requests for DOT regulatory interpretations and exemptions that may spur AV development; and
- identification of new tools and regulatory structures for USDOT's National Highway Traffic Safety Administration that could aid in AV deployment, such as expanded exemption authority and premarket testing to assure that AVs will be safe before being sold.

While the federal government has traditionally regulated vehicles for safety, states have had the authority to regulate operation of passenger vehicles through laws governing licensing of drivers and vehicles; traffic regulation; liability; and motor vehicle insurance. Behind USDOT's Model State Policy is a growing concern that in the absence of traditional federal vehicle regulations some states could move forward on their own, resulting in possible diverse and even conflicting state regulations. According to the National Conference of State Legislatures, 15 states plus the District of Columbia have enacted legislation related to AVs, and related bills have been introduced in 33 states in 2017.

There is a range of issues that may be affected by possible disruptions caused by AVs, including the following:

Liability and insurance. Currently, driving liability applies to the vehicle operator. With a driverless vehicle, that liability could shift to the companies that created the software and technologies in the vehicle or the manufacturer that integrated those technologies into the car. Insurance rates are based in part on the performance of an individual driver. In addition, states have had responsibility for product liability law, but without uniformity in tort laws from state to state. The elimination of a driver will call for new definitions and clarity in the legal framework.

Infrastructure and transportation funding. Roadways may need significant changes to accommodate AVs, which will rely on well-marked lanes, accurate signage, and traffic lights that can communicate easily and clearly with AVs. Methods of funding these infrastructure investments may need to change as well. Some analysts believe that AVs may be powered more frequently by electricity, rather than gasoline; such vehicles would not pay motor fuel taxes that support the Highway Trust Fund, further eroding its ability to maintain federally supported transportation improvements. Similarly, local governments may see a decline in parking fees and traffic fines that are often used to fund transportation programs. If those sources decline, governments will need to define new ones if they seek to maintain their public roadways.

Vehicle Communications. In some concepts, fully autonomous vehicles would be able to drive without communicating directly with surrounding vehicles and obstacles. However, a parallel line of motor vehicle research has focused on vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications, allowing vehicles to share data about speed, location, traffic congestion and road conditions. USDOT estimates that up to 80% of vehicle crashes (not including crashes based on intoxicated or drowsy drivers) could be prevented with such communications.

Since 1999, the Federal Communications Commission (FCC) has allocated a portion of spectrum for DSRC. Federal and private sector research on V2V and V2I has been based on the assumption that this spectrum would be dedicated only to vehicle communications. Recently, telecommunications companies have sought to share this spectrum band to facilitate the rapid growth in wireless devices, a change that some argue could compromise the integrity of V2V and V2I communications. The FCC is evaluating whether this spectrum allocation should be maintained or shared.

Cybersecurity. Increasing vehicle automation also leads to a rise in the amount of data collected, adding two policy issues to the AV discussion: data privacy and ownership, and hacking of that data.

Most motor vehicles on the road today use an Event Data Recorder (EDR) to record information about the vehicle and driver seconds before a crash. The 2015 Fixing America's Surface Transportation (FAST) Act included data privacy provisions for EDRs. With AVs, the large number of sensors collecting data when the vehicle is in motion are not covered by the EDR protections, and it is unclear who owns the data and will have access to it.

Tests have demonstrated that hackers may be able to gain access to an AV's communications system and take control of the vehicle. In response, industry and USDOT are collaborating on guidance for technology developers to build data protection into their software. Legislation has also been introduced in Congress to address cybersecurity concerns.

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