

[American Vision for Safer Transportation through Advancement of Revolutionary Technologies \(AV START\) Act \(S 1885, 115th Congress\)](#)

Supports and provides a regulatory framework for manufacturer development of autonomous vehicle technology.

Updated last **February 6, 2018**
for the 11/28/2017 version of the bill.



WHAT IT DOES

The American Vision for Safer Transportation through Advancement of Revolutionary Technologies (AV START) Act ([S 1885](#)) establishes regulations for the development of highly automated vehicle (HAV) technologies. An HAV is defined by the bill as a motor vehicle “with a gross vehicle weight of 10,000 pounds or less that is equipped with a [Level 3, 4, or 5](#) automated driving system (ADS), as per the [SAE International J3016](#) standard.

The 22 sections included in the AV START Act regulate the testing, commerce, and safety of HAVs by appointing committees, working groups, and expert panels to research related policy, technology, and social issues, establishing reporting requirements for manufacturers, and initiating new consumer education programs. The Act puts in motion research efforts that will identify portions of the existing [Federal Motor Vehicle Safety Standards](#) that will need to be updated to apply to vehicles driven by automation instead of a human driver. The bill further prohibits state and local governments from regulating the design, construction, or performance standards of ADS and HAV systems and components, but otherwise maintains the jurisdiction of the [National Highway Traffic Safety Administration](#) (NHTSA) and states.

Several sections of the bill apply directly to manufacturers of HAV and related technology:

- Manufacturers will be permitted to test ADS and HAV that do not meet the traditional federal vehicle safety standards developed originally for non-autonomous vehicles. Manufacturers who wish to test HAVs must provide information that identifies the vehicle as an HAV, and the test vehicles must be driven by agents or employees of the manufacturer. Test vehicles may not be sold to consumers.
- The [Department of Transportation](#) (DOT) can increase the number of vehicles per manufacturer that are exempted from [Federal Motor Vehicle Safety Standards](#) (FMVSS). The bill increases the maximum number of exemptions from a maximum of 2,500 vehicle exemptions ([49 CFR Part 555](#)) per manufacturer to 50,000 vehicles by the first year, 75,000 vehicles by the second year, and 100,000 vehicles by the fifth year, with additional exemptions after the fifth-year subject to further approval. The increase in exemptions reduces the burden of applying to NHTSA on a case-by-case basis for additional exemptions. However, exemptions may only be made for new, innovative features without established regulations and will not be permitted to reduce vehicle occupant safety.
- Manufacturers will be permitted to disable certain driver controls when the vehicle is operating in an automated mode. While manufacturers are currently prohibited from rendering federally mandated vehicle safety controls (e.g., steering wheel and pedals) inoperable by drivers, this exception would allow manufacturers to transfer operability control from the driver to the autonomous vehicle.
- Incentives may be provided to companies who manufacture HAVs in the US.
- Manufacturers will also be required to submit publicly accessible safety evaluation reports to the DOT no later than 90 days before the manufacturer introduces an HAV system or component into commerce. While the reports are mandatory, the manufacture and sale of HAV will not be conditional on the content of the report. Safety evaluation reports must be updated

annually and include assessment, testing and validation processes for nine subject areas, including:

- System safety: Engineered safety practices to support reasonable [system safety](#).
- Data recording: Documented processes for testing, validation, and collection of data for recording system malfunctions, degradations, and failures to identify their causes and to facilitate information sharing, knowledge building, and crash reconstruction.
- Cybersecurity: Approaches to guard against vehicle hacking risks and encourage the exchange of information within the industry.
- Human-machine interface: Approaches for communicating information to the driver about automation status, including interfacers for people with disabilities.
- Crashworthiness: Verification that occupants and other road users will be protected in crash situations according to [NHTSA crashworthiness standards](#).
- Documentation of capabilities: Abilities and limitations of the automated driving system.
- Post-crash behavior: Clarification of behaviors of critical systems and sensors following damage from a crash.
- Accounting for applicable laws: Documented plans for how vehicles are programmed to comply with all applicable federal, state, and local traffic laws.
- Automation function: The conditions under which the automated system is intended to function (e.g., infrastructure requirements), object and event sensing capabilities, the fall back behavior in the event of a system malfunction, and performance assessment during testing.

The bill also provides a framework to promote consumer safety that includes the following measures:

- The DOT will be required to establish an HAV Technical Committee no later than 180 days after the enactment of the bill. The Committee will be comprised of fifteen industry experts (representing the states, manufacturers, and safety organizations) who will make recommendations to the DOT related to rulemaking, policy, and guidance as well as HAV performance and safety issues. The Committee will also create working groups to address specific HAV issues, submitting an official report containing rulemaking recommendations to the DOT no later than five years after the creation of the committee. The Committee will be permitted to set up working groups at its discretion; however, it will be required to set up a working group to develop voluntary best practices regarding HAV accessibility for people with disabilities.
- The DOT will establish a working group to create a framework for improved consumer education efforts about ADS and HAV, including at the point of sale. The working group will identify and recommend voluntary educational strategies for manufacturers to adopt.
- The DOT will research traffic safety effects of HAVs, including mixed fleets of HAV and traditional vehicles, by working with state and local governments to identify common defects, identifying the impacts on local law enforcement, and developing new methods for collecting crash data.
- Manufacturers will be required to equip all passenger motor vehicles weighing less than 10,000 pounds with a system that alerts vehicle operators to check rear seating positions, a provision intended to promote child safety.

The bill addresses cybersecurity and its safety threats directly. The DOT would take the following measures to protect the cybersecurity and cyberprivacy of consumers:

- HAV and ADS manufacturers will be required to develop and execute a written plan for identifying and decreasing cybersecurity threats. These plans should be formatted for public release. Manufacturers will be encouraged to exchange information with each other on cybersecurity threats and responses.
- Establish a HAV Data Access Advisory Committee to make recommendations for the ownership and control of information collected by HAV and ADS technology.
- The DOT will develop resources for consumer awareness and education on cybersecurity risks to be made publicly accessible on the NHTSA website. The Act further requires that manufacturers direct consumers to these resources through vehicle manuals or the manufacturer's website.
- NHTSA will promote privacy rights transparency by creating a database on the NHTSA website that contains information about how personally identifiable information is collected and used by autonomous vehicles.

The bill also requires multiple studies on HAV safety. The DOT's [Volpe National Transportation Systems Center](#) will lead a 180-day study to identify FMVSS that reference human drivers and develop alternative language for HAVs. Future rulemaking will be based on the results of the report. The DOT will also conduct a study on HAV implications for transportation infrastructure, mobility, the environment, and fuel consumption, and a study on methods for encouraging domestic manufacture of ADS and HAV technologies.

Finally, the AV START Act will preempt state laws affecting the design, performance, and construction of HAVs. States will also not be allowed to discriminate against operators with disabilities. However, states will still be permitted to regulate HAV sale, distribution, and repair.

RELEVANT SCIENCE

Fully autonomous vehicles are equipped with SAE Level 5 automation systems, where the vehicle can perform all operating functions with no human input; vehicles can drive themselves from a starting point to an ending point independently. Fully autonomous operation requires the effective integration of multiple technologies:

- [Sensors](#) are used to create and maintain a perception of objects within a vehicle's surroundings. Most current autonomous vehicles are equipped with different combinations of four main types of technology, including cameras, radar, lidar and ultrasonic sensors. First, cameras visually detect objects around the vehicle. Cameras are advantageous for object recognition because they detect light and color, but struggle with depth perception. Second, radio detection and ranging ([RADAR](#)) detects surrounding by sending out electromagnetic waves that reflect off objects and provide information about how far away the object is and how fast it is moving. These signals allow vehicles to see hundreds of feet away in vision-impairing conditions, but most cannot detect height and only provide a 2-D perception of the world. Third, light imaging detection and ranging ([LIDAR](#)) produces a 3-D map of the surrounding world by using scanning lasers to measure the distance between the vehicle and other objects. These sensors are most effective for identifying obstacles of the vehicle, but are currently too expensive for commercial production. Lastly, ultrasonic sensors function by measuring sound waves reflecting off solid objects. These sensors have a very short range, but are very effective for three-dimensional mapping with accuracies within a centimeter, and outperform radar at close range.
- [Global Positioning Systems](#) (GPS) are used to collect vehicular location data. GPS systems determine the present location of the vehicle by analyzing signals received from satellites.
- [Inertial Measurement Units](#) (IMU) are used to collect vehicular motion and rotation data. Such systems supplement GPS systems in instances where satellite data is unavailable; they cannot determine absolute vehicular position, but can determine the location of a vehicle relative to its starting point.
- Processors and software function as the brain of the car, performing large-scale data processing to interpret sensor data in real time and make autonomous decisions accordingly. These systems use machine learning algorithms to detect patterns in the data they receive from sensors and GPS systems. These systems then make various decisions based on that data, such as identifying and following traffic signs and markings.

In contrast, semi-autonomous vehicles require a driver to perform some driving operations, depending on level of vehicle autonomy. Semi-autonomous vehicles may possess a limited number of these features or allow such features to be disabled.

RELEVANT EXPERTS

[Michael Clamann, PhD, CHFP](#), is the SciPol Lead Editor in Robotics and Artificial Intelligence and a Senior Research Scientist for Duke Robotics.

- Combs, T., Sandt, L., McDonald, N. and Clamann, M. January 7-11 2018. "Limitations in Detection Technologies for Automated Driving Systems and Implications for Pedestrian Safety." 97th Annual Transportation Research Board Meetings, Washington D.C.
- Clamann, M., Aubert, M., and Cummings, M. January 8-12, 2017. "[Evaluation of Vehicle-to-Pedestrian Communication Displays for Autonomous Vehicles](#)." 96th Annual Transportation Research Board Meeting, Washington D.C.

[Mary Cummings, PhD](#), is a Professor of Mechanical Engineering and Materials Science at the Duke Pratt School of Engineering and the Duke Institute of Brain Sciences and Director of the Humans and Autonomy Lab. Her research focuses on interactions between humans and unmanned vehicles and the engineering of human-robot systems.

- Cummings, Mary. 2017. "The Brave New World of Driverless Cars: The Need for Interdisciplinary Research and Workforce Development." *TR News* 34-37.
https://hal.pratt.duke.edu/sites/hal.pratt.duke.edu/files/u24/TRN_308_Cummings_%20pp34-37%20web.pdf.
- Tucker, M., Aubert, M., Sampaio, V., Clamann, M., and Cummings, M. 2016. "Detection of Attentional State in Long-Distance Driving Settings Using Functional Near-Infrared Spectroscopy." 2016 95th Annual Transportation Research Board Meeting, Washington D.C., January 10-14.
- Solovey, E., Powale, P., and Cummings, M. "A Field Study of Multimodal Alerts for an Autonomous threat detection system." HCII 2017, Vancouver, CA. doi: [10.1007/978-3-319-58475-1_29](https://doi.org/10.1007/978-3-319-58475-1_29)

BACKGROUND

The AV START Act uses the [SAE International](#) (SAE) definitions for levels of automation to define the terms "Highly Automated Vehicle", "Dedicated Highly Automated Vehicle", and "Automated Driving System". The SAE defines six levels of vehicle automation, from no automation to full automation.

- SAE Level 0: No automation
- SAE Level 1: Driver assistance
- SAE Level 2: Partial automation
- SAE Level 3: Conditional automation
- SAE Level 4: High automation
- SAE Level 5: Full automation

There are currently no fully-autonomous vehicles available for consumer purchase, but several companies have created partially-autonomous vehicles. Most manufacturers have introduced vehicles with level 1 automation through including features such as cruise control on models. A smaller number of manufacturers such as [Tesla](#), [Uber](#), [Google](#), [Audi](#), [Volvo](#), [Mercedes-Benz](#), and [Cadillac](#) have introduced level 2 automated-vehicles. Level 3-5 automated vehicles are still under development.

Current vehicle regulations are divided between federal and state jurisdiction:

- The federal government exercises jurisdiction through the NHTSA and regulates safety standards, industry compliance with safety standards, and public communication of safety issues. Most notably, NHTSA has developed the Federal Motor Vehicle Safety Standards (FMVSS) which regulate the design, construction, performance, and durability of vehicles.
- State governments maintain jurisdiction over licensing and registration, insurance and liability, enforcement of traffic regulations, and safety inspections.

NHTSA grants vehicle manufacturers up to 2,500 temporary exemptions from compliance with the FMVSS, provided the manufacturer demonstrates that the exemption will not compromise vehicle safety. These exemptions are often used with the introduction of new technology to the market that is not yet regulated but is equally as safe as or safer than existing technology. Since current FMVSS do not accommodate much emerging autonomous vehicle technology, the Act increases the maximum number of temporary exemptions so that manufacturers will not be burdened with [repeatedly applying](#) to the NHTSA for additional exemptions. Manufacturers will no longer be granted exemptions when FMVSS are updated to accommodate the aspect of technology for which the exemption is sought.

ENDORSEMENTS & OPPOSITION

Endorsements:

Some groups commended the bill for incentivizing AV innovation and accelerating the development and testing of AV technology.

- Senator John Thune (R-SD), [press release](#), September 28, 2017: “This legislation proposes common sense changes in law to keep pace with advances in self-driving technology. By playing a constructive role in the development of self-driving transportation systems, our government can help save lives, improve mobility for all Americans—including those with disabilities, and create new jobs by making us leaders in this important technology.”
- Niskanen Center, [letter](#), September 25, 2017: “This bill, if passed, would help accelerate the testing and ultimate deployment of a technology that is poised to significantly curtail one of the most pressing public safety concerns facing Americans.”
- Competitive Enterprise Institute (CEI), [letter](#), October 2, 2017: “CEI supports S 1885, American Vision for Safer Transportation Through Advancement of Revolutionary Technologies Act, as an important first step for bringing these technologies and applications to market. With highway fatalities now approaching 40,000 per year, it is more urgent than ever to allow for the deployment of technologies that address the primary cause of auto crashes: human error and misbehavior.”

Disability advocate groups applauded the bill for increasing the accessibility of AV technology for the disabled.

- National Federation of the Blind, [press release](#), September 29, 2017: “This bill will promote equal access to automated vehicles for the blind and others with disabilities through the prohibition of discriminatory licensing practices and the promotion of accessible user interface.”

Opposition:

Consumer groups raised safety concerns, complaining that the bill puts too much power in the hands of automakers and lacks sufficient industry oversight.

- Advocates for Highway and Auto Safety, [statement](#), October 3, 2017: “The AV START Act takes a dangerous hands-off approach to hands-free driving. It lacks adequate government oversight and industry accountability. There are warning signs already that this bill puts too much trust in the hands of automakers and places too little importance on consumer safety protections.”
- Joan Claybrook (former Administrator of the National Highway Traffic Safety Administration), [statement](#), October 3, 2017: “It puts the federal auto safety agency in the back seat in terms of ensuring industry accountability. And, it leaves consumers stranded on the side of the road without essential protections or basic information.”
- National Association of City Transportation Officials, [press release](#), October 3, 2017: “The legislation as currently written hinders this progress—weakening instead of strengthening cities’ and states’ ability to engage with private partners on safe operations and data sharing.”
- Senator Richard Blumenthal, [statement](#), January 18, 2018: “As it stands, this bill does not include enough protections to keep drivers, passengers and pedestrians safe,” he said in December, “but I’m hopeful we can strengthen these safeguards while allowing for limited testing and continued innovation.”

Other groups criticized the bill for failing to include commercial vehicles in its provisions.

- American Trucking Association, [letter](#), October 3, 2017: “The same protections and incentives for innovation that this bill provides for passenger vehicles—things like federal preemption to ensure that state and federal regulations do not conflict or impede interstate commerce, and the ability to receive exemptions from existing federal regulations so that new technology can be developed and tested—should apply to commercial vehicles as well. It is simply inconceivable that this legislation would favor one type of vehicle over another, as both cars and trucks travel together every day on the same roads and bridges.”

STATUS

S 1885 was introduced in the Senate on September 8, 2017, and referred to the [Committee on Commerce, Science, and](#)

[Transportation](#). On October 4, 2017, the Committee approved an amended version of the bill; on November 28, 2017, that amended version was placed on the Senate Legislative Calendar to await further consideration by the full Senate.

RELATED POLICIES

The following bills related to AV have been introduced to the 115th Congress:

- [SELF DRIVE Act \(HR 3388\)](#). Sponsor: [Representative Robert Latta](#) (R-OH-5); introduced on July 25, 2016. Prevents states from banning AV, grants AV manufacturers safety standard exceptions for vehicles entering the market, and requires manufacturers to create a framework to prevent cyberattacks on AV.
- [LEAD'R Act \(HR 3412\)](#). Sponsor: [Representative Markwayne Mullin](#) (R-OK-2); introduced on July 26, 2017. Gives the National Highway Traffic Safety Administration full jurisdiction over the regulation of HAV.
- [MORE Act \(3405\)](#). Sponsor: [Representative Mimi Walters](#) (R-CA-45); introduced on July 26, 2017. Exempts manufacturers of HAV from certain motor vehicle testing and evaluation safety standards.
- [SHARES \(3430\)](#). Sponsor: [Representative Brett Guthrie](#) (R-KY-2); introduced on July 26, 2017. Establishes a Highly Automated Vehicle Information Sharing Advisory Council within the National Highway Traffic Safety Administration to make recommendations to manufacturers about sharing information about HAV testing on public streets.
- [Vehicle Innovation Act of 2017 \(S 1225\)](#). Sponsor: [Senator Gary C. Peters](#) (D-MI); introduced on May 24, 2017. Supports the research and development of innovation for vehicle technologies. Another version of this bill ([HR 4050](#)) was introduced in the House on October 12, 2017.

In 2016 the National Highway Transportation Safety Administration released the Federal Automated Vehicles Policy ([SciPol brief available](#)) to provide guidance to industry and regulators for safe design, state policy recommendations, and regulatory tools for HAVs. The nine subject areas in the AV START Act's safety evaluation report appear to be based on safety assessment topics included in the NHTSA guidance. The Federal Automated Vehicles Policy was replaced in 2017 with [Automated Driving Systems: A Vision for Safety](#).

SPONSORS

Sponsor: [Senator John Thune](#) (R-SD)

Cosponsors:

- [Senator Gary C. Peters](#) (D-MI)
- [Senator Roy Blunt](#) (R-MO)
- [Senator Debbie Stabenow](#) (D-MI)

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