U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON ENERGY AND COMMERCE

November 10, 2016

TO: Members, Subcommittee on Commerce, Manufacturing, and Trade

FROM: Committee Majority Staff

RE: Hearing entitled "Disrupter Series: Self-Driving Cars."

I. INTRODUCTION

On Tuesday, November 15, 2016, at 10:30 a.m. in 2322 Rayburn House Office Building, the Subcommittee on Commerce, Manufacturing, and Trade will hold a hearing entitled "Disrupter Series: Self-Driving Cars."

II. WITNESSES

Panel I

- Mark Rosekind, Ph.D., Administrator, National Highway Traffic Safety Administration.

Panel II

- Mitch Bainwol, President and CEO, Alliance of Automobile Manufacturers;
- Ann Wilson, Senior Vice President, Motor & Equipment Manufacturers Association;
- Gary Shapiro, President and CEO, Consumer Technology Association;
- Kirk Steudle, P.E., Chief Deputy Director, Michigan Department of Transportation; and
- Laura MacCleery, Vice President Consumer Policy and Mobilization, Consumer Reports.

III. BACKGROUND

A. Overview

Self-driving cars or autonomous vehicles are motor vehicles capable of operating without any direct human input or control over a vehicle's safety-critical functions, such as steering, acceleration, and braking.[1] These vehicles generally work by using a combination of three systems: a global positioning system (GPS) or other mapping system that defines the starting and

[1] See http://www.nhtsa.gov/About+NHTSA/Press+Releases/U.S.+Department+of+Transportation+Releases+Policy+on+Automated+Vehicle+Development

ending point of the drive; a sensor system composed of cameras, lasers, radar, or lidar (a technology that measures distance using laser light) that detects dynamic and variable roadway conditions; and a computer system that can turn the information from the mapping system and sensor systems into a driving action, which is typically executed by the vehicle's internal electronic network.[2]

Today, fully self-driving cars remain in the conceptual design and developmental stage. However, auto manufacturers are producing commercial-ready vehicles that are equipped with semi-autonomous driving systems.[3] Many of these automated driving systems vary across manufacturers, including the degree to which the system is able to operate without direct human input or control within a motor vehicle.[4] To establish consistency within the emerging self-driving car market, SAE International, a standards-setting organization, has classified automated driving systems into six different levels.[5] The National Highway Traffic Safety Administration (NHTSA) recently adopted SAE International's definitions of automation levels for its own use.[6]

The six levels of automation span from "No Automation" (Level 0), where the human driver performs all aspects of the driving task and monitors the driving environment, to "Full Automation" (Level 5), where the automated driving system is capable of performing all aspects of the driving task, including monitoring the driving environment.[7] Levels 1 through 4 define vehicles with automated driving systems that vary in their ability to execute the steering, acceleration, and deceleration functions of a vehicle and the need for a human driver to monitor the surrounding environment at any point during the driving trip.[8] Automated driving systems between Levels 1 and 4 also differ in their ability to operate in certain environments and on certain roadway conditions.[9] The most notable distinction between Levels 0 through 2 and Levels 3 through 5 is that a human driver must always monitor the driving environment in Levels 0 through 2, whereas the automated driving system is capable of monitoring the driving environment in Levels 3 through 5.[10]

As automated driving systems advance and become increasingly sophisticated, automotive industry experts expect that highly autonomous vehicles or fully self-driving cars will be available on the market sometime between 2020 and 2025.[11] Industry experts also project that by 2025, cars with partial and fully autonomous features will represent 12 to 13 percent of

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[2] See http://time.com/3719270/you-asked-how-do-driverless-cars-work/; See also http://www.eetimes.com/author.asp?section_id=36&doc_id=1330069
[3] See http://www.nytimes.com/2015/04/03/automobiles/semiautonomous-driving-arrives-feature-by-feature.html
[4] Id.
[5] See http://www.sae.org/misc/pdfs/automated_driving.pdf
[6] See http://www.nhtsa.gov/About-NHTSA/Press-Releases/U.S.-Department-of-Transportation-Releases-Policy-on-Automated-Vehicle-Development
[7] See http://www.sae.org/misc/pdfs/automated_driving.pdf
[8] Id.
[9] Id.
[10] Id.
[11] See https://www.theguardian.com/technology/2015/sep/13/self-driving-cars-bmw-google-2020-driving; See also http://www.bcg.com/expertise/industries/automotive/autonomous-vehicle-car-future.aspx

the global driving fleet.[12] By 2035, it is estimated that there will be 12 million fully self-driving cars and 18 million partially autonomous vehicles on the road around the world.[13]

B. Economic and Societal Impact of Autonomous Vehicles

There are many economic and societal benefits anticipated with the commercial deployment of self-driving cars. The most significant potential benefit is increased vehicle and roadway safety. Currently, traffic accidents account for approximately 32,000 fatalities per year, rising to over 35,000 in 2015 – the largest increase in traffic deaths since 1966.[14] Traffic fatalities have also risen over 10 percent in the first half of 2016, which has been attributed to numerous factors, including an increase in vehicle miles traveled by drivers on account of lower gas prices, behavioral error, and distracted driving.[15] Self-driving cars, however, have the potential to eliminate human error and distraction from the driving task because—due to sophisticated sensor systems—they can operate without blind spots and maintain a 360-degree awareness of the road at all times.[16] Self-driving cars may also have faster reaction times to obstacles and unpredictable roadway activity than human drivers.[17] As a result, self-driving cars are predicted to reduce traffic fatalities by 90 percent, saving almost 30,000 lives per year in the U.S. and 1 million lives globally.[18]

In addition to improving safety, self-driving cars may also reduce congestion and improve traffic mobility. Researchers suggest that automated driving systems will be able to "adjust [vehicle] speed according to road demand, capacity, environmental conditions, and geographic area."[19] These adjustments will help eliminate congestion and gridlock caused by traffic speed and volume inconsistencies.[20] Self-driving cars are also expected to be capable of predicting or calculating changes in traffic, enabling a vehicle to alter its route mid-course to take the most efficient driving trip, which can further reduce travel delays.[21]

In predicting car movements and traffic patterns, self-driving cars can also determine "how smoothly a car accelerates or decelerates."[22] This can help reduce fuel usage, increase fuel

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[12] Id.
[13] See http://www.klgates.com/nhtsa-guidelines-drive-toward-an-autonomous-vehicle-future-09-23-2016/; See also http://www.bcg.com/expertise/industries/automotive/autonomous-vehicle-adoption-study.aspx
[14] See https://www.theguardian.com/technology/2015/dec/17/self-driving-cars-safety-future-interactive; See also http://www.nhtsa.gov/About+NHTSA/Press+Releases/nhtsa-2015-traffic-deaths-up-07012016
[15] See http://www.nytimes.com/2016/10/06/us/traffic-deaths-up-more-than-10-percent-in-first-half-of-2016.html?_r=0; See also http://www.cnbc.com/2016/08/22/traffic-fatalities-on-the-rise-as-americans-drive-more-miles-text-behind-the-wheel.html; See also http://www.npr.org/sections/thetwo-way/2016/08/29/491854557/traffic-deaths-climb-by-largest-increase-in-decades
[16] See https://www.wired.com/2016/03/self-driving-cars-wont-work-change-roads-attitudes/
[17] Id.
[18] See http://www.theatlantic.com/technology/archive/2015/09/self-driving-cars-could-save-300000-lives-per-decade-in-america/407956/
[19] See https://www.lta.gov.sg/ltaacademy/doc/J14Nov_p12Rodoulis_AVcities.pdf
[20] Id.
[21] Id.
[22] See http://www.autoblog.com/2016/03/24/study-autonomous-vehicles-improve-mpg-epa-tests/

economy, and reduce emissions.[23] Studies estimate that self-driving cars and other forms of intelligent transportation systems could achieve a 2 to 4 percent reduction in oil consumption and related greenhouse emissions over the next 10 years due to smart sensors and connected features that allow the car to operate efficiently throughout the course of travel.[24] Reductions in oil consumption from automated vehicle technologies could generate fuel savings of up 15 percent for consumers.[25] Self-driving cars have also been estimated to achieve 30 percent greater fuel efficiency compared to conventional vehicles and may help reduce pollution by over 90 percent.[26]

Another expected benefit of self-driving cars is their potential to improve transportation access and mobility for disabled, elderly, and underserved communities.[27] Self-driving cars enable new mobility models that can provide personalized "point-to-point" transportation services to consumers who cannot walk, drive, or navigate the complexities of public transportation systems.[28] Additionally, individuals who do not own or who cannot afford private car ownership may have opportunities to engage in less expensive ride-sharing options provided by self-driving vehicles.[29] Individuals living in rural areas, where public transportation is limited or nonexistent, may also be able to increase their mobility options through autonomous vehicles.[30] New mobility and accessibility options provided by self-driving cars can ultimately help improve societal engagement and economic opportunities among these communities.

Other potential benefits of self-driving cars include increased labor productivity and labor cost-savings, as well as gains in land-use efficiency. For example, self-driving cars can allow commuters to spend less time driving and more time working while in transit, which could lead to increased pay or shorter hours at the office.[31] Self-driving cars can also be programmed to drop off and collect passengers when required, decreasing demand for nearby parking and opening up city land for more efficient uses. [32] Autonomous vehicles that remain in operation throughout the day may eliminate the need for parking altogether, or may "return to depots in less expensive locations where more land is available."[33]

C. NHTSA Activity

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[23] See http://www.autoblog.com/2016/03/24/study-autonomous-vehicles-improve-mpg-epa-tests/
[24] See https://www.scientificamerican.com/article/self-driving-cars-could-cut-greenhouse-gas-pollution/
[25] Seehttp://ensia.com/features/are-self-driving-vehicles-good-for-the-environment/
[26] See http://ensia.com/features/are-self-driving-vehicles-good-for-the-environment/; See also https://ingworld.ing.com/en/2016-1Q/12-column-m-cliffe
[27] See http://www.mckinsey.com/industries/automotive-and-assembly/our-insights/ten-ways-autonomous-driving-could-redefine-the-automotive-world
[28] See http://www.thetransportpolitic.com/2015/06/23/will-autonomous-cars-change-the-role-and-value-of-public-transportation/
[29] See https://www.theguardian.com/media-network/2016/apr/20/autonomous-driverless-cars-how-cities-might-look-vehicles
[30] See http://healthaffairs.org/blog/2016/03/04/steering-autonomous-vehicle-policy-the-role-of-public-health/
[31] See http://www.latimes.com/opinion/op-ed/la-oe-greenhouse-driverless-job-loss-20160922-snap-story.html
[32] See https://www.lta.gov.sg/ltaacademy/doc/J14Nov_p12Rodoulis_AVcities.pdf
[33] Id.

Over the last three years, NHTSA has issued both policy statements and agency guidance addressing the development and deployment of self-driving cars in the United States. Beginning in 2013, NHTSA issued a Preliminary Statement of Policy Concerning Automated Vehicles that contains the agency's plans for research on automated technologies, as well as recommendations to States on how to test, license, and regulate self-driving cars.[34] In January 2016, NHTSA released an update to the 2013 Preliminary Statement affirming its authority to use all available legal and regulatory tools at its disposal to determine the safety potential of new motor vehicle technologies, including automated driving systems.[35] In this update, NHTSA also pledged to eliminate any obstacles that would prevent or delay vehicular technology innovations from realizing their potential.[36] NHTSA did advise however that the safe deployment of autonomous technologies would require "a rigorous testing regime that provides sufficient data to determine safety performance," and informs policymakers about future deployment rules and regulations.[37]

In March 2016, NHTSA issued a report in conjunction with the Department of Transportation's Volpe Center on autonomous vehicles. The report evaluates how existing Federal Motor Vehicle Safety Standards (FMVSS) address or consider automated driving systems and technologies.[38] It also identifies FMVSS that may create challenges or barriers to the introduction of self-driving cars into commerce.[39] The report finds that while current FMVSS "do not explicitly address automated vehicle technology and often assume the presence of a human driver," there are few regulatory barriers facing the deployment of automated vehicles that comply with applicable FMVSS.[40] Automated vehicles however that diverge from conventional vehicle design (e.g. vehicles that lack a steering wheel or brake pedals) may face regulatory obstacles or certification challenges for commercial deployment.[41]

Following the release of the Volpe Center report, NHTSA held two public meetings in April to solicit public feedback on the safe operation of automated vehicles.[42] These meetings were intended to help inform NHTSA's work on the development of "best practice guidance" for the deployment of autonomous safety technology, which NHTSA announced it would do in its January update to the 2013 Preliminary Statement.[43]

In September, NHTSA issued a Federal Automated Vehicles Policy (Guidance) to establish a foundation and framework for the safe introduction and deployment of highly

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[34] See http://www.nhtsa.gov/About-NHTSA/Press-Releases/U.S.-Department-of-Transportation-Releases-Policy-on-Automated-Vehicle-Development
[35] See DOT/NHTSA Policy Statement Concerning Automated Vehicles. 2016 Update to "Preliminary Statement of Policy Concerning Automated Vehicles." Available at: http://business.cch.com/plsd/AutonomousVehiclesPolicyUpdate4-8-16.pdf
[36] Id.
[37] Id.
[38] See http://ntl.bts.gov/lib/57000/57000/57076/Review_FMVSS_AV_Scan.pdf
[39] Id.
[40] Id.
[41] Id.
[42] See http://www.nhtsa.gov/nhtsa/symposiums/april2016/index.html
[43] See http://www.nhtsa.gov/About-NHTSA/Press-Releases/U.S.-Department-of-Transportation-Releases-Policy-on-Automated-Vehicle-Development

autonomous vehicles.[44] NHTSA has requested public comment on the Guidance and intends to update it at least once a year; the Guidance is not binding on States, manufacturers, or other entities.[45]

The Guidance consists of four sections including: vehicle performance guidance, model State policy, NHTSA's current regulatory tools, and new tools and authorities. The first section outlines best practices for the safe design, development, testing, and deployment of highly autonomous vehicles (HAVs) for both test and production-level vehicles.[46] It also requests that manufacturers voluntarily submit a "Safety Assessment Letter" that addresses how the entity is considering the performance of the automated driving system with respect to privacy and cybersecurity, crashworthiness, ethical considerations, post-crash behavior, validation methods and other areas.[47]

The second section of the Guidance provides a model regulatory framework for States to adopt if they choose to regulate HAVs.[48] The model policy includes recommendations on who should oversee the testing of HAVs within the State; how manufacturers and other entities should apply to States to test HAVs on public roadways; the registration and titling of HAVs, as well as law enforcement considerations; and suggestions for how to address liability and insurance issues.[49] States are also encouraged to work with each other to standardize and maintain road infrastructure for the deployment of HAVs.[50]

The third section of the Guidance addresses the current regulatory tools and processes NHTSA has at its disposal to address the introduction of new motor vehicle technologies.[51] The regulatory tools and processes include: letters of interpretation – which allows NHTSA to describe its view of the meaning and application of current statutes and regulations as they relate to motor vehicles and motor vehicle equipment; exemptions from existing standards – which allows NHTSA to provide temporary and limited exemptions from compliance with certain FMVSS to manufacturers; rulemakings to amend existing standards or create new standards; and enforcement authority – which allows NHTSA to address defects that pose an unreasonable risk to safety.[52] NHTSA affirms that it will not prohibit the introduction of a new motor vehicle or motor vehicle technologies into a vehicle fleet as long as they comply with all applicable Federal Motor Vehicle Safety Standards.[53]

The fourth section of the Guidance proposes new regulatory tools and authorities that may be useful to NHTSA's efforts in facilitating the safe and expeditious development of

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[44] See http://www.nhtsa.gov/nhtsa/av/av-policy.html
[45] Id.
[46] Id.
[47] Id.
[48] Id.
[49] Id.
[50] Id.
[51] Id.
[52] Id.
[53] Id.

autonomous vehicles.[54] Those new regulatory tools and authorities include: expanded exemption authority, enhanced data collection tools, pre-market approval authority, and authorization to modify safety test track procedures to avoid the gaming of tests by automated driving systems.[55]

Following the release of the Guidance, NHTSA issued an Enforcement Guidance Bulletin outlining the agency's views on its enforcement authority under the National Traffic and Motor Vehicle Safety Act as it relates to potential safety defects in automated vehicle technologies.[56] In the Enforcement Guidance Bulletin, NHTSA affirms that its enforcement authority concerning safety-related defects extends and applies "equally to current and emerging automated technologies."[57] NHTSA also affirms that its enforcement authority applies "notwithstanding the presence or absence of an FMVSS for a particular type of advanced equipment or technology."[58]

In October, the Department of Transportation announced plans to establish an Advisory Committee on Automation Transportation (ACAT) for a two-year period.[59] The purpose of the ACAT is to provide the Secretary of Transportation with information, technical advice, and recommendations on "cross-modal matters relating to the development and deployment of automated vehicles."[60] The ACAT's work will also be used to help the Department of Transportation prepare for the training and education, regulation, and safety oversight of emerging technologies.[61] The notice includes a solicitation for nominations to the ACAT, which will consist of at least 15 people representing various perspectives on automated transportation.[62]

NHTSA held another public meeting on the agency's autonomous vehicle Guidance on November 10.[63] NHTSA specifically sought input from automotive industry stakeholders on how to "refine the overall structure and content" of the safety assessment letter referenced in the Guidance.[64]

D. State Activity

Several States, including California, Florida, Nevada, Utah, Michigan, North Dakota, Tennessee, and the District of Columbia have enacted laws addressing autonomous vehicles.[65] Each State has taken a different approach in regulating and overseeing the testing, research, development, licensing, permitting, registration, and deployment of self-driving cars.[66]

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[54] Id.
[55] Id.
[56] See https://www.gpo.gov/fdsys/pkg/FR-2016-09-23/pdf/2016-23010.pdf
[57] Id.
[58] Id.
[59] See https://www.transportation.gov/briefing-room/us-department-transportation-announces-new-advisory-committee-automation
[60] See https://www.federalregister.gov/documents/2016/10/20/2016-25392/advisory-committee-on-automation-in-transportation
[61] Id.
[62] Id.
[63] See http://www.nhtsa.gov/About-NHTSA/Press-Releases/nhtsa_av_public_meeting_11012016
[64] Id.
[65] See http://www.ncsl.org/research/transportation/autonomous-vehicles-legislation.aspx
[66] Id.

Following the release of NHTSA's Guidance, a few States have taken additional steps to regulate the operation of self-driving cars within their jurisdiction and signaled intent to adopt recommendations offered in the Guidance.[67]

IV. ISSUES

The following issues will be examined at the hearing:

- What impact self-driving cars will have on traffic and roadway safety.
- How to create a consistent and uniform national regulatory framework for the testing and deployment of self-driving cars.
- What impact will NHTSA's guidance have on the development and deployment of self-driving cars.
- The impact self-driving cars will have on vehicular travel, mobility, and access to the transportation services we have today.
- How to best address cyber-security in self-driving cars.
- How to educate consumers about self-driving cars and encourage widespread acceptance and adoption of automated vehicle technologies.

V. STAFF CONTACTS

If you have any questions regarding this hearing, please contact Paul Nagle or Olivia Trusty of the Committee Staff at (202) 225-2927.

[67] Id.