Committee on Transportation and Infrastructure
U.S. House of Representatives
Washington, DC 20515

Bill Shuster
Chairman

Christopher P. Bertram, Staff Director

Nick J. Rahall, II
Ranking Member

James H. Zoia, Democrat Staff Director

November 19, 2013

SUMMARY OF SUBJECT MATTER

TO: Members, Subcommittee on Highways and Transit
FROM: Staff, Subcommittee on Highways and Transit
RE: Subcommittee Hearing on "How Autonomous Vehicles Will Shape the Future of Surface Transportation"

PURPOSE

The Subcommittee on Highways and Transit will meet on Tuesday, November 19, 2013, at 10:00 a.m. in 2167 Rayburn House Office Building to receive testimony related to autonomous vehicles and the surface transportation system. At this hearing, the Subcommittee will hear from the National Highway Traffic Safety Administration (NHTSA), General Motors, Nissan North America, Inc., Carnegie Mellon University, the American Association of State Highway Transportation Officials (AASHTO), and the Eno Center on Transportation on how autonomous vehicles will shape the future of transportation.

BACKGROUND

From the time Henry Ford rolled the Model T off the assembly line, the automobile has continued to profoundly impact Americans. After the automobile became commercially viable, millions of citizens purchased automobiles for daily use, in turn altering American's living patterns, leisure activities and mobility. As Americans drove more, the societal need for better transportation infrastructure was undeniable. On June 29, 1956, President Dwight D. Eisenhower signed into law the *Federal-Aid Highway Act of 1956*, which established the Interstate Highway System comprised of 46,876 highway miles, 55,500 bridges, 104 tunnels and 14,750 interchanges.[1] The Interstate Highway System gave American's unprecedented access to businesses, goods and services, and jobs and has remained largely unchanged for the past 50 years. Advances in computer technology, however, are beginning to revolutionize the automobile and the way Americans travel.

[1] The Eisenhower Interstate Highway System. *Federal Highway Administration*. http://www.fhwa.dot.gov/interstate/faq.htm. Accessed: October 7, 2013.

Function-specific automation, such as automatic breaking systems and automatic parallel parking, is already available in vehicles rolling off the assembly line today. More advanced automation combines these functions with integration of braking, throttle, and steering control and will begin to reduce the need for driver control of the vehicle. The lesser the degree to which a human driver is required to control the vehicle, or is expected to resume control after a period of time, the more autonomous the vehicle.

Fully autonomous vehicles are at the end of the automation spectrum. These vehicles are capable of navigating the road without human input by sensing their environment through electronic sensors and computer software algorithms. Their electronic sensors are usually comprised of radar, lidar, global positioning systems and optical cameras that feed sensory data from the environment into an on-board computer processor; the computer is then able to control and maneuver the vehicle based on the sensory data. Although research and development on autonomous vehicles has been decades ongoing, recent advances in computer and in-vehicle driver assist technologies have brought commercial availability of autonomous vehicles closer to reality.

On August 7, 2012, the internet conglomerate Google announced it had logged over 300,000 accident-free miles with a dozen autonomous vehicles, a milestone in the development and deployment of autonomous vehicles on the Nation's highway system.[2] Google has not announced plans to sell autonomous vehicles to consumers but automobile manufacturers are working on their own autonomous vehicles. On August 27, 2013, Nissan Motor Company announced plans to deliver the first commercially-viable autonomous vehicle system by 2020.[3] Other automobile manufacturers that claim to have a working autonomous vehicle prototype include General Motors, Mercedes-Benz, Ford, Toyota, and Audi. These companies envision offering consumers greater productivity while driving and, more importantly, a safer driving experience.

By current estimates, the potential safety benefits from autonomous vehicles cannot be ignored. NHTSA estimates that 34,080 fatalities occurred in the United States as a result of vehicle crashes in 2012, with human error as a primary cause of vehicle crashes. One study estimates human error is the probable cause for 93 percent of vehicle crashes.[4] If the factor of human error could be reduced through the adoption of autonomous vehicles, vehicle crashes and fatalities could be significantly reduced in the future. NHTSA estimates economic costs from vehicle crashes in the United State at $230 billion per year, based on year 2000 data. These safety benefits can only be realized, however, if federal, state and local policies are in place to ensure autonomous vehicle integration with the existing vehicle fleet and infrastructure.

In 2011, Nevada passed a law to authorize the state's department of transportation to develop rules and regulations governing the use of driverless cars on its roads, making it the first

[2] R. Rosen. "Google's Self-Driving Cars: 300,000 Miles Logged, Not a Single Accident Under Computer Control," *The Atlantic*, August 9, 2012, Retrieved from: http://www.theatlantic.com/technology/archive/2012/08/googles-self-driving-cars-300-000-miles-logged-not-a-single-accident-under-computer-control/260926/.

[3] A. Ohnsman. "Nissan Sets Goal of Introducing First Self-Driving Cars by 2020," *Bloomberg*, August 27, 2013, Retrieved from: http://www.bloomberg.com/news/2013-08-27/nissan-sets-goal-of-bringing-first-self-driving-cars-by-2020.html.

[4] National Highway Traffic Safety Administration (2008). National Motor Vehicle Crash Causation Survey. U.S. Department of Transportation, Report DOT HS 811 059.

state to adopt an autonomous vehicle law. The law charges the Nevada Department of Transportation with setting safety and performance standards and requires designated areas where driverless cars may be tested. Florida and California soon followed Nevada's lead by enacting autonomous vehicle laws of their own. Legislatures in several other states are considering similar legislation.

On May 30, 2013, NHTSA announced its preliminary statement of policy concerning autonomous vehicles. The new policy includes plans for research on related safety issues and recommendations for states related to the testing, licensing, and regulation of autonomous vehicles. NHTSA plans to continue autonomous vehicle research activities regarding human factors, electronic control system safety, and system performance requirements. NHTSA will also offer its expertise to states seeking autonomous vehicle legislation in regards to licensing, driver training, and conditions for operation. NHTSA and the Research and Innovative Technology Administration are also researching connected vehicle technology which allows vehicles to communicate, via wireless radio signals, driving information such as speed, lane departure, and environment information to other vehicles on the highway. Connected vehicle technology would complement autonomous vehicle systems to create greater situational awareness for equipped vehicles.

The potential introduction of autonomous vehicles into the market on a larger scale raises many policy questions and challenges. Without proper planning for the integration of autonomous vehicles into existing infrastructure and vehicle fleet, operating constraints may restrict the efficiency and safety benefits of these vehicles. Design of the driver-vehicle interface, which will need to balance the automated benefits to a driver while ensuring a driver remains alert if suddenly required to take control of the vehicle, is key to reaping the potential safety benefits of this technology. The interaction between vehicle and driver will require some oversight, as this will result in ultimate responsibility for the safe operation of the vehicle. What, or whom, is responsible for the safe operation of the vehicle, will impact liability in the event of a crash. With connected vehicle technology, there must also be enough market penetration for the technology to be utilized effectively. In other words, a connected vehicle is only useful if there are other connected vehicles and the appropriate infrastructure with which it can communicate.

Autonomous vehicles present a unique opportunity to improve highway safety, decrease congestion, lower emissions, expand mobility, and create new economic opportunities for jobs and investment. Automobile manufacturers have undertaken significant research and development activities, with the goal of one day offering an autonomous vehicle to the average consumer. Federal, state and local governments have begun laying the groundwork for a future where autonomous vehicles may integrate with the existing vehicle fleet and infrastructure. With careful research and planning, autonomous vehicles could one day revolutionize American mobility.

WITNESS LIST

The Honorable David Strickland
Administrator
National Highway Traffic Safety Administration

Mr. Kirk Steudle
Director
Michigan Department of Transportation
On behalf of the AASHTO

Mr. Mike Robinson
Vice President of Sustainability and Global Regulatory Affairs
General Motors

Mr. Andrew Christensen
Senior Manager of Technology Planning
Nissan Technical Center North America

Dr. Raj Rajkumar
Carnegie Mellon University

Dr. Joshua Schank
President and CEO
Eno Center for Transportation