Remarks Prepared for
Ronald Medford, Deputy Administrator
National Highway Traffic Safety Administration
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Connected-Driverless Vehicles Panel Session
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Thank you, Jim [Jim Esselmann of FHWA, panel moderator] for the invitation to participate on this panel.

The National Highway Traffic Safety Administration's mission is to save lives, prevent injuries, and reduce the economic costs of road crashes. We maintain a data-driven focus on every aspect of driving safety and automotive innovation.

I'm pleased to report that the broad trend is encouraging: Traffic fatalities have been steadily declining over the last five years since reaching a near-term peak in 2005, decreasing by 26 percent from 2005 to 2011. NHTSA is moving aggressively to further reduce highway fatalities.

We're living in an incredible period of transportation history-in-the-making. Change is the name of the game, and we have much to look forward to, including long-term initiatives already underway to increase fuel efficiency, connect communities, and make vehicles safer.

Connected and automated vehicle technologies have the potential to change the way we look at

transportation. While NHTSA has worked on crashworthiness issues for over 40 years and will continue to make progress in this area, crash avoidance technologies and active safety offer amazing—perhaps unprecedented-- potential for achieving large reductions in the number of fatal crashes. The best protection against a crash is to prevent it from happening in the first place.

In order for automated driving to be successful, we must have reliable technology and fulfill requirements for safety, privacy, security, and consumer acceptance. There is also a real need to develop performance specifications and non-traditional methods to validate the performance of a high level of automated driving where the vehicle is making decisions for the driver. There

are no developed methods for doing this. We may need to depend on modeling and simulation of detailed traffic interactions that lead to crashes.

We must understand and develop standards and methods of operation that accommodate distinct levels of automated control. We think about various levels of automation along a continuum that balances the roles of the driver and the machine, culminating in fully automated driving.

We are already familiar with Assisted Automation, where the driver has complete authority, but cedes limited fundamental control to the vehicle in certain normal driving or crash-imminent situations (such as enhanced steering control, automatic braking, adaptive cruise control, or lane keeping).

Monitored Automation involves shared authority: The driver cedes primary control but is still responsible for monitoring and safe operation. The human is expected to be available at all times. An example would be a system that combined lane centering with adaptive cruise control for “hands-off” and “feet-off” driving. But it is still ‘eyes-on” for the driver to continually monitor the road and traffic.

For Conditionally Automated driving, the human can cede full control authority under certain traffic and environmental conditions, but is expected to be available for occasional control. The car is responsible for safe operation. We consider the current Google concept to be in this

category. Here it's "hands-off," "feet-off," and "eyes-off" until the driver decides to resume control, or the car tells him he has to with an adequate time cushion.

In the Fully Automated mode, the driver provides destination or navigation input, but is not expected to be available for control. Responsibility for safe operation rests solely on the automated systems. We know of no such vehicle being designed for civilian highway use at this time, but at some time in the future this may be the logical outcome of the many efforts at automation currently underway.

NHTSA has made a significant research investment in the potential applications of Assisted Automation types of technologies,

including forward collision warning, crash imminent braking, and lane departure warning. The agency is encouraging manufacturers to install some of these technologies on vehicles through its New Car Assessment Program (NCAP) and is actively engaged in research that will help us decide whether to incorporate some of them into our regulatory regime.

Automated vehicles offer an important and challenging new method for reducing crash risk that we believe holds great promise. The question is what we should be doing to ensure that this new technology is responsibly entering the market so as not to create unanticipated

negative consequences that could affect the public's confidence in the technology.

NHTSA has been having extensive discussions with Google, and numerous car makers, about plans to deploy this technology and the issues that we believe are going to be important to its safe introduction.

The development of automated vehicles is a worthy goal, with great potential for improving vehicle safety. Our challenges include: Understanding and evaluating driver behavior in these vehicles; developing performance requirements for the highly complex crash environments that they will encounter; and ensuring that the systems (including sensors,

maps, and software, etc.) are effective and reliable.

We have developed a Motor Vehicle Automation Roadmap to examine the performance of automated technology as a vehicle safety system. As part of this work we plan to conduct research on the reliability and security of software systems that support automated vehicle control and on the performance of drivers interacting with these vehicles.

The introduction of automated vehicles has the potential to change not only the way that vehicles operate but the way we at NHTSA regulate them. Most of NHTSA's safety standards assume the need for a human driver to operate required safety equipment. A vehicle

that drives itself challenges this basic assumption.

This is also true of state efforts to govern motor vehicle safety. State highway safety programs overwhelmingly focus on preventing driver behaviors that are deemed unsafe such as speeding or drunk driving. When a crash occurs, we can usually determine what factors contributed to the crash. This determination may be much more difficult when control of the vehicle seamlessly transitions from the driver to the vehicle. It is likely that NHTSA's regulations may have to evolve to address these aspects of automated vehicles.

NHTSA may also have to consider new methods of testing vehicles in order to specify minimum

performance standards for automated vehicles. The agency's regulations currently focus on the performance of safety systems in discrete operating scenarios or test conditions. They require a certain minimum safety performance of a system and contain a test procedure to test this aspect of performance. On an automated vehicle, all of the vehicle's safety systems are connected and controlled through a computer, and this must function in every driving scenario, so any test of one scenario, or even multiple scenarios, may not cover the full range of performance of the vehicle.

In addition to the potential safety impact of automated vehicles, the agency is also aware that these technologies have significant added potential to contribute to intelligent management

of roadway traffic and reduce the burden of highway traffic on the environment. These potential benefits make the continued exploration of automated driving technologies a worthwhile endeavor—and NHTSA's decisions on these technologies will inevitably influence the manner and pace with which they are adopted.

NHTSA is seeking to be an active partner in the development and implementation of connected vehicle and automated driving technologies—an undertaking that requires collaboration with product developers, insurers, academia, and state and federal governments. The agency is planning to initiate research on emerging automated driving technologies later this fall.

Another very promising, and related, area of rapid technological development is vehicle-to-vehicle (or “V2V”) communications, often referred to as “connected vehicles.” As compared to automated vehicles, which involve technologies focused on an individual vehicle, V2V technologies involve communications between vehicles that can yield enormous safety benefits, as well as environmental benefits. These two technologies are complementary. It’s like the desktop computer of 20 years ago; they were immediately useful by itself, but the real power and benefit came from “linking” them all together.

Even without automation, Connected Vehicle Technologies have the potential to address

approximately 80 percent of the vehicle crash scenarios involving unimpaired drivers. Because of the potential safety benefits and increasing maturity of this technology, NHTSA has announced that in 2013 we plan to make a decision about the Agency's next steps for Connected Vehicle Technology as it relates to light duty vehicles–and a decision for heavy duty vehicles in 2014.

NHTSA's decision-making will be based on data and a detailed analysis of the possible approaches to implementation. The data will come primarily from V2V vehicle testing programs, and our Safety Pilot, which consists of driver clinics and a large-scale model deployment.

Starting in 2011, NHTSA conducted Safety Pilot driver clinics in the first phase of a two-part research and demonstration program jointly developed with the Research and Innovative Technology Administration (RITA) in coordination with other DOT agencies.

The driver clinics were designed to evaluate cars equipped with vehicle-to-vehicle Dedicated Short Range Communications (DSRC) systems in a controlled environment where researchers observed drivers' responses. The technologies we tested include in-car collision warnings, "do not pass" alerts, warnings that a vehicle ahead has stopped suddenly, and other similar safety messages.

The driver clinics are now complete, and in May we announced the results: More than four out of five of the participating drivers strongly agreed that they would like to have vehicle-to-vehicle safety features on their personal vehicles. In addition, more than 90 percent of the participants believed that a number of specific features of the connected vehicle technology would improve driving in the real world, including features alerting drivers about cars approaching an intersection, warning of possible forward collisions, and notifying drivers of cars changing lanes or moving into the driver's blind spot.

A second phase of the Safety Pilot will further evaluate Connected Vehicle technology in a real-

world field test from the summer of 2012 through the summer of 2013. It will focus on vehicle-to-vehicle applications, in addition to continuing the research on a limited number of vehicle-to-infrastructure applications.

The model deployment will take place in Ann Arbor, Michigan and include approximately 2,800 cars, trucks, and buses equipped with vehicle-to-vehicle communications devices. These vehicles will send and receive electronic data from other equipped vehicles at the site and translate data for six safety applications that warn the driver if and when specific safety hazards occur.

The testing will include vehicle original equipment and aftermarket equipment to test the

potential of early safety benefits. NHTSA is working closely with the Federal Motor Carrier Safety Administration (FMCSA) and the Federal Transit Administration (FTA) on the heavy vehicle and transit bus aspect of our research.

All of the test systems and devices emit a basic safety message 10 times per second that forms the data stream that other in-vehicle devices use to determine when a potential traffic hazard exists. This information, when combined with the vehicle's own data, provides highly accurate data for crash-avoidance safety applications.

The Safety Pilot Model Deployment will obtain empirical test data for determining the effectiveness of each of the technologies at reducing crashes. These capabilities will also be

extended to a limited set of applications in which vehicles will communicate with highway infrastructure.

Our research is showing that these safety applications may significantly reduce collisions that typically occur in the real world, such as crashes at intersections or when changing lanes.

Ultimately, blending or fusing V2V communications with increasing levels of vehicle automation could result in the most dramatic safety improvements in our nation's driving history. That's why we think we are on the brink of an amazing era in automotive safety. But the challenges are substantial, the research must be thorough, and industry and government must work together to get it right.

Thank you.