Testimony of
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On Highways and Transit
("How Autonomous Vehicles Will Shape the Future of Surface Transportation")

Good morning, and thank you for the opportunity to participate in this very important hearing. The role that technology is already playing – and will increasingly play in the future -- to assist the drivers of our vehicles in managing the various conditions and circumstances that they encounter on the highways is fascinating to plan for and be a part of.

Technology advances have been a part of our business and our products since the early days of the automobile. GM is proud to have invented many things that we take for granted these days, like the electric starter; the first all-steel body; the first production vehicle with air bags; the first catalytic converter; safety glass in all locations and OnStar. These "firsts" – among many others -- have helped advance vehicle technology and safety over the decades. Combined with more sophisticated crash test dummies, increasingly rigorous crash test scenarios, and emerging test protocols to evaluate active safety technologies, the advancements to auto performance and safety have been remarkable.

So it is not surprising that GM is investing in technologies that provide increasing levels of driver assistance and vehicle management. And even better, we are working on systems that do not require dramatic upgrades or modifications to the national highway infrastructure network.

To the greatest degree possible, the goal is to keep the systems contained within the vehicles and between vehicles -- with one of the key highway needs being to provide -- at a minimum -- clearly marked lanes and shoulders. This will enhance the capabilities of the technologies we are already using to "sense" the road, such as radar, ultrasonic sensors and cameras, along with GPS location capabilities, to assist the driver.

Our work has taken us a long way. We're making important steps in implementing active safety technology -- but there is still much work to be done before a fully autonomous vehicle can be commercialized.

Over the past two years the media has devoted much attention to the idea of a "self-driving" car. Everyone from traditional automotive companies and technology companies to universities have had something to say and in some cases a technology to demonstrate. These demonstrations are both interesting and exciting, as they stretch our imagination to think about what the future may be like.

For the most part, as the name implies, people assume that an autonomous vehicle will take you to your destination without your involvement -- after simply issuing a command -- without any oversight by the driver.

Let me say for the record, that these types of systems are a significant distance into the future. Realistically, we expect that for the foreseeable future, while systems will add automation to support the driving task, the driver will still need to be engaged and in control. This is because driving is a very complicated task, and it will take some time for computer-driven systems to be capable of managing and reacting to all of the situations that drivers encounter. In addition, the existing U.S. car parc numbers hundreds of millions of vehicles. So even as we promote more and more technology to enhance this capability, we should expect it to take a generation (or more) for this technology to be commonplace and reach the level of "driver freedom" that some envision.

For GM, the underpinnings of this debate started in 1948, when Ralph Teetor invented what eventually became the modern Cruise Control. Noteworthy is that it was not until 1958 that the system was integrated into a production automobile. Even then, the systems were not standard -- and they were very pricey. Most consumers during that time felt that their money had better uses – and they could just depress the accelerator pedal themselves.

Still, the advent of Cruise Control was the first time that some aspect of vehicle control was allowed to be removed from the driver. It was not designed for safety – but more of a customer convenience feature.

Today, GM offers "Adaptive Cruise Control" (ACC) on several vehicles, which is an example of the "building blocks" we are developing toward more automated systems of the future. ACC is an intelligent form of cruise control that slows down and speeds up the vehicle automatically with the traffic ahead. Like normal cruise control, the driver sets the speed – but there is also a gap setting. ACC is typically paired with a collision warning system that alerts the driver of a potential collision ahead -- and may also be equipped with a system that begins braking before the driver might have time to react. Such systems provide great driving assistance, but they do not replace the oversight that the driver must provide.

GM has talked publically about taking this type of system to the next level – for example, adding the ability of the vehicle to maintain lane control. We call this more advanced system "Super Cruise" – and expect that it will provide even greater assistance to drivers, including hands-free capability on certain freeway drives. This system, too, though, will require a driver's supervision. We believe that this type of technology is realistic in the amount of automation that can be brought to market yet this decade. In fact, *Popular Mechanics* named GM's Super Cruise semi-automated driving technology a winner of its ninth annual Breakthrough Awards that recognize innovators and products that advance the fields of technology, medicine, space exploration, and automotive design.

Currently, the definition of autonomous/automated technology is being discussed and frequently is interpreted in different ways. NHTSA's recent document entitled "Preliminary Statement of Policy Concerning Automated Vehicles" really starts to frame that discussion, and

will provide the basis for the collaborative work that will need to be done among the various involved players down the road. NHTSA has indicated that it intends to regularly review and update this document based on the development of technology and new opportunities. The Society of Automotive Engineers (SAE), and organizations like the German automobile association (VDA) in Europe, are also working on similar documents.

At the same time, we are also seeing that a number of states are – or plan to become -- involved in defining, guiding or regulating autonomous technology implementation. We have already seen states introduce and consider legislation, and in a few cases pass legislation regulating autonomous vehicles. GM understands the intentions behind these regulations, but for now, we believe they are premature. In some cases, states could unintentionally or needlessly restrict vehicles already on the road – or technology development and implementation that is underway. We hope NHTSA will lead the way here – so we are working with one federal approach to addressing automated technology – and not a patchwork of various state attempts to become involved.

One of the benefits of greater automated control of the vehicle is the additional highway safety it can provide. Technologies that provide incremental assistance to the driver to better manage the task of keeping the vehicle under control are good for safety and can minimize the potential for or likelihood of crashes. In the coming years, automated driving systems paired with advanced safety systems, could help reduce the severity of a crash, or in some cases eliminate many crashes by interceding on behalf of drivers before they're even aware of a hazardous situation.

In addition to the obvious highway safety benefits, wide implementation of these systems could offer potentially significant benefits for improved fuel economy and CO2 reduction. Also, eliminating -- or virtually eliminating -- crashes could have profound impact on how we engineer vehicles for occupant safety and crash worthiness. It will give us an opportunity to take a fresh look at how we design body structures to manage crash energy. Consequently, there may be opportunities to reduce vehicle mass and engineer vehicles differently. Finally, the ability to sense other cars, traffic congestion and even pedestrians would allow for smoother traffic flows, reduced noise, less pollution and overall enhanced safety.

So, you may ask “how can we get this technology on the road faster -- what can we do to support it and move it along?" Let me mention three areas that will be important to us as we pursue these technologies:

1. Let the market work -- let manufacturers like GM do what we do best and compete for customers with features that add real value to their drive today and in next generation models;
2. Support a federal approach to addressing any relevant operating requirements, guidelines and standards -- so that automated technologies and connected vehicle communications are consistent, validated and secure. Also, a reasonable phase in period for any requirements is critical; and finally
3. Provide an environment that promotes the development and implementation of these technologies in the U.S. -- rather than in other countries. For example, protecting

automakers from frivolous litigation for systems that meet performance requirements and relevant government operating standards.

In conclusion, moving towards significant levels of autonomy in vehicle control are worth our best efforts. For now, they will come forth incrementally -- as technologies are proven to be durable, reliable and cost effective for our customers. They may not result in “driver-less” vehicles for many years to come – but the benefits of even the steady incremental changes we are making are worth the investment and continued exploration.

Thank you again for this opportunity to testify.