Oral Testimony of Dr. Randy Avent
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Mr. Chairman, ranking member Senator Nelson and members of the subcommittee, thank you for the opportunity to address you today on this very important topic.

As many of you know the vision of driverless cars has been around for well over 50 years, but little progress was made until 2004 when DARPA created a prized competition called the DARPA Grand Challenge. Since then, there has been an exponential growth in the underlying AV technology that mirrors the development trajectories in other disruptive markets like computing, networking and DNA sequencing.

Today I'd like to briefly touch on three dimensions of Connected and Autonomous Vehicles: market impact, technical and regulatory challenges and the potential role of the federal government.

Numerous papers abound outlining the promises of autonomous vehicles. Developed and implemented correctly, the primary advantage of autonomous vehicles centers on significantly lowering driver related deaths. Last year alone, there were over 40K fatalities in the US at a cost of over $410B – and more than 90% of those were due to human error. But there are many secondary advantages that are also significantly important. For instance, Autonomous Vehicles can improve access for the elderly, children and poor and can make public transportation more effective by solving the "last mile" problem. It can significantly increase the utilization of automobiles, which is less than 5% now, and with higher utilization of fewer cars, the capacity of our transportation infrastructure would naturally rise. Beyond the transportation sector impact, core technologies underlying autonomy will impact other large markets such as agriculture, logistics, national defense and manufacturing. In fact, it would be hard to find any technology with a more disruptive impact on both the **US and global** economy than Connected and Autonomous Vehicles. Piston powered vehicles driven by people and built by traditional car manufacturers may be soon replaced by interconnected computers on wheels scheduled and controlled by autonomous algorithms developed by IT companies. US car manufacturers will need to look more like IT companies. Insurance markets, law enforcement, hotels, real estate, lawyers, auto repair and health care will all be affected, just to name a few.

But while the promise of AV technology is noteworthy, there are still substantial barriers to its widespread adoption. For one, the AV technology core relies on what I call the "Sensor and Signal Processing chain" and there's still significant work that needs to be done on the edge cases to improve performance. A strong regulatory framework is paramount to safety and consumer acceptance, but an overregulated market is likely to stifle innovation and give our global competitors an advantage. To this end, we need a science-based, data-driven approach

to creating policies and legislation that's modeled after successful verification or certification approaches in other industries. This framework must integrate the full spectrum of testing approaches ranging from digital simulation and hardware-in-the-loop emulation, to closed-circuit and public open road testing in urban areas. Lastly, as the fundamental technology transitions away from automotive and civil engineering, there will need to be a rapid shift in the transportation industry and their regulatory partners towards computer science, electrical engineering and analytics.

States such as Florida have taken a leadership role in enabling this market. The federal government can have a very constructive role in enabling this transformative technology through research funding, through safety consortiums that investigate and provide factual data around AV accidents much like the NTSB role in aviation accidents, and through creating quasi-governmental organizations much like the Department of Energy (DOE) and the Department of Defense's (DoD's) Federally Funded Research and Development Centers (FFRDCs) and University Affiliated Research Centers (UARCs) that conduct applied research and provide unbiased technology expertise to the government.

Finally, Florida Poly is working with its partners to research solutions to these challenges. This includes a deep partnership with the Florida Turnpike Enterprise's world-class AV test track called SunTrax, and a partnership with the Orlando Smart City initiative that provides open road testing in an urban setting. These two test complexes, combined with Florida Poly's new Advanced Mobility Institute, is focused on addressing many of these vexing challenges.

Thank you for your time.