HFES Position on AV Start Act

The Human Factors and Ergonomics Society (HFES) opposes the proposed AV START Act [S.1885] being considered by the US Senate.

Major concerns about the bill include:

- **Waiver of safety standards** - As opposed to non-automated vehicles, which are limited to 2,500, this allows for the exemption from safety standards <u>for each manufacturer </u>of up to 15,000 vehicles in year one, 40,000 vehicles in year two and 80,000 vehicles in year three. This is the size of most vehicle fleets. While the ability to get an exemption for regular vehicles is limited to 2 years, that limit is extended to 10 years for highly automated vehicles. This allows literally millions of highly automated vehicles onto the roads, except from safety standards, with no requirements for capabilities or testing.

- **Justification of the bill on the basis of increasing safety** - The primary justification for the bill is that will reduce accidents caused by human drivers. 2016 data shows that people average 495,000 miles between accidents and over 95 million miles between fatal accidents. No automated vehicle comes even close to this level of performance, and it will be many years before they do. (The best is currently Google/Waymo at 5,600 miles per human intervention). Given that highly automated vehicles capable of matching/out-performing humans are so far away, it is imprudent to rush to provide a blanket waiver of safety standards now, with no indication of what new laws are needed to guide their safe introduction.

- **Prohibition of states** from enacting or enforcing laws regarding highly automated vehicles or advanced driving systems, putting this under federal control. While Federal uniformity in regulations would undoubtedly be beneficial for automobile manufacturers, at present states are providing the only safety regulations available for automated vehicle systems. Given that the present act does not address many of the safety concerns that exist, the AV Start act would act to decrease, not increase, needed regulations in this arena.

- **Testing -** There are no stated requirements for automated vehicle testing prior to receiving safety waiver or be approved for introduction for sale. While people have to pass vision and driving tests, highly automated vehicles do not under this bill. Highly automated vehicle systems should be required to demonstrate equivalent or improved safety, across both situations in which it is reliable and in automation failure conditions that involve resumption of control or over-ride by human drivers.

- **Driver Interface** - There are no stated requirements for displays that will inform drivers of what automation is doing or keep them in the loop, nor requirements for achieving safe transition to manual control when needed. Driver interfaces for semi-automated vehicles should be required to provide accurate situation awareness of the state of the vehicle and the external driving environment as well as transparency into the automation's state, settings and modes, and what it is planning to do. The automation should provide highly salient warnings when the

automation fails or requires manual intervention, with enough lee time to allow for safe resumption of manual control.

- **Removal of controls** - The bill allows manufacturers to remove steering wheels, brakes, accelerator pedals, gear shifts and other features required for the driving by the human when the car is in automated mode. Human over-ride of automation should always be possible. Efforts to remove steering wheels, brakes or other minimum equipment required for humans to over-ride an automated vehicle violate minimum safety requirements and should not be allowed until automated vehicle systems have proven extremely high levels of reliability in a wide variety of driving conditions, including the ability to withstand hacking and other tampering.

- **Training** - There is a section in the bill that advocates for the development of education and marketing strategies for manufactures, however this is purely voluntary. Training will be much more important with vehicle automation than most people realize. The aviation community has had to learn the hard way how difficult it is to build an adequate understanding of automation to enable people to oversee/intervene and operate with it. Automobile manufacturers should provide extensive training on the capabilities, limitations and behaviors of automated and semi-automated systems so that drivers obtain the accurate mental model required for effective oversight and interaction with them. New training should be provided on any automation updates that are made over the course of the system's lifetime so that the automation's behavior remains predictable to the driver.

- **Safety Reports** - The main advantage of the bill is the requirement for manufacturers to provide a Safety Evaluation Report on issues like system safety, crashworthiness, and cyber-security through documented testing, validation, and assessment. However "The Secretary may not condition the manufacture, testing, sale, offer for sale, or introduction into interstate commerce of a highly automated vehicle or automated driving system based on a review of a safety evaluation report or additional information submitted under this section." This makes those safety reports fairly toothless. Anything that is considered a trade secret may be omitted from the report. They also do not appear to be detailed enough to guide needed improvements/regulations.

- **Advisory Committe**e - The other positive thing about the bill is the establishment of a Highly Automated Vehicle Advisory Committee. This committee can review the safety reports and provide recommendations to congress. However the reports may not be detailed enough to support needed recommendations.

These deficits create a bill that will significantly lower the safety of the US road system for drivers, pedestrians and the public.

Research Background

The HF/E research base shows that automation is well known to negatively affect human manual performance and oversight abilities, and can thus decrease safety in subtle ways rather than improving it. Over 40 years of research on automation and more recent research on automated vehicles shows that many new types of driver errors and safety hazards may be introduced (Endsley, 2017; Onnasch, Wickens, Li, & Manzey, 2014), including:

    (1)   Loss of driver engagement and low situation awareness that is required for monitoring automation and intervening appropriately when needed,

    (2)   Poor driver understanding of system functioning leading to poor expectations of system behavior and inappropriate interactions with the vehicle automation.

    (3)   Loss of manual skills needed for manual performance and decision-making.

The expectation that automated driving systems will necessarily enhance safety is erroneous because it fails to take into account the significant changes that such systems make to human driving behavior. To summarize the results of over 30 research studies on human-automation interaction, *"the more automation is added to a system, and the more reliable and robust that automation is, the less likely that human operators overseeing the automation will be aware of critical information and able to take over manual control when needed."* (Endsley, 2017).

Further, automated vehicles, like people, are not necessarily 100% fully reliable or capable of recognizing or avoiding all accident conditions. While it is easy to point to accidents in which human drivers play a significant role, this view neglects the strong safety component that experienced and knowledgeable drivers bring to the avoidance of accidents on a daily basis.