

July 25, 2019

Docket Management Facility
US Department of Transportation
Room W12-140
1200 New Jersey Avenue, S.E.,
Washington, DC 20590-0001

RE: Removing Regulatory Barriers for Vehicles with Automated Driving Systems
Docket No. NHTSA-2019-0036

These comments are submitted on behalf of Humanetics Innovative Solutions, Inc (Humanetics). For over fifty years, Humanetics and the companies from which it descended have been leaders in Anthropomorphic Test Device (ATD) innovation, research and manufacturing. Humanetics welcomes the opportunity to provide comments and input regarding the regulatory barriers for vehicles with Automated Driving Systems (ADS).

General Comments

- **Page 5:** Humanetics notes that this ANPRM is limited to those vehicles without traditional manual controls but with traditional seating. NHTSA rarely mentions in this ANPRM that the usage of traditional seats may change significantly with ADS vehicles. This usage of traditional seats needs to be strongly considered in evaluating the safety of these vehicles. As an example, it is very likely that occupants of the left front seat (driver's seat) may recline their seatback significantly while riding in the vehicle. This usage of seats needs to be considered in the 200 series FMVSS compliance tests.

Existing 200 series FMVSS tests (such as FMVSS 208) are conducted on non-ADS vehicles with the seatback in a traditional position (approximately 23 degrees for many vehicles). NHTSA should require additional compliance tests with the seatback reclined to its anticipated position while in use (perhaps 45 degrees or greater). This is true for fully functioning ADS systems (autonomous vehicles) as well as for a limited amount of ADS features (such as level 3 and 4 autonomous vehicles.) If a vehicle is designed with a reclining seatback and there is some level of ADS features, then it should be anticipated that the occupant will recline and the vehicle should be evaluated in that condition. Humanetics has anticipated this testing need of the industry and has developed a family of ATDs to be used in a more reclined position for compliance tests of ADS vehicles. These ATDs are based on the THOR dummy design and are referred to as THOR AV ATDs. The THOR dummy design incorporates the latest in ATD technology and biofidelity.

In addition, NHTSA should consider revising the hand and feet placement of ATDs in the left front seating position of vehicles with no manual controls. The positioning of the ATD for compliance tests, such as FMVSS208, should be similar to the positioning of the right front occupant, that is, femurs parallel with arms down and hands near the ATD's thighs.

- **Page 9:** NHTSA indicates it must insure that standards are reasonable, practicable and appropriate for the types of vehicles being evaluated. For ADS vehicles with no manual controls, existing ATDs such as Hybrid IIIs, are not practicable or appropriate, as these ATDs do not recline to a position that is anticipated to be commonly used in these vehicles.
- **Page 11:** Humanetics strongly agrees with NHTSA's position that vehicles with ADS meet existing FMVSS compliance conditions with only reasonable modifications. Although ADS systems may reduce the likelihood of collisions between vehicles, there will certainly be collisions with ADS vehicles as these vehicles will interact with non-ADS vehicles for many years to come. As such, existing series-200 FMVSS standards (with modifications) must be retained.
- **Page 12:** Humanetics strongly agrees with DOT's automation principles, with a focus on its position to prioritize safety, and should promote a standard set of ADS-DV test protocols and tools to ensure a minimum standard for vehicle safety is met for all vehicles. This standards setting should be pursued in close cooperation with the industry to accommodate a wide range of potential ADS technologies and keep the safety standards on pace with the rapid rate of innovation in the ADS-DV sector.
- **Page 15:** Humanetics recommends all possible seating configurations be considered – not just treating the left front occupant as existing right front regulations specify. There may be alternate seating positions which are unlike the existing right front position that may require special evaluations, test protocols and equipment. This is especially true for occupant restraint evaluations.
- **Page 37:** If self-certification is accepted, existing test protocols should be used by OEMs and validated with physical testing. Physical testing of 200 series FMVSS crash test standards should be required. Although computer simulations can be used to help the vehicle design process, physical tests are still necessary to validate the crash simulations. This is true today with existing vehicles. The introduction of ADS vehicles will not change the limitations of crash computer simulations and, thus, physical testing of vehicles will continue to be necessary. Alternately, special test procedures with unique and alternate test devices should be specified.
- **Page 52:** Humanetics recommends that NHTSA retain physical compliance tests for series 200 FMVSS compliance. Computer simulations can, and should, continue to assist vehicle manufacturers in designing their vehicles. However, physical compliance tests need to be retained as the vehicles themselves will be going through significant design changes with ADS. In addition, unexpected variations in vehicle build due to manufacturing issues may compromise the validity of computer simulations. These issues may not be fully comprehended in initial simulations. Vehicle models have taken many years to perfect based on traditional vehicle architectures and seating configurations. Many of the vehicle models will have to be re-confirmed and adapted based on the significant vehicle changes.

VI. Possible Approaches to Revising Crash Avoidance Test Procedures

Page 36, Question 9a: NHTSA should initially establish the validation criteria for all the components/modules/sub-assemblies in the simulation models to ensure the simulation accurately represents the real-world physics; for example, for occupant safety, NHTSA could establish standards for Finite Element (FE) dummy models validations and/or human body models and certify them as standard tools.

Page 36, Question 9b: The biggest advantage of simulation vs. real-world test is that simulation can represent a greater range of testing scenarios/loading conditions, which real-world tests could not achieve; the quick turnaround time saving/cost saving is very obvious with the simulation approach.

Page 36, Question 10: The non-physical (virtual) will closely replicate the physical test in the virtual world. The virtual, non-physical will support faster pace and more robust product design development by utilizing numerical design optimization and able to run “what-if” scenarios. The virtual version of the non-physical will assist NHTSA in identifying more robust metrics (physical and virtual).

D. Simulation

Page 53, Question 30: Almost all the aspects of safety related testing (crash/active safety, crash worthiness/crash avoidance, injury mitigation) can be simulated utilizing the right tools.

Page 54, Question 31: Similar to response to question 9a, NHTSA should first establish the validation criteria for all the components/modules/sub-assemblies in the simulation models to ensure the simulation accurately represents the real-world physics; for example, for occupant safety, NHTSA could establish standards for Finite Element (FE) dummy models validations and/or human body models and certify them as standard tools.

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Thank you for the opportunity to provide comments and input regarding the regulatory barriers for vehicles with Automated Driving Systems. We would be pleased to discuss any of these issues further with Agency staff.

Sincerely,



Christopher J. O'Connor
President and CEO
Humanetics Innovative Solutions, Inc.