

May 2021

Equitable Safety for Female Occupants

In the last decade, the safety of female occupants in vehicles has been an issue raised by many safety experts and consumer groups. Traditional vehicle safety development has favored male occupants and concentrates on the average male. Certainly, this has historical reasons: in the 1950s Anthropomorphic Test Devices (ATDs) started their careers in the Air Force and were first used to protect pilots, on their way to work, who were strictly male. When ATDs were introduced into mainstream regulation in the 1970s for vehicle safety development, the average male was maintained as the primary archetype. Over time, other statures, specifically the 5th percentile female and the 95th percentile male, were developed to ensure that the design of vehicle components and systems were functional for the smallest and largest occupants, but the female remains as a passenger, and not a driver. Today, however, with as many female as male drivers on the road, and with better biofidelic devices and measurement technology, it is time to reconsider a more equitable standard of safety for female occupants.

Crash data show that female occupants in vehicles, compared to male occupants, are 73% more likely to suffer injury and 17% more likely to die [US data from NHTSA Injury Vulnerability and Effectiveness of Occupant Protection Technologies 2013, 2018]. Women are 44% more vulnerable to neck injury, 38.5% more vulnerable to abdomen injury and 79% more likely to be injured in the lower leg and ankle. Contributing factors are the unique female physiology, muscle structure, body fat distribution and bone density, as well as the kinematics of the seating position closer to the steering wheel. Data shown by the expert from Sweden [see documents GRSP/58/07 and GRSP/58/08 Rev. 1] support many of these findings.

Following the presentation of the expert from Sweden at the 58th session of GRSP, Humanetics analyzed what the future of Anthropomorphic Test Devices could – and should – look like, especially regarding the average female occupant. Female occupant safety has always had a high importance at Humanetics and a number of female ATDs have been developed that are not in use so far in legislation or consumer testing. Dummies like the 5th percentile female WorldSID, the pregnant female, the Elderly (representing a 70-years old, slightly overweighted female occupant), are available but unfortunately have not – maybe not yet – found an extended interest of vehicle safety experts. Finite element models could also be available. The latest generation of the 5th percentile ATDs, the THOR-5F, has been designed specifically around the female physiology and is instrumented with sensors where women are most vulnerable to injury. The - THOR-5F is already actively used by some manufacturers and test labs. She ensures that safety can be developed to address the unique injury risks of female occupants and the challenge of adapting airbags, seat belt restraints and other safety features and the development of new features to reduce her risk of injury and death.

Humanetics will work with any party interested in these devices that represent vulnerable occupants. Regarding the 50th percentile female, Humanetics offers to actively support Sweden in the development and evaluation of the respective Anthropomorphic Test Device. However, the development process of a new 50th percentile female dummy is most likely to be a medium to long-term activity. Nevertheless, Humanetics believes that the advanced biofidelic version of the 5th percentile female, could immediately serve as a short-term solution that could increase the safety of female vehicle occupants when used in the driver seat, where women sit in 75% of crashes when they are injured or killed.

In case of further questions please contact:

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