



THOR-AV 50M

Representing the Anthropometry of a Reclining Occupant in an Autonomous Vehicle

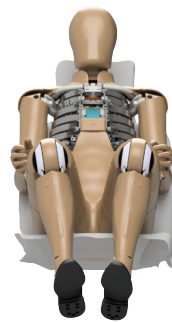
As automakers are charging ahead with Autonomous Vehicle (AV) innovations, they are being challenged to think differently about seating configurations and the potential effect on occupant safety. Today's crash test protocols are based on standard forward-facing seats – which typically feature a front driver, passenger seat and rear seat benches with limited recline. However, AV concept cars have seen entirely different seating configurations, e.g. lounge style setups with rear-facing front rows, diagonal cross seating, and increased reclined seatback angles for comfort. These different seating positions pose unique challenges when it comes to occupant protection, for which a standard dummy may not be suitable.

To respond to the industry needs, Humanetics launched an initiative to modify an existing Anthropomorphic Test Device (ATD) to be used specifically for AV crash testing. A THOR-50M was updated so that it could be easily positioned in the representative postures of various reclined seatback angles. Refinements were also made to improve submarining behavior and neck torsion biofidelity in these complex seating scenarios. The resulting model is THOR-AV 50M.



Modifications include:

- New neck with updated curvature
- Restructured upper thoracic spine
- New lumbar
- New pelvis
- New abdomen with pressure sensors



The new neck features an added torsion element to improve its z-direction biofidelity. The restructured upper thoracic spine provides the necessary adjustment for positioning in a reclined seating posture, and a more representative lumbar spine with increased bending ability was created. Data from a recent study was leveraged when designing the pelvis bone shape, and the geometry of the uncompressed pelvis flesh was generated with a technique used in a prior Humanetics project. In addition, mechanical features were developed to provide more appropriate coupling between the flesh and the bone. THOR-AV also includes a newly developed abdomen that complies with UMTRI AMVO anthropometry, complete with integrated pressure sensors. The FE model was developed concurrently with the physical ATD and utilized to aid in the design of the dummy.

The first THOR-AV 50M prototype is scheduled for assembly in mid-May 2019, and will be followed up with a biofidelity evaluation. The ATD will also be evaluated in the same test configurations determined in NHTSA Automated Vehicle Safety (AVS) PMHS research projects. The FE model is now available for purchase. Please contact your Humanetics regional office for more information.

