



TEST DEVICE FOR HUMAN OCCUPANT RESTRAINT

THOR-50M - 50TH PERCENTILE MALE



- What?**
- Anthropomorphic Test Device (ATD, or crash test dummy)
 - Represents male of average height and weight
 - Designed for frontal and frontal oblique crash tests
 - Measures risk of injury to occupants in a crash
 - Used in hundreds of NHTSA research tests

Why? THOR's **human-like characteristics** in a crash and state-of-the-art **measurement capability** make it the best choice to evaluate the advanced safety features in today's vehicles.

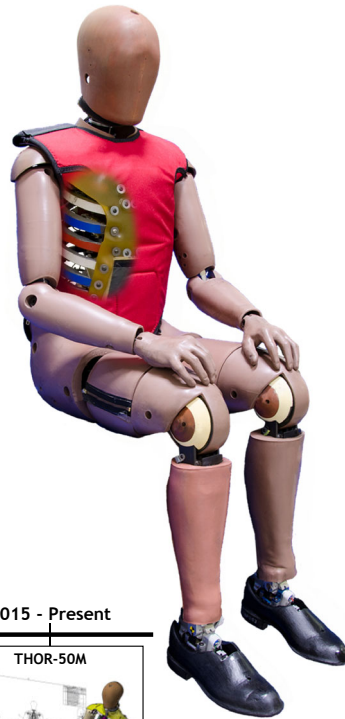
Human-Like Characteristics

- Neck that bends, twists, and stretches for realistic head motion
- Torso with anatomically correct ribcage and shoulder
- Flexible spine to allow proper upper body motion
- Abdomen and pelvis that mimic human seat belt interaction
- Legs that respond to impact of dashboard and pedal

Measurement Capability

Over 100 distinct measurements to help predict injury, including:

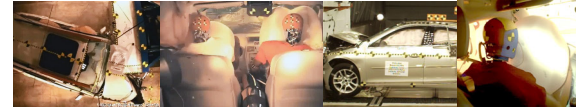
- Head acceleration and rotation
- Neck forces and moments
- Ribcage motion at four locations and three dimensions
- Abdomen motion at two locations and three dimensions
- Pelvis, thigh, shin, and ankle forces



SAFETY IN NUMBERS

8 THOR-50M ATDs owned by NHTSA, used in:

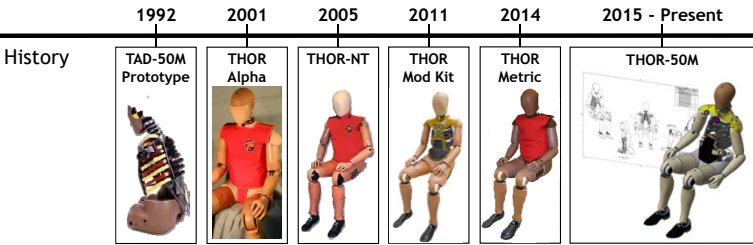
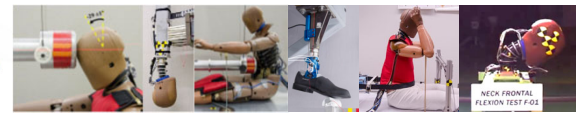
164 Vehicle Crash Tests



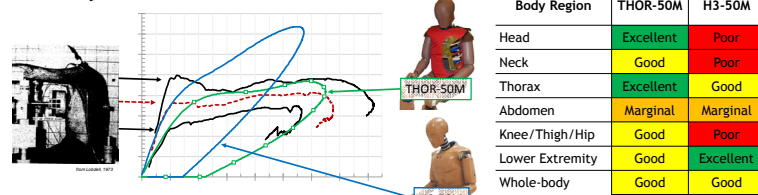
348 Crash Simulation Sled Tests



1013 Dynamic Component Tests

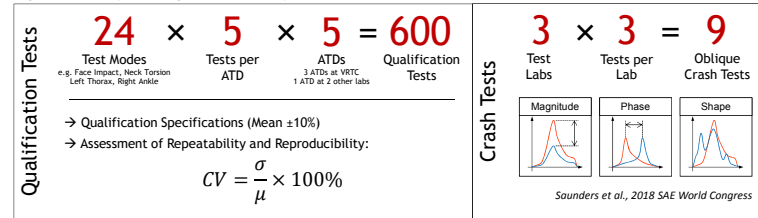


Biofidelity



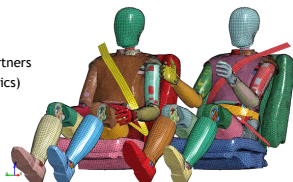
Parent, D., Craig, M., Moorhouse, K., "Biofidelity Evaluation of the THOR and Hybrid III 50th Percentile Male Frontal Impact Anthropomorphic Test Devices," 61st Stapp Car Crash Conference, November 2017.

Repeatability & Reproducibility



Finite Element Model

- Allows virtual crash tests, parametric analyses
- Developed by NHTSA with support from academic and industry partners
- Current work (University of Virginia Center for Applied Biomechanics)
 - Update hardware to current drawing package
 - Match response to current qualification specifications
 - Improve computational efficiency and stability



Enhancements

DTS In-dummy Data Acquisition System (DAS)

ATD LabTech Improved 3D thorax and abdomen measurement

Application in NHTSA Research Projects

UNIVERSITY OF VIRGINIA CENTER FOR APPLIED BIOMECHANICS
Assessing Occupant Protection for Automated Vehicles

UMTRI (UNIVERSITY OF MICHIGAN TRANSPORTATION RESEARCH INSTITUTE)

Oblique Restraint Countermeasures

EDAG Vehicle FE Model Development