

Diversified Technical Systems

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# Safe seats for everyone

Outfitted with cutting-edge data acquisition, the Hybrid III 5<sup>th</sup> female ATD is helping to advance female occupant protection in vehicles through improved seating design

It is highly likely that anyone who works in automotive safety testing has been asked, “What is the safest car you can buy?” But what people don’t often ask is, “What’s the safest place to sit in a car?” Years ago, the answer would have been automatic: “The back seat.” But with the advances in crumple zones, seatbelts and airbags, newer statistics are showing that this may no longer be the case. IIHS president David Harkey has been quoted as saying, “It’s not that the rear seat has become less safe, it’s that the front seat has become more safe over time.”

With the significant rise in ridesharing and a future in which autonomous vehicles are set to put passengers in all sorts of scenarios that are

considered ‘out of position’ (OOP), the rear seats are being used much more than in the past. Much of the existing safety data for the rear seat positions has focused on young children in booster or baby seats. In an effort to ensure safety restraints are equally effective for all occupants, an increasing number of Euro and US NCAP tests include older children and more female ATDs. One Euro NCAP test specifies a Hybrid III 5<sup>th</sup> percentile (HIII 5<sup>th</sup>) female test dummy in the driver’s seat, passenger seat and back seat positions.

“Current restraints, airbags and seatbelts may not prevent injuries as effectively for females or smaller occupants,” explains Rainer Rahaeuser, international sales manager at

Diversified Technical Systems (DTS), a manufacturer of data acquisition systems for crash testing. “We want to make sure every occupant is safe, regardless of size or gender.”

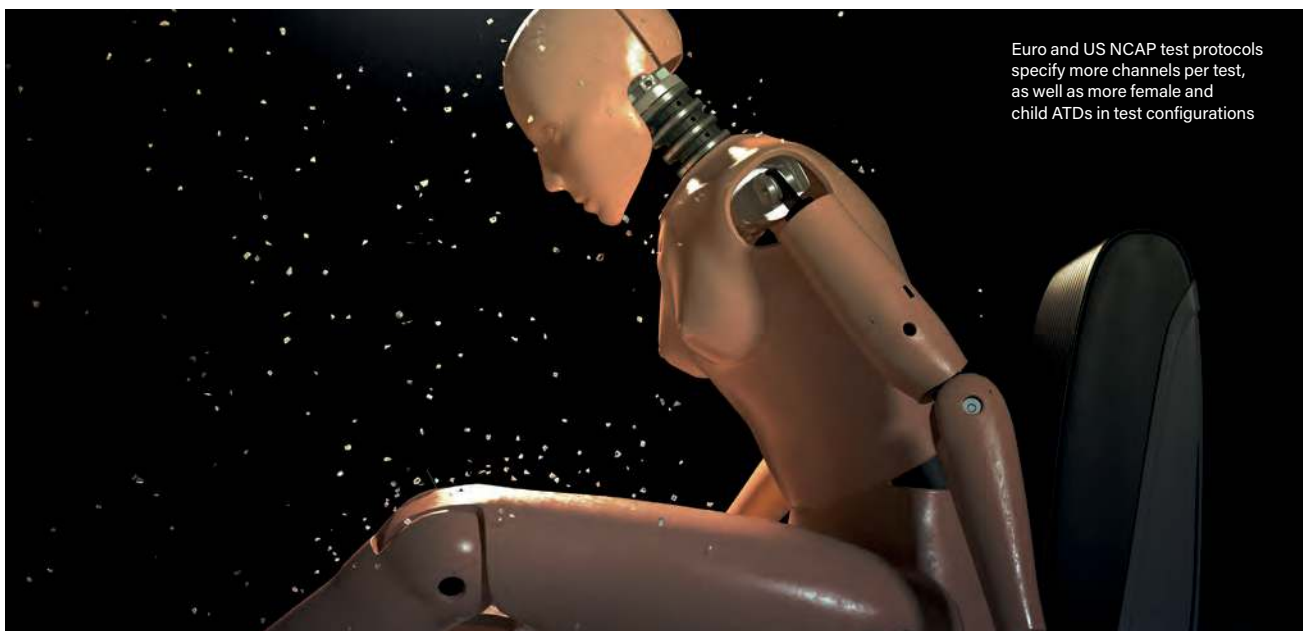
Weighing 108 lb (49kg) and 5ft (152cm) in height, the HIII 5<sup>th</sup> female was originally developed in 1988 to evaluate submarining (when the lower part of the body is pushed deep into the seat cushion and slips beneath the lap belt during a head-on collision). A decade later, the HIII 5<sup>th</sup> was upgraded to evaluate injury criteria in OOP test scenarios, based on a petite driver sitting close to the steering wheel.

While there’s some ongoing debate whether the Hybrid III 5<sup>th</sup> represents a small female, a large child, or both, what is clear is that tests are requiring

more channels per ATD.

On average there are now 40+ sensor channels per HIII 5<sup>th</sup> female and 100+ channels per male ATD, such as THOR, Hybrid III 50<sup>th</sup> and WorldSID. Managing tests with hundreds of channels has virtually made embedded DAS the standard. In addition to eliminating around 30-40 lb (13-18kg) of sensor cable per ATD, in-dummy DAS significantly reduces test setup time as well as cable management issues, including dummy positioning.

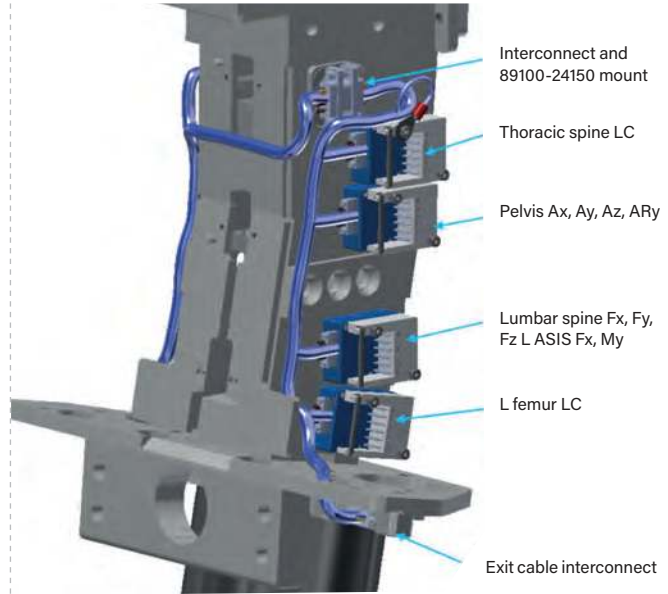
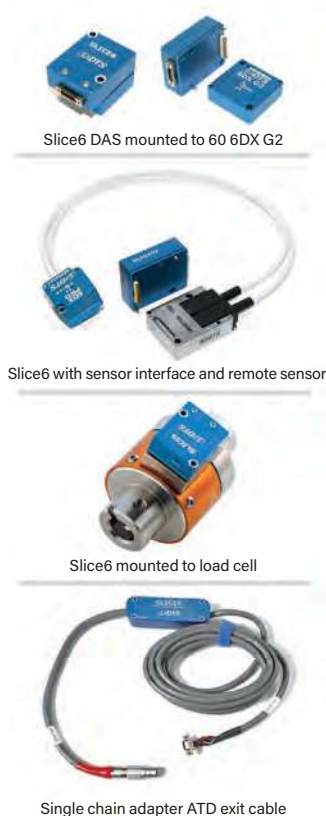
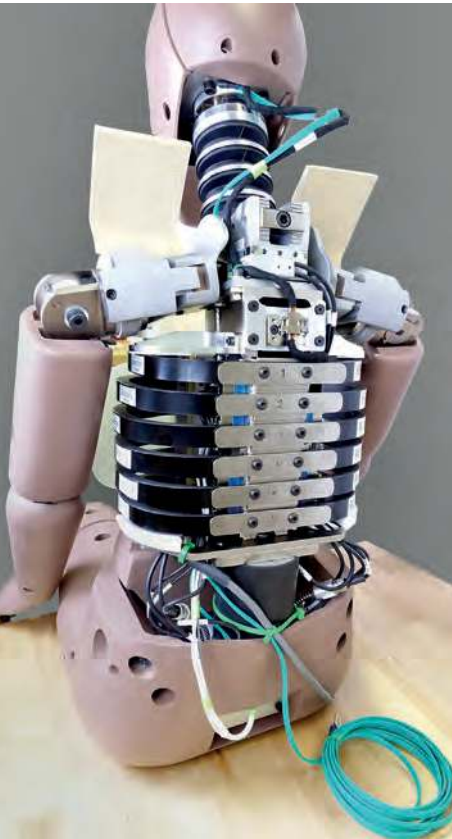
Even with notably smaller, low-mass and low-power DAS, embedding everything into these smaller ATDs is still a challenge. “Our teams in Michigan and California worked with key customers and came up with a few new twists so that Slice6 would fit



Euro and US NCAP test protocols specify more channels per test, as well as more female and child ATDs in test configurations

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ABOVE: Slice6 integration kits are available to retrofit the Hybrid III 5<sup>th</sup>, Hybrid III 50<sup>th</sup>, THOR, WorldSID, Q6 and Q10 dummies. Images shows the Slice6 in the HIII 5<sup>th</sup> spine box  
LEFT: With a single exit cable and a variety of plug-and-play sensors, Slice6 in-dummy DAS represents a game-changer for crash testing

in the HIII 5<sup>th</sup>,” explains Chad Ivan, sales manager at DTS. This includes development of the new single chain adaptor, a smaller version of the internal interface device that is required to manage power, status and trigger for up to 60 channels.

The data acquisition system for the HIII 5<sup>th</sup> was originally developed by DTS for the US Army WIAMan vertical load manikin. “The Slice6 system is the culmination of our 23+ years of in-dummy DAS experience,” comments Ivan. “The commonization of cable lengths, transducers, schemas and connectors results in an in-dummy solution that is not only flexible, but also robust and reliable.

“It’s vital that everything gets installed the same way every time. The DAS and sensors need to be calibrated

regularly, which requires that ATDs be disassembled, reassembled and validated on a regular basis,” explains Rahaeuser. With such limited space and access, it’s vital that all the wires, sensors and connectors are well protected and that the documentation is clear. “With hundreds of sensor cables in an ATD, even if a single cable gets pinched or damaged during a test, that can have a big effect on the test data,” adds Rahaeuser.

There is also the bigger picture. Vehicle manufacturers and test laboratories often have hundreds of ATDs and thousands of transducers to manage. “The ultimate goal is having a fleet of ATDs with a common in-dummy DAS solution that is faster, more power-efficient and assists in lowering total cost level

of ownership and fleet efficiency,” explains Ivan. While many new ATDs and advanced pedestrian legform impactors (aPLI) are being ordered new with in-dummy DAS, DTS assures customers with existing fleets of analog dummies that retrofitting is also simple with the turnkey Slice6 integration kits.

DTS’s Slice6 system is based on a centralized cable harness that is, in effect, the central nervous system of the ATD. Miniature Slice6 units are strategically distributed throughout to create a wide variety of channel-count configurations. ATDs can also be upgraded to support more channels by changing out cable harnesses strategically located in the legs or in the upper thorax. Unlike many in-dummy systems, the Slice6

modules are all completely interchangeable within a dummy or with any other dummy. In addition, Slice6 is compatible with other DTS hardware and it is possible to combine the systems in a single test setup using DTS’s DataPro software.

“No other system on the market boots up faster, is more flexible and can record for as long as the Slice6,” says Ivan. “It’s changing the face of in-dummy DAS and advancing automotive safety for drivers, passengers and pedestrians, no matter what their size.”

DTS currently offers Slice6 in-dummy retrofit kits for the Hybrid III family, THOR, WorldSID and the Q-Series six-year-old and 10-year-old child dummies. Solutions for the SID-IIs, ES-2 and BioRID are currently in the works. ◀