

## EXECUTIVE SUMMARY

New work was commissioned to modify and evaluate an existing automotive Hybrid III anthropomorphic test dummy (ATD) in order to determine its suitability for use in fall-arrest testing, and to generate a specification that would facilitate the manufacture and increase the availability of test dummies for use within the fall protection industry.

Testing fall-arrest systems (FAS) with an ATD increases the complexity of test procedures to a certain extent, but offers potentially significant improvements in the fidelity of loading applied to the FAS, and therefore a higher confidence that an approved FAS will perform acceptably in the field. In addition, harness strap impingement on the neck can be assessed. Also testing FAS within a caged ladder may only be viable with an ATD.

The ATDs currently used in fall-arrest testing are quite old and rare, and their condition is becoming problematic. It is very difficult to replace worn out parts as the manufacturers of the ATDs no longer exist, or no longer support them. Test laboratories have limited access to suitable ATDs and hiring is difficult.

A series of modifications were carried out to a 50th percentile Hybrid III male ATD, covering the pelvis, crotch, abdomen and neck. These modifications resulted in the prototype fall-arrest test dummy (FATD). Initial tests demonstrated that the modifications carried out were effective.

In order to determine whether the newly developed FATD was a viable test dummy for fall-arrest test work, a series of representative drop-tests, (based on improved test methods), were planned in order to compare the test behaviour of the FATD with that of the Sierra Stan ATD, the (ATD used in previous HSE research).

During the main test programme it was found that the FATD was not performing as expected. There were movement restrictions in the waist and pelvis areas and the knees had broken, allowing the lower legs to revolve about the knees in a non human-like manner. Further investigation revealed that additional modifications of the FATD were required. These included relieving of the flesh between the upper legs and hip, and the replacement of the weaker Hybrid III knees with those from the Hybrid II ATD.

Upon satisfactory completion of the new modifications, further evaluation of the FATD would be required and the main test programme would need to be repeated with the Sierra Stan ATD.

Further funding was sought to address this work as the modifications had not been foreseen at the outset. As funding could not be procured due to financial difficulties, the project was suspended at this point. Consequently it was not possible to generate a new FATD specification, which was one of the aims of the project, but the work has been sufficiently documented and the equipment stored to the extent that work could easily be recommenced.

During the project, HSE expressed an interest to develop a specification for a larger 95th percentile (100 kg) FATD, in addition to the 50th percentile (75 kg) FATD under development. The objectives were defined, and would consist of modifying an existing 95th percentile Hybrid III test dummy with standard available components, and modifying neck, torso and crotch areas using knowledge gained from the 50th percentile work. The work on the 95th percentile FATD was not proceeded with.

Other work included a preliminary assessment of the Ogle OPAT ATD, to determine its suitability for fall-arrest testing.

It should be noted that the main work described in this report is preliminary in nature and as such no attempt has been made to assess the biofidelity of the FATD. This is something which could be considered in future work.