9th Triennial International Aircraft Fire and Cabin Safety Research Conference
October 28 – October 31, 2019
Atlantic City, NJ

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Topic: Crashdynamics – Analytic Modeling

Title: A data set for calibrating the ES-2re Virtual Anthropomorphic Test Device for Aviation Configurations

Abstract

The Federal Aviation Administration (FAA) requires dynamic testing of aircraft seats to demonstrate that the seating system protects occupants in the event of a crash. FAA Advisory Circular 20-146 sets forth an acceptable means to demonstrate compliance to the dynamic requirements by computer modeling analysis techniques. This methodology requires the use of a virtual Anthropomorphic Test Device (v-ATD) that meets the performance requirements of the physical ATD. A procedure to calibrate the virtual Hybrid II and FAA Hybrid III ATDs is defined in SAE Aerospace Recommended Practice (ARP) 5765. The procedure involves four parts to evaluate the fidelity of the virtual representation of the ATD: mass and geometry evaluation, sub-assembly evaluation, pelvic shape evaluation, and dynamic response evaluation for aviation unique loading scenarios. As part of the development of the initial release of the ARP, a series of physical dynamic crash tests of the two ATDs were completed by the National Institute for Aviation Research at Wichita State University to provide the dynamic response evaluation.

FAA Policy Statement PS-ANM-25-03-R1 defines the technical criteria for approving side-facing seats that provides an equivalent level of safety to forward facing seats. This policy specifies the ES-2re ATD for horizontal injury criteria tests. As with the forward-facing ATDs, the ES-2re sub-assembly calibration tests do not fully evaluate the v-ATD for aviation loading scenarios. To support addition of the ES-2re to the ARP, a series of dynamic crash tests were run at the Civil Aerospace Medical Institute in order to generate the data necessary to evaluate the fidelity of the ES-2re for aviation unique loading scenarios. These tests focused on two specific areas not fully evaluated in the existing sub-assembly tests: an evaluation of shoulder belt interaction and tensile loading of the neck near the pass/fail limit of 405 lbs. The data set to be presented includes repeated tests in two configurations that evaluate these two areas. The full data set will be available for use by v-ATD developers and users of the v-ATDs.