

A Comparative Evaluation of Two Helicopter Crash Tests

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This presentation will provide a comparative evaluation of two full-scale crash tests of an MD-500 helicopter. These tests were performed at NASA Langley's Landing and Impact Research (LandIR) facility in Hampton, Virginia. In the first test, conducted in December 2009, the MD-500 helicopter was retrofitted with an externally deployable composite honeycomb, designated the Deployable Energy Absorber (DEA). The objectives of the test were: (1) to evaluate the performance of the DEA under realistic crash conditions, (2) to generate test data to validate a system-integrated finite element simulation, and (3) to obtain data from a specially-designed dummy to assess thoracic injury mechanisms during helicopter crash events. Two DEA blocks were attached to the belly skin of the helicopter between the skid gears. Four instrumented Anthropomorphic Test Devices (ATDs) were used to represent two crew and two passengers. The right rear passenger was a specially designed 50th percentile Human Surrogate Torso Model (HSTM50) attached to the pelvis and legs of a 50th percentile Hybrid III male ATD. The HSTM50 is an anatomically correct, instrumented human-like torso that contains physical representations of internal organs. The final test article weighed 2,930 lb. During the crash test, the helicopter impacted a concrete surface under combined (40-ft/s forward and 26-ft/s vertical) velocity conditions.

A second full-scale crash test of an MD-500 helicopter without DEA was conducted successfully at the LandIR Facility in March 2010. The objectives of the test were similar to the previous test with the main goal of obtaining baseline crash test data for comparison. The MD-500 test article was the same one as used in the crash test in December 2009. Following that test, damage to the airframe was assessed and found to be minor and limited to the front right subfloor region. The damage was repaired and the test article was prepared for the second crash test. The same four ATD occupants were used, as in the previous test. The final test article weighed 2,906 lb. The test article impacted the concrete surface under combined (40-ft/s forward and 26-ft/s vertical) velocity conditions.