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Analysis and Crash Test of a Composite General Aviation Airplane

The crashworthiness performance of a four-place low-wing general aviation aircraft was investigated during the AGATE program with the objective of significantly enhancing the crashworthiness safety of this class of aircraft. The crash conditions were defined as a 30° nose-down impact at V_{so} . A systems approach to crashworthiness was used to integrate the safety technologies into the design. These technologies included an advanced composite airframe, an energy absorbing subfloor, a load-limiting engine mount, and seats and restraints that had been certified to the requirements of 14 CFR 23.562. The integration effort was based on simulations using the LS-DYNA and Nastran finite element programs and the ATB multi-body dynamics program. The full-scale crash test was conducted at the Impact Dynamics Test Facility at NASA Langley Research Center. The test article was instrumented with accelerometers, and Hybrid II anthropomorphic test dummies. High-speed video and film data were also acquired during the test. The paper presents the background and motivation for the test, the methodology employed used to design the test article, and the results of the study.