DESIGN OF AN ENHANCED COMPONENT HIC TESTER

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ABSTRACT

The certification of aircraft frequently requires engineers to demonstrate that a head strike into anyone of several cabin furnishings complies with the Head Injury Criteria (HIC) requirements specified in 14 CFR 23.562 and 14 CFR 25.562. Full-scale sled tests, which are currently used to evaluate designs of aircraft interior furnishings, often consume several test articles in the development of engineering solutions and in the demonstration of the compliance of the design. Therefore, the HIC compliance poses a significant problem for the airlines and the manufacturers of jet transports due to high costs and schedule overruns during the development and certification of aircraft seats. The problem encountered in the certification of 16G airline seats, referred to as the front-row HIC problem, occurs for seats located directly behind bulkheads or cabin class dividers. This research addresses the development of an alternate component testing method for the evaluation of the HIC without consuming a seat during each test. A device from this research can be used to evaluate different designs and/or test conditions at relatively low cost and in a short period of time. Such a device produces less scatter of the HIC data and is appropriate for identifying critical impact parameters. This will result in lowering the cost of cabin design that will improve aircraft safety without compromising on the safety standards/criteria. In this thesis, a design for the prototype of the component HIC tester is developed. Two degrees of freedom are available in this design. Not only is the motion of the upper torso along with the head represented in this design, but also the pelvic translation of the A TD is also represented. The component HIC testers, which are presently being used, have only one degree of freedom and hence have limitations in their application.