BULKHEAD DESIGN FOR FRONT ROW HIC ATTENUATION

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ABSTRACT

The Head Injury Criteria, (HIC), in the dynamic seat certification requirements specified in 14CFR 23.562,25.562,27.562,29.562 [3-5] requires engineers to demonstrate that a head strike into anyone of several cabin furnishing complies with a HIC threshold of 1000 units. Compliance with the HIC poses a significant problem for many segments of the aircraft industry. The problem encountered in the certification of 16G seats, referred to as the front row HIC problem, occurs for seats located directly behind bulkheads and cabin class dividers. These structures are typically stiff and hence produce unacceptably large fIIC values. The increasing demand for contribution of the present day technology towards the safety of the onboard passengers motivated this research to demonstrate the "Proof of Concept" that there are potential solutions for the bulkhead-HIC problem by the government, aircraft seat manufacturers and Federal Aviation Administrations (FAA's) Civil Aeromedical Research Institute (CAMI) and Wichita State University's National Institute for Aviation Research. This research is an attempt to find a valid and cost effective approach to solve the front row HIC problem. The crux of the project is to demonstrate the "Proof of Concept" and to generate a design methodology for the development of bulkheads for HIC attenuation. MADY1\10biodynamic simulations, supported by simple quasi-static tests and analysis of finite element models of the bulkhead structure, are utilized for the design of HIC compliant bulkheads. The validated MADTh10 models are then used to conduct a parametric. study on the effect of stiffness and strength of the bulkhead on HIC attenuation below injury levels. Design heuristics are generated for the development and fabrication of such HIC compliant bulkheads that are finally assessed by conducting full-scale dynamic sled tests at both small and large seat setback distances,