

PERFORMANCE EVALUATION OF HEAD STRIKE TEST RIG AND HEAD/NECK IMPACTOR USING BIODYNAMIC MODELING SOFTWARE

By

KENG FEI CHAN

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ABSTRACT

The certification of cabin furnishings inside the aircraft must comply with the Federal Regulations 14 CFR Part 23.562, 25.562, 27.562, and 29.562. Full-scale sled testing is the traditional method used to assess the certification and safety of occupant bulkhead impact criteria. However, the full-scale sled tests often consume and destroy several test articles in the development of engineering solutions. This procedure also provides too much scatter or variation on the outcome of the Head Injury Criteria (HIC). In addition, time and cost have demonstrated other problems. Many industries and researchers urge to find a simple and reliable tester to substitute the full-scale sled test. Some of the existing component testers have been studied in this thesis, namely NIAR Pendulum Test Rig, and MGA's head/neck impactor. Analytical models have also been developed to evaluate the potential of each component tester. In the pendulum test rig, different masses are utilized for the analysis. The results of the pendulum testers show that a head mass of 10-pounds for stiff panels and a 16-pounds for soft panels provide best correlation compared with full-scale sled tests. The head/neck impactor shows good correlation for typical production-type bulkheads when they are slitted to reduce their stiffness. The study demonstrates that a better correlation can be achieved for smaller distances between the impactor and the bulkhead. This study demonstrates that the component test methods not only eliminate the use of an anthropomorphic test dummy in crash tests, but also give conservative values to account for the variable occupant position at the time of impact.