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# MADYMO HII 50th ATD for Aircraft Seat design and Certification

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Abstract

Aircraft seat certification using testing could be very costly and requires multiple phases of development before it can meet the regulations. Numerical simulation is less expensive method to be used for the aircraft seat from concept design to certification. The test variability always been a challenge in the occupant safety testing for both automotive and aviation industry, with all the parameters involved in each test, it makes it very difficult to control.

Three dynamic sled test setups were investigated based on the FAA requirements per Part 23.562 (normal, utility, acrobatic and commuter transport) Part 25.562 (transport category airplanes) and Part 27.562 (normal category rotorcraft). The sled tests were evaluated with different seat belt systems. Each test was repeated 3 times to investigate test variability. The percentage of error between the three tests was documented. MADYMO model with HII 50th%ile was built and then validated to all the tests. Rigid seat was used for all test conditions.

The results from this study show that test variability is real and it is hard to control due to multiple parameters. The variability was analyzed between each repeated setup and the error matrix was documented. The validated model was compared to the test variability and most of the responses were within the tolerances of the different tests.

The latest release of the MADYMO Hybrid II ellipsoid 50th ATD version 5.0 was used to complete the correlation for this study. The Hybrid II ellipsoid ATD was updated in 2009 with new thorax, spine, facet pelvic, facet hands and head. The test variability was identified for all the responses and analyzed using the error matrix. Acceptable level of correlation was achieved compared to the test. The validated models can be used to optimize occupant responses and reduce injury.

In this study, Traditional and MPP LS DYNA-MADYMO coupling model was generated and validated to a sled test. Occupant response data from Hybrid II 50th ellipsoid model was compared to the test data. Acceptable level of correlation was achieved with full FE deformable seat and MADYMO Hybrid II 50th ATD.