VALIDATION METHODS FOR IMPACT DYNAMIC MODELS

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Historically, in the field of aircraft impact dynamics, crash tests are designed for concept evaluation. Typically measurements are limited to accelerations at the base of a seat and elsewhere away from the area of maximum damage. Due to the harsh environment of a full-scale aircraft test, reliable information is often not available regarding the transmission of loads or strains from the point of impact up through the structure and into the floor or seat. This type of information is critical for those who wish to improve upon the design of aircraft for crashworthiness. Toward that goal, a vertical drop test of a Fokker F28 regional transport (~ 60 passengers) section was performed. The test was designed to acquire detailed responses to compare with nonlinear transient dynamic finite element simulations.

The presentation contains details concerning the design of the section drop test, and comparisons of test data with pre-test simulation results. The test section was a uniform cylindrical shell and was released from 14 feet resulting in a pure vertical impact velocity of 30 ft/sec. The 442 lb test article was loaded with 1700 lbs. simulating flight loads on the floor. The section was densely instrumented with accelerometers, strain gages and displacement transducers comprising a total of 112 channels of data. In addition, targets were applied to enable photogrammetric measurement of the relative motion of multiple points on the section. High-speed film cameras (400 frames per second) captured the impact test and were synchronized with the data acquisition system. The presentation includes a description of the placement of the instrumentation based on finite element predictions. In particular, the displacement data acquired via the displacement transducers and photogrammetry techniques is assessed and correlated with the finite element model.