

## **AIRCRAFT SEAT CUSHION REPLACEMENT BY FINITE ELEMENT ANALYSIS AND USING CUSHION DATA DERIVED FROM HIGH SPEED COMPONENT TESTS.**

Prasanna Bhonge, PhD

Aircraft seat cushions need to be replaced over time and with use. Sometimes the original cushions are no longer available for purchase from the manufacture and other times the customer prefers a cushion type that is more comfortable to them. CFR XX.562 (b) (1) demands physical test (also know as down test), in case of any changes in the cushion geometry or physical properties. These tests are costly and time consuming and many times the seat frames of older aircraft are not available for test due to the manufacture no longer produces the out of production seat frames.

This research proposes Aircraft seat cushion replacement by Finite Element Analysis (FEA) and using cushion load deflection characteristics from high speed component tests. At this stage, the research is also limited for cushions made from non-energy absorbing foams.

Non-Linear FEA is carried out on the existing seat or rigid seat to simulate the test condition XX.562 (b) (1), to determine the response of the existing seat cushion. Nominal stress strain curves are derived from the high speed load deflection curves and provided to the Finite Element Model. Validation of FEA results and the test results are carried out based on the magnitude and phase of the seat response. Requirements are to verify that the validation results are within +/- 10% of the test results.

Rerun the same seat model using the new cushion design and verify that the response of the new cushion, such as lumbar load and floor reaction loads, are similar to that of the old cushion design.