

INVESTIGATION OF FIN BUFFET CHARACTERISTICS OF A DEVELOPMENTAL COMBAT AIRCRAFT THROUGH WIND TUNNEL EXPERIMENTS

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Abstract

Airframe buffet is an important dynamic problem associated with combat aircraft flight, especially in the high Angle-of-Attack (AoA) regime. Occurrence of buffet due to flow separation at high angles of attack needs to be structurally cleared and a buffet boundary needs to be established. The methodology adopted to clear the aircraft from buffet during high AoA flight testing of a developmental light combat aircraft is focused in this article. Experimental unsteady pressure data from low speed wind tunnel tests conducted on a scaled down (1:10) model and airframe especially fin vibration data measured from flight tests formed the basis for this methodology. The reference spectrum has been formulated through unsteady pressures measured using pressure transducers mounted on the fin of the wind tunnel model. This spectrum (scaled up to 1:1) i.e. pressure Power Spectral Density (PSD) excitation was used as an input to the FE model of aircraft fin mounted on the rear fuselage. Buffeting response predicted in terms of acceleration PSD on the fin and rudder have been compared with the flight measured acceleration PSD data to validate the numerical model. The validated model is used to predict loads to clear the aircraft for further flight envelope expansion at high AoA.

Keywords: Buffet, Angle-of-Attack, Wind Tunnel, Vibration Test, Power Spectral Density