Chapter 5

Conclusions

In this work, innovative aeroelastic analysis techniques, namely wavelet and Fourier-based higher order spectral moments, are used for the identification of physical aeroelastic nonlinearities. Data from model tests of a High Speed Civil Transport flexible semispan model and flight tests of an F-16 aircraft were analyzed. In both cases, intermittency was a major aspect of the aeroelastic response. This necessitated the use of the wavelet-based Higher Order Spectra to identify nonlinear aeroelastic responses. In the HSCT model studies, the results showed that "hard" flutter is related to intermittent nonlinear coupling between the shock motion and large amplitude structural motions. Analysis of LCO encountered during test flights of an F-16 aircraft showed quadratic and cubic couplings in the acceleration signals of the under-wing launchers and high quadratic coupling levels between flaperon motions and wing oscillations.