World Academy of Science, Engineering and Technology
International Journal of Aerospace and Mechanical Engineering
Vol:11, No:09, 2017

Aeroelastic Analysis of Engine Nacelle Strake Considering Geometric Nonlinear Behavior

Authors : N. Manoj

Abstract : The aeroelastic behavior of engine nacelle strake when subjected to unsteady aerodynamic flows is investigated in this paper. Geometric nonlinear characteristics and modal parameters of nacelle strake are studied when it is under dynamic loading condition. Here, an N-S based Finite Volume solver is coupled with Finite Element (FE) based nonlinear structural solver to investigate the nonlinear characteristics of nacelle strake over a range of dynamic pressures at various phases of flight like takeoff, climb, and cruise conditions. The combination of high fidelity models for both aerodynamics and structural dynamics is used to predict the nonlinearities of strake (chine). The methodology adopted for present aeroelastic analysis is partitioned-based time domain coupled CFD and CSD solvers and it is validated by the consideration of experimental and numerical comparison of aeroelastic data for a cropped delta wing model which has a proven record. The present strake geometry is derived from theoretical formulation. The amplitude and frequency obtained from the coupled solver at various dynamic pressures is discussed, which gives a better understanding of its impact on aerodynamic design-sizing of strake.

Keywords : aeroelasticity, finite volume, geometric nonlinearity, limit cycle oscillations, strake
Conference Title : ICAAA 2017 : International Conference on Aeroelasticity and Aeroelastic Analysis
Conference Location : London, United Kingdom
Conference Dates : September 21-22, 2017