

Flutter Control Analysis of an Aircraft Wing Using Carbon Nanotubes Reinforced Polymer

Authors : Timothee Gidenne, Xia Pinqi

Abstract : In this paper, an investigation of the use of carbon nanotubes (CNTs) reinforced polymer as an actuator for an active flutter suppression to counter the flutter phenomena is conducted. The goal of this analysis is to establish a link between the behavior of the control surface and the actuators to demonstrate the veracity of using such a suppression system for the aeronautical field. A preliminary binary flutter model using simplified unsteady aerodynamics is developed to study the behavior of the wing while reaching the flutter speed and when the control system suppresses the flutter phenomena. The Timoshenko beam theory for bilayer materials is used to match the response of the control surface with the CNTs reinforced polymer (CNRP) actuators. According to Timoshenko theory, results show a good and realistic response for such a purpose. Even if the results are still preliminary, they show evidence of the potential use of CNRP for control surface actuation for the small-scale and lightweight system.

Keywords : actuators, aeroelastic, aeroservoelasticity, carbon nanotubes, flutter, flutter suppression

Conference Title : ICAAE 2019 : International Conference on Aerospace and Aviation Engineering

Conference Location : Bangkok, Thailand

Conference Dates : December 17-18, 2019