Wind Tunnel Testing and MATLAB© Modeling

Matthew L. Wilbur
U.S. Army Vehicle Technology Directorate
Langley Research Center, VA

Cadet James C. Gallagher
United States Military Academy
West Point, New York

ABSTRACT:

Wind tunnel testing provides an opportunity to test responses of an aircraft based on various atmospheric conditions without actually building a prototype. Based on dynamic loading conditions experienced through transonic flight, an aircraft can experience a phenomenon called "flutter" which is an un-damped exponential growth motion of the aircraft's wings. By measuring the response of accelerometers located at important points on the aircraft, one can then pinpoint a condition that would result in failure of the aircraft. Wind tunnel testing helps predict flutter conditions for the model. In addition, software modeling can help testing before an actual model is created. By using a Finite Element Modeling code in MATLAB©, the rotor of a helicopter is modeled with various piezo-electric materials. This modeling can then be used with other software to conduct tests on the reaction of the rotor blade to various forces or electric fields.

KEYWORDS: flutter, finite element modeling, piezo-electric materials

CONTACT: Matthew L. Wilbur, U.S. Army Vehicle Army Technology Directorate, AMSRD-ARL-WM-BC, Langley Research Center, VA, Tel: (757) 864-1268, Email: matthew.l.wilbur@nasa.gov

CDT Michael A. Faries, United States Military Academy, West Point, NY, Tel: (845) 515-5215, Email:james.gallagher@usma.edu