

MATERIALS AND STRUCTURES SYMPOSIUM (C2)  
Smart Materials and Adaptive Structures (5)

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ACTIVE FLUTTER SUPPRESSION USING DISTRIBUTED PIEZOELECTRIC ACTUATORS FOR  
WINGS UNDER THERMAL CIRCUMSTANCES

**Abstract**

Flutter characteristics of the hypersonic flight Vehicles can be severely affected by aerodynamic heating. An investigation of active flutter suppression using distributed piezoelectric actuators is performed in this paper for wings under thermal circumstances. Finite element model of a low aspect-ratio wing is built and its flutter characteristics as well as natural dynamic characteristics are analyzed under both normal temperature circumstance and thermal circumstances. Rational function approximation of unsteady aerodynamics is executed in order to establish the state-space equations of mechanic-electric coupling wing model. LQG and PID control laws are designed for active flutter suppression under typical thermal circumstance. Analytical results of close-loop system indicate that flutter characteristics of the wing is improved prominently. The solution scheme of thermal flutter and active flutter suppression is proved valid.

Key words: Aerothermoelasticity; Thermal Flutter; Hypersonic; Active Flutter Suppression; Piezoelectric Actuator