SMA-Enabled Adaptive Structures for Vibroacoustic and Aeroacoustic Control

Thursday, October 6, 2016
4:00 p.m. | 202 Reed McDonald Building

Abstract
Noise-related issues are playing an ever-increasing role in aerospace systems due to the continual drive for weight-efficient structures, improved performance, broadened mission scenarios, growth in population around airports, and growth in the aerospace industry itself. Applications of interest in aerospace include those that affect the vehicle or its passengers/payload (vibroacoustics), such as sonic fatigue and interior noise, and those that affect the environment and populated communities, such as engine and airframe noise. The Structural Acoustics Branch at NASA Langley Research Center has active research programs in all of these areas.

Typical mission scenarios for aerospace vehicles involve widely varying operating conditions. However, most aerospace structural systems are point designs or a compromise. Adaptive structural systems have long been sought to enable improved performance over a wider range of operating conditions. Shape memory alloys (SMAs) have been shown to be enabling for a wide variety of aerospace applications and they hold great potential for enormous impact in the future.

This presentation will give an overview of previous, recent and ongoing research activities at NASA Langley Research Center at the intersection of noise control and SMA-enabled adaptive structures. Examples will include 1) composite structures with an embedded SMA constituent, termed SMA hybrid composite structures, that respond to environmental heating for structural life enhancement and low-frequency noise transmission reduction, 2) SMA hybrid composites that respond to environmental heating and/or control stimulus to reconfigure a jet-exhaust nozzle for noise reduction, and 3) superelastic SMA structures that enable massive reconfiguration of airframe components so as to reduce airframe noise without detrimental effects on aerodynamics. Recent and ongoing airframe-noise-reduction work done in collaboration with researchers in the Department of Aerospace Engineering at Texas A&M University will be highlighted.

Dr. Travis L. Turner is a senior research engineer in the Structural Acoustics Branch at NASA Langley Research Center. He has 28 years of experience conducting theoretical, computational and experimental research in the areas of adaptive structures, vibroacoustics, structural dynamics and thermoelasticity and over 16 years of experience developing SMA-enabled, adaptive structures technology for thermoelastic, vibration, noise transmission, and aeroacoustic/flow control. He has over 50 technical publications, 5 patents and 4 patents pending.

Refreshments will be served at 3:45 p.m. | Hosted by Dr. Darren Hartl