

# Mechanical Engineering Seminar

**Thursday  
September 17th,  
2009  
at 3:30 p.m.  
in EN 1045**

**Lawrence Ukeiley**  
Research and Engineering  
Education Facility  
Department of Mechanical  
and Aerospace Engineering  
University of Florida



## Flow Over Open Cavities and Their Control

The flow over open cavities represents a rich flow field and one of significant practical importance in the aerospace industry as well as many others. Fundamentally, the flow features in the cavity are driven by the shear layer at the opening and its interaction with the aft wall. These interactions create an intense aeroacoustic environment in and around the cavity which can be detrimental in many of the applications. This presentation will highlight predominantly experimental studies of the characteristics of flow over cavities and attempts at control with the aim of reducing the surface pressure fluctuations. The studies of the flow characteristics have been conducted over a range of free stream Mach numbers and have involved both Particle Image Velocimetry and time resolved surface pressure fluctuations measurements. These measurements have been used to develop low-dimensional descriptions of the flow using the Proper Orthogonal Decomposition and Stochastic Estimation resulting in a time dependent description of the flow field. From these results a better understanding of the sources in the flow has been developed which can be used guide flow control. In addition to the studies of the flow features open loop control using several leading edge blowing concepts in three-dimensional cavity configurations will be discussed. These control studies involve steady fluidic blowing at the cavities leading edge and have been validated for different scale cavities with the goal of developing a system practical for aircraft application.

### *Biography*

Dr. Lawrence Ukeiley is currently an Assistant Professor in the Mechanical and Aerospace Engineering. His research has mainly been in the area of experimental fluid dynamics and the study of large scale coherent motions, in both high-speed and low speed flows, where he works on fundamental problems that have direct practical applications. He currently is developing an active experimental research program in the study of unsteady fluid dynamics at the University of Florida's Research and Education Facility which has included the development of new wind tunnel laboratories. In these facilities Dr. Ukeiley and his group are concentrating on studies of unsteadiness of the large scale vortical motions and how they interact with both the fixed and free boundaries to develop a better understanding of fluid structure interactions and noise generation.