

Weekly CEA FM Seminar: Fall 2017



JOHNS HOPKINS Center for Environmental & Applied Fluid Mechanics

Date: **Friday, September 29, 2017**
Time: 11:00 AM
Location: Hodson Hall # 210
Speaker: **Dr. Jürgen Seidel (U.S. Air Force Academy)**
Title: ***“Flow Control for Flexible Structures”***

Abstract

With the demand for higher performing, more efficient air vehicles, current design efforts are envisioning light weight, large aspect ratio wings. However, these designs exhibit very large deformation during flight and the designs are limited by adverse instabilities. These aeroelastic instabilities are triggered by the aerodynamic forces interacting with the structural deformations and, in the worst case, can result in loss of structural integrity of the aircraft. Such instabilities are typically identified as flutter, or in the situation of a marginally stable system, a limit cycle oscillation.

Recent efforts to extend the flight envelop of such vehicles beyond the flutter boundary have incorporated active control. The seminar will highlight some efforts and detail one approach to addressing these instabilities, namely flow control. Active flow control, which introduces a small amount of energy to the flow (e.g. by blowing fluid into the main flow), allows for major benefits, including a direct, local, and instantaneous modification of the flow field. The perturbation of the flow is ideally amplified through a natural flow instability and therefore affects the global flow state and allows the control effort to remain small. A way to further improve upon active flow control techniques is to utilize unsteady actuation, i.e. time dependent actuation on a time scale commensurate with the flow through time.