JOHNS HOPKINS
Center for Environmental
& Applied Fluid Mechanics

Weekly CEAFM Seminar: Spring 2013

Date: **Friday, April 5, 2013**

Time: 11:00 AM

Location: Gilman 50 (Marjorie M. Fisher Room)

Speaker: **DR. ANYA JONES** (University of Maryland-College Park)

Title: ***"FLUID DYNAMICS OF FORCE PRODUCTION ON LOWREYNOLDS NUMBER ROTATING WINGS"***

Abstract

The translational phase of an entomological wing stroke can be modeled as a rotating wing. This model allows for a simpler flow field in which is it possible to more closely examine the fundamental flow-physics that govern unsteady force production of a flapping wing. Of particular interest is the time scale of development of the leading edge, root, and tip vortices; their structure; and their relative importance for lift generation. Force measurements have been performed over a large parameter space to study the effects of Reynolds number, wing acceleration, wing planform, and root cutout. Particle image velocimetry (PIV) has been used to evaluate the strength and structure of the leading edge vortex along the wingspan. Dye flow visualization highlights interactions between the leading edge and tip vortices. The structure of the leading edge vortex changes with Reynolds number, but the shape of the lift curve is relatively insensitive to parameter variations. The lift curve does vary with root cutout and is highly sensitive to the method of nondimensionalizing forces.

Bio

Dr. Jones is an Assistant Professor in the Department of Aerospace Engineering, where she is a member of the Alfred Gessow Rotorcraft Center, University of Maryland Energy Research Center, and Maryland Robotics Center. She received her PhD in experimental aerodynamics from the University of Cambridge, United Kingdom, her S.M. in aeronautics and astronautics from MIT, and her B.S. in aeronautical and mechanical engineering from Rensselaer Polytechnic Institute. Her research is focused on experimental fluid dynamics of unsteady, three-dimensional, and separated flows. Current projects focus on unsteady low Reynolds number aerodynamics, vortex dynamics, and flow control with applications to MAVs, flapping wings, and wind/water turbines; as well as separated and reverse flow rotor aerodynamics.