Weekly CEAFM Seminar: Spring 2017

JOHNS HOPKINS
Center for Environmental
& Applied Fluid Mechanics

Date: **Friday, March 31, 2017**

Time: 11:00 AM

Location: Gilman Hall # 132

Speaker: **Prof. Philippe Lavoie** (University of Toronto)

Title: ***"Characterization and Control of the Blunt Trailing Edge Wake"***

Abstract

Blunt trailing edges are often used to improve the structural characteristics of airfoils in high load situations and/or reduce wave drag on transonic wings. However, the wake generated behind blunt trailing edges can lead to higher-pressure drag, unsteady aerodynamic loading and higher noise emission. This presentation will discuss some of the dynamically important features of the blunt trailing edge wake behind a non-lifting body as a precursor for their control. Of particular importance will be the presence of a secondary instability that is closely linked to the von Karman vortex street in the wake. The discussion of the wake dynamics will be followed by the presentation of an active flow control methodology known as "distributed forcing", which leverages the secondary instability to achieve a large change in the blunt trailing edge wake with minimal energy input. Implementations of this flow control system using dielectric barrier discharge plasma actuators and synthetic jets will be presented. Results from these experiments will highlight the conditions under which the von Karman vortex street can be suppressed in the wake, leading to 20-30% pressure drag reduction.

Bio

Philippe Lavoie is Associate Professor at the University of Toronto Institute for Aerospace Studies (UTIAS) and holds the Percy Edward Hart Professorship in Aerospace Engineering. He co-founded the Center for Research in Sustainable Aviation based at UTIAS where he is has been Associate Director for the last 5 years. His research areas include turbulence, flow control and experimental aerodynamics. His current research is focused on studying flow structures and instabilities associated with transitional and turbulent flows as a precursor to their control. He has successfully developed and implemented active flow control systems experimentally for a number of different wall-bounded and separated shear flows.