# AEROSPACE & MECHANICAL ENGINEERING

## 2012 COLLOQUIUM 2013
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**UNIVERSITY OF NOTRE DAME, NOTRE DAME, INDIANA 46556**


**SPEAKER:** **Joe Jewell**
Graduate Aerospace Laboratories
California Institute of Technology
Pasadena, California


**TOPIC:** **HYPERVELOCITY BOUNDARY LAYER TRANSITION: CHARACTERIZATION AND CONTROL VIA NONEQUILIBRIUM THERMOCHEMISTRY**

**DATE:** Wednesday, April 10, 2013

**TIME:** 3:30 p.m.

**PLACE:** Lower Level Auditorium, Geddes Hall

**RECEPTION:** 2:45 – 3:15 p.m. – 365C Fitzpatrick Hall


*ABSTRACT*

In this talk, I present results from recent experimental investigations into a fundamental problem in compressible flow: measuring and characterizing the laminar to turbulent transition process in boundary layer flows in thermochemical nonequilibrium at high enthalpy. In this flow regime, where the second or Mack mode instability dominates, nonequilibrium effects for certain species (in our work, carbon dioxide) can actually suppress transition through the absorption of energy from acoustic disturbances through vibrational relaxation. Higher thermal loads, by half an order of magnitude or more, result from the increased heat transfer due to turbulent flow, so laminar to turbulent transition is a critically important process in hypervelocity vehicle design. We measure the propagation and growth of turbulent spots within the boundary layer, characterize transition delay for flows in air with increasing mass fractions of carbon dioxide, and also investigate the efficacy of gas injection mechanisms into the hypervelocity boundary layer for inhibiting second mode transition, with the goal of gleaning useful data to be exploited in future aerospace vehicles.


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NOTE: ***If you are interested in meeting individually with Mr. Jewell, please contact Linda at 631-5431***