JOHNS HOPKINS
Center for Environmental & Applied Fluid Mechanics

Friday, April 20, 2018
3:00 PM, 132 Gilman Hall

"*Flight & Quiet-Tunnel Measurements of Hypersonic Boundary-Layer Transition*"

Presented by Prof. Thomas Juliano

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Abstract: Understanding and predicting heating rates are crucial factors in the development of future high-speed flight vehicles. HIFiRE-5 is a flight-test program, led by the U.S. Air Force Research Laboratory, designed to investigate the hypersonic aerothermodynamics of a three-dimensional geometry (in this case, an elliptic cone with a 2:1 aspect ratio). The HIFiRE-5b flight vehicle was launched on a sounding rocket in 2016 and achieved a Mach number of 7.7 to 7.9 and freestream unit Reynolds number of $5*10^6$ /m to $50*10^6$ /m during descent. A multi-lobed transition front was observed, with earliest transition at the centerline, on the leading edges, and part way in between. It is suspected that a different mechanism is responsible for each of these lobes. Although the centerpiece of the HIFiRE-5 program is the flight test, it also benefitted from pre- and post-flight computational analyses and wind-tunnel testing. This talk will summarize highlights from the HIFiRE-5 program, focusing especially on the heat flux and boundary-layer transition measured in flight and in the Boeing/AFOSR Mach-6 Quiet Tunnel at Purdue University.