



Hypersonic Quiet Tunnel Measurements of HIFiRE-5 Boundary-Layer Transition

**Tuesday,
March 18, 2014,
3:30P.M.**

**Lower Level
Auditorium,
Geddes Hall**

Refreshments served
at 3:00 p.m. in the
Geddes Hall
Coffee House

The Hypersonic International Flight Research Experimentation (HI-FiRE) program is a hypersonic flight test program executed by the Air Force Research Laboratory (AFRL) and Australian Defence Science and Technology Organisation (DSTO). The principal goal of HIFiRE flight five is to measure hypersonic boundary-layer transition and heat flux on a three-dimensional body. Understanding and predicting heating rates are crucial factors in the development of future high-speed flight vehicles. The HIFiRE flight tests are supported by a ground test campaign; this talk presents measurements of heat flux and boundary-layer transition in the Boeing/AFOSR Mach-6 Quiet Tunnel (BAM6QT) at Purdue University. This facility has been developed to provide quiet flow at high Reynolds number, with low noise levels comparable to flight. This tunnel's good optical access enabled global measurement of the heat flux by means of temperature-sensitive paint. Two modes of transition were observed: transition along the centerline, suspected to arise from the amplification of second-mode waves in the inflected boundary layer, and transition roughly halfway between the centerline and leading edges, probably due to the breakdown of crossflow vortices. Reducing the noise level from conventional to quiet substantially delayed both transition modes.



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