

Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Investigation of Transition Initiated by a Wave Packet in a Hypersonic Cone Boundary Layer¹ JAYAHAR SIVASUBRAMANIAN, HERMANN FASEL, University of Arizona — Direct Numerical Simulations (DNS) are performed to investigate the linear and nonlinear transition regime of a hypersonic boundary layer on a sharp circular cone at zero angle of attack. In a natural transition scenario a broad disturbance spectrum is excited by freestream disturbances leading to complex wave interactions. Therefore, in order to understand the natural transition process in hypersonic cone boundary layers, the flow was pulsed through a hole on the cone surface to generate a wave packet with a wide range of disturbance waves. First, DNS of a linear three-dimensional wave packet was performed and results are compared to linear stability theory (LST). A good agreement was found to exist between DNS and LST results. Then to study the nonlinear regime, DNS of a nonlinear wave packet was performed. The wall pressure disturbance spectrum of the nonlinear wave packet indicated the presence of fundamental and subharmonic resonance mechanisms.

¹Funded by the Air Force Office for Scientific Research under grant FA9550-08-1-0211.

Jayahar Sivasubramanian
University of Arizona

Date submitted: 11 Aug 2009

Electronic form version 1.4