Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Effect of Wall-Temperature Variation in Laminar Boundary Layer Stability[1] HONG YAN, Wright State University, DATTA GAITONDE, Air Force Research Laboratory — A high-fidelity three-dimensional numerical study is performed to explore the effect of thermal perturbation in a Mach 1.5 flat plate laminar boundary layer. The thermal bump is pulsed at a frequency determined from the linear stability theory. A high-speed and low-speed streaky region is formed downstream in response to the pulsing. The flow stability characteristics are assessed by varying the initial disturbance amplitude, pulsing frequency and the shape of the thermal bump. The rectangular and circular shape are considered. The former one generates two pairs of counter-rotating streamwise vortices at the four edges, while the latter one generates only one pair. The mean flow is greatly distorted, which makes it susceptible to secondary instabilities. The transition mechanism is evaluated using the transient growth and the traditional linear stability theory.

[1]Authors like to thank the AFOSR for grant sponsor and NCSA for computing resources.

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Date submitted: 02 Aug 2008 Electronic form version 1.4