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**Flow Instability Induced by Surface Thermal Perturbation**[1]
HONG YAN, Wright State University, DATTA GAITONDE, Air Force Research Laboratory, JOSEPH SHANG, Wright State University — A three-dimensional simulation was performed to study the pulsed thermal bump and its induced kinetic response on the flow structures of a Mach 1.5 laminar boundary layer. The pulsed thermal bump is characterized as a surface heating element with $\Delta T_w = 500$K and frequency of 100 kHz and duty cycle of 0.5, and is centered on a flat plate to mimic spanwise periodic series of heating element. The spectrum analysis shows that the primary frequency mode dominates, but higher harmonics are observed far downstream of the heating element. The vortex generation depends mainly upon the spanwise velocity variation induced by the thermal bump. The vortex shedding is significant in the pulsed heating, while it is not observed in the steady heating. The generalized inflection points are observed during the heating process for both steady and pulsed heating, while they are not seen in the no heating condition. Results indicate that the spanwise disturbance is a dominant factor in heating induced flow instability.

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