Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Root Influence on Swept Impinging Oblique Shock Boundary Layer Interactions[1] JORGE CASTRO MALDONADO, SATHYAN PADMANABHAN, JAMES THREADGILL, JESSE LITTLE, The University of Arizona — Shock boundary layer interactions (SBLIs) are ubiquitous in internal and external supersonic flows. Detrimental effects include structural fatigue through unsteady pressure loading and high aerothermal stresses. An understanding of swept (3D) interactions is lacking compared to their unswept (2D) counterparts. To this end, the effect of disturbances induced by a microramp at the root region of a swept SBLI is investigated. Experiments are conducted at a nominal Mach number of 2.3 with a fully turbulent boundary layer ($Re_\theta = 5.5 \times 10^3$). Previous investigations show unsteady shock motion with constant frequencies across the spanwise domain. To determine if this frequency content is associated with the root structure, the length scale of root separation is altered by installing a microramp of height $0.3\delta_0$, placed $15\delta_0$ upstream of the root inviscid shock impingement location. Preliminary oil flow visualization shows no significant differences on the mean flow topology away from the root, enabling direct comparisons between the baseline and perturbed unsteady behavior. Mean and unsteady wall pressures are captured to assess changes in pressure distribution and associated spectral content, gaining valuable insight into the underlying physics.

[1]Sponsored by the Air Force Office of Scientific Research

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Date submitted: 01 Aug 2019 Electronic form version 1.4