Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Stabilizing Effect of Sweep on Low-Frequency STBLI Unsteadiness MICHAEL ADLER, DATTA GAITONDE, Ohio State Univ - Columbus — A Large-Eddy Simulation database is generated to examine unsteady shock/turbulent boundary-layer-interaction (STBLI) mechanisms in a Mach 2 swept-compression-corner. Such interactions exhibit open separation, with separation relief from the sweep, and lack the closed mean recirculation found in spanwise-homogeneous STBLIs. We find that the swept interaction lacks the low-frequency coherent shock unsteadiness, two-decades below incoming turbulent boundary layer scales, that is a principal feature of comparable closed separation STBLIs. Rather, the prominent unsteady content is a mid-frequency regime that develops in the separated shear layer and scales weakly with the local separation length. Additionally, a linear perturbation analysis of the unsteady flow indicates that the feedback pathway (associated with an absolute instability in spanwise-homogeneous interactions) is absent in swept-compression-corner interactions. This suggests that 1) the linear oscillator is an essential component of low-frequency unsteadiness in interactions with closed separation. 2) Low-frequency control efforts should be focused on disrupting this oscillator. 3) Introduction of 3D effects constitute one mechanism to disrupt the oscillator.

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Date submitted: 31 Jul 2017 Electronic form version 1.4