Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

On the spectral characteristics of separated flows in a spiked body at supersonic flow KARTHICK SK, DEVABRATA SAHOO, Faculty of Aerospace Engineering, Technion-Israel Institute of Technology, Haifa - 3200003, SUDIP DAS, Department of Space Engineering and Rocketry, Birla Institute of Technology, Mesra - 835215, JACOB COHEN, Faculty of Aerospace Engineering, Technion-Israel Institute of Technology, Haifa - 3200003 — A sharp-tip hemispherical spiked body experiences a form of unsteadiness due to separation caused by a shockwave boundary layer interaction in a supersonic flow (M=2). A series of computational studies using the Ansys-Fluent: Detached Eddy Simulation sheds light on understanding the spectral characteristics of the unsteadiness. The fluctuations intensity of the unsteady events like the shock motions, shedding of large-scale coherent structures from the separated shear layer, and charging/ejecting of fluid mass from the recirculation region, is found to be dependent on the separation point from the spike's leading edge and the separation angle. As the spike length is increased beyond a critical length, the recirculation region's length remains almost constant, whereas, the upstream boundary layer thickness increases. The large scale structures traveling along the separated shear layer carry shocklets, and parts of their feet interact with the spike-forebody wall around the recirculation region. The resulting gas dynamics enable the disturbances to bounce back and forth between the forebody wall and the separation point. The unsteady spectra obtained from the x-t plot of static pressure fluctuations along the spike and forebody wall for different upstream boundary layer thicknesses supplement the observation.

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Date submitted: 09 Aug 2020 Electronic form version 1.4