

Abstract Submitted
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Investigation of corner shock boundary layer interactions to understand inlet unstart MORGAN FUNDERBURK, North Carolina State University — Inlet unstart is a detrimental phenomenon in dual-mode ramjet/scramjet engines that causes severe loss of thrust, large transient structural load, and potentially a loss of the aircraft. In order to analyze the effects that the corner shock boundary layer interaction (SBLI) has on initiating and perpetuating inlet unstart, a qualitative and quantitative investigation into mean and dynamic features of corner SBLI at various Mach numbers is made. Surface streakline visualization showed that the corner SBLI is highly three-dimensional with a dominant presence of corner separation vortex. Further, the peak r.m.s. pressure was located at the periphery of corner separation vortex, suggesting that the unsteady loading is caused by the corner vortex. Power spectral densities of wall-pressure fluctuations in the peak r.m.s. location were analyzed in order to characterize the dominant frequencies of oscillation of the flow structures and to unravel the dynamic interactions between them in order to expand the operating margin of future hypersonic air breathing vehicles.

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