Abstract Submitted
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Control of Stationary Crossflow Modes in a Supersonic Boundary Layer using Distributed Roughness[1] CHAN-YONG SCHUELE, ERIC MATLIS, THOMAS CORKE, University of Notre Dame, STEPHEN WILKINSON, P. BALAKUMAR, LEWIS OWENS, NASA Langley Research Center — Passive methods like distributed micron sized roughness elements have proven to work efficiently as subsonic laminar flow control devices. Attempts to experimentally extend the principle of suppression of the most amplified stationary cross flow modes to supersonic boundary layers have not been successful until now. This study presents evidence for the receptivity of a supersonic boundary layer with transition dominated by stationary cross flow modes to patterned roughness with different wave numbers. Experiments have been performed at the Mach 3.5 NASA LaRC Supersonic Low Disturbance Tunnel on a 7 deg half angle sharp cone at 4.3 deg angle of attack and a unit Reynolds number of $2.5x10^5 in^{-1}$. Pitot tube pressure measurements as well as surface flow visualization were used to detect the occurence of stationary crossflow modes and transition. Based on these two measurement approaches we conclude that the stationary cross-flow mode was receptive to the passive patterned roughness, indicating that control of transition to turbulence in cross-flow dominated conditions should be possible.

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