Abstract Submitted
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Impact of Freestream Tunnel Noise on the Mach 6 Flow Interacting with a 35 Degree Compression Ramp[1] FABIAN DETTENRIEDER, BRYSON SULLIVAN, DANIEL J. BODONY, University of Illinois at Urbana-Champaign — Conventional blow down wind tunnels generate acoustic fields from their boundary layers that impinge on the test article. At supersonic speeds, the models bow shock distorts the sound and generates vortical and entropy waves that also impact the model. These disturbances affect the models boundary layers and alter their transition and separation, subsequently affecting global properties of the flowfield. We study this process for a Mach 6 flow approaching a 35 degree compression ramp mounted on a flat plate with a sharp leading edge using direct numerical simulation. The conditions and model geometry match experiments conducted in the NASA Langley 20-inch Mach 6 tunnel. The incoming sound field is constructed from tunnel characterization data and included in the DNS. Comparisons of the flat plate–compression ramp flows are made between the quiet and sound-laden freestreams.

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