Boundary-layer transition on a flared cone in a Mach 6 quiet wind tunnel

JERROD HOFFERTH, WILLIAM SARIC, Texas A&M University

The Mach 6 Quiet Tunnel at Texas A&M is a low-disturbance blowdown facility suitable for boundary-layer stability and transition research. Following its reactivation in 2009, initial testing confirmed the presence of low-disturbance ($< 0.1\% P'_t/P_t$) freestream flow at select locations on the centerline of the nozzle for settling chamber pressures up to 10 atm, and a fully-traversed freestream flow-quality assessment is currently underway. As a third performance benchmark to complement these direct measurements, the present work measures the transition location on the NASA Langley 93-10 flared-cone model. This model has a 0.5m length, beginning as a $5^\circ$ half-angle circular cone. At the $X = 254$mm station, a flare of surface radius 2.35m begins which is intended to induce transition within the quiet test core. Boundary-layer transition is detected on the thin-walled model by an observed surface temperature rise using an array of 51 embedded thermocouples. Transition data are presented for a sharp (2.5 $\mu$m) nose-tip radius case for comparison with the Lachowicz & Chokani (1996 data). Data for larger-radius nose-tips are also presented.

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William Saric
Texas A&M University

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