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Effect of Discrete Roughness on Transition on a Sharp Cone at an Angle of Attach at Mach 6[1] ERIC MATLIS[2], THOMAS CORKE[3], University of Notre Dame, MICHAEL SEMPER, U.S. Air Force Academy — Experiments were performed to investigate passive discrete patterned roughness for transition control on a sharp right-circular cone at a 6° angle of attack at Mach 6.0. The angle of attack was set to produce a mean cross-flow velocity component in the boundary layer over the cone in which the cross-flow instability is the dominant mechanism of turbulent transition. The focus is transition control which is based on exciting less-amplified stationary cross-flow modes that suppress the growth of the more-amplified cross-flow modes, and thereby delay transition. The passive roughness consisted of an azimuthal array of micron-size indentations (dimples) at an axial location that was just upstream of the first linear stability neutral growth branch for cross-flow modes. Both critical and sub-critical azimuthal mode numbers of roughness were examined. The receptivity of the stationary cross-flow modes to the roughness was evaluated using Silicone-oil surface flow visualization. The visualization images were post-processed using a pixel-intensity based spectral analysis. Of particular interest was the effect that higher (conventional) tunnel acoustic levels had on the roughness receptivity.

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