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Influence of Mach Number and Incoming Boundary Layer on Shock Boundary Layer Interaction ILONA STAB, JAMES THREADGILL, JESSE LITTLE, University of Arizona — Wall pressure fluctuations, schlieren imaging, oil flow visualization and PIV measurements have been performed on the shock boundary layer interaction (SBLI) formed by a 10° compression ramp. The incoming Mach number and boundary layer characteristics are varied to examine their influence on the SBLI. Focus is placed on understanding the effect of these parameters on the structure and unsteadiness of the resultant interaction. Lower Mach numbers $M = 2.3$ ($\delta_0 = 1.7\ mm,\ \theta = 0.29\ mm,\ Re_\theta = 3115,\ H = 1.4$) and $M = 3$ ($\delta_0 = 1.3\ mm,\ \theta = 0.25\ mm,\ Re_\theta = 1800,\ H = 1.8$) show a turbulent or transitional approach boundary layer with no apparent separation at the ramp. Mach 4 has a large separated region which is seemingly a result of a now laminar or transitional approach boundary layer. Pulsations in the separated region correspond to the expected low frequency SBLI dynamics showing a broad peak around a Strouhal number of $St = fL_{int}/U_\infty = 0.27$ which is lower than the characteristic frequency of the turbulent boundary layer. Additional results examining the influence of boundary layer modifications (e.g. sweep) and wind tunnel side-walls are also included.

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