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On the Unsteadiness of a Transitional Shock Wave-Boundary Layer Interaction Using Fast-Response Pressure-Sensitive Paint[1] E. LARA LASH, JOHN SCHMISSEUR, Univ of Tennessee Space Inst — Pressure-sensitive paint has been used to evaluate the unsteady dynamics of transitional and turbulent shock wave-boundary layer interactions generated by a vertical cylinder on a flat plate in a Mach 2 freestream. The resulting shock structure consists of an inviscid bow shock that bifurcates into a separation shock and trailing shock. The primary features of interest are the separation shock and an upstream influence shock that is intermittently present in transitional boundary layer interactions, but not observed in turbulent interactions. The power spectral densities, frequency peaks, and normalized wall pressures are analyzed as the incoming boundary layer state changes from transitional to fully turbulent, comparing both centerline and outboard regions of the interaction. The present study compares the scales and frequencies of the dynamics of the separation shock structure in different boundary layer regimes. Synchronized high-speed Schlieren imaging provides quantitative statistical analyses as well as qualitative comparisons to the fast-response pressure sensitive paint measurements.

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