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Experimental Study of Supersonic Inlet Flow Unstart Induced by Mass Injection[1] HYUNGROK DO, University of Notre Dame, SEONG-KYUN IM, Stanford University, MARK G. MUNGAL, Santa Clara Universtiy, MARK A. CAPPELLI, Stanford University — It is demonstrated that the boundary layer conditions of supersonic model inlet flows strongly affect the unstart that is induced by a transverse jet injection. Planar laser Rayleigh scattering from condensed CO_2 particles is utilized to visualize flow features. Studies conducted over a range of inlet configurations reveal that relatively thick turbulent boundary layers in asymmetric wall boundary layer conditions prompt the formation of oblique unstart shocks that facilitates fast inlet unstart. In contrast, thin symmetric boundary layers span pseudo-shocks which appear to be quasi-stationary under some configurations. The unstart threshold is found to be sensitive to channel height and the relative concentration of injected CO2. We find that higher jet injection pressure can be accommodated with higher CO_2 concentration because of the heavier molecular weight of CO_2, and that unstart occurs at lower jet injection rates for smaller inlet model heights.

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