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**Pressure Modulated Sonic Jet in Supersonic Crossflow** TOBIAS ROSSMANN, Lafayette College — Sonic transverse jets in supersonic crossflow are modulated using high-amplitude variations in jet stagnation pressure to enhance jet penetration and mixing. An injection/modulation apparatus combining a powered resonance tube and acoustic resonator is used to create low momentum ratio jets ($J = 1, 2$) in a supersonic cross-stream ($M = 3.5$). The injector has the capability to modulate the jet supply pressure at sufficiently high frequency ( $> 15$ kHz) and amplitude (up to 190 dB) to access relevant Strouhal numbers ($St = 0 - 0.3$) and amplitudes (up to 10% of the jet stagnation pressure) related to mixing enhancement. Planar laser Mie scattering in both side and end views allows for instantaneous imaging of the jet fluid to quantify jet trajectory, spread, and mixing behavior. For modulated $J = 2$ transverse jets, the recirculation zone directly downstream of the injection location is eliminated and significantly faster centerline signal decay rates are seen. For the $J = 1$ modulated jets, substantial increases in centerline penetration, jet spread, and centerline signal decay rate are shown. Additionally, PDF analysis of the instantaneous jet fluid signal values is performed to compare local mixing efficiencies between the modulated and un-modulated cases.

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