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Supersonic Jet Noise Reduction EPHRAIM GUTMARK, NICK HEEB, University of Cincinnati, JUNHUI LIU, KAILAS KAILASANATH, U.S. Naval Research Laboratory — Three noise reduction technologies have been examined experimentally as they have been applied to overexpanded, perfectly expanded and underexpanded supersonic jets from convergent-divergent nozzles. The technologies include chevrons, fluidic injection and fluidically enhanced chevrons. The flowfield was measured by shadowgraph and particle image velocimetry (PIV). The acoustics were measured by near and far-field microphone. Chevrons were shown to reduce or eliminate screech, reduce broadband shock associated noise and reduce mixing noise. Fluidic injection was shown to reduce screech, reduce broadband shock associated noise and mixing noise. It also shifts the shock-associated noise peaks to higher frequency and generates increased high frequency noise as chevrons do. The fluidic injection produces the same reduction near x/D = 10 at mid frequencies and the same increase in high frequencies near the nozzle as chevrons. Both noise reduction techniques reduce the size of the large scale structures and so both reduce BBSN by the same mechanism. The principal difference between chevrons and fluidic injection is that for constant injection mass flow the effectiveness of fluidic injection increases with decreasing values of M_j while for chevrons the trend is reversed.

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