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Numerical Simulations of Noise Generated by High Aspect Ratio Supersonic Rectangular Jets - Validation[1] KAMAL VISWANATH, RYAN JOHNSON, KAILAS KAILASANATH, Naval Research Laboratory, BHUPATINDRA MALLA, EPHRAIM GUTMARK, University of Cincinnati — The noise from high performance jet engines of both civilian and military aircraft is an area of active concern. Asymmetric exhaust nozzle configurations, in particular rectangular, potentially offer a passive way of modulating the farfield noise and are likely to become more important in the future. High aspect ratio nozzles offer the further benefit of easier airframe integration. In this study we validate the far field noise for ideally and over expanded supersonic jets issuing from a high aspect ratio rectangular nozzle geometry. Validation of the acoustic data is performed against experimentally recorded sound pressure level (SPL) spectra for a host of observer locations around the asymmetric nozzle. Data is presented for a slightly heated jet case for both nozzle pressure ratios. The contrast in the noise profile from low aspect ratio rectangular and circular nozzle jets are highlighted, especially the variation in the azimuthal direction that shows "quiet" and "loud" planes in the farfield in the peak noise direction. This variation is analyzed in the context of the effect of mixing at the sharp corners, the sense of the vortex pairs setup in the exit plane, and the evolution of the high aspect ratio exit cross-section as it propagates downstream including possible axis-switching.

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