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Investigation of the Near-Field Acoustic Properties of Supersonic Jets with Fluidic Injection using Large-Eddy Simulations JUNHUI LIU, K. KAILASANATH, RAVI RAMAMURTI, Naval Research Laboratory, DAVID MUNDAY, EPHRAIM GUTMARK, University of Cincinnati — Numerical simulations of Imperfectly Expanded Supersonic Jets from a CD nozzle with fluidic injection have been carried out. A MILES (Monotonically Integrated Large Eddy Simulations) approach with a finite element version of Flux-Corrected Transport algorithm is used. It is found that the fluidic injection alters both shock-cell structures and the near-field noise spectra. It eliminates screech tones and reduces the noise intensities, especially in the region near the main nozzle exit. A wide range of injection conditions, such as the size and number of fluidic nozzles and the injection angle, are simulated and studied. Since both fluidic injection and chevron geometry introduce counter-rotating streamwise vortices that alter the shear layers and the shock-cell structures of the main jet, a detailed comparison of the mechanism of these two approaches for noise reduction are made. Furthermore, the effect of a combination of chevrons and fluidic injection on noise reduction is also investigated numerically. Work sponsored by SERDP.

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