Investigation of the Near-Field Acoustic Properties of Supersonic Jets with Fluidic Enhanced Chevrons using Large-Eddy Simulations

JUNHUI LIU, K. KAILASANATH, RAVI RAMAMURTI, Naval Research Lab, NICHOLAS HEEB, DAVID MUNDAY, EPHRAIM GUTMARK, University of Cincinnati — Since it has been found that chevrons reduce noise more effectively in the underexpanded operating range, but fluidic injection with constant injection mass flow rate is more effective in the overexpanded range, fluidic enhanced chevrons (a combination of chevrons and fluidic injection) are investigated numerically based on a MILES (Monotonically Integrated Large Eddy Simulations) approach. Both overexpanded and underexpanded jet conditions are tested and results are compared with experimental data. The mean flow field and the near-field noise spectra are also compared with those from the case with fluidic injection alone and the case with chevrons alone. It is found that fluidic enhanced chevrons have a larger impact in the overexpanded operating range than that in the underexpanded range.

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