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Large-Eddy Simulations of Supersonic Heated Jets JUNHUI LIU, K. KAILASANATH, Naval Research Lab., NICK HEEB, EPHRAIM GUTMARK, University of Cincinnati — Large-eddy simulations of imperfectly expanded jet flows from a convergent-divergent nozzle with a heated (600K) and a cold jet conditions have been carried out. Mach wave radiation is present outside the jet core and the heated jet shows a much larger density shear-layer spreading than the cold jet. The potential core length is shortened, but the shock-cell shape and shock-cell spacing remain similar to those shown in the cold jet. It is found that the Crocco-Busemann equation captures well the correlation between the temperature and the axial velocity in the cold jet, but it underestimates the nonlinear variations in the shock-containing region in the heated jet. Temperature effect has more impact on the high-frequency components of pressure fluctuations near the nozzle exit, but the impact moves to low- and mid-frequency ranges further downstream. The convection speed of the near-field pressure waves increases with the temperature. The heated jet is found to be more sensitive to the inflow pressure perturbations than the cold jet.

Junhui Liu
Naval Research Lab.

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