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Flow and noise prediction of transonic turbulent jets including nozzle geometry using LES[1] MOHAMMAD SHOEYBI, SIMON MENDEZ , PARVIZ MOIN, Stanford University — An unstructured large eddy simulation (LES) method is employed to investigate a turbulent jet in transonic regime. The far-field noise is computed using the integral solution to the Ffowcs Williams-Hawkings equations. The approach has been validated by comparing the near field flow and the far-field sound with the experimental data of Brown and Bridges (AIAA 2006 & 2008) for a jet with a Mach number 0.89 and a temperature ratio 0.84. Although some differences between power-spectra densities from simulation and the corresponding experimental measurements have been observed in regions near the nozzle exit, they are in excellent agreement with experimental data elsewhere. Along the centerline the mean velocity decay is well predicted and turbulent intensity profiles are to within 10-20% of the experimental data. The predicted far-field noise spectra at different polar angles are all within 3dB of the measured experimental ones for Strouhal numbers ranging from 0.05 to 3. Comparisons of flow and sound fields of the heated and unheated jets will be presented.

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