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Large eddy simulations of supersonic twin rectangular jets including screech[1] JINAH JEUN, GAO JUN WU, SANJIVA K LELE, Stanford University — In this work the aeroacoustics of supersonic jets including screech tones, issuing from military-style twin rectangular nozzles with aspect ratio of 2:1 and design Mach number of 1.5, is studied numerically. Large eddy simulations (LES) are performed using the unstructured compressible flow solver CharLES developed by Cascade Technologies, to fully replicate the nozzle geometry including the upstream duct with flow divider and sharply turning converging-diverging nozzle. Equilibrium wall-model is used to account for the internal boundary layers. Three different nozzle operating conditions, which correspond to two over-expanded conditions and one ideally-expanded condition, are considered. At each operating condition, the far-field acoustic spectra are obtained from the near-field LES data using the Ffowcs Williams-Hawkings method. Both near-field flow statistics and the far-field acoustics are compared with experiments conducted at the University of Cincinnati, to examine predictive capabilities of the LES solver. Interactions between closely placed two jet plumes as they spared are captured, and the effects of nozzle operating conditions on them are discussed.

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