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Large-Eddy Simulations of Noise Generation in Supersonic Jets at Realistic Engine Temperatures JUNHUI LIU, ANDREW CORRIGAN, K. KAILASANATH, BRIAN TAYLOR, Naval Research Laboratory — Large-eddy simulations (LES) have been carried out to investigate the noise generation in highly heated supersonic jets at temperatures similar to those observed in high-performance jet engine exhausts. It is found that the exhaust temperature of high-performance jet engines can range from 1000K at an intermediate power to above 2000K at a maximum afterburning power. In low-temperature jets, the effects of the variation of the specific heat ratio as well as the radial temperature profile near the nozzle exit are small and are ignored, but it is not clear whether those effects can be also ignored in highly heated jets. The impact of the variation of the specific heat ratio is assessed by comparing LES results using a variable specific heat ratio with those using a constant specific heat ratio. The impact on both the flow field and the noise distributions are investigated. Because the total temperature near the nozzle wall can be substantially lower than the nozzle total temperature either due to the heating loss through the nozzle wall or due to the cooling applied near the wall, this lower wall temperature may impact the temperature in the shear layer, and thus impact the noise generation. The impact of the radial temperature profile on the jet noise generation is investigated by comparing results of lower nozzle wall temperatures with those of the adiabatic wall condition.

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