

Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Active noise control in an ideally expanded Mach 1.3 jet* JIN-HWA KIM, IGOR ADAMOVICH, MO SAMIMY, The Ohio State University, GAS DYNAMICS AND TURBULENCE LAB COLLABORATION — Localized arc filament plasma actuators developed at OSU were used for jet noise control in an ideally expanded Mach 1.3 jet with an exit diameter of 2.54 cm and a Reynolds number of 1×10^6 . The azimuthal modes of forcing were $m = 0-3$. The forcing Strouhal number was varied from 0.13 to 5.0. The far-field noise was measured at 30° and 90° relative to the jet axis. Laser sheet flow visualization was also carried out. When the jet was forced at a low frequency, the noise level was increased at both measuring locations, but not as much as that in a Mach 0.9 jet in our previous work. At 30° location, the noise was decreased at forcing Strouhal numbers higher than 0.5 for all azimuthal modes. At higher azimuthal modes, the noise level decreased at lower forcing Strouhal numbers in general. At this measuring location, the maximum reduction of 2.2 dB was at a forcing Strouhal number of about 1.0 for $m = 3$ mode excitation. At 90° location, the noise level reduction started at higher forcing Strouhal numbers than at 30° location. The maximum noise reduction was 1.0 dB at a forcing Strouhal number of 2.0 for $m = 3$ mode excitation. The flow visualization showed well organized large-scale structures at low forcing Strouhal numbers, which are probably responsible for the increased noise at low Strouhal numbers.

*Supported by NASA Glenn Research Center

Mo Samimy
The Ohio State University

Date submitted: 31 Jul 2007

Electronic form version 1.4