Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Active control of high subsonic jets[1] JIN-HWA KIM, JEFF KASTNER, YURII UTKIN, IGOR ADAMOVICH, MO SAMIMY, The Ohio State University — Localized arc filament plasma actuators developed at OSU were used for the jet flow control in a Mach 0.9 jet with an exit diameter of 2.5 cm and a Reynolds number of 7.9x10^5. The azimuthal modes of forcing were m = 0-3, $\pm$1, $\pm$2, and $\pm$4 since only eight actuators were used. The forcing Strouhal number was varied from 0.13 to 3.0. The jet spreading was strongly dependent on the actuation modes at low Strouhal numbers. However, the effects of mode were negligible at a higher forcing Strouhal number. As far as the spread/mixing enhancement is concerned, the most effective forcing was at an approximate Strouhal number of 0.3, which is inline with what is in the literature. The average streamwise velocity field showed that the jet spreading was best at a forcing mode of m = $\pm$1. At a low Strouhal number ranging from 0.13 to 0.4, the decay of the centerline Mach number for m =1, 2, and $\pm$2 was comparable to that for m = $\pm$1. The jet spreading/mixing enhancement was minimal at higher azimuthal modes of m=3 and $\pm$4. In these modes, the centerline Mach number decayed slower than any other modes. The growth and decay of the perturbation, imparted by the plasma actuators, along a lipline of the jet showed a good correlation with the jet spreading.

[1]Supported by NASA Glenn Research Center and OCAPP.

Mo Samimy

Date submitted: 02 Aug 2006 Electronic form version 1.4