Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Suppression or Enhancement of Pressure Fluctuations in High Subsonic Cavity Flow Using Plasma Actuators[1] MO SAMIMY, KEVIN YUGULIS, SAMUEL HANSFORD, JAMES GREGORY, The Ohio State University, GDTL/AARL TEAM — Localized arc filament plasma actuators (LAFPAs) were used to control pressure fluctuations in a Mach 0.6 cavity flow with a Reynolds number based on the cavity depth of 200,000. The rear wall of the cavity is inclined 30° with respect to the upstream flow and the cavity depth and length-to-depth ratio are 12.7 mm and 4.86. Five actuators were uniformly distributed along the span of the cavity 1 mm upstream of the cavity leading edge. Forcing was conducted quasi-two-dimensionally (all actuators operated in phase) and three-dimensionally (actuators operated out of phase). Time-resolved pressure and PIV measurements were used to assess the effectiveness of the actuators and to explore the physics of the flow. The results show that with proper selection of forcing frequency; (1) the cavity tone can be suppressed by over 20 dB and the broadband pressure fluctuations can be suppressed by over 5 dB in a strongly resonating cavity, and (2) the resonance can be re-established and the peak tone as well as the broadband pressure fluctuations can be significantly amplified in a weakly resonating cavity. Both quasi-two-dimensional and three-dimensional controls were successful in controlling the flow, but the control was less sensitive to forcing frequency change in the latter than former; and much wider forcing frequency range could be used in case (1) than case (2).

[1]Supported by AFRL/ISSI.

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Date submitted: 26 Jul 2013 Electronic form version 1.4