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Supersonic cavity flow control using plasma actuators[1] NATHAN WEBB, DENNIS OMARI, MO SAMIMY, The Ohio State University — Flow over cavities with a length to depth ratio of order 1 undergo so called "Rossiter" resonance for certain combinations of free stream Mach number, upstream boundary layer characteristics, and cavity length. This is caused by the amplification of natural perturbations in the cavity shear layer by the Kelvin-Helmholtz instability. The amplified perturbations in the shear layer grow and roll up into large-scale structures, which interact with the trailing edge of the cavity. This interaction produces acoustic waves that travel upstream and further perturb the shear layer. If the timing/phase is correct, a feedback loop is formed. Artificial perturbations can be used to alter the resonance condition and thus the flow characteristics. In the past we used Localized Arc Filament Plasma Actuators (LAFPAs) to perturb the shear layer of a subsonic cavity and demonstrated significant control authority to suppress or excite resonance. This work seeks to examine control authority of the LAFPAs in the supersonic regime. Experiments conducted with a supersonic cavity demonstrated the LAFPAs retain the ability to suppress or excite resonance. The ability to either excite or suppress resonance, as needed, is required in some applications.

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