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Flow Structure of Supersonic Cavity Flow with and Without Control GEORGE SHUMWAY, University of Florida, MICHAEL SHEEHAN, FARRUKH ALVI, Florida State University, LAWRENCE UKEILEY, University of Florida — Supersonic flow over an open cavity is studied experimentally to examine the effects of control on the flow field. Detailed PIV measurements were acquired for a rectangular cavity with a ramped floor in a Mach 1.5 free stream flow at the AAPL at FSU. The measurements were acquired for both an uncontrolled case and a case where micro-jets were used at the leading edge of the cavity. The properties of the micro-jets (pressure, diameter and injection location) have been optimized and have been shown to significantly reduce the fluctuating surface pressure through out the cavity both in terms of peak and broadband levels. Examination of flow field properties shows significant differences in the distribution of turbulent energy and the recirculation velocities. Further examination of the PIV snapshots with the POD has yielded insight into some of the similarities and differences in the turbulent structure between the controlled and baseline configurations. The cases yielded nearly the same amount of energy in the dominant mode (16% vs. 18%) however there are significant differences in the spatial features of the modes. In this presentation we will present features of the controlled and baseline cases including a quantitative analysis of the differences between the POD modes from the two cases.

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