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Effects of Segmented Slot Blowing at the Leading Edge of a Finite Span Cavity in Supersonic Flow BENJAMIN GEORGE, LAWRENCE UKEILEY, Univ of Florida - Gainesville, LOUIS CATTAFESTA, KUNIHIKO TAIRA, Florida State University — In this investigation, the effects of employing segmented slot blowing at the leading edge of a finite span cavity in Mach 1.4 flow are studied. The rectangular cavity under consideration has a length to depth ratio of 6 and width to depth ratio of 2 with an approaching turbulent boundary layer. Qualitative surface flow visualization results reveal changes in the flow characteristics due to the introduction of the sidewalls and multiple slot blowing configurations, as has been previously shown. Quantitatively, unsteady surface pressure measurements and particle image velocimetry (PIV) were utilized to characterize the mechanisms for suppressing surface pressure fluctuations in a three-dimensional flow field. Joint time-frequency analysis using wavelet transformations highlight changes in the tonal and broadband surface pressure fluctuations as a function of time with the different slot configurations. PIV data results from the baseline finite span case were compared with the slot blowing cases to illustrate their effects on the mean flow field properties in the shear layer and recirculation region. Finally, the finite span cavity experimental results are compared with previously acquired data for the full span cavity case to gain some insight into the flow field modifications as the cavity span is altered.

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