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Particle Image Velocimetry of a Supersonic Flow over a Finite-Width Rectangular Cavity STEVEN BERESH, JUSTIN WAGNER, JOHN HENFLING, RUSSELL SPILLERS, BRIAN PRUETT, Sandia National Laboratories — Stereoscopic particle image velocimetry measurements have been acquired in the streamwise plane for supersonic flow over a rectangular cavity of variable width, peering over the side wall lip to view the depths of the cavity. The complex camera angles were treated using two-axis scheimpflug focusing and perspective correction inherent in the camera calibration algorithm. The data reveal the turbulent shear layer over the cavity and the recirculation region within it. The mean position of the recirculation region was found to be a function of the length-to-width ratio of the cavity, as was the turbulence intensity within both the shear layer and the recirculation region. Compressibility effects were observed in which turbulence levels dropped and the shear layer thickness decreased as the Mach number was raised from 1.5 to 2.0 and 2.5. Supplemental measurements in the crossplane and the planform view suggest that zones of high turbulence were affixed to each side wall centered on the cavity lip, with a strip of turbulence stretched out across the cavity shear layer whose intensity was a function of the length-to-width ratio.

Steven Beresh
Sandia National Laboratories

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