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Controlled Flow Distortion in an Offset Diffuser using Hybrid Trapped Vorticity[1] T.J. BURROWS, B. VUKASINOVIC, A. GLEZER, Georgia Institute of Technology — Trapped vorticity concentration engendered by deliberate modification of the internal surface of an offset diffuser is coupled with a spanwise array of surface-integrated fluidic-oscillating jets for hybrid flow control of streamwise vorticity concentrations that dominate the base flow and give rise to flow distortions at the engine inlet. The local and global characteristics of the diffuser flow in the absence and presence of the actuation are investigated at Mach numbers up to M = 0.7, using surface oil-flow visualization and pressure distributions, and particle image velocimetry. It is shown that two sources of streamwise vorticity dominate the base flow distortion, namely, corner and a central pair of counter-rotating vortices. The present investigations demonstrate that the actuation affects the topology, strength and scale of the trapped vorticity and thereby its coupling to and interaction with the counter rotating streamwise vortices, where the central vortex pair becomes fully suppressed. As a result, the actuation significantly alters the evolution of the flow within the diffuser, and leads to significant suppression of pressure distortion at the engine inlet (by about 80%) at actuation level that is less than 0.7% of the diffuser's mass flow rate. These findings indicate the utility of hybrid trapped vorticity actuation for mitigating adverse effects of secondary vorticity concentrations formed by local separation and corner flows.

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Travis Burrows
Georgia Institute of Technology

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