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Control of Shock-Induced Separation and Vorticity Concentrations in a Serpentine Diffuser[1] TRAVIS BURROWS[2], BOJAN VUKASINOVIC[3], ARI GLEZER[4], Georgia Institute of Technology — Advanced propulsion inlet systems utilize complex serpentine diffusers, whose geometry engenders large-scale streamwise vortices and boundary-layer separation coupled to shock formation at high flow rates that limit engine efficiency operating range due to severe losses and distortion. The present experimental investigation demonstrates active control of the diffuser transonic shock by utilization of surface-mounted fluidic oscillating jets, thereby indirectly control streamwise vorticity concentrations by exploiting the coupling to the shock. It is demonstrated that flow control modifies the shock topology and footprint, confining it towards the diffuser's sidewalls. Consequently, the streamwise vortices are displaced, ultimately mitigating their advection of low-momentum fluid into core diffuser flow. This active flow control leads to a 35% reduction in average diffuser circumferential distortion and a concomitant increase in pressure recovery, indicating the capability of this flow control approach to extend the engine operation range beyond its nominal operating condition.

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