Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Hybrid Manipulation of Streamwise Vorticity in a Diffuser Boundary Layer[1] ABRAHAM GISSEN, BOJAN VUKASINOVIC, JOHN CULP, ARI GLEZER, Georgia Institute of Technology — The formation of streamwise vorticity concentrations by exploiting the interaction of surface-mounted passive (micro-vanes) and active (synthetic jets) flow control elements with the cross flow is investigated experimentally in a small-scale serpentine duct at high subsonic speeds (up to M = 0.6). Streamwise vortices can be a key element in the mitigation of the adverse effects on pressure recovery and distortion caused by the naturally occurring secondary flows in embedded propulsion systems with complex inlet geometries. Counter rotating and single-sense vortices are formed using conventional passive micro-vanes and active high-power synthetic jet actuators. Interaction of the flow control elements is examined through a hybrid actuation scheme whereby synthetic jet actuation augments the primary vanes' vortices resulting in dynamic enhancement of their strength. It is shown that such sub-boundary layer individual vortices can merge and evolve into duct-scale vortical structures that counteract the inherent secondary flow and mitigates global flow distortion.

[1]Supported by NASA and the Boeing Company.

Abraham Gissen
Georgia Institute of Technology

Date submitted: 06 Aug 2010 Electronic form version 1.4