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Effect of Boundary Layer Thickness on Secondary Structures in a Short Inlet Curved Duct JEREMY GARTNER, MICHAEL AMITAY, Rensselaer Polytechnic Institute — The flow pattern in short ducts with aggressive curvature can lead in some cases to an asymmetric flow field. In the current work, a two dimensional honeycomb mesh was added upstream of the curved duct to create a pressure drop across it, and therefore an increased velocity deficit in the boundary layer profile. This velocity deficit led to a stronger streamwise separation, overcoming the flow mechanisms that result in the asymmetric flowfield. Experiments were conducted at $\boldsymbol{M} = 0.2$, 0.44 and 0.58 in an expanding aggressive duct with square cross section with an area ratio of 1.27. Pressure data, together with Particle Image Velocimetry (PIV), verify the symmetry of the incoming flow field. Steady pressure distributions along the lower surface of the curved duct were obtained, as well as steady and time dependent total pressure distributions at the aerodynamic interface plane, enabling the analysis of the flow characteristics throughout the duct length. The effect of inserting a honeycomb was tested by increasing its height from 0 to 2.2 times the baseline flow boundary layer thickness upstream of the curve. Crosstream flow symmetry was achieved for specific geometrical configurations with a negligible decrease in the pressure recovery.

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