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Experimental Investigation of Flow Control in a Compact Inlet Duct[1] BRIAN DEBRONSKY, MICHAEL AMITAY, Rensselaer Polytechnic Institute — Attractive to aircraft designers are compact inlets, which implement curved flow paths from the air intake of the engine to the compressor face. A compromise must be made between the compactness of the inlet and its aerodynamic performance. The aerodynamic purpose of inlets is to decelerate the oncoming flow before reaching the engine while minimizing total pressure loss, unsteadiness and distortion. Low length-to-diameter ratio inlets have a high degree of curvature, which inevitably causes flow separation and secondary flows. To address this issue, active flow control was implemented on a compact (L/D = 1.6) inlet to improve its performance metrics. The experiments were conducted at a Mach number of 0.44, where the actuation from an array of skewed and pitched jets produced streamwise vortices opposite to the secondary flow structures. The actuation resulted in an improved pressure recovery at the aerodynamic interface plane (AIP), where both the strength of the secondary structures and the flow unsteadiness were significantly reduced.

[1]Northrop Grumman Corporation

Michael Amitay
Rensselaer Polytechnic Institute

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