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Experimental Investigation of Actuators for Flow Control in Inlet Ducts[1] JOHN VACCARO, YOSSEF ELIMELECH, MICHAEL AMITAY, Rensselaer Polytechnic Institute, FLOW CONTROL RESEARCH LAB TEAM — Attractive to aircraft designers are compact inlets, which implement curved flow paths to the compressor face. These curved flow paths could be employed for multiple reasons. One of which is to connect the air intake to the engine embedded in the aircraft body. 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. Currently, the length of the propulsion system is constraining the overall size of Unmanned Air Vehicles (UAVs), thus, smaller more efficient aircrafts could be realized if the propulsion system could be shortened. Therefore, active flow control is studied in a compact (L/D=1.5) inlet to improve performance metrics. Actuation from a spanwise varying coanda type ejector actuator and a hybrid coanda type ejector / vortex generator jet actuator is investigated. Special attention will be given to the pressure recovery at the AIP along with unsteady pressure signatures along the inlet surface and at the AIP.

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