

Abstract Submitted
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Experimental Investigation of Actuators for Flow Control in Inlet Ducts¹ JOHN VACCARO, MICHAEL AMITAY, Rensselaer Polytechnic Institute — For military applications, inlet designs are constrained by low observability requirements, which call for the use of an S-duct inlet. The inlet's purpose is to limit the line-of-sight to the compressor and decelerate the incoming flow while minimizing total pressure loss, distortion, and unsteadiness. In addition, in unmanned aerial vehicles, the inlet length can determine the overall size of the aircraft. For this reason, aggressive inlets can have a large impact on overall system efficiency. Experiments have been conducted which evaluate the effectiveness of different actuation systems for active flow control in an aggressive S-duct inlet, $L/D = 1.5$ (at flow conditions representative of flight conditions). Comparisons will be made between: steady and unsteady blowing from a single 2-D tangential slit, spanwise varying injection from a tangential slit, and spanwise varying injection of a hybrid actuator that has both a Coanda type injector along with vortex generator jets to eliminate vorticity developed by secondary flow inherent to S-ducts. Evaluation criteria will include total pressure recovery, AIP distortion levels, and unsteady pressure fluctuations.

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