

AFRL-VA-WP-TM-2006-3199

**REACTIVE CONFORMAL INLET
TECHNOLOGY ENHANCEMENT**



**Angela Scribben
Melissa Withrow**

**Aerospace Vehicle Integration and Demonstration Branch (AFRL/VAAI)
Aeronautical Sciences Division
Air Vehicles Directorate
Air Force Materiel Command, Air Force Research Laboratory
Wright-Patterson Air Force Base, OH 45433-7542**

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WRIGHT-PATTERSON AIR FORCE BASE, OH 45433-7542**

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*//Signature//

ANGELA SCRIBBEN, Ph.D.
Work Unit Manager

//Signature//

FRANK WITZEMAN
Chief, Aerospace Vehicle Integration and
Demonstration Branch

//Signature//

MICHAEL J. STANEK, Ph.D.
Technical Advisor
Aeronautical Sciences Division

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14. ABSTRACT As part of its Reactive Conformal Inlet Technology Enhancement (RECITE) program, AFRL is examining conformal inlet technology. Because they are flush to an air vehicle's fuselage, conformal engine air inlets cause less drag than other inlet designs. AFRL recently investigated a conformal inlet and two active flow control slot variations. Test results showed that the smaller flow control slot performed as desired and was most effective at lower wind tunnel Mach numbers and at higher active flow control mass flow rates. AFRL engineers will incorporate these valuable data into future RECITE inlet designs that require smaller amounts of active flow control air.						
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Reactive Conformal Inlet Technology Enhancement

As part of its Reactive Conformal Inlet Technology Enhancement (RECITE) program, AFRL is examining conformal inlet technology. Because they are flush to an air vehicle's fuselage, conformal engine air inlets cause less drag than other inlet designs. AFRL is examining ways to take full advantage of these benefits while minimizing a common drawback of conformal inlets, airflow distortion that negatively affects engine performance.

AFRL recently investigated a conformal inlet and two active flow control slot variations. The first variation was 20% of the inlet height, and the second variation was 5% of the inlet height. Both variations were designed to improve engine air quality by ejecting air over the length of the recessed ramp leading down to the inlet. In addition, engineers also evaluated the effectiveness of the ramp's sidewalls, which were shaped to passively influence air quality.

Engineers evaluated the effectiveness of these active and passive flow control variations during a wind tunnel test involving various tunnel Mach numbers, inlet mass flow rates, and flow control mass flow rates. Test results showed that the smaller flow control slot performed as desired and was most effective at lower wind tunnel Mach numbers and at higher active flow control mass flow rates. While the ramp walls did not significantly influence air quality, they proved a good starting point for further research. AFRL engineers will work with the Air Force Office of Scientific Research and the Air Force Institute of Technology to incorporate these valuable data into future RECITE inlet designs that require smaller amounts of active flow control air and that have improved passive flow control methods.

An ideal air vehicle engine inlet would transform incoming air's kinetic energy into high pressure air with no distortion. The closer an inlet is to ideal, the better the engine's performance. Submerged inlets have many advantages, but they traditionally cause varying levels of air flow non-uniformity, or distortion. The RECITE program is examining ways to eliminate this distortion.

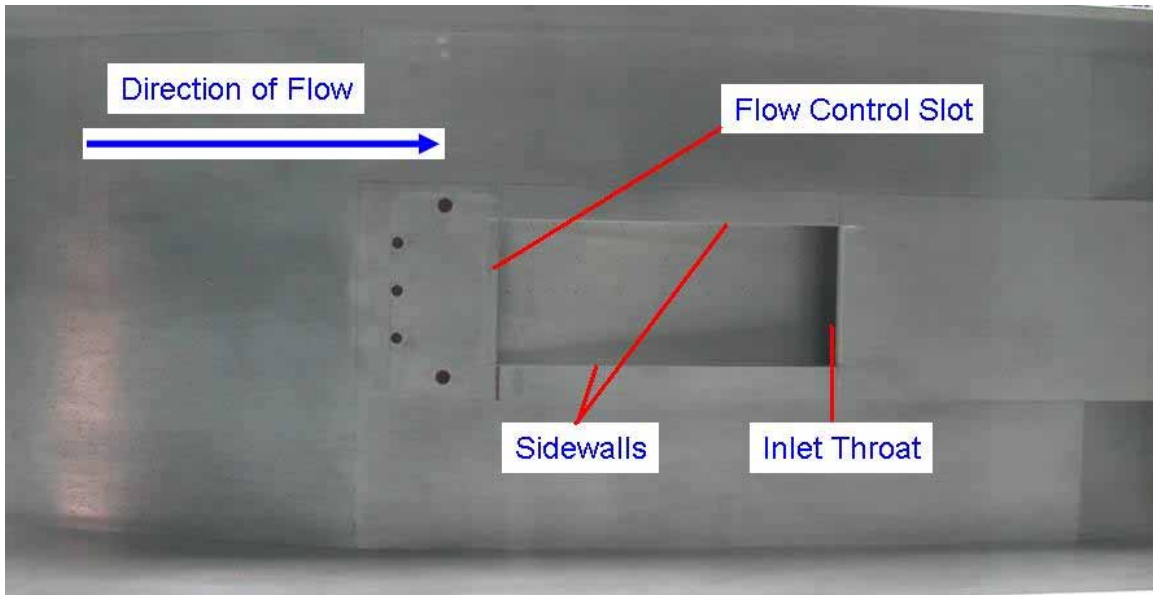


Figure 1: View of a conformal engine air inlet