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Flow Control of the Stingray UAV at Low Angles of Attack JOHN FARNSWORTH, JOHN VACCARO, MICHAEL AMITAY, Rensselaer Polytechnic Institute — The effectiveness of active flow control, via synthetic jets and steady blowing jets, on the aerodynamic performance of the Stingray UAV was investigated experimentally in a wind tunnel. Global flow measurements were conducted using a six component sting balance, static pressure, and Particle Image Velocimetry (PIV) measurements. Using active control for trimming the Stingray UAV in pitch and roll at low angles of attack has similar effects to those with conventional control effectors. The synthetic jets were able to alter the local streamlines through the formation of a quasi-steady interaction region on the suction surface of the vehicle's wing. Phase locked data were acquired to provide insight into the growth, propagation, and decay of the synthetic jet impulse and its interaction with the cross-flow. The changes induced on the moments and forces can be proportionally controlled by either changing the momentum coefficient or by driving the synthetic jets with a pulse modulation waveform. This can lead the way for future development of closed-loop control models.

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