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Active Control of a Flapping Wing in a Gust Setup RYAN WALLACE, MARK ANDERSON, MARK GLAUSER, Syracuse University — The aim of this experiment is to determine the response of a flapping Micro Air Vehicle wing to a wind gust while in forward and hovering flight and apply an active control to respond to the wind gust. The flapping wing is driven by a DC brushless motor which is geared to allow for flapping at frequencies up to 3 Hz. The wing is set up vertically in the wind tunnel, and can flap up to angles of 120 degrees. To simulate a wind gust perpendicular to the free stream flow a diffuser is set up on top of the wind tunnel. Strain gages are attached to the wing. It has been shown while simultaneously measuring the dynamical strain and the velocity field with a PIV system, that a realistic estimate of the wake flow field can obtained using low dimensional tools (POD, mLSE). The wing and the flapping mechanism are mounted directly on a force balance to calculate the lift being produced. In order to prevent flow separation on the wing during a sudden wind gust the wing is actively deformed by an attached piezoelectric actuator. The end result is to have closed loop control to produce stable hovering and forward flight.

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