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An Experimental Investigation of Compressible Dynamic Stall on a 2-D Airfoil Subjected to Non-Harmonic Pitching Motion DUSTIN COLEMAN, FLINT THOMAS, THOMAS CORKE, PATRICK BOWLES, KATIE THORNE, University of Notre Dame — An experimental study of dynamic stall was conducted on a 2-D airfoil operating at Reynolds number up to $2x10^6$ and over a Mach number range of 0.2 - 0.4. The primary pitching frequency was 6.58 Hz producing reduced frequencies ranging from 0.035 - 0.075. The facility was constructed to allow a second pitching frequency to be mechanically added to the primary mode of the airfoil providing both harmonic and non-harmonic disturbances to the pitch motion in order to simulate aerodynamic conditions where stall flutter may occur. Static pressure data was acquired using 30 surface mounted dynamic pressure transducers simultaneously sampled at a rate of 5 kHz. Instantaneous pressure time series and resultant forces were analyzed to elucidate the consequent fluid interactions. Preliminary results indicate that the higher frequency input provides a mechanism for increased aerodynamic stability throughout the dynamic stall cycle.

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