

Abstract Submitted
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Experimental investigation of the leading edge vortex on vertical axis wind turbine blades¹ REEVE DUNNE, BEVERLEY MCKEON, California Institute of Technology — A NACA 0018 airfoil is pitched about the leading edge over a large angle of attack range ($\pm \sim 40^\circ$) at a chord Reynolds number of 110,000 to simulate the flow over a single blade in a vertical axis wind turbine (VAWT). Particle image velocimetry (PIV) measurements are made to investigate the effects of pitching on leading edge vortex (LEV) development and separation. Time resolved experiments are performed to track vortex formation and convection over the airfoil for sinusoidal pitching motions corresponding to a VAWT trajectory as well as impulsive pitch up and pitch down motions. These results are compared to the wake of steady, post stall, high angle of attack airfoils ($\alpha = 20^\circ - 30^\circ$). The characteristics of the leading edge vortex development and subsequent separation from the airfoil are discussed, with a view to characterizing its effect on power generation with VAWTs and future flow control strategies for turbine performance improvement

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