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An experimental study of small-scale flexible wind turbine blades[1] PARIYA POURAZARM, YAHYA MODARRES-SADEGHI, MATTHEW LACKNER, University of Massachusetts — With the increasing size of offshore wind turbine rotors, the design criteria used for the blades may also evolve. Current offshore technology utilizes three relatively stiff blades in an upwind configuration. With the goal of minimizing mass, there is an interest in lightweight rotors that instead utilize two flexible blades oriented downwind. These design possibilities necessitate a better understating of the fundamental behavior of such flexible blades. In the current work, a series of experiments are conducted using a small scale wind turbine built with adjustable features. The blades are designed using relatively thin, low Reynolds number airfoils and built using rapid-prototyping methods with a flexible material. The number of blades as well as their pitch angle, stiffness, and distance from the tower can be varied. The tests are conducted in a wind tunnel with a cross-section of 1 m by 1 m, a wind speed range of 3 to 20 m/s and a turbulence intensity of less than 1%. The small scale wind turbine is tested both upwind and downwind and a dynamic strain gauge is placed on the blades to measure blade deflection and dynamic loading in various configurations.

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