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An Experimental Comparison Between Flexible and Rigid Airfoils at Low Reynolds Numbers[1] JAYLON UZODINMA, Jackson State University, DAVID MACPHEE, University of Alabama — This study uses experimental and computational research methods to compare the aerodynamic performance of rigid and flexible airfoils at a low Reynolds number throughout varying angles of attack. This research can be used to improve the design of small wind turbines, micro-aerial vehicles, and any other devices that operate at low Reynolds numbers. Experimental testing was conducted in the University of Alabama's low-speed wind tunnel, and computational testing was conducted using the open-source CFD code OpenFOAM. For experimental testing, polyurethane-based (rigid) airfoils and silicone-based (flexible) airfoils were constructed using acrylic molds for NACA 0012 and NACA 2412 airfoil profiles. Computer models of the previously-specified airfoils were also created for a computational analysis. Both experimental and computational data were analyzed to examine the critical angles of attack, the lift and drag coefficients, and the occurrence of laminar boundary separation for each airfoil. Moreover, the computational simulations were used to examine the resulting flow fields, in order to provide possible explanations for the aerodynamic performances of each airfoil type.

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