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The effects of freestream turbulence on the pressure distributions and lift characteristics of airfoil LEON LI, R. JASON HEARST, Norwegian University of Science and Technology — Airfoils employed in engineering applications are often subjected to significant flow variations which can have adverse impacts on their aerodynamic performance and structural stability, for example a wind turbine operating in the atmospheric boundary layer or an airplane on final approach. The impact of these incoming (or freestream) variations is presently not well understood. To gain a better understanding, one must explore a wide parameter space of freestream parameters. This study uses 9 different passive grid configurations to alter the freestream turbulence (FST) in a wind tunnel in order to measure the impact of FST on the pressure distribution and lift characteristics of a NREL S826 reference airfoil. The FST intensity ranges from 0.5% to 5.4%, and the chord-normalized integral length scale varies between 0.07 and 0.24. The chord Reynolds number (Re) was varied between 200-400k. Preliminary results show that an increase in turbulence intensity increases both the maximum lift coefficient and the lift slope. The latter observation contrasts with some results reported in the literature with a smaller FST parameter space and different Re range. The impact on the pressure distribution and separation points will also be examined.

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