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Lift and Drag Measurements of Superhydrophobic Hydrofoils[1]
SAMRAT SUR, JEONG-HYUN KIM, JONATHAN ROTHSTEIN, University of Massachusetts - Amherst — For several years, superhydrophobic surfaces which are chemically hydrophobic with micron or nanometer scale surface features have been considered for their ability to reduce drag and produce slip in microfluidic devices. More recently it has been demonstrated that superhydrophobic surfaces reduce friction coefficient in turbulent flows as well. In this talk, we will consider that modifying a hydrofoil's surface to make it superhydrophobic has on the resulting lift and drag measurements over a wide range of angles of attack. Experiments are conducted over the range of Reynolds numbers between 10,000<Re<50,000. The effect of superhydrophobicity on separation point and vortex structure will be studied using Particle Image Velocimetry (PIV) and streak images. We will show that changes to the drag and lift coefficients along with changes to separation point at high angles of attack are observed when the hydrofoil is made superhydrophobic. The hydrofoils are coated Teflon that has been hot embossed with a 325grit stainless steel woven mesh to produce a regular pattern of microposts. In addition to fully superhydrophobic hydrofoils, selectively coated symmetrical hydrofoils will also be examined to study the effect that asymmetries in the surface properties can have on lift and drag.

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Jonathan Rothstein
University of Massachusetts - Amherst

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