

Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Modified Contact Line Dynamics about a Surface-Piercing Hydrofoil¹ MORGANE GRIVEL, DAVID JEON, MORTEZA GHARIB, California Institute of Technology — The contact line around a surface-piercing hydrofoil is modified by introducing alternating hydrophobic and hydrophilic bands along one side of the body. These bands are either aligned perpendicular or parallel to the flow direction. The other side of the hydrofoil is un-patterned and retains its original, uniformly hydrophilic properties. The hydrofoil is mounted onto air bearings, such that it can freely move side-to-side in the water tunnel. A force sensor is attached to the setup via a universal joint in order to measure the forces acting on the body for several Reynolds numbers (ranging from 10^4 to 10^5) and angles of attack (ranging from -10° to 10°). Cameras are also used to record the resulting flow structures and free surface elevation. The generation of wave trains and an altered free-surface elevation (also associated with the generation of surface waves) are observed over a wide range flow conditions. Force measurements elucidate how introducing these flow features impacts the forces acting on the hydrofoil, specifically with regards to the generation of lateral forces due to the asymmetric wetting conditions on either side of the hydrofoil.

¹Work is funded by ONR grant N00014-11-1-0031 and NSF GRFP grant DGE-1144469

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Date submitted: 25 Jul 2016

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