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Free Swimming in Ground Effect JACKSON COCHRAN-CARNEY, NATHAN WAGENHOFFER, SAMANE ZEYGHAMI, KEITH MOORED, Lehigh University — A free-swimming potential flow analysis of unsteady ground effect is conducted for two-dimensional airfoils via a method of images. The foils undergo a pure pitching motion about their leading edge, and the positions of the body in the streamwise and cross-stream directions are determined by the equations of motion of the body. It is shown that the unconstrained swimmer is attracted to a time-averaged position that is mediated by the flow interaction with the ground. The robustness of this fluid-mediated equilibrium position is probed by varying the non-dimensional mass, initial conditions and kinematic parameters of motion. Comparisons to the foils fixed-motion counterpart are also made to pinpoint the effect that free swimming near the ground has on wake structures and the fluid-mediated forces over time. Optimal swimming regimes for near-boundary swimming are determined by examining asymmetric motions.

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