Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Benefits of unsteady swimming near a wall DANIEL QUINN, PETER DEWEY, KEITH MOORED, ALEXANDER SMITS, Princeton University — The benefits of flying and swimming near the ground have been well-documented for fixed-wing vehicles, and have led to 'wing-in-ground' craft (WIG) with higher efficiencies than their conventional counterparts. Here it is examined whether unsteady propulsion techniques experience these same enhancements. Experimental particle image velocimetry was conducted in the wake of a rigid pitching panel and a flexible triangular fin, both actuated at several distances from a fixed wall. In both cases, an increase in momentum flux behind the trailing edge was observed, suggesting thrust amplification is present. A finite core vortex array model was developed to model the wake behind these propulsors. Mirror image vortex cores were placed across the wall to satisfy the zero flux boundary condition, and the effects of viscosity were estimated by assuming a slowly expanding Gaussian distribution of vorticity around each core. The model offers insight into the origins of the momentum amplification due to the presence of the wall. Supported by ONR MURI Grant N00014-08-1-0642.

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Date submitted: 03 Aug 2011 Electronic form version 1.4