Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

A computational investigation of heaving flexible panels in a fluid

ALEXANDER HOOVER, RICARDO CORTEZ, LISA FAUCI, Tulane University, ERIC TYTELL, Tufts University — We present a 3-dimensional computational model of a flexible panel with heave oscillations at the leading edge. Our approach uses direct numerical simulations of the fully coupled fluid-structure interaction system within an immersed boundary framework. The effective flexibility of the panel is varied over a range of heaving frequencies and bending rigidities, with the resulting force measurements recorded. We find good agreement with recent experimental results, confirming that resonant peaks of the trailing edge amplitude correspond to localized boosts in thrust. We then use the model to explore the relationship between the thrust recorded from a tethered, heaving panel and the forward swimming speed of an untethered, heaving panel. The deflections of the panels are further examined with beam mode analysis from the Euler-Bernoulli beam equation. Spanwise variations of the panel dimensions are also considered.

Alexander Hoover
Tulane University

Date submitted: 31 Jul 2016 Electronic form version 1.4