Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Fluid-structure interaction response and stability of flexible hydrofoils in cavitating flow YIN LU YOUNG, ANTOINE DUCOIN, EUN JUNG CHAE, University of Michigan — There is an increasing interest in the use of passive/active control mechanisms to take advantage of the fluid-structure interaction response of flexible lifting bodies to improve propulsive efficiency and performance from ambient flow. However, design of these flexible lifting bodies are not trivial, particularly for heavily loaded and cavitating, off-design conditions, because of potential hydroelastic instability failure mechanisms such as divergence or flutter. Hence, the objectives of this research are to (i) develop and validate an efficient coupling procedure to predict the hydroelastic response of flexible hydrofoils in unsteady flows, and (ii) investigate the influence of fluid density and viscosity on the FSI response and stability of flexible hydrofoils in cavitating flows. A multiphase CFD code is coupled with a simplified 2-DOF model to represent the spanwise bending and twisting response of a flexible hydrofoil. The influence of coupling algorithms on the accuracy and stability of the numerical predictions are discussed.

Antoine Ducoin
post doctoral fellowship

Date submitted: 05 Aug 2011 Electronic form version 1.4