Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Optimal passive pitch reversal via elastic coupling MICHELE MILANO, ROBERT SPADE, DAVID JURJEVICH, Arizona State University — We consider a prototypical experimental setup, comprising a pitching and heaving rectangular plate. The plate is heaving sinusoidally at constant frequency and variable amplitudes, and a rotational spring generates the pitching motion passively. The rotational spring is simulated by a servo motor driven by a model following controller, and a genetic algorithm optimizes the spring parameters so as to maximize the average lift produced. We present results showing the relationship between optimal parameters for linear and nonlinear springs, and we also investigate the effect of the tip region flow on optimality. PIV measurements for the optimal cases highlight critical features of the flow, showing that the passive pitch reversal is due mainly to leading edge vortices.

Michele Milano
Arizona State University

Date submitted: 07 Aug 2009 Electronic form version 1.4