Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Experimental investigation of 2D flexible plunging hydrofoil[1] RUIJUN TIAN, ROBERT MITCHELL, FANGJUN SHU, New Mexico State University — It is believed that both birds and insects benefit from their wing flexibility during the flapping flight. One of the possible benefits is higher lift force generation capability than that of rigid wing models. Both experimental and computational work has discovered that the leading edge vortex (LEV) plays an important role in this advantage of high lift force generating efficiency. In the present work, flow physics related to high lift-generating flexible wings are investigated experimentally. Both flexible and rigid hydrofoils (NACA0012) were actively plunged in glycerol-water solution with various amplitude, frequency and Reynolds number combinations. Phase-locked Particle Image Velocimetry (PIV) measurements were conducted to investigate the generation and evolution of the LEVs. Lift and drag forces during plunging were also measured to uncover the relationship between the force response and the surrounding flow field development. The overall results were also compared between flexible and rigid hydrofoils to provide qualitative data for validation of computational work.

[1]Supported by Army High Performance Computing Center.

Fangjun Shu
New Mexico State University

Date submitted: 07 Aug 2012 Electronic form version 1.4