Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Vortex Tilting and the Enhancement of Spanwise Flow in Flapping Flight SPENCER FRANK, University of Central Florida, GIOVANNI BARBERA, BO CHENG, XINYAN DENG, Purdue University — The leading edge vortex is key in lift generation on flapping wings. Its stability depends on the transport of the entrained vorticity into the wake via spanwise flow. This study investigates the generation and enhancement of spanwise flow based on the chordwise vorticity that results from the tilting of the leading edge vortex and trailing edge vortex. Two dynamically scaled robotic model wings, one rectangular and one insect wing shaped based on *Drosophila melanogaster* (fruit fly), are submerged in a tank of mineral oil and actuated into flapping motion. The overall flow structure was visualized and measured by a Volumetric 3-component Velocimetry (V3V) system (TSI, Inc.). From the three dimensional flow measurements obtained, the chordwise vorticity resulting from the vortex tilting is shown. The distribution of the resulting spanwise flow induced by the vortex tilting is shown using isosurfaces and on a planar cross section downstream of the leading edge. It is observed that the largest spanwise flow is located in the area between the tilted leading edge vortex and the tilted trailing edge vortex, supporting our hypothesis that the vortex tilting enhances the spanwise flow. This vortex tilting mechanisms helps to explain the overall flow structure and the stability of the leading edge vortex.

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Date submitted: 15 Aug 2011 Electronic form version 1.4