Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Aerodynamics of high frequency flapping wings[1] ZHENG HU, JESSE ROLL, BO CHENG, XINYAN DENG — We investigated the aerodynamic performance of high frequency flapping wings using a 2.5 gram robotic insect mechanism developed in our lab. The mechanism flaps up to 65Hz with a pair of man-made wing mounted with 10cm wingtip-to-wingtip span. The mean aerodynamic lift force was measured by a lever platform, and the flow velocity and vorticity were measured using a stereo DPIV system in the frontal, parasagittal, and horizontal planes. Both near field (leading edge vortex) and far field flow (induced flow) were measured with instantaneous and phase-averaged results. Systematic experiments were performed on the man-made wings, cicada and hawk moth wings due to their similar size, frequency and Reynolds number. For insect wings, we used both dry and freshly-cut wings. The aerodynamic force increase with flapping frequency and the man-made wing generates more than 4 grams of lift at 35Hz with 3 volt input. Here we present the experimental results and the major differences in their aerodynamic performances.

[1]This work was supported by NSF Grant 0545931.

Xinyan Deng

Date submitted: 09 Aug 2010 Electronic form version 1.4