

Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

High Speed Videogrammetry Study of Flexible Wings in Flapping Flight NATHAN LUNSFORD, ERIC JOHNSON, JAMEY JACOB, Oklahoma State University — Recent interest in the area of micro and nano air vehicle (MAV and NAV) development has called for a better understanding of the mechanics of natural flight at very low Re . Of particular interest is the area of mammalian flight, which has adapted a highly flexible membrane for creating lift. A high-speed videogrammetry system along with a two-axis lift balance was developed in order to better understand how flexible membrane wing systems work. Two MotionPro X high-speed cameras recorded the motions of the wings. These videos were then analyzed using the Photomodeler software package, which built a 3D model of the wing motion. Using this system, wings of several varying geometries and flexibilities were tested and compared with each other. Flapping frequencies from 1 Hz up to 30 Hz have been examined. The effect of chord-wise wing-stiffeners on wing deformation and lift generation has also been examined. The wing system was placed in a gust/shear tunnel to examine the effect of varying free-stream velocities on the wing deformations during steady and unsteady flight and its gust alleviation behavior.

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Date submitted: 04 Aug 2008

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