

Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

An Experimental Investigation on Flapping Flexible Membrane Wings HUI HU, Aerospace Engr. Dept., Iowa State University, GREGG ABATE, Air Force Research Laboratory, Elgin Air Force Base, ROBERTO ALBERTANI, Research & Engineering Education Facility, University of Florida — Thin and flexible membrane wings are unique to flying and gliding mammals, such as bats, flying squirrels and sugar gliders. These animals exhibit extraordinary flight capabilities with respect to maneuvering and agility that are not observed in other species of comparable size. In this study, comprehensive wind tunnel experiments are conducted to assess the effects of membrane flexibility (rigidity) on the aerodynamic performance of the flapping flexible membrane wings to quantify the benefits of using flexible membrane wings compared with conventional rigid wings for flapping-wing Micro-Air-Vehicle (MAV) applications. The present study is conducted from the viewpoint of aerospace engineers to try to leverage the unique feature of flexible membrane airfoils/wings found in bats and other flying/gliding mammals as an effective aerodynamic control method to explore the potential applications of such non-traditional, bio-inspired flexible membrane wings to flapping-wing MAVs to improve their flight agility and maneuverability.

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Date submitted: 28 Jul 2008

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