Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Impulse perturbation and recovery in a free flying insect[1] TYSON HEDRICK, JEREMY GREETER, University of North Carolina at Chapel Hill — Flying animals are renowned for their ability to recover from substantial perturbations due to environmental turbulence, contact with other objects, or other sources. These capabilities are due to the underlying aerodynamics of flapping flight (its open-loop properties) and feedback control based on the neurosensory inputs, the combination providing the animal's closed-loop response. Here we examine the sources of perturbation resistance and recovery in a flying insect by delivering a pitch impulse perturbation to hovering hawkmoths (*Manduca sexta*) while characterizing the response of the animal using high-speed stereo videography. The closed-loop neurosensory and open-loop aerodynamic components of the response were then separated by comparing the observed response dynamics of the animal to those predicted from a variety of open loop models and simulations of hawkmoths. We found that the moth's perturbation response was dominated by its open-loop aerodynamic properties, which include sufficient damping to rapidly slow the pitch perturbation. A slower sensory response helped bring the moth back to a level orientation.

[1]Funded by NSF IOS-0920358 to TL Hedrick

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Date submitted: 04 Aug 2011 Electronic form version 1.4