

Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Wing Flexion and Aerodynamics Performance of Insect Free Flights HAIBO DONG, Wright State University, ZONGXIAN LIANG, YAN REN, Wright State University, WRIGHT STATE UNIVERSITY TEAM — Wing flexion in flapping flight is a hallmark of insect flight. It is widely thought that wing flexibility and wing deformation would potentially provide new aerodynamic mechanisms of aerodynamic force productions over completely rigid wings. However, there are lack of literatures on studying fluid dynamics of freely flying insects due to the presence of complex shaped moving boundaries in the flow domain. In this work, a computational study of freely flying insects is being conducted. High resolution, high speed videos of freely flying dragonflies and damselflies is obtained and used as a basis for developing high fidelity geometrical models of the dragonfly body and wings. 3D surface reconstruction technologies are used to obtain wing topologies and kinematics. The wing motions are highly complex and a number of different strategies including singular vector decomposition of the wing kinematics are used to examine the various kinematical features and their impact on the wing performance. Simulations are carried out to examine the aerodynamic performance of all four wings and understand the wake structures of such wings.

Haibo Dong
Wright State University

Date submitted: 10 Aug 2010

Electronic form version 1.4