Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

A self-excited flapper from fluid-structure interaction OSCAR M. CURET, KENNETH S. BREUER, Brown University — The flexible nature of lifting and propulsive surfaces is a common characteristic of aquatic and aerial locomotion in animals. These surfaces may not only move actively, but also passively or with a combination of both. What is the nature of this passive movement? What is the role of this passive motion on force generation, efficiency and muscle control? Here, we present results using a simple wing model with two degrees of freedom designed to study passive flapping, and fluid-structure interaction. The wing is composed of a flat plate with a hinged trailing flap. The wing is cantilevered to the main body to enable a flapping motion with a well-defined natural frequency. We test the wing model in a wind tunnel. At low speed the wing is stationary. Above a critical velocity the trailing wing section starts to oscillate, generating an oscillating lift force on the wing. This oscillating lift force results on a self-excited flapping motion of the wing. We measure the kinematics and the forces generated by the wing as a function of flow velocity and stiffness of the cantilever. Comparisons with aeroelasticity theory will be presented as well as details of the fluid-structure interactions.

Oscar M. Curet
Brown University

Date submitted: 06 Aug 2010 Electronic form version 1.4