

Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Aerodynamic performance of membrane wings with adaptive compliance OSCAR M. CURET, ALEXANDER CARRERE, ARJUN PANDE, KENNETH S. BREUER, Brown University — Some flying animals use wing membranes with adaptive compliance to control their aerodynamic performance. In this work we characterize the mechanical properties and aerodynamic performance of a low aspect ratio membrane wing composed of a dielectric film supported on a rigid frame. We test the wing model in a wind tunnel. When a fixed voltage is applied across the wing membrane the camber increases, accompanied by a small increase in lift (less than 2%). However, lift is significantly increased when the wing is forced with an oscillating field at specific frequencies that correspond to the characteristic vortex shedding frequency. We present the results concerning the kinematics and aerodynamic performance of the adaptive wing membrane and the coupling between the vortex shedding and the forced modulation of elastic modulus.

Oscar M. Curet
Brown University

Date submitted: 06 Aug 2012

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