Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Vortex shedding interactions with an oscillating flat plate[1]
ARNOLD SONG, KENNETH BREUER, Brown University — We present results from a model system designed to study the interactions between vortex shedding and structural compliance, as might be exhibited in systems as diverse as flying animals with compliant wings or traffic signs subject to hurricane-force winds. A sharp-edged plate is mounted at high angle of attack such that vortex shedding from the leading and trailing edges results in fluctuations of the aerodynamic forces. In its open-loop mode of operation, the angle of the plate is oscillated in a controlled sinusoidal manner, and the aerodynamic forces and vortex characteristics are measured using a torque sensor at the root of the support rod and a hot wire located in the wake. The onset of hysteresis in the aerodynamic forces generated during the pitching cycle is documented as a function of mean and fluctuating angles. In its closed-loop mode, the angle of the plate becomes a function of the aerodynamic forces such that an arbitrary virtual stiffness and damping can be proscribed. These different modes of operation, generated by the interactions between the fluid and structural forces are presented and discussed.

[1]Supported by AFOSR - bioinspired flight program

Arnold Song
Brown University

Date submitted: 05 Aug 2009 Electronic form version 1.4