Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Manipulation of Leading-Edge Vortex Evolution by Applied Suction[1] JAMES BUCHHOLZ, JAMES AKKALA, The University of Iowa — The generation and shedding of vortices from unsteady maneuvering bodies can be characterized within a framework of vorticity transport, accounting for the effects of multiple sources and sinks of vorticity on the overall circulation of the vortex system. On a maneuvering wing, the diffusive flux of secondary vorticity from the surface is a critical contributor to the strength and dynamics of the leading-edge vortex, suggesting that flow control strategies targeting the manipulation of the secondary vorticity flux and the secondary vortex may provide an effective means of manipulating vortex development. Suction has been applied in the vicinity of the secondary vortex during the downstroke of a periodically-plunging flat-plate airfoil, and the flow evolution and aerodynamic loads are compared to the baseline case in which suction is not applied. Observation of the resulting surface pressure distribution and flow evolution suggest that the secondary flux of vorticity and the evolution of the flow field can be altered subject to appropriate position of the suction ports relative to the developing vortex structures, and at a specific temporal window in the development of the vortex.

[1]This work was supported by the Air Force Office of Scientific Research, grant number FA9550-16-1-0107 and NSF EPSCoR grant number EPS1101284.

James Buchholz
The University of Iowa

Date submitted: 31 Jul 2016 Electronic form version 1.4