Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Xwing: A 3D Viscous Design Tool for MAVs DON GIPE, KAMRAN MOHSENI, University of Colorado at Boulder — Characterizing the 3D effects of low Reynolds number flow over low aspect ratio wings is computationally expensive using the full Navier-Stokes Equations. Recently, the use of Micro Aerial Vehicles as a tool for both scientific and military applications has grown leading to a diverse range of applications as well as designs. This development has created the need for a less computationally expensive approach for design of Micro Aerial Vehicles (MAVs). Xwing is a design tool for rapid calculation of aerodynamic forces of MAVs. Xwing uses an invisid solver to compensate for the effect of tip vortices over a low aspect ratio wing. A potential flow – boundary layer matching technique was used at each 2D cross section using this effective angle of attack. The calculated displacement thickness at each cross section was used to obtain a new effective airfoil at each section. This iterative process could continue until convergence is achieved. The validity of the technique was tested in several cases including tapered, twisted, and swept wings at both low and high Reynolds number flows.

Don Gipe
University of Colorado at Boulder

Date submitted: 06 Aug 2010 Electronic form version 1.4