Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Leading Edge Vortex Detection Using On-Body Pressure Sensing JEFF DUSEK, JASON DAHL, MICHAEL TRIANTAFYLLOU, Massachusetts Institute of Technology, CENTER FOR ENVIRONMENTAL SENSING AN MODELING COLLABORATION — Ongoing experiments within the Center for Environmental Sensing and Modeling (CENSAM) have shown that the low pressure region characteristic of a vortex allows for their detection and tracking using pressure sensors alone. While early experiments were conducted with wall mounted pressure sensors and externally generated vortices, a new series of experiments has succeeded in detecting separated flow generated by the sensing body. A combined pressure sensing and particle image velocimetry (PIV) approach was used to detect the leading edge vortex shed from a hydrofoil accelerated at a fixed angle of attack. A NACA 0018 foil was instrumented with four pressure sensors at discrete locations along the foil in the chord-wise direction. When accelerated from rest, the traces from each of the four pressure sensors displayed a distinctive, transient drop, consistent with results observed in previous experiments. From the pressure sensor results, it was theorized that a leading edge vortex was being created, and subsequently shed and convected along the foil chord. Two-dimensional PIV techniques were used to image the flow near the foil surface, allowing the anticipated vortex formation and shedding to be verified.

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Date submitted: 07 Aug 2010 Electronic form version 1.4