Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

The Flow Field on Hydrofoils with Leading Edge Protuberances[1]
DERRICK CUSTODIO, Worcester Polytechnic Institute (WPI), CHARLES HENOCH, Naval Undersea Warfare Center (NUWC), Newport, RI, HAMID JOHARI, California State University, Northridge, OFFICE OF NAVAL RESEARCH COLLABORATION — The exceptional mobility of the humpback whale has been linked to the use of its unique pectoral flippers. Biologists speculate that the flippers leading edge protuberances are a form of passive flow control. Force measurements on 2D hydrofoils with spanwise uniform leading edge protuberances, resembling those seen on the humpback whale flipper, were taken in a water tunnel and have revealed performance modifications when compared to a baseline NACA 63(4)-021 hydrofoil model. Qualitative flow visualization techniques and Particle Image Velocimetry (PIV) flow field measurements on the modified hydrofoils have shown that streamwise vortices originating from the shoulders of the protuberances are the likely cause of performance changes. Varying levels of interaction among adjacent streamwise vortices have been observed as a function of angle of attack and chord location. The circulation of these vortices as a function of angle of attack and spatial location was measured and an analysis of the vortex interactions will be presented.

[1]University Laboratory Initiative (ULI)

Derrick Custodio
Worcester Polytechnic Institute

Date submitted: 07 Aug 2009 Electronic form version 1.4