

Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Tip vortex cavitation suppression via mass injection HARISH GANESH, University of Michigan, Ann Arbor, NATASHA CHANG, RYO YAKUSHIJI, STEVEN CECCIO, University of Michigan, Ann Arbor — Tip vortex cavitation (TVC) suppression by mass injection in the core of the vortex was studied with an elliptical plan-form hydrofoil NACA-66 modified in a re-circulating water tunnel of known nuclei distribution. The chord based Re was $O(10^6)$ for all experiments. Water and Polyox WSR 301 solution for a range of concentrations (10 to 500ppm) and relative flow rates (Q_{jet} / Q_{core} of 0.033 to 0.27) were injected. Also, different injection port size and angle of attack were studied. It was found that the TVC suppression effect was different for inception and desinence. The baseline (no injection) inception cavitation number was more than the average negative pressure coefficient, $-C_p$ of the vortex, while mass addition reduced the inception cavitation number to approximately the $-C_p$ value. TVC desinence for the baseline case was found to match the estimated $-C_p$ value and polymer injection provided some cavitation suppression. Flow measurements were made to understand the underlying physics of TVC. The mechanisms and scalability that lead to TVC suppression by mass injection are discussed.

Harish Ganesh
University of Michigan, Ann Arbor

Date submitted: 08 Aug 2009

Electronic form version 1.4