Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Cavitation in hydrofoils at large angle of attack[1] KARTIKEYA MAHALATKAR, KARMAN GHIA, URMILA GHIA, University of Cincinnati — Hydrofoils are used in surface and underwater applications to develop large lift for maneuvering, stabilization, etc. They often experience cavitation at high-Reynolds number Re ($> 20\text{x}10^6$) and large angles of attack α (up to 25°), and this results in periodic loss of lift. Prediction of the dynamics of these lift fluctuations requires accurate simulation of the flow physics of cavitation. Most experimental or numerical studies presently available have been carried out for Re $< 5\text{x}10^6$ and at $\alpha <$ 10°. A 2-D cavitating flow over a NACA0015 hydrofoil is simulated numerically, for α and Re varying from 0-28 degrees and $5\text{x}10^6$-$45\text{x}10^6$, respectively. The Fluent solver, with a second-order accurate scheme, is used for the analysis. A validation study is carried out at $\alpha = 8°$, and showed good agreement with existing numerical and experimental studies. The final presentation will include detailed analysis of dynamics of lift variation, frequency of shedding of cavitation clouds, and the cavity vortex formation and its effect on lift.

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Date submitted: 15 Aug 2005 Electronic form version 1.4