Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Accuracy In Numerical Prediction Of Cavity Length and Vapor Cloud Shedding Frequency Of Cavitating Flows Over Various Geometries. ARVIND JAYAPRAKASH, KATHIKEYA MAHALATKAR, University of Cincinnati — Standard two-equation turbulence models have been found to be incapable of predicting cavitating flow due to high compressibility in the vapor region. In order to predict the dynamics of vapor cloud shedding, Courtier-Delgosha (J. of Fluid Eng, 125, 2003) suggested a modification for the eddy viscosity for k-epsilon turbulence model. Though the modification works in capturing the dynamic behavior of cavitation sheet, the accuracy of cavity length and frequency is not achieved for a wide range of cavitation numbers. This is due to the complex flow features present during a cavitating flow and the incapability of Couitier-Delgosh's turbulence modification to account for these factors. A tuning factor is introduced in the turbulence modification of Coutier-Delgosha, which can be adjusted for different types of geometries. This modified form is then tuned and tested on prediction of cavitating flow over several geometries including NACA 0015 hydrofoil, Convergent-Divergent Nozzle, and Wedge. Good comparisons for both cavity length and frequency of vapor cloud shedding were obtained for wide range of cavitation numbers in all the geometries. The commercial CFD software Fluent has been used for this analysis. Comparisons of cavity length and vapor cloud shedding frequency as predicted by the present turbulence modification and those observed in experimental studies will be presented.

Arvind Jayaprakash
University of Cincinnati

Date submitted: 07 Aug 2006 Electronic form version 1.4