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**An Assessment of Supercavitation Transition using Computational Fluid Dynamics** MELISSA FRONZEO, MICHAEL KINZEL, Penn State ARL — A computational fluid dynamics approach is used to improve the understanding of supercavitation and its physical characteristics. A ventilated disk cavitator is used in several studies to evaluate these physics. The first study focuses on twin vortex cavities, specifically to understand correlation between cavity shape and pressure. The study uses validated measurements (in the CFD model) of the cavity shape and pressure for various ventilation rates and Fr numbers. The data is used to evaluate the semi-empirical formula of L.A Epstein, where results indicate a potentially improved correlation. In addition, the detailed measurements of the CFD model yield insight on improved experimental measurement techniques for cavity pressure. The second study uses unsteady detached eddy simulations (DES) to predict hysteresis in the transition behavior of the cavity closure from toroidal vortex to twin-vortex regimes. The solution is initialized as a toroidal-type cavity (low gas ventilation rate), then the ventilation rate is slowly increased until a twin-vortex cavity is formed. In addition, the opposite process is also performed. The data is analyzed to develop an understanding of the unknown physical mechanisms involved in the transition process.

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