Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Partial Cavity Drag Reduction SIMO MAKIHARJU, KEARY LAY, RYO YAKUSHIJI, MARC PERLIN, STEVEN CECCIO, University of Michigan — The notion of using air to reduce a ship's frictional drag dates back to the 19^{th} century. Bubbles, air layers and air filled cavities have been proposed, but there has been little systematic research published. To address this, partial cavity drag reduction experiments were carried out at the W. B. Morgan Large Cavitation Channel. The partial cavity was investigated at Reynolds numbers to 70 million and stable cavities with frictional drag reduction of more than 95% were attained. The model used was a 3 m wide and 12 m long flat plate with a plenum on the bottom. The design of the cavity was based on both linear gravity wave theory and two-dimensional inviscid numerical calculations. To create the partial cavity, air was injected at the base of an 18 cm backwards facing step 1.5 m from the nose of the plate. Frictional loads, free stream speed, air flow and cavity pressures were measured over a range of flow speeds and air fluxes. High speed video was used to investigate the unsteady three dimensional cavity closure. Cloud shedding, similar to sheet-cloud cavitation shedding with natural cavitation on hydrofoils, was observed at the closure.

Simo Makiharju
University of Michigan

Date submitted: 01 Aug 2008 Electronic form version 1.4