

Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Mitigation of Helical Vortex Separation of a 5:1 Prolate Spheroid at an Angle of Attack JAMES SCHULMEISTER, MICHAEL TRIANTAFYLLOU, MIT — Ocean and air vehicle maneuvering performance is determined by the balance between a vehicle's capacity to exert large lateral forces and its fluid dynamic resistance. The flow past a 5:1 prolate spheroid at an angle of attack is representative of many maneuvering hull forms where cross-flow separation creates helical vortices that dramatically increase drag during maneuvers. We investigate a shape modification to a 5:1 prolate spheroid that streamlines the spheroid in the cross-flow direction in order to mitigate vortex separation. We conduct a series of experiments with models towed at angles of attack between 5 and 30 degrees at a Reynolds number by length equal to 100,000. Reconstructions of the helical vortex separation from cross-flow particle image velocimetry measurements show that modest streamlining significantly reduces the size and circulation of separated vortices, indicating drag reduction.

James Schulmeister
MIT

Date submitted: 01 Aug 2015

Electronic form version 1.4