

Abstract Submitted  
for the DFD14 Meeting of  
The American Physical Society

**Asymmetries in the high Reynolds number wake of a submarine model in pitch** ANAND ASHOK, TYLER VAN BUREN, Princeton University, ALEXANDER SMITS, Princeton University and Monash University — Experiments are reported in the wake of a submarine model (DARPA SUBOFF) over a wide range of Reynolds numbers based on the length  $Re_L$  between  $10^5$  and  $30 \times 10^6$  at a pitch angle of 8 degrees. Two-component velocity measurements were taken at five cross-stream planes, downstream of the stern of the model ( $2 < x/D < 14$ ), using hot wire anemometry. The wake is distinguished by two principal vortex structures, but the strength of the two vortices are not equal, leading to an asymmetric wake that slowly rotates. The asymmetry appears to be endemic, and is not affected by freestream turbulence, changes in tripping, surface roughness, and small angles of yaw. They persist across all the Reynolds numbers measured, and the effects of Reynolds number are only important at low Reynolds number in that the wake becomes independent of Reynolds number when  $Re_L \geq 4.8 \times 10^6$ . This work was supported under ONR Grant N00014-13-1-0174 (Ron Joslin).

Anand Ashok  
Princeton University

Date submitted: 31 Jul 2014

Electronic form version 1.4