Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

High-performance sailboat hydrofoil optimization using vortex lattice methods, and the effects of free-stream turbulence GIANLUCA MENEGHELLO, MIT, POORIYA BEYHAGHI, THOMAS BEWLEY, UCSD — The identification of an optimized hydrofoil shape depends on an accurate characterization of both its geometry and the incoming, turbulent, free-stream flow. We analyze this dependence using the computationally inexpensive vortex lattice model implemented in AVL, coupled with the recently developed global, derivative-free optimization algorithm implemented in $\Delta - DOGS$. Particular attention will be given to the effect of the free-stream turbulence level — as modeled by a change in the viscous drag coefficients — on the optimized values of the parameters describing the three dimensional shape of the foil. Because the simplicity of AVL, when contrasted with more complex and computationally expensive LES or RANS models, may cast doubts on its usefulness, its validity and limitations will be discussed by comparison with water tank measurement, and again taking into account the effect of the uncertainty in the free-stream characterization.

Gianluca Meneghello
MIT

Date submitted: 01 Aug 2016 Electronic form version 1.4