Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

The leading-edge vortex of yacht sails[1] ABEL ARREDONDO-GALEANA, IGNAZIO MARIA VIOLA, Institute for Energy Systems, School of Engineering, University of Edinburgh — We experimentally show, for the first time, that a stable Leading-Edge Vortex (LEV) can be formed on an asymmetric spinnaker, which is a high-lift sail used by yachts to sail downwind. We tested a 3D printed rigid sail in a water flume at a chord-based Reynolds number of ca. 10^4. We found that on the leeward side of the sail (the suction side), the flow separates at the leading edge reattaching further downstream and forming a stable LEV. The LEV grows in diameter from the root to the tip of the sail, where it merges with the tip vortex. We detected the LEV using the γ criterion, and we verified its stability over time. The lift contribution provided by the LEV was computed solving a complex potential model of each sail section. This analysis indicated that the LEV provides a substantial contribution to the total sail's lift. These findings suggest that the maximum lift of low-aspect-ratio wings with a sharp leading edge, such as spinnakers, can be enhanced by promoting a stable LEV.

[1]This work was funded by the Consejo Nacional de Ciencia y Tecnologia (CONACYT)

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Date submitted: 04 Aug 2017 Electronic form version 1.4