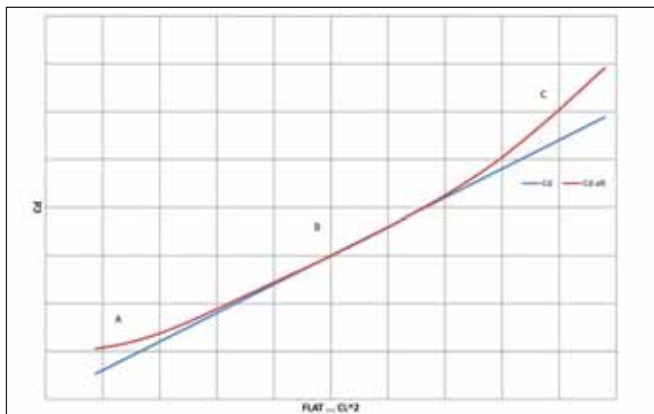


## Marching on into 2014

The tremendous success of the 2013 season – a 15 per cent increase in certificates worldwide and close racing at well-attended events – has not stopped the ITC from continuing to explore ways to improve the rating system for the 2014 season. Meanwhile, the fact that no major concerns were raised about the VPP has helped give validation for the new hydro model introduced at this time last year. Ongoing research on the aero model (at the wind tunnel in Milan and using CFD with the OpenFOAM code at the Wolfson Unit) continues in parallel with a few other areas of improvement to be implemented next year into the VPP.

### Headsails

One of the main new features of the ORC rating system is the new definition of headsails, which is now fully in line with the ISAF Equipment Rules of Sailing (ERS) and RRS: any sails with a ratio of mid-girth over foot-length below 75% will now be considered a headsail, without any limit to the roach, whether or not there are battens, and if the sail is set flying or in a luff groove.



ORC lift-drag aero model: blue is theoretical, red is with real sails

All headsails will now have the same measurements as jibs (ie with LPG, JL, JH, JGT, JGU, JGM and JGL).

The VPP is therefore now set up to handle all of the following types of headsails:

- Non-overlapping jibs – luffed headsails with  $LPG < 110\%$  of J, with and without battens, with and without roach (no modifications from the 2013 VPP).
- Genoas or overlapping jibs – luffed headsails with  $LPG > 110\%$  of J, without battens, with and without roach (no modifications from the 2013 VPP). The big difference from last year is the possibility of having positive roach in overlapping sails.
- Genoas or overlapping jibs – luffed headsails with  $LPG > 110\%$  of J, with battens, with and without roach (a new set of aero coefficients will take into account the increased efficiency due to the battens).
- Headsails set flying with and without roach, without battens (no modifications regarding so-called Code 0 sails but now with the possibility of having roach below the previous 55% limit.)
- Headsails set flying with and without roach, with battens (a new set of aero coefficients will take into account the increased efficiency due to the battens and that there is the possibility of having roach below the previous 55% limit).

So there are no differences for existing sails, but the VPP will model the increase in performance for battened headsails (except for non-overlapping jibs) and the extension of possible roach for Code 0s below 55% mid-girth.

### CFD study

ITC research has been taking place using the CFD Virtual Wind Tunnel set up by the Wolfson Unit using the OpenFOAM code,

running on the University of Southampton's IRIDIS 3 high-performance computer and co-ordinated by Andy Cloughton. Jason Ker provided a range of flying shapes for this study, comparing these with existing wind tunnel data to try to develop a new sail depowering methodology.

The current aero model describes lift ( $C_l$ ) versus drag ( $C_d$ ), as shown on the graph to the left. The straight line is theoretical while in reality sails will fall on the curve described in red.

- Region A is where easing the sails for maximum depowering in strong winds creates extra drag.
- Region B is where the VPP has a simple linear fit that works fine.
- Region C is where the sails are tightly trimmed in light air to get maximum drive at the expense of extra drag.

This serves to better understand the interplay between induced drag and centre of effort height so that the current sail depowering scheme can be improved to take into account how boats with different sail area/rig height to righting moment ratios depower themselves in different ways.

### Other important VPP changes

- The default rig weight for carbon masts is now slightly higher, based on higher modulus carbon used in modern spars. This will only affect boats with an unweighed carbon mast.
- The matrix of time allowances used in the Offshore Single Number rating has changed to reflect a more realistic variation of wind speed with wind angle in offshore races.
- The Dacron cloth allowance used in ORC Club now also extends to ORCi certificates.
- Limits and restrictions on equipment and materials were changed to be consistent with other class rules and ISAF. Accordingly, mast jack pumps are now allowed onboard although not allowed for use while racing, and use of titanium or carbon in stanchions and pulpits is also now allowed.
- Further refinement of the new hydrodynamic model, introduced last year.
- Ratings can now be calculated for boats with double keels with bulbs.
- Ratings can now be calculated for boats with canting keels together with water ballast.
- The canting keel with double canard has been revised to better take into account the maximum draft at each heel angle.
- The aerodynamic model for masthead spinnakers was improved based on new wind tunnel data, with the maximum heel formulation also reduced while under spinnaker.
- A new shaft/propeller configuration for short shafts has been introduced.

### 2014 research agenda

- a) LPP rewritten to a more advanced language, with new features, 3D hull files converter etc
- b) Added resistance in waves
- c) Fine-tuning of Residuary Resistance formulation
- d) Transom drag revision
- e) The effect of crew weight trim moment on performance
- f) Evaluation of dynamic wetted area
- g) Revision of the default Righting Moment
- h) Revision of the downwind aero model after wind tunnel tests
- i) Further improvement of the new depowering scheme for the upwind aero model, as described above. We would also like to work further on the reefed sail conditions
- j) Examination of the effect of sail stacking on the windward side in the event that this is made legal for offshore sailing.

We look forward with confidence to another great year in 2014!

*Alessandro Nazareth, ITC chairman*

