ORC

Chipping away

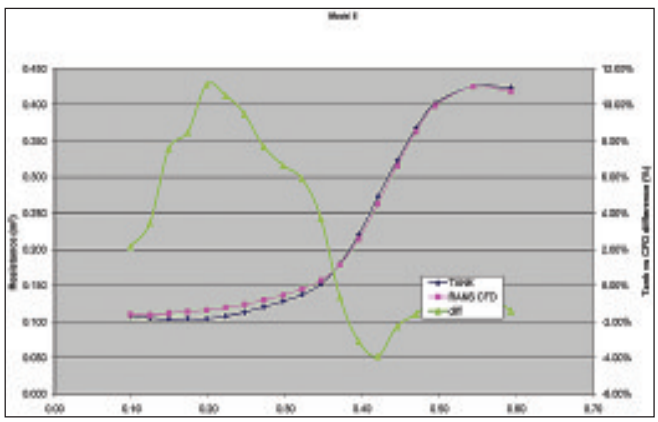
The ITC met in Annapolis following the 2011 Chesapeake Sailing Yacht Symposium. This meeting was fundamental to planning the ITC agenda for the next 12 months and addressed the following primary topics.

Extreme trim

The committee examined a trend among a small number of owners to trim their boats aft for ORC measurement. This happens mainly in small boats where the crew weight is great compared to DSPL (and static trim can thus be easily reversed when sailing). To bring an end to this exploitation a new formulation will be implemented to 'virtually' optimise the crew's position.

Appendages

In 2010 the introduction of the new Offset Editor allowed separate measurement of appendages from the canoe body. This procedure is important when boats change keels and other appendages as it reduces the need to remeasure the whole



Residuary resistance compared using CFD (in pink) and the Delft testing tank – the green line highlights the percentage variation

boat. A new procedure that will interpolate stations to rebuild a correct Offset File will be introduced into the Offset Editor to allow measurers to scan appendages with independent stations – or even using horizontal waterplanes.

IMS – a global measurement tool

The powerful ORC LPP code is already returning a lot of valuable information about boat parameters. Taking into account the measurement trim and the inventory list (that is now included in the single boat file and contains the weights and CGs of anchors, chain, tools, batteries, deck hardware, sheets and so on onboard during measurement), it will now be possible to derive a lot of certified data useful for obtaining certificates under other handicap systems such as IRC, ORR and so on. This measurement tool will be developed further during 2011.

LPP as a standalone hydrostatic code

The LPP is now run together with the VPP as a single code. As the LPP can be useful not only as a global measurement tool (see above) but also as a hydrostatic code, during 2011 the ORC programmer will develop it as a standalone code able to provide full output data for a wide variety of applications.

(New) Offshore Handicap

Over the next 12 months the ITC will study a new Offshore Single Number Handicap based on different courses and wind speeds. Currently the GPH (General Purpose Handicap) is used (an average of Circular Random 8 and 12) but it remains too dependent on reaching conditions. The new Offshore Handicap will be more relevant to courses currently used for offshore races.

Spinnaker shape

In the 2011 VPP the spinnaker shape function was introduced to gradually reduce rated area below 12kt TWS in the ratio Reference Area/Measured Area (removing typeforming of small spinnakers). The ITC has now approved an immediate slight revision of the reference area calculation based on the following formulations (based only on foretriangle dimensions):

$SL_{ref} = ASL_{ref} = 0.95*(ISP^2+J^2)^{1/2}$
$SMG_{ref} = SF_{ref} = 1.8*J$
$AMG_{ref} = ASF_{ref} = 1.8*J$

Delft testing

- The three new light (high LVR) models built in 2010 have now been retested with trim moment applied.
- The two latest light models will be tested upright with the truncated transom at the same overhang as the baseline TP52.
- More models (only those with up-to-date shapes) will be tested heeled to increase the ITC's heeled-drag database.
- New model results recently generated at Delft will shortly be made available to augment the ORC tank test database.
- Most models have been retested at higher Fns (up to 0.75).

Following these tests the ITC will have a much wider matrix of upright and heeled results, key to refining residuary resistance.

Residuary resistance

Feedback from the racecourse has been positive and the ITC is confident the ORC VPP is now at a good level, hence a decision was made to review Residuary Resistance on a biannual basis going forward. The use of CFD to increase the matrix of tank test results was also discussed. Non-linear Free Surface Panel or RANS Free Surface with Structured Mesh methods could be used (subject to cost and available expertise). However, a standard process for such computation should be defined taking account that:

- Panel methods compute only wave resistance (no viscous drag, no form factor).
- RANS computes a total resistance that can only be split into tangential force and pressure force.

Hence further analysis will be needed to compare tank-measured residuary resistance with CFD results. In the graph (*left*) an example of CFD validation test for a model is shown. Generally CFD returns higher resistance than the tank at low speed (fn<0.3) – the green line represents the percentage of difference.

RANS CFD vs tank test

A working group on Residuary Resistance, led by Andy Claughton with Kay Enno Brink and Davide Battistin (the ORC programmer), was appointed. The first task is to thoroughly re-analyse the Delft Systematic Series. The polynomial used to compute RR is now well known but it should be noted that:

1. This polynomial has been used in the VPP since 1999.
2. It is related to tank test data created without trimming moment applied.
3. The hull lines used feature wide station spacing, introducing a systematic error in the regression due to lack of precision in LPP calculations for model parameters.
4. Almost the whole Delft database has since been updated.
5. In 2007 a resistance corrector for light boats (SBF) was introduced to provide more equitable prediction for such boats in the Froude range Fn 0.225-0.375.
6. In 2009 the immersed transom resistance was first taken into account and introduced in the VPP; RR should be re-scaled to take into account this component of frictional resistance.

In the meantime, the ITC will continue to look into how the RR model can be improved given it must remain a coefficient-based Froude number dependent formula.

Alessandro Nazareth, ITC chairman ❑