INTERNATIONAL TECHNICAL COMMITTEE

Meeting
Friday 22nd October 2021 via Zoom

Present: Andy Claughton (GBR - Chairman), Alessandro Nazareth (ITA – Deputy Chairman)
Nicola Sironi (ITA - ORC Deputy Chief Measurer), Antoine Cardin (FRA),
Robert Ranzenbach (USA), Matteo Polli (ITA),), Manolo Ruiz de Elvira (ESP)
Zoran Grubisa (CRO - ORC Chief Measurer), David Lyons (AUS)
Panayotis Papapostolou (GRE-ORC Programmer), Jason Ker (GBR)
Davide Battistin (ITA-ORC Programmer),

Apologies: Apologies for absence were received from Research Associate Lex Keuning

Registered Observers:

Jay Tyson	USA	Eiji Mizukoshi	JPN
Karl-Hannes Tagu	EST	Robert Jacobsen	GER
Arend Van Bergeijk	NED	Philipp Luke	NED
Edward Cesare	USA	Willem Ellemeet	NED
Larry Fox	USA	Johan Tuvstedt	SWE
Zacharias Dantsios	GRE	Ab Pasman	NED
Arthur Peltzer	NED	Fabrizio Pirina	ITA
Michael Quist	DEN	Marcus Mauleverer	UK

Minutes.

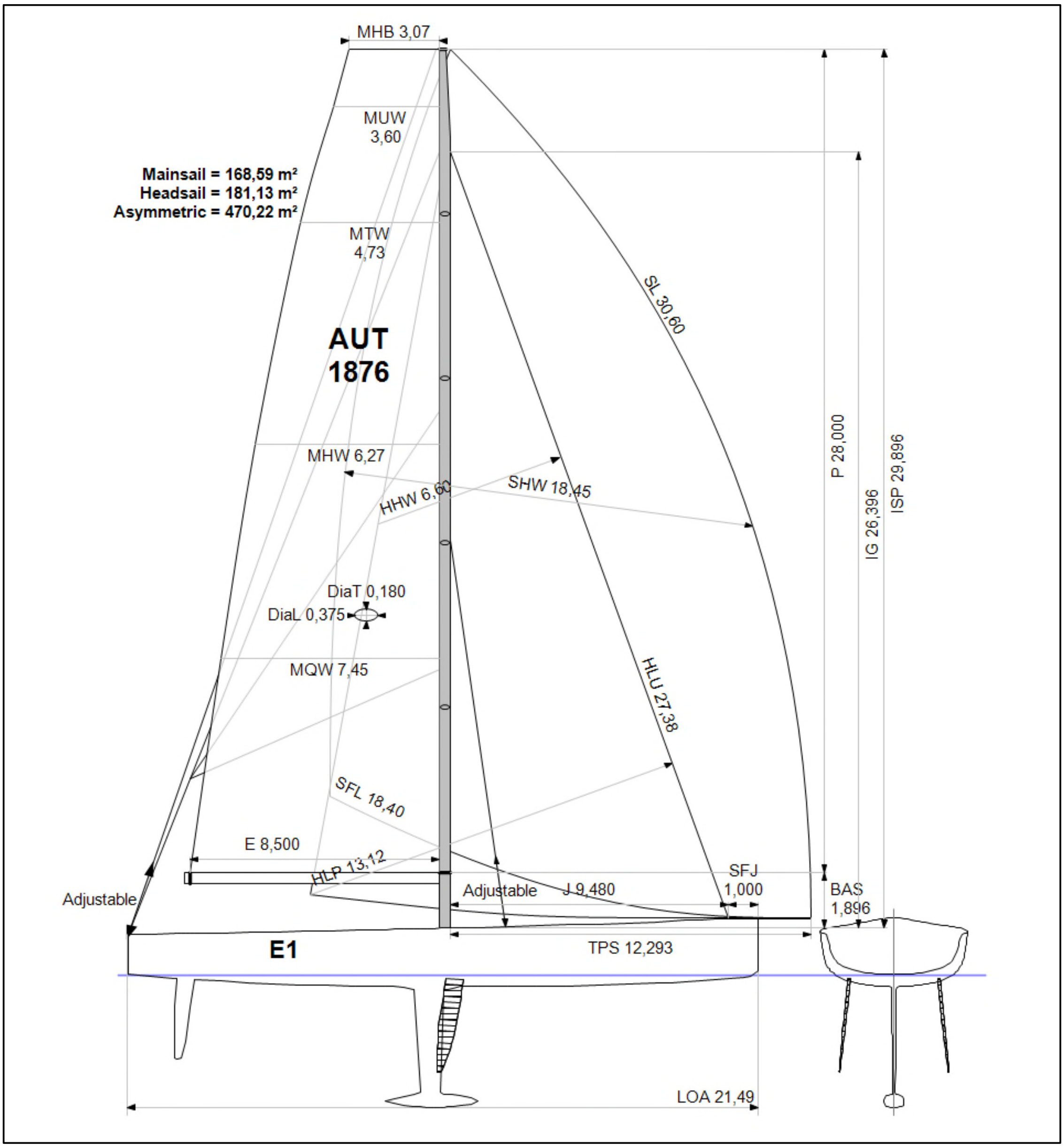
1 2022 Certificate.

The 2022 Certificate will present the All-Purpose Handicap alongside the traditional GPH. The ITC believes that the APH offers a more reliable single number comparator of all round boat performance.

The certificate page one cartoon has been developed to present more graphical information about the hull and sail plan. This is necessary to help the visualization of the multiple headsails set on different hoist and tack points, superstructure geometry and appendage configuration. The driver for these developments was the handling of the new multihull fleet, but there are benefits for rating officers, race managers and competitors in presenting more graphical information which can be assessed more quickly than tables of numbers.

From the outset the ORCmh (multihull) certificate has shown the silhouette of the hulls and appendages in the side and front view. This approach will be adopted for monohull foiling yachts on an experimental basis in 2022. Due to the designers concerns about having accurate underwater geometry displayed on the certificate the conventional ORCi certificate cartoon will remain in its current form.

Figure 1-1 2022 Certificate Cartoon showing underwater parts.



2 VPP &LPP development

2.1 <u>ORCi MkII</u>

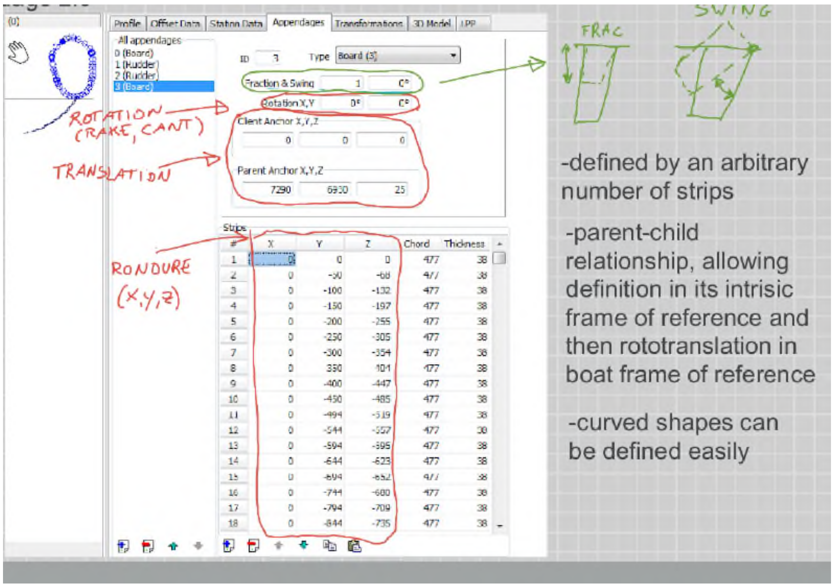
Over the last 5 years the ORC programmer Davide Battistin has been working to bring the VPP and LPP code up to date in terms of coding style. This has moved 100,000 lines of Fortran code into a new framework, putting the force model algorithms into logic containers and updating the nomenclature into a consistent framework. This now means the code is easier to maintain, quicker to run, and intelligible to a competent programmer.

This work is now complete, and the 2022 handicaps will be calculated using the MkII code.

2.2 <u>LPP and Offset 2.0</u>

As part of the MkII updating the capabilities of the LPP have been extended to calculate hydrostatics at a reduced displacement, in preparation for the foiling cases where part (or all) of the weight of the boat is supported by the foil and not buoyancy. The LPP can also be used as a stand-alone analysis tool.

With the appearance of foil supported yachts the number and type of appendages has increased. The current LPP approach of defining everything as vertical cross sections is not well suited to appendages that are away from the centreline, not set in the centre plane of the hull, and that can be retracted or rotated. Appendages of this type, centreboards, daggerboards, double rudders, DSS foils etc. will now be defined in the OFFset 2.0 method. This defines the appendage in its most convenient local co-ordinate system of three orthogonal axes. It defines the rondure (locus of the leading edge), together with the local chord length and thickness. This geometry definition is then mated to the hull offsets at a specified position in the hull coordinate system, and the extent of available extension and rotation defined in the LPP.



3 Proposed VPP changes for 2022.

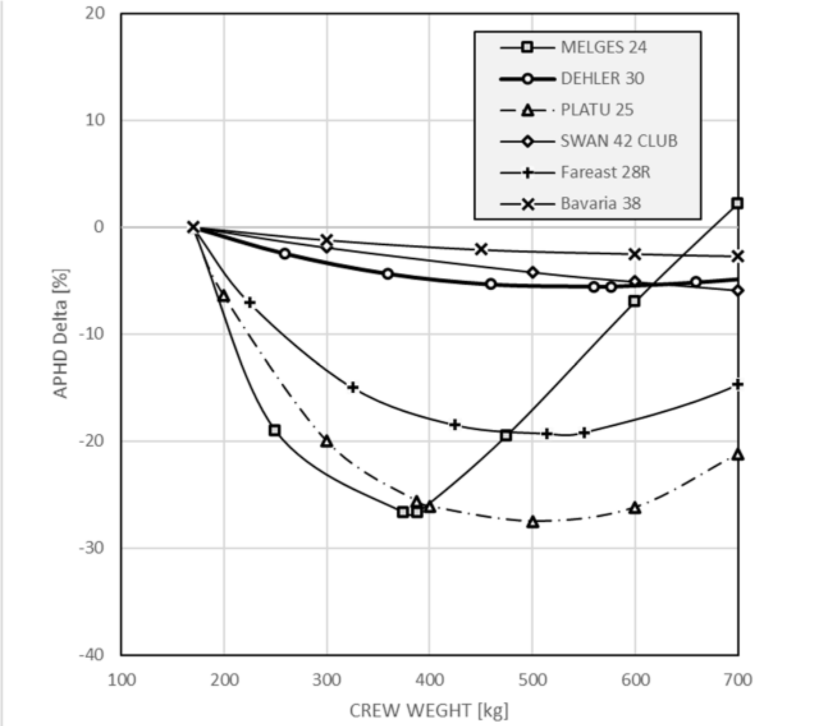
The ITC proposes the following changes to the VPP in response to items on the committee's research agenda, and proposals from the ITC observers.

3.1 Declared and Default crew weight (CW)

The current VPP uses the Declared CW to increase the crew righting moment, but the sailing displacement is computed using the Default crew weight.

$$CW = 25.8 \cdot LSM0^{1.4262}$$

For 2022 the Declared CW will be used to calculate the crew righting moment and the sailing displacement. This has a further benefit in that the Stability Index will now be calculated for the sailing condition. This new approach has been evaluated, and the Double Handed All Purpose handicaps show greater sec/m than those for a fully crewed yacht. A soft limit that will be included in the VPP so that a DECLARED CREW WEIGHT above 20% of DEFAULT will be treated as CW=1.2*DEFAULT CW, to avoid any exploitation in light wind races if declaring very heavy crew weights.



3.2 Minimum Jib

The VPP will no longer require a "minimum jib sail area" to complete its calculations.

3.3 Cat Rig yachts.

A new scheme to measure the sails of Cat rigged mainsails has been prepared. This allows the calculation of a rated sail area for these boats which are characterised by unstayed masts and a sprit or wishbone boom. The VPP can now provide scoring polars for single and twin masted cat rig boats. Sailing without a jib is not something that was envisaged when the IMS VPP was first written. The sail force coefficients, although defined separately as a jib and mainsail combine together to give a good answer for conventional sloops. However there is no guarantee that the current mainsail coefficients used individually are as good as they can be. During 2022 the ITC will conduct research on a set of mainsail in isolation coefficients and review the situation.

3.4 PIPA for electric drive and hydro-generation units.

Yachts are now appearing in the ORC fleet that have electric propulsion pods and permanently deployed hydro-generators. The measurement scheme and calculation for PIPA will be updated to include these installations. The calculated resistance for a hydro-generator will not be sensitive to the power being extracted from the impeller.

3.5 Whisker pole set to leeward sail force coefficients.

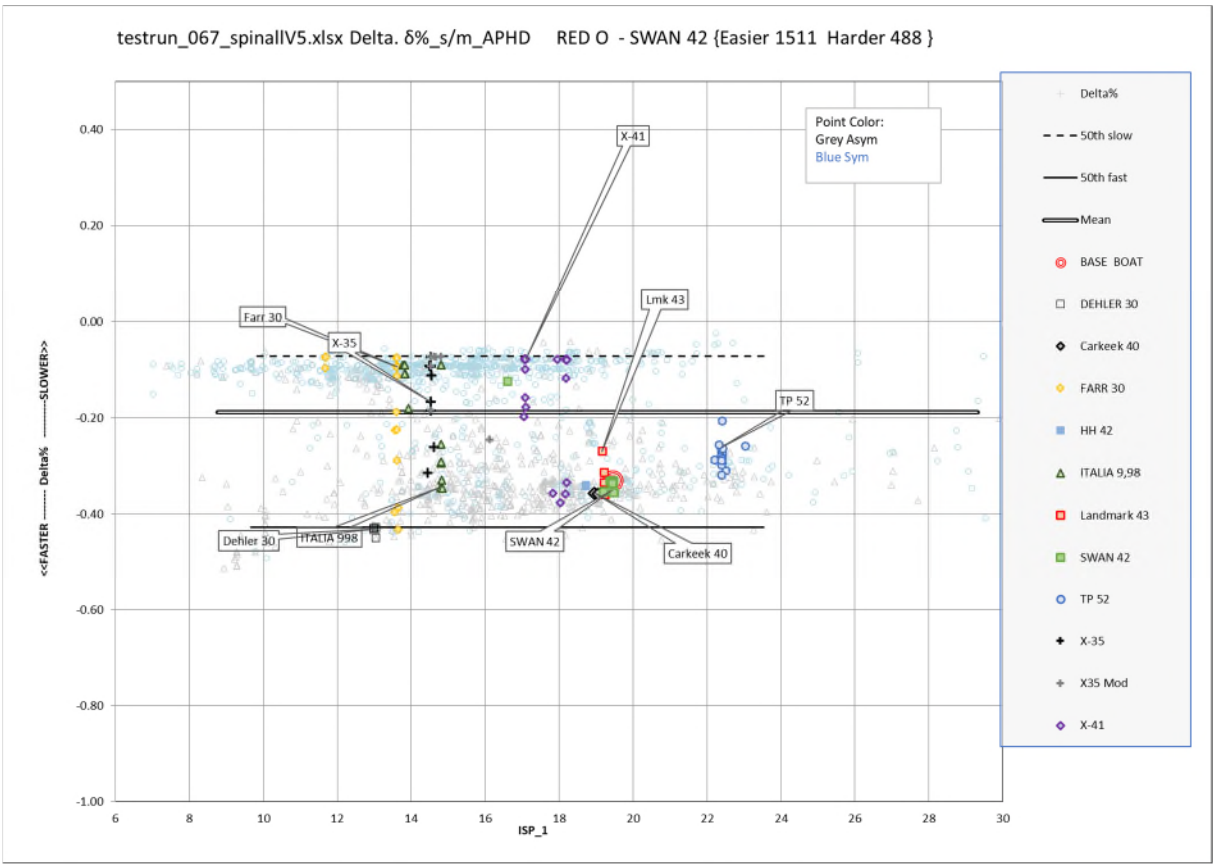
The use of a whisker pole deployed to leeward provides improved sail force by holding the clew of the headsail outboard of the deck edge. The 2022 VPP will include sail force coefficients that model this effect based on our HSF (Headsail Set Flying) research. Initially the switch to these coefficients will be triggered by the presence of a whisker pole in the yachts inventory. The whisker pole length will be recorded at the time of measurement, included in the database, but it will have no effect on the handicapping polars at this time.

3.6 Spinnaker Sail Force Coefficients.

The VPP accommodates three spinnaker configurations, symmetrical or asymmetrical sails on a conventional spinnaker pole, and asymmetrical sails tacked on the yacht centreline. The ease of handling of the latter has seen it adopted on new yachts and retrofitted to earlier designs. The asymmetric sail designs has improved over time, with sails designed for vmg running with a large portion of the sail projecting to the windward side of the boat. The ITC concluded that the sail force coefficients should be adjusted to better balance the observed performance of differently rigged yachts. This modest change reduces the gybing angles, and also speeds up the fleet which improves the matching of the observed and predicted performance for the yachts in the performance database.

The change in All Purpose Handicap between the 2021 and the proposed 2022 VPP is shown in Figure 3-1. Also shown on the figure are the members of several well known types of boat.

Figure 3-1 Spinnaker Force Coeffient test run.



3.7 Keel viscous resistance force model.

During 2021 John Victorin (ITC observer) presented a critique of the keel viscous resistance force model. This highlighted three features that the ITC have now sought to improve.

1. The treatment of the top strip of the keel
   Currently this is treated in the same way as a keel bulb. This was to handle keels with large

root fillets. This style of keel has not been seen at the marquee regattas during the last few years. The ITC propose to treat the top strip like the other four strips in future.

2. Revised viscous resistance coefficient for keel sections.
   This change implements a more sophisticated approach, replacing the tabular interpolation with a continuous function based on thickness to chord ratio (tcr). There is no change to the fundamental approach. That is , a viscous resistance coefficient, based on the Reynolds number of the keel strip and a form factor based on the local tcr multiplied by the strip wetted surface area. There is a cap on the maximum tcr at 18% to discourage very short and fat bulbs.

3. Revised resistance coefficient for keel sections.
   In a similar manner to 2) above the calculation of the viscous resistance of the lowest strip, which includes the keel bulb if present, has been updated. A new viscous resistance coefficient scheme is proposed that includes the bulb thickness chord ratio (tcr). There is a cap on the maximum bulb tcr at 25% to discourage very short and fat bulbs.

In due course the geometry defined by the Offset 2.0 methods will allow a better delineation between the keel and bulb. Also the data assembled to derive the new force models has more insight to offer and the form factor calculations, particulalry for the bulb will be reviewed during 2022. Consequently the keel viscous resistance calculations will probably be improved againin the 2023 VPP.

The proposed formulations are shown below.

Keel (Strips 2-5)

cff = 0.0000853*logrn**4 - 0.0025252*logrn**3 + 0.0278513*logrn**2 - 0.1363492*logrn + 0.2539752

kff1 = 1.5*tcr + 7.*tcr**3

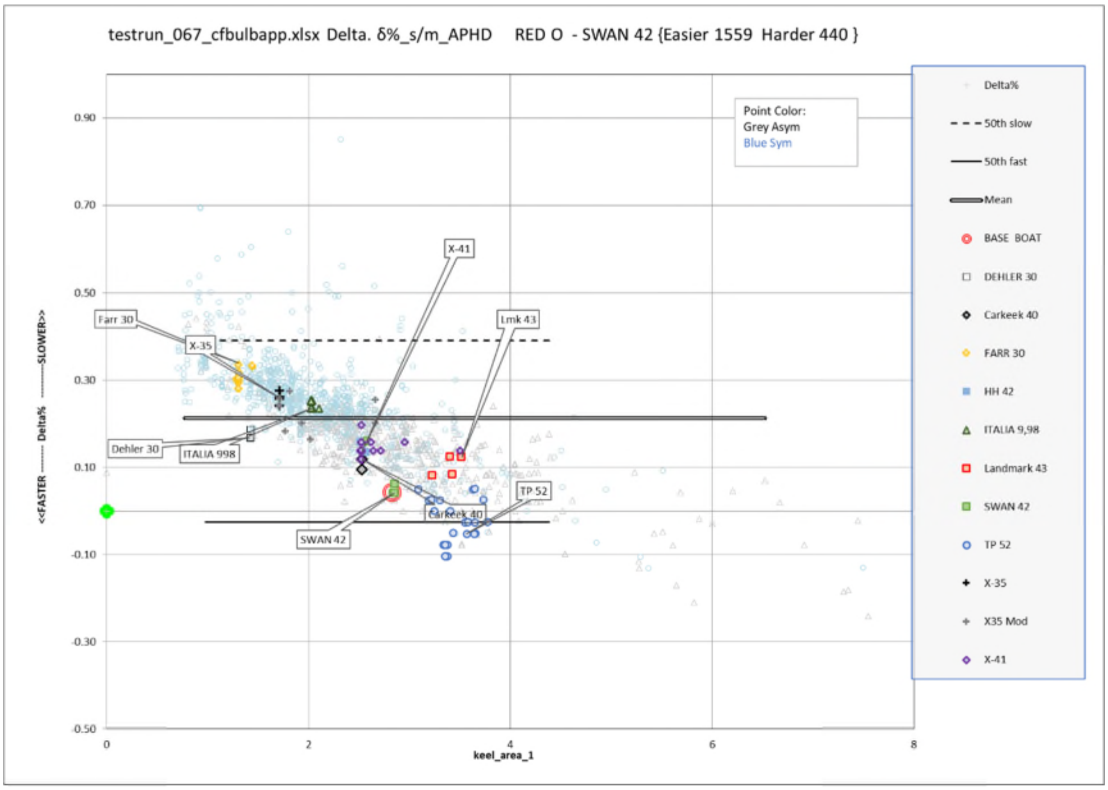
Bulb (Strip 1)

cff = 0.0000853*logrn**4 - 0.0025252*logrn**3 + 0.0278513*logrn**2 - 0.1363492*logrn + 0.2539752

bulb tcr (thickness_strip=vol_strip/area_strip*1.4),
relaxed tcr upper limit, set to 0.25
kff1 = -13.1753*tcr**3 + 9.3842*tcr**2 - 0.7581*tcr + 0.1442

The change in All Purpose Handicap between the 2021 and the proposed 2022 VPP is shown in Figure 3-2

Figure 3-2



3.8 Atmospheric boundary layer profile (Wind Gradient).

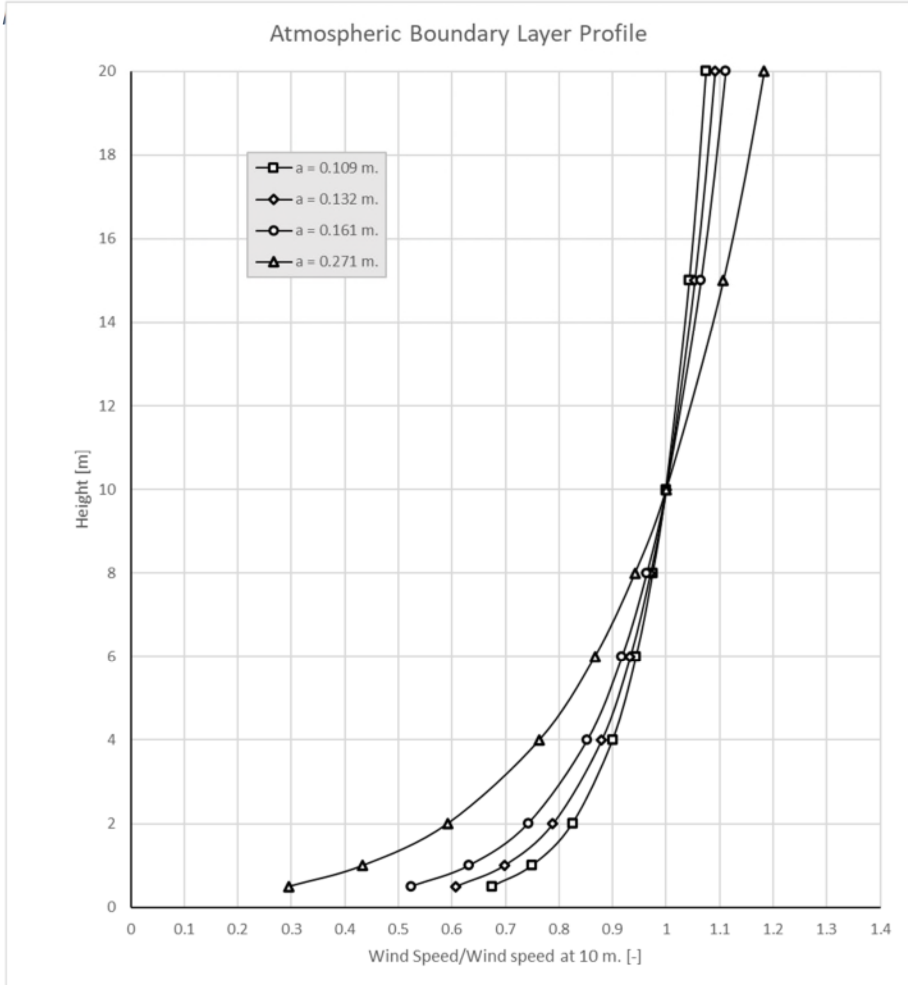
The calculation of the wind speed (V_{Tz}) variation with height (z) above the water surface has remained unchanged since the VPP was first written. The chosen profile has an 'a' value of 0.109. This corresponds to a well-mixed atmospheric boundary layer blowing over a smooth sea.

$$V_{Tz} = V_{Tzref} * \left(\frac{z}{Z_{ref}}\right)^{a}$$

The choice of vertical velocity profile has a large effect on the relative handicaps, because boats with taller masts have more of their sail area in the stronger wind.

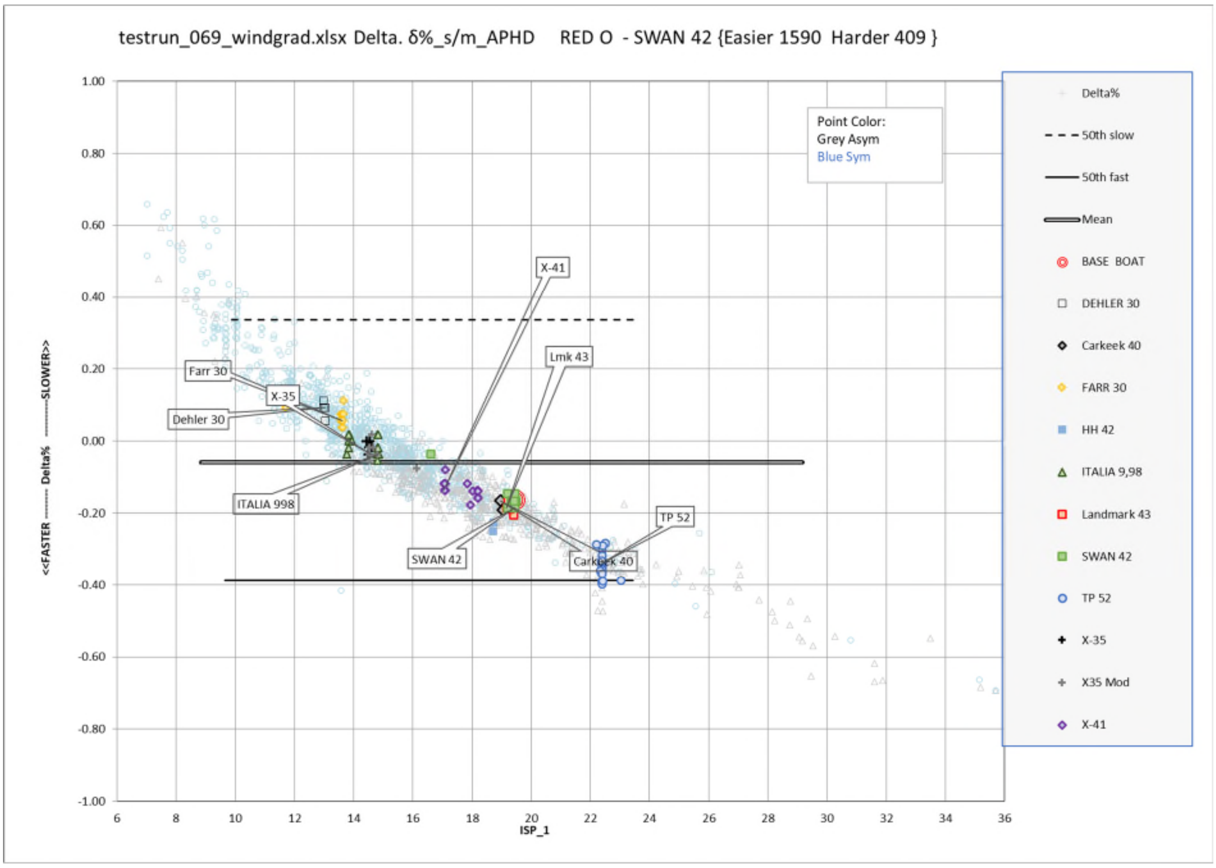
The current vertical velocity profile lies at the end of the spectrum of anticipated conditions. Published data suggests that for typical venues more than 85 % of the races will be sailed with more stable profiles, i.e. with a higher 'a' value than the current one. Furthermore, the presence of obstacles to the wind flow such as other yachts or nearby land will further thicken the boundary layer, reducing the wind velocity at lower levels. For example a more stable (i.e. less vertical mixing) boundary layer has an 'a' value of 0.16 and on land the presence of trees and bushes increases the 'a' value to 0.2.

Several submissions over the years have observed that the largest boats in a class do better than smaller ones. An increase in the 'a' value would not only make the VPP vertical velocity profile more similar to that usually experienced, but also provide some handicap relief to the smaller boats in a class.



Published data suggests that for typical venues more than 85% of the races will be sailed with more stable profiles, i.e. with a higher ZoThe change in All Purpose Handicap between the 2021 and the proposed 2022 VPP is shown in Figure 3-4.

Figure 3-4



3.9 All effects test runs.

The ITC propose the adoption of a revised VPP that includes the following changes:

1. Symmetric and asymmetric spinnaker coefficients,
2. Appendage viscous resistance.
    a. Keel top strip treated as a normal keel strip,
    b. Revised viscous resistance coefficient and form factor for keel strips 2-5,
    c. Revised viscous resistance coefficient and form factor for keel strip 1 (lowest strip)
3. Assumed wind gradient.
4. New Crew weight treatment.

Items 1 and 2 in the list above can be regarded as improvements to the force models in the VPP, and their effect on relative handicaps is what the ITC desired to achieve.

Item 3, the wind gradient, is a matter of judgement. The ITC's analysis indicates that this modest change makes the wind gradient assumed by the VPP a small step closer to the average conditions experienced by the fleet. It also provides a small handicap benefit to the smaller boats in a class.

The test runs are coded "Option C" has all the items 1-4, and "Option D" has the wind gradient effect removed.

Both these new executables have been used to rescore last years World and European Championships. The revised results show no or single place changes, except for the sportsboat fleet.

Figure 3-5 shows the APHD deltas between the MKII 2021 VPP and Option C

Figure 3-6 shows the deltas to Option D

Figure 3-6 All Effetcs option C. APHD delta vs IMS L

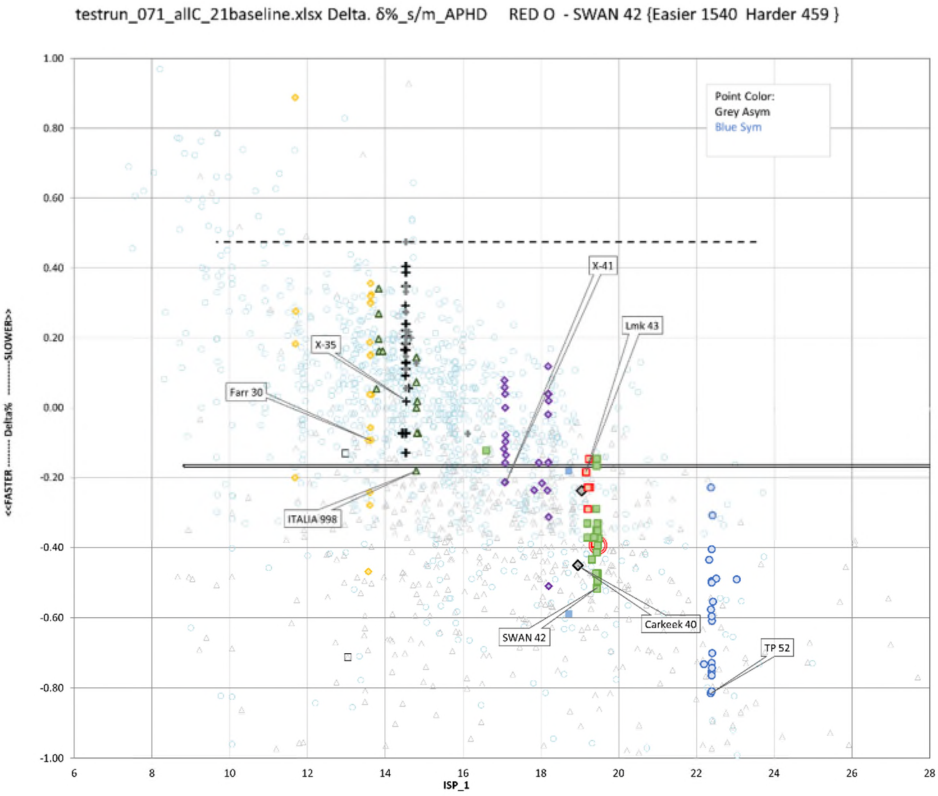
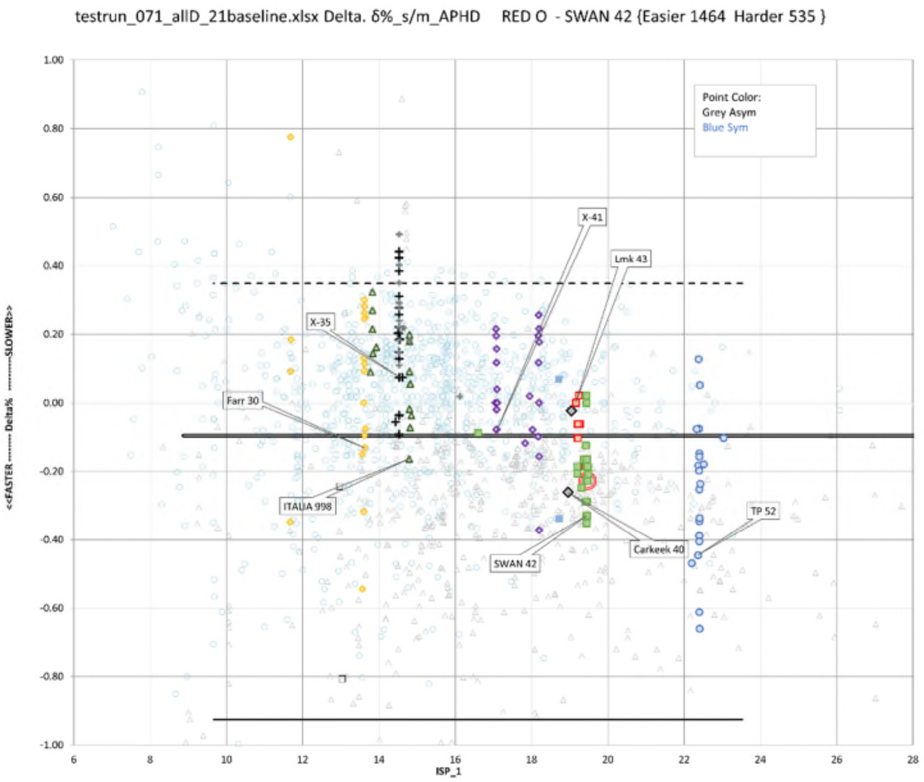


Figure 3-5 All Effetcs option D. APHD delta vs IMS L



4 Canoe Body Residuary Resistance

The work plan proposed in item 5.1 of the 2020 minutes has been carried out. Whilst the work has not been brought to the point where a VPP change could be confidently proposed, the indications are that this work will provide an improved residuary resistance (Rr) formulation.

4.1 Development

Two more fleets of CFD hulls have been added to the ORC database, to extend the speed ranges and hull types. The drag curves derived from the CFD provide the basis to train and test the Neural Networks that calculate the Rr based on the hull shape. This data base now extends to over 1500 boats, there is no other body sailing yacht resistance data like it in the world.

A method has been established to easily communicate the Neural Network force models (Python environment) to the VPP (Fortran environment).

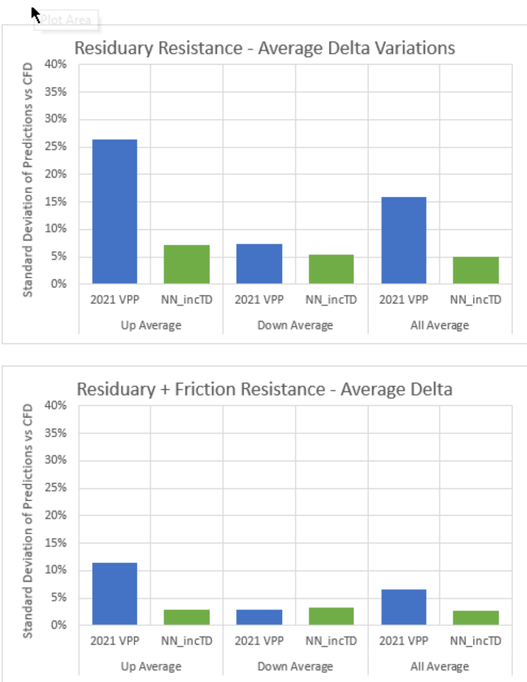
We now have 7 real boats run in CFD against which we can evaluate the accuracy of the NN calculations. The CFD studies were run at the same speeds and heel angles that the VPP predicted for the upwind and downwind VMG solution at 8, 12, & 16 knots These studies have confirmed that the current Rr force model should be updated as soon as we have a better solution.

The boats in the CFD database are: HH42, Landmark 43, Class 40, TP52, Swan 45, X35 & Beneteau 36.7.

4.2 Results

Figure 4-1 compares the current 2021 VPP with the latest neural network force model. The vertical axis is the Standard Deviation (SD) of the calculated resistance (residuary and total) compared to the specific boat values. There is a column for the 2021 VPP (blue) and the NN based VPP (green) for each upwind and downwind test point.

Figure 4-1



For all wind speeds and angles the new force model has an SD 3 to 4 times lower than the 2021 VPP. As a guide with an SD of 3%, the VPP would calculate the drag of the hull within +/- 3% of the real value for 70% of the fleet. In due course it is hoped to improve the 16 knots TWS downwind predictions. In this zone where boats speeds are high it is difficult to accurately capture the correct balance between crew position and trim in the CFD.

Whilst the essence of the resistance prediction is the same as when we used the 22 boat Delft Series, the application of state of the art CFD and neural network analysis offers the real prospect of a significant improvement in resistance prediction.

The ITC will develop this approach and propose a new residuary resistance formulation for the 2023 VPP.

5 Performance Database

The ITC have continued their valuable collaboration with KND, adding more boats to the observed performance database. The ITC would like to thank the owners for giving access to their data, and the navigators for collating the log files to give to KND. This is valuable work in providing real performance data to judge the VPP predictions against.

Figure 5-1

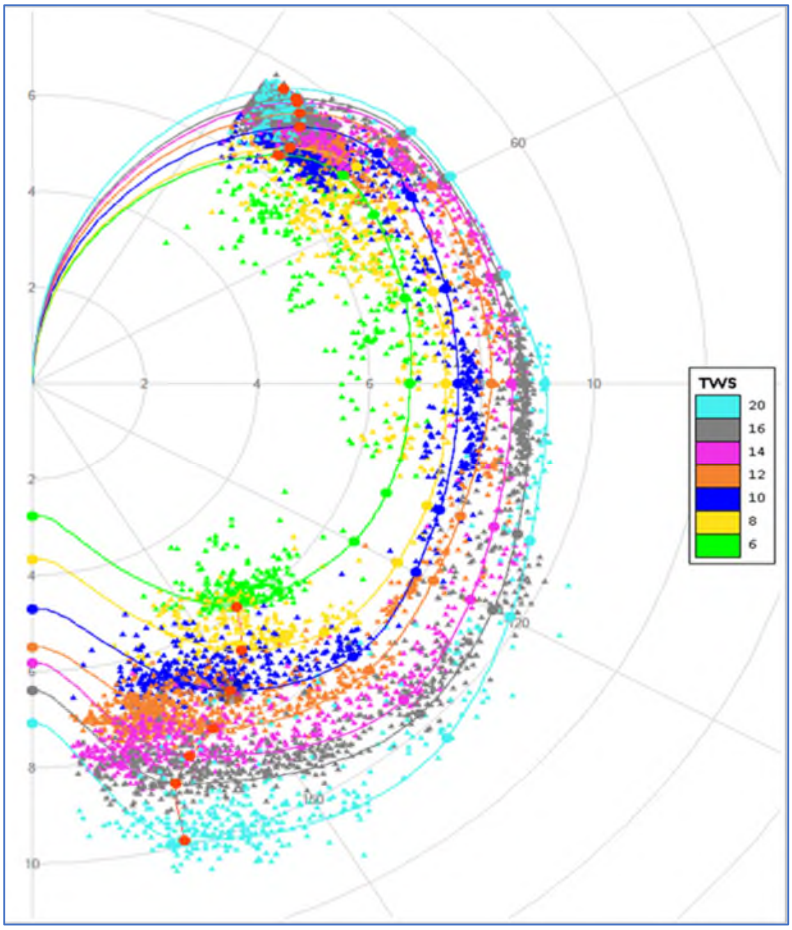


Figure 5-1 shows an example of the data KND work with to produce polar curves. The analysis gathers individual phases of steady sailing data and then adjusts the speed to that which would pertain to the integer true wind speeds; 6, 8, 10, 12, 14, 16, 20 in the case of data prepared for the ITC.

Because the crew is not always sailing the boat at its optimum, because other environmental influences like favourable or unfavourable sea conditions can influence performance, or because the boat was in dirty air, an “averaging” process of the collected data (in this case 10,392) is utilized to generate well-mannered polar curves.

6 Keel structural failures

The accident statistics show that keels continue to fall off sailing yachts. The Offshore Special Regulations now include a keel structural inspection (OSR 3.02 Structural Inspection and Appendix L), and the Oceanic and Offshore Committee committee have set up a working party led by Dr. Jason Smithwick.

The ITC has discussed this matter during the year and reached the following conclusions.

- The mandatory pre-race inspection process, whilst valuable in terms of raising awareness, does little to mitigate against future keel failures. Preventing keel failure starts with good design, followed by good fabrication, followed by good maintenance. Commercial ship building mandates survey during construction and this should be considered for our fleet.
- There has been extensive analysis by expert engineers of the failure incidents, but these reports submitted to the courts or arbitration panels are generally *sub judice*. Placing these reports in the public domain would significantly improve the design methods. This process has begun.
- Approval has been given by Australian Sailing's CEO to appoint a solicitor to apply to the Federal Court of Australia on behalf of Australian Sailing for permission to get copies of the various "Showtime" keel failure (Jan 2020) expert engineering reports (including David L's individual report and joint report with another engineer). Interested parties are being approached to confirm their consent to the release of the reports and this is being followed up.
- ITC Member David Lyons will be the Convenor of a Working Group that looks after ISO 12215. Part 9 of ISO 12215 (small craft appendages) is open to ISO systematic review until March 2022 and David Lyons will also be project leader appointed to deal with actions arising from this review. With this, it is hoped to move along the effort on fatigue and inspections etc. Any ITC or World Sailing members that may have any comments towards systematic review of 12215:9 appendages please raise them with the working group through David Lyons and also through your national standards body.
- ORC will continue to liaise with World Sailing’s Oceanic and Offshore Committee and its working parties.

7 Aluminium Core.

The ORC rules currently prohibit the use of Aluminium core material because it lacks the durability to provide a long life for the structure. However, it is now the material of choice for foiling yachts such as the current America’s Cup Class yachts because of its superior mechanical properties.

In the coming seasons we will see large foiling yachts join the ORC fleets at the marquee regattas. The owners of these yachts understand the trade-off involved in using aluminium core.

So as not to hamper the structural design of these yachts Rule 101.2 f will be suspended for yachts that are measured for an experimental fully-foiling ORCi certificate

8 Foiling.

The 2022 VPP will include force models for partially and fully foiling boats based on the CFD studies conducted by the ORC & SYRF.

9 2022 Strategic planning.

1. VPP, LPP & Manager housekeeping. (100% Staff)
2. Cat rig Aero. (20% Staff 80% ITC)
    - 2.1. Source Candidate sail shapes
    - 2.2. Create CFD Geometry
    - 2.3. Run CFD
    - 2.4. Analyse CFD
    - 2.5. Prepare updated Aero model.
3. Residuary Resistance. (50% Staff 50% ITC)
    - 3.1. Develop existing NN models
    - 3.2. Develop new code for 2022
4. Database. (100% ITC)
    - 4.1. Add new boats, ULDB sled
    - 4.2. Continue analysis
5. Foils. (50% Staff 50% ITC)
    - 5.1. Implement Foil force model and optimisation routine.
    - 5.2. Complete ORC/SYRF Report
6. Boat Specific Analysis. (20% Staff 80% ITC)
    - 6.1. Add new boats as resources allow.
7. Encourage dialogue with new ORC fleets.
    - 7.1. Prepare Standard Operating Procedures (SOP) to promote communication on VPP and scoring. (See Submission USA7)
8. Upwind Aero CFD. (20% Staff 80% ITC)
   If resources are available.
    - 8.1. Source Candidate sail shapes
    - 8.2. Create CFD Geometry
    - 8.3. Run CFD
    - 8.4. Analyse CFD
    - 8.5. Prepare updated Aero model.

10 Next Meeting.

If pandemic restrictions permit we will hold a face-to-face meeting on the weekend of April 1st to 3rd 2022 in Winchester.

Submissions.

The Committee discussed the submissions assigned to the ITC. The contributions from the observers were very helpful in framing the committees' responses.

Submission: ESP 1

Reporting committee: ITC

CREW WEIGHT IN SAILING TRIM

PROPOSAL

Change ORC rules 100.3 and 102.3 as follows:

100.3 Sailing Trim shall be the plane of flotation derived from the Measurement Trim as in 100.2 with the addition of declared crew weight, sails and gear.

102.3 Minimum crew weight may be applied by the Notice of Race and Sailing Instructions and shall be calculated as follows: Minimum CW = Maximum CW - (the greater of: 25% of Maximum CW or 85 kg). Minimum CW = Declared CW - 10% of Declared CW.

RATIONALE

It is common for boats with declared crew weights closer to the default to race with the minimum crew weight displayed on the certificate, as defined rule 102.3. This happens mostly in local regattas against competitors who are racing according to their certificate weights, especially in light wind conditions. If we remove the same amount of crew weight from the default figure to the declared figure and subtract this from the DSPL, the GPH shows very little change. In contrast, if this change in weight is deducted from the crew weight, the effect on GPH is much larger.

This does not make any sense, because the boat sails with the same amount of weight, either in the displacement or in the crew weight. The formulae should use the declared weight or to allow a maximum margin between the declared and actual weight, that it could be of the 10% of the declared CW.

Response:

The submission rightly notes that there is a performance difference between adding or subtracting weight at the centre of gravity, and changing the crew weight, because the crew weight can be used to increase righting moment. It is proposed to amend the VPP to address this. (ITC Minutes 3.1)

Submission: ESP 2

Reporting committee: **ITC**
MEASUREMENT COMMITTEE

HEADSAIL AREA AND SPINNAKER SAIL AREA

PROPOSAL

To promote that ORC and IRC should use the same formulae for the calculations of headsail and spinnaker sail area. To encourage the measurers to write the sail area on headsails and spinnakers. If we are sure our formulae are more accurate than theirs, we should encourage them to use ours, otherwise, we should use theirs. ORC rules 111.1, 113.1 and 114.2.

RATIONALE

Every regatta decides which rating / scoring system they will use. There are several boats using both rating systems due to this. The fact that both systems use different formulae for the sail area calculation creates some confusion and can be a source of other problems. It is highly recommended to write the sail area on the sail's measurement sticker but having to write both rating system's sail areas (that are very similar, but not equal) makes the task more difficult for measurers.

Response:
This is not a question of the relative "accuracy" of the area measurement. The ORC VPP sail force coefficients are based on the current measurement methods, both in terms of the linear measurements and the area calculation. Consequently, a change to these methods would mean re-casting the sail force coefficients to match, which the ITC are reluctant to do.
The ITC certificate records all the sail dimensions and the calculated areas.
The *UMS* records *all* the *sail dimensions required for the most widely used* handicap *rules*. *Each rule* can then access the *input values it need*s.
The submission is therefore not supported.

Submission: GER 1

Reporting committee: **ITC**

VISCOUS RESISTANCE

PROPOSAL

In the ITC Minutes from 2019 and 2020 Viscous Resistance has been recognized by the ITC and studied but has not been assessed yet due to lack of racing. Now that there has been more racing, a new revision should be implemented. It may have an impact on sportsboat fleets, a sector where growth should be encouraged to engage the interest of the younger generation of racing sailors.

1. Change the present tabled (Table 6.1 VPP Documentation) flat plate Cf to, for example, the ITTC friction line, as was discussed under point 6.5 in the ITC minutes October 2019.

2. Introduce a form factor for bulb Cf based on thickness/chord, and it is suggested to approximate this ratio as

   t /c= k∗√(Vol bulb/Chord bulb)

   and selecting a suitable k to avoid point measurements.

RATIONALE

1. The present tabled Cf values for appendages, and particularly reflected as a flat line in for typical yacht keels relevant area between Re 1.000e6 and Re 6.310e6, are possibly not correct for real life appendages under sailing conditions. The present formulation favors long chord appendages, particularly in the smaller boat sizes and may be one explanation for some boats changing to "ORC keels" in the smaller classes and why larger boats with keels with relatively short chords (e.g. TP52) are very competitive whereas smaller boats of similar concept are struggling in ORC racing.
2. The present lack of a form factor for bulbs is not accurate since it just takes the wetted area into account, and thus unduly favors slender high wetted area bulbs.

Response:

The ITC proposes to amend the calculation of the viscous resistance of keels and bulbs to address the effects detailed in the submission. ITC Minutes item 3.7.

Submission: MANCOM 2

Reporting committee: **ITC**
MANAGEMENT COMMITTEE
PROMOTION AND DEVELOPMENT COMMITTEE

IMPLIED WIND

PROPOSAL

Find a better name and explanation of "Implied Wind" that can make Performance Curve Scoring easier to accept.

RATIONALE

Use of different ratings for different wind speeds is now available in several different scoring methods, starting from Triple Number up to four and recently even five wind ranges in the ORCsy system. Increasing the number of wind ranges will produce more accuracy in scoring, and if continued to even more options will logically evolve from being step functions to being the most advanced scoring option available with ORC – Performance Curve Scoring. However, it is thought that the term "Implied Wind" as result of PCS calculations may not be easy to understand and therefore it should be replaced with another term.

Response:

Whilst acknowledging the popularity of single number scoring associated with defined wind bands, the ITC promotes the PCS scoring method, because this makes the best use of the VPP scoring polars. The ORC acknowledges there are obstacles to making the system clearly understood and fluent to use for competitors ***and*** *race committees.*

The terminology is one such obstacle. Performance curve scoring might be better described as Polar Curve Scoring, and Implied wind better framed as "Scoring wind".

In response to this submission the Chief Measurer has published a paper describing the different scoring options and how each might best be implemented

Submission: POL 1

Reporting committee: **ITC**

ADDITIONAL VALUE FOR TRUE WIND SPEED OF 24 (OR 26) KNOTS

PROPOSAL

To extend the range of true wind speeds up to 24 knots (maybe even 26 knots) in the performance tables.

RATIONALE

Offshore races may be carried out in the wind speeds higher than 20 knots. The ORC VPP is dedicated mainly to offshore races, so it would be reasonable to extend the range of the wind speeds up to 24 knots, maybe even 26 knots, to improve calculation of the results of racing in these conditions.

Response:

The ITC addressed similar submissions in 2015 and 2018.

The ORCi VPP generates polar tables to handicap yacht races. It is very rare that the Implied Wind derived from the handicap calculations ever reaches 20 knots, so there would be no improvement to the race scoring by extending the polar table to higher wind speeds.

The submission is not supported.

Submission: RUS 1

Reporting committee: ITC

SYMMETRIC SPINNAKERS WITH SHW/SFL = 0.75 – 1.00

PROPOSAL

1. To develop polars for symmetrical spinnakers for SHW / SFL ration between 0.75 – 1.0
2. To include into the VPP a boat speed calculation with each symmetric spinnaker listed in the sail inventory as “active,” like it is done for asymmetrical spinnakers
3. Re-word Rule 111.4 (c) and add (d) as follows:

   c) For spinnakers with SHW/SFL in range of 0.75 – 0.85 aerodynamic forces are calculated with both coefficients for all spinnakers listed in the sail inventory list and for the headsail set flying with one giving faster boat speed taken as final

   d) For spinnakers with SHW/SFL > 0.85 aerodynamic forces are calculated for spinnaker only

   This may need to re-word rules 113.1 and 114.2 as follows: “Rated area for each spinnaker is the measured area of any spinnaker in the sails inventory, but it shall not be taken less than: ….”

RATIONALE

1. There are very flat symmetrical spinnakers that could be used at TWA’s less than 90 degrees. It seems that a single Cl / Cd curve for all types of spinnakers does not reflect this fact.
2. In moderate and strong wind spinnakers of less sail area can give more speed than large ones because of the lack of stability with large sails.

Response:

The ORC VPP’s already handle a wide range of sail types, adding another layer of complexity to the sail force coefficients for symmetric spinnakers is not desirable for the following reasons:

- *The sails described in the submission are used for only a small part of the polar table, i.e. 90-110 AWA and wind speeds above 14 knots.*
- *The coefficients have worked well date because the REEF and FLAT functions adequately model the behaviour of small area spinnakers in the narrow range of conditions they are used.*

The submission is therefore not supported.

Submission: RUS 2

Reporting committee: **ITC**

HEADSAIL FURLER

PROPOSAL

To re-word IMS Rule F9.8 as follows:

"If there is a headsail furler on a fixed forestay and there is only one headsail in a sail inventory, and this headsail has HLP greater than 110% of J, this shall be recorded as "YES" and if not as "NO".

To re-word ORC Rating Rule 111.4(d) as follows:

"If there is a headsail furler on a fixed forestay, and there is only one headsail in a sail inventory which has HLP greater than 110% of J in accordance with IMS F9.8."

RATIONALE

1. The current text of the rules is not clear. There are 3 interpretations possible:
   - Luff groove devices allowed with the single luff grove only (usually the have two groves)
   - Only one headsail may be onboard during the race, and it shall have HLP > 1.1 J
   - Only one headsail may be in a sail inventory, and it shall have HLP > 1.1 J
2. The intention of this Rule is to give an extra handicap credit to boats that cannot change headsails according to weather conditions and have to use the furler in order to decrease sail area in a strong wind. The current rules allow the interpretation that there may be multiple headsails in a sail inventory but only one of them present onboard during the particular race. In this case a yacht can choose her sails for particular race conditions using the weather forecast. This goes against the intention of the Rule.

Response:
The rule texts will be clarified to ensure that the furling sail is a single sail. Permitted Heavy Weather sails and/or storm jibs may still be carried.

Submission: SLO 1

Reporting committee: **ITC**

HLP LIMIT FOR HEADSAIL FURLER RATING CREDIT

PROPOSAL

To delete the limit for the HLP to be greater than 110% of J, which is used as the limit for headsail furler credit in IMS rule F9.8.

RATIONALE

More and more new "standard cruising" boats have jibs smaller than 110% and their normal equipment includes a headsail furler. Limiting HLP to be greater than 110% of J should be deleted, so even a boat using only a self-tacking jib could benefit from using a headsail furler. The new IMS rule F9.8 should read: “If there is a headsail furler on a fixed forestay used in association with only one headsail, this shall be recorded as “YES” and if not as “NO.”

Response:

The rating credit is intended to offer help to yachts which sail have to sail upwind with a significant amount of the jib furled, which reduces the aerodynamic efficiency. This loss of efficiency is less if a smaller sail is set on the furler because the sail is partially furled only in stronger winds and percentage of the sail wound onto the furler is less. This suggests the issue could be addressed by using a sliding scale of coefficients, possibly linked to the REEF term.

The submission is supported. During 2022 the ITC will develop a force model that replaces the hard LP limit with a handicap credit that varies across the wind range based on the single furling headsails LP.

Submission: USA 1

Reporting committee: **ITC**

EXPAND THE RANGE OF THE VPP

PROPOSAL

Have ITC examine the possibility to expand the range of the VPP down to 4 knots TWS.

RATIONALE

In many distance races in the USA the wind can often dip below 6 knots, making it difficult to accurately rate performance in these very light air conditions. If ORC can accurately calculate boat speeds for lower wind speeds and include those in the wind mix used to develop the custom ORC ratings for the BYC Mackinac Race Shore and Cove courses this would be a positive development.

Response:

The ORCi is a handicapping VPP, and to date the ITC has found no compelling reason to extend the calculation to lower wind speeds. However the races in the USA, particularly on the Great Lakes present a new challenge; prolonged periods of very light winds (not calms) and a desire to race using handicaps for specific wind bands.

At present the use of three wind bands can produce very different corrected times for races depending on the band chosen when the choice of wind band is not clear cut.

The ORC will set up working group of ITC members and club representatives to explore the problem. This study will review the course and wind speed data and re-score the races using different scoring methods. During this exercise it will be possible to calculate polar curves at lower wind speeds to examine their benefit in the scoring process. This study will also examine the best way to implement multi wind band scoring methods.

For the coming season the race organisers are at liberty to choose any scoring method, and the ORC staff will support that effort.

Submission: USA 2

Reporting committee: ITC

HEADSAIL SET FLYING UPWIND

PROPOSAL

Have ITC make a thorough examination of the effect of HSF's on upwind VMG performance

RATIONALE

It has been observed with some C/R designs that in 6 knots an HSF in the sail inventory is calculated to be faster than the largest headsail, and thus affecting the boat's rating on W/L courses in light winds. HSF's should only be contributing to performance on reaching angles, not upwind VMG.

Response:

The ITC understands the situation described. There is anecdotal evidence that in light winds an HSF can be used successfully upwind on offshore courses where tacking is infrequent. The VPP polar curves show that the presence of an HSF in the inventory can improve upwind Vmg speeds, if such a sail is designed to sail upwind and can be appropriately sheeted. At present the measurements taken of the sails and mast do not offer a way to decide if the sail is so designed or can be properly sheeted.

The same issue is apparent to an even greater extent for multihulls, and the ITC are investigating ways to avoid the VPP producing optimistic polar speeds using sails that cannot be set. At present there is no proposal for a change to the 2022 VPP to address this matter.

Submission: USA 3

Reporting committee: **ITC**

VPP TREATMENT OF PLANING BOATS

PROPOSAL

Can ITC evaluate and improve the way the VPP handles the commencement and cessation of planing and its effect on scoring and help devise recommendations for class splits based on boat type

RATIONALE

A handful of boats that can plane are racing against many boat types that cannot plane, and this creates problems for how to do class splits because GPH alone is not capturing the differences. We would welcome an improvement in rating accuracy along with suggestions for suitable class splits in mixed fleet circumstances.

Response:

The submission speaks to two matters, planing and the use of GPH for class splits.

Planing:

The CFD data used to calculate the hull resistance extends into the "planing" regime. The hull resistance curves show no sudden inflection that suggests planing is an being an on/off switch that occurs at a particular speed. The ITC is confident that the residuary resistance model captures the planing effects accurately.

GPH:

The formula for GPH does not include polar data for points of sail and wind speed where boats are planing.

This is the technical reply to the submission, but the sailors are responding to what they see on the race course. This requires a dialogue between the technical and the sailing experts to define the symptoms of the issue in a common lexicon. Once this done a "cure", if there is one, can be devised. The ITC will prepare a brief specification of how such a process can be established.

Submission: USA 5

Reporting committee: **ITC**
MANAGEMENT COMMITTEE

ESTIMATED STABILITY ON CLUB CERTIFICATES

PROPOSAL

Re-examine the decision to eliminate use of Estimated Stability on Club certificates.

RATIONALE

There are 100's of boats racing coastal and offshore races with Club certificates and no easy way for OA's to evaluate their eligibility under the US SEER (or OSR's) without having an estimate of Stability Index. ISO standards are impossible to gauge with most older designs built in the US, and ORC discourages inclinations of boats without approved ORCi offset files, yet it is too burdensome and expansive to expect these boats to be laser-scanned for measurement. While understanding the potential liability from estimates made on matters related to safety, devising some formulation of SI would greatly help OA's to ensure compliance with the safety rules, and we ask ITC to re-examine this issue.

Response:

The OSR regulations and ISO standards specifically require that the righting arm curves used to assess stability be derived from 1) an accurate definition of the hull and deck topography, ***and 2)*** *a VCG-derived figure from an inclining test. The ORCi Stability index complies with these requirements, notwithstanding that the deck topography is not captured.*

It is unsafe to use an estimated VCG in deriving a righting arm curve for offshore race compliance. Even for boats of the same class the range of VCG positions can results in differences in the Range of Stability of several degrees.

There is no justifiable reason to determine safety criteria by using estimated values, particularly for boats that are close to the limits. These are the boats that should be thoroughly checked.

The submission is not supported.

Submission: USA 7

Reporting committee: ITC

FAVORED AND UNFAVORED RATED PERFORMANCE IN USA FLEET

PROPOSAL

Examine the rated performance of unusual US boat types along with some possibly favored designs in the ORC fleet (eg, Swan 42's)

RATIONALE

In the US fleet there are boat types that have not until now been a part of the ORC fleet in decades, namely the ULDB Sleds. We would like ITC to examine more closely the rated performance of these boats so they can be competitive in ORC scoring relative to more modern designs. Conversely, there are some favorably-rated designs in the current ORC fleet - such as Club Swan 42's - and we would like to have these examined as well by ITC.

The ITC acknowledges that some individual boats or classes are seen as favoured by their competitors, or unfavoured by their owners and crews. This is an unchanging fact of life, but that does not relieve the ITC of its responsibility to make sure that new boat types racing under ORC are modelled as accurately as possible. For example, the ULDB sleds. Also the ITC must investigate where there is evidence of a particular boats handicapping being too penalised or favoured. Item 4 of the ITC minutes address the accuracy of the resistance prediction and plans to improve it.

The work of the ITC in improving the VPP predictions are in four parts;

1) Development of the CFD database and the Neural Network simulations that calculate the hull resistance,

2) boat specific CFD studies and

3) expansion of the observed performance database,

4) Improvement of the race scoring process.

The last three items in the list can only be progressed with the help of sailors and race organisers.

CFD database.

The current resistance database is populated from the results of several hundred CFD runs on hulls that are mathematically defined to give a systematic variation of several hull form parameters (length/volume ratio (LVR), beam/draft ratio (BTR) prismatic coefficient (Cp) etc. It is the most comprehensive set of systematic hull resistance data in the world. But it is still the case that if a real boat lies towards the edges or outside the parameter set the predicted resistance is more prone to error. Resources don't permit expanding the parameter space further in all directions. But when new types of boat enter the fleet there are processes in place to determine how gaps in the database affect the handicaps.

On the other hand, any time the CFD database is changed, or the NN parameters adjusted the handicap of every boat in the fleet changes. It is not possible nor desirable to single out specific *hull types for "special treatment". A level playing field must be achieved through building better force models, not "twiddling the dials".*

Boat specific CFD.

During the last 3 years the ITC have run CFD on some real boats, as described in the minutes item 4. The boats are set up at the speed, heel and leeway predicted by the VPP, and the CFD returns the actual hull resistance, which can be compared with the VPP estimate. This process allows us to examine how ell the VPP is doing, particularly for boats that lie outside the ORC norm, such as the Class 40's.

This process has a cost, and requires collaboration with the yacht designer to get the input data, but it is the ITC's intention to expand this data over time. A good candidate for evaluation would be a ULDB.

Performance Database.

Item 5 of the ITC minutes describes the observed performance database. The process for analysing data logged onboard a yacht is well established. The ITC are happy to analyse "good" data from well sailed and navigated boats. It is an important part of judging VPP developments.

Scoring.

This question has been addressed in other submissions, but the ITC understand that no matter how good the VPP becomes it is only useful if it improves the racing experience of handicap fleets. The ORC will continue to work with local and National Authorities to get scoring options and certificate processing that meet their needs. To this end there are a growing list of bespoke options included in the appendices of the ORC rules and on Page 2 of country-specific certificates.

In conclusion the ITC has mechanisms that address this submission, and will prepare some more detailed specifications of the methods describe above to facilitate collaboration with new and existing ORC fleets.

ENDS