OFFSHORE RACING CONGRESS

World Leader in Rating Technology

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ITC - INTERNATIONAL TECHNICAL COMMITTEE

Minutes of a meeting of the **International Technical Committee** of the Offshore Racing Congress held on 26-27 October 2013 in UVAI office, Rome (Italy).

- Present: Alessandro Nazareth (Chairman) Andy Claughton (UK) Jason Ker (UK) Kay-Enno Brink (GER) Nicola Sironi (ORC Chief Measurer) Zoran Grubisa (CRO-ORC Staff) Panayotis Papapostolou (GRE-ORC Programmer) Davide Battistin (ORC Programmer)
- Observers: Riccardo Provini (Uvai Director) Emanuel Richelmy (Uvai journalist) Emanuela di Mundo (ORC journalist) Claudio Maletto (ITA – Designer) Maurizio Cossutti (ITA- Designer) Alessandro Paganini (ITA- Designer) Claudio Schiano (ITA – RO) Gennaro Aveta (ITA – ORC Staff)

Apologies for absence were received from committee members David Lyons, Fabio Fossati, Rob Pallard, Philippe Pallu De La Barriere and Research Associate Lex Keuning.

WELCOME, MEETING LOGISTICS

The Committee thanks UVAI for hosting the committee with the customary hospitality. The Committee noted the resignation message from Philippe Pallu de la Barrière after 8 years of assiduous attendance, and thanks for his contributions, wishing him a good luck for the future ambitous projects in energy and environment saving projects.

1. REPORT ON 2013 SEASON – CURRENT VPP FEEDBACK

Nicola Sironi reported about season races and results. The World Championship in Ancona was a success in terms of participation, the best boats were all on the top while the scoring was very tight in corrected time differences. The same was observed in major regattas. Another sign of VPP accuracy is that there were no major concerns or complaints raised from the sailing constituency.

The Chief Measurer reported also about some issues encountered during the season like particular headsails, checks and tolerances in controls during the races, LPP, offset file measurement (new ways of generating the OFF or designer files). All the above issues have been discussed (see below) and will also be discussed in the Measurement Committee at next AGM.

2. SUBMISSION REVIEW

2.1 Submission: ARG 1 - LCB FOR BOATS WITH AGE DATE EARLIER THAN 1995

The LCB position on the fleet of pre-1995 boats was in some ways not correctly assessing their residuary drag. However, the elimination of LCB as a parameter affects the RR calculations, so the perceived disadvantage in fact seems due to an unrated advantage in the previous years.

2.2 Submission: ESP 1- JH DEFAULT

The ITC discussed a default JH formulation based on LPG (5%) to address the problems of old sails without having JH measured. A new sail will have JH as all other measurements (other girths, JL and LPG), so this problem should disappear in the near future.

2.3 Submission: FRA 1 - ALUMINIUM MAST ALLOWANCE

The ITC inspected the current formulation based on Elastic modulus looking also at the fleet with aluminium masts. A raised modulus for carbon will be used for the carbon mast default mast weight.

2.4 Submission: GER 1 - OFFSHORE SINGLE NUMBER HANDICAP

The formulation currently in use was used in several offshore races, both in the ToT and the ToD scoring methods, so Kay-Enno explained the German Submission's logic, which leaves a net loss to leeward.

The new formulation provided by Kay-Enno seems better, and the ITC recognized its technical foundations, but it was agreed to defer any decision about change in the OSN established 2 years ago to the Management Committee.

Proposal_26_Oct_2013	8	12	16
Beat	0.40	0.30	0.20
60	0.05	0.15	0.20
90	0.05	0.10	0.15
120	0.05	0.15	0.20
150	0.05	0.15	0.15
Run	0.40	0.15	0.10

So ITC will suggest the following new formulation for 2014:

2.5 Submission: GRE 1 - Propeller installation.

It was agreed to reintroduce a propeller installation type with shaft, but not exposed, that was eliminated a couple of years ago. The problem came from some Club boats with a housed or very short propeller shaft able to get the full allowance of an exposed shaft. By re-introducing the old "other" prop installation type, the problem will be solved.

2.6 Submission: GRE 2 – Extend Dacron cloth sails allowance to ORCi.

The ITC agrees on the concept, and proposes to adopt it, to remove all differences between International and Club results.

2.7 Submission: MANCOM 3 - MATERIALS AND PRACTICES MODERNIZATION

The Committee devoted much time discussing possible amendments of ORC Rule 101 (Materials) and 205.2 (Mast Jack on board). Regarding Rule 101 these were the main modifications proposed:

101.2 The following materials are prohibited:

- a) In hull and deck structures: Standard modulus (high strength) Carbon fiber exceeding 270 GPa.
- b) In spars with the exception of booms, bowsprit and spinnaker poles: Cored sandwich construction where the core thickness at any section exceeds the thickness of the two skins.
- c) No material with density greater than 11,34 kg/dm³ except when fitted to the boat before 01.01.2013.
- d) Pressure applied in the manufacture of hull and deck structures greater than 1 atmosphere
- e) Temperature applied in the manufacture of hull and deck structures greater than 80°C.
- f) Aluminium honeycomb cores in hullshell and deckshell structures.
- g) In hull and deck structures: Plastic foam core of nominal density less than 60 kg/m³.

Regarding Rule 205.2, mast jack will be allowed on board but not to be used while racing.

Another item discussed was the use of light materials like titanium and carbon in stanchions and pulpits, and the Committee agreed to assign a .005 gyradius reduction pending a validating test run.

Final rule wording will be checked within the ITC before publishing 2014 rules.

2.8 Submission: NED 1 - LPP CLIPPING ROUTINE

The clipping routine is under revision while reconsidering the LPP. New routines need to be added to address clinker hulls. Another "fix" easy to implement is an error message when a "double back" in a station between adjacent points is found.

2.9 Submission: NED 2 - DEFAULT LPS, RULE 106.1

It has been agreed that all Club boats without stability measurements (using only the default RM) resulting in an LPS<103° will have their VCG lowered until LPS=103° is reached. ITC also decided a BIAS factor of 3% on RM for unmeasured ORC CLUB boats.

2.10 Submission: NOR 1 - OVERLAPS BETWEEN ASYMMETRIC, CODE 0 AND GENOA

See Par. 3.4

2.11 Submission: RUS 1 - HEEL LIMIT ON DOWNWIND COURSE

The committee agrees about the fact that an excessive heel in downwind courses could let the boat broach, but the ORC VPP must be firstly seen as a handicap system. Therefore it could happen that some values (like heel) are not exactly corresponding to reality.

But, considering that excess heel downwind is causing excess weather helm, the ITC will investigate the values of rudder angle (that is now already included into VPP, but only for information) and if some anomalous values are detected, it may produce a formulation to reduce the heel angle.

2.12 Submission: RUS 2 - SPEED CALCULATION OF SMALL YACHTS

The VPP has a routine for the calculation of added resistance in waves (see ORC VPP Documentation chapt. 6.5, page 68). The wave energy spectrum has been modified in the past to reflect the fact that the majority of races are held in flat water, reducing the energy at low wind speed.

The corresponding resistance formulation takes into account many non-dimensional factors plus a size factor (depending on L). The Committee will work on the above two factors in 2014 to see if small boats' speed is really overestimated. Regardless, the modification of the drag coefficients for upwind sails goes some way to addressing this perceived problem.

3. HYDRODYNAMICS

3.1 Fine tuning of new hydro model (length exponent, geometric BTR).

The new Residuary Resistance formulation proved to be very robust and reliable in handicapping boats during the 2013 season. The ITC has however worked on fine-tuning of the following items, with the aim to increase accuracy:

a) BTR: Currently the integrated BTR is transformed into a geometric BTR as input in the RR surfaces (that depends on BTR and LVR). The Committee is developing a new formulation based on the waterplane area inertia (WPI) that better reflects characteristics of the boat at each heel angle.

BTR = K * (WPI/L)^0.3333 * L*(WPI/L)^1/3/VOL

- b) The region of surfaces with LVR < 4 has been re-faired
- 3.2 Transom Drag revision

This item has been deferred by ITC to next year for a more robust and reality-related formulation of transom drag.

3.3 Canting keel with canard(s) fine tuning

The current formulation to compute induced drag for boats equipped with a canting keel and canard is computing the effective draft of appendages, taking the maximum depth in upright conditions and computing the heeled one with a cosine dependency, without taking into account that in some cases with the canard off of the centreline the maximum depth could increase at certain heel angles.

ORC programmer Davide will elaborate on this more accurate formulation.

3.4 Crew weight trim moment

This item has been deferred by ITC to next year to study a correct formulation that reflects crew position sensitivity and hence the trim on boat performance.

3.5 Evaluation of dynamic wetted area

Jason Ker reported about having already done some correlation work on dynamic wetted area versus static wetted area at different BTR and LVR. This would be a further improvement in the viscous resistance formulation, and has been programmed. The results of the test runs were not satisfactory, therefore the ITC decided to postpone this item to next year as it deserves some more study before including it into the VPP.

3.6 Default RM revision

The current default RM calculation (see ORC VPP Documentation chapt. 4.4.5 page 30) is based on a polynomial of non-dimensional parameters that multiply boat length and DSPL. The formulation has been derived from a regression using a data set of the entire ORC fleet with a valid inclining, but in some cases (mainly in the lower and upper Length ranges) this is not so close to reality.

To increase the accuracy the Committee inspected a different approach to derive a default VCG instead of RM, using a component weight method, estimating the components W and CG of hull, deck, and adding mast and keel from database.

Not having enough time to develop the above approach with enough accuracy, the ITC did not recommend implementation for 2014, but to keep this on the ITC agenda for next year.

3.7 Possibility for the VPP to rate boats with double keel with bulb

With the present ORC VPP it is possible to handicap boats with double fixed keels (composed only of fins) by making an offset file without a keel (just with the hull + rudder) and using the canard section in the Manager to input the double keel data. This approach doesn't allow rating boats that have the double fixed keel with a bottom bulb. The bulb will be included into the new Manager inputs and its resistance (frictional and residuary) will be computed using the same formulation for a single fixed bulb.

3.8 Canting keel with Water ballast boats

During the summer ORC programmer Davide Battistin made a modified special VPP to rate boats that have both canting keel and water ballast tanks, to allow some of them to race in ORC classes in some events. The results were not so close to reality because in some cases the boats were slower when using the ballast.

After examining some results and with the help of Jim Schmicker, the Committee deduced that this effect was mainly due to water ballast trim tanks that were not correctly addressed by the VPP because they were increasing also the RM.

A modification of the VPP will be implemented for 2014 taking into account the water ballast tanks, but only those that increase stability (and hence have TCG>0) and making special runs combining canting and water ballast in different ways, and select the fastest.

4. **AERODYNAMICS**

4.1 Downwind wind tunnel results analysis

Fabio Fossati made a first draft of the report of the wind tunnel tests performed in Milan last July for the Valencia meeting.

The tests were done combining two mainsails (one with square top roach and one with an typical IMS max roach curve) and 4 asymmetrics tacked on a bowsprit (2 larger sails with the shape of an A1 and A2, and two smaller sails, all with the shapes of an A1 and A2). The post-processing must be slightly revised because of some corrections in the areas of the sails (the VPP internal area) and the blockage coefficients, but the first analysis returned quite different results from the current VPP coefficients, with more lift and a different slope in the power to AWA relationship.

So, Davide Battistin made a further post-processing correction to the areas and considering a blockage coefficient of approximately 3%, but without a similar test made with a pole instead of a bowsprit it will be difficult to change sail coefficients.

The Committee will study the possibility to extend the tunnel tests later this year or early next year to try to determine a new set of coefficients for spinnakers in 2014. Nonetheless, the Committee will derived from the tests some useful information to verify the power formulation introduced last year.

So the power function was modified to avoid typeforming for masthead spinnakers versus an ISP lower than P+BAS, so a correction was made for boats having ISP<0.95*(P+BAS).

4.2 Situation with CFD investigation (Open Foam)

Andy Claughton worked on the CFD Virtual Wind Tunnel set up by the Wolfson Unit using the OpenFOAM code running on the University of Southampton "IRIDIS 3" high performance computer. The CFD studied a range of flying shapes that Jason Ker provided soon after the Valencia meeting, comparing these with existing wind tunnel data to try and develop a new sail de-powering methodology.

The current Aero model describes the Cl^2 Cd behavior according to a constant slope on the line down from Clmax. In reality sails fall on a curve described by the red circles in the sketch plot below:



Region A where easing the sails for maximum de-powering creates extra drag Region B where the VPP has a simple linear fit that "works" Region C where the sails are tightly trimmed to get max drive at the expense of extra drag

The study served to better understand the interplay between Induced drag and center of effort height in a way so that the current sail depowering scheme could be amended to take into account boats with different sail area/rig height to righting moment ratios that de-power in different ways.

The CFD study ran on different sail shapes and returned a span in the Cl range and then got from that data a simple curve that defines a multiplier, which when applied to the baseline curve gives a new Cl-Cd ratio:

Flat	0.1	0.2	0.3	0.4	0.5	0.55	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1
Cd Multiplier.	1.060	1.060	1.060	1.060	1.060	1.060	1.055	1.048	1.035	1.020	1.008	1.002	1.000	1.004	1.060

The results of the test run are in the direction expected, so the ITC decided to implement in the 2014 VPP this new cd-cl^2 multiplier as a better representation of the physics related to sail de-powering. But it also was decided that the completion of this work (above all the depowering modification related to REEF factor) will be deferred to next year's agenda.

4.3 Two-mast aero model revision (ketches, schooners, gaff rigs etc.)

The Committee believes that these rig configurations are not so popular, so devoting time to model the different double mast configurations will take a lot of time and resources and is not a priority. So it would be better to use the current ketch model introduced last year (with a 25% lift reduction on the mizzen) to rate other rigs, taking into account the equivalence of sail areas.

4.4 Genoas (LPG>110%) with roach + Code Zero treatment

The Committee discussed the NOR Submission and other experiences from the field related to genoas featuring some roached leech, and reached the conclusion that headsails can include genoas as well as jibs using the ERS measurements and the area and center of effort calculations, giving up any differentiation between headsails.

An extension of this decision led to a proposal to also change the treatment of Code Zero sails. These type of sails, accepted in ORC from 2008 as a special kind of spinnaker, can be treated instead as a special kind of headsail, thus lining up with the ERS definition and the treatment adopted by other Rating Systems using a special set of coefficients for these sails when they are set outside the foretriangle. In particular, all headsails (mid girth < 75% foot length) set inside the foretriangle (IG, J) will be treated as genoa/jibs, while those set outside the foretriangle will be treated as loose luffed headsails with different treatment if with battens

This will require some work after the AGM, so it's not included in the test runs circulated ate the AGM.

4.5 Possibility to rate Parasailor spinnaker

The Committee confirmed what was discussed in the past regarding this kind of spinnakers, allowing them in ORC CLUB, measuring these sails as if the holes are closed with cloth, adding extra sail area.

5. SMALL AND LIGHT BOATS ISSUE

See SUBMISSION RUS 2 (chapt. 2.10)

6. LPP UPGRADE TO ACCEPT OTHER FORMATS AND CLINKER HULLS

The Committee devoted a long discussion to this item. Davide Battistin is currently re-writing the LPP, also to solve some tricky problems of appendage clipping (see submission NED 1 Par. 2.6). This will results in a more easily-maintained LPP for the future. There was unanimous agreement to retain the current OFF format as the only format for LPP input, it is simple, consistent and preserves the link to physically measured hull shapes. A study to ascertain the sensitivity of stations spacing and placement will be performed to produce a standard for OFF file generation from a variety of 3-dimensional geometry files.

The ITC will study separate conversion software to create .OFF files to this standard from different 3D hull forms.

Some IMS and ORC rules should be amended to take into account the above concepts:

B2.2 a) should be changed to add a station wherever a big change in slope of hull bottom line or any discontinuity is found

B2.2 b) should be changed to allow the positioning of forward freeboard stations in different places (e.g. the bow knuckle)

B2.2. c) should be changed to allow placement of aft freeboard stations in different places (e.g. at transom end)

7. SCORING SOFTWARE

One of the main issues related to scoring software is when handicaps have non-monotonic change with TWS (e.g. with a minimum time allowance reached at less than 20 kts TWS, so at the high end a decreasing speed with increasing wind). In this case ITC suggests changing the curve in a way that a slight slope is retained from the maximum point up to 20 kts of TWS. Another issue is related to the details of the spline calculation used in the various available software programs.

To obtain the same results in terms of corrected time, ORC will provide detailed documentation for the spline calculation. The source code isn't enough, and a "black box" module is difficult to interface in different software platforms.

The difficult question to solve is the behaviour at the extremes of the considered range of the curve, and what options to choose to look for in points outside the range. For example, at the high wind end the curve tends to flatten, sometimes dropping, on windward courses, and different options on the tangent at the extremes can give different results.

The important thing is to create some "benchmark" using the existing programs, which could be used to test and verify any new software being presented in order to be approved to ensure consistency of the results, given the same input data.

8. CLASS DIVISIONS

One of the big issues in current races is that large differences in handicaps in the same class could cause some problems when the wind isn't steady, so there are not only real problems for the Race Committee to change courses but also when choosing scoring options, because the wind is not the same for the larger and smaller boats of the same division racing on the same course.

There are some submissions requesting to increase the number of classes racing for the World Championship next year, and this could be a solution but there are issues related to the number of boats, nations and continents in each class to award the title.

A ManCom submission is asking to establish 3 main ranges with limits set at 500 and 600, but after a long discussion the ITC recommends the following class divisions (with 2013 VPP) looking at the current database of well-attended races of the year:

CLASS 0 GPH < 420 CLASS 1 420 < GPH < 475 CLASS 2 475 < GPH < 550 CLASS 3 550 < GPH < 600 CLASS 4 600 < GPH < 630 CLASS 5 630 < GPH < 700 CLASS 6 GPH > 700

The above limits will need to be adjusted according to next year's VPP to keep as much as possible the boats in the same class so that they fall with the above limits this year.

9. J CLASS

J class boats are currently racing with a customized VPP rule (developed by the Wolfson Unit MTIA at the University of Southampton). This year they were asked to get an ORC certificate for racing in Porto Cervo at the last Maxi Yacht Rolex Cup, belonging to the Supermaxi Division which used ORC for scoring.

For this reason the ORC Chief Measurer got in touch with the class representative, Martyn Prince, addressing all the details to run these boats. According to Martyn the experience was very favorable, and the J Class could in fact become a Rating Office on its own, providing to its 8 members ORCi rating certificates, allowing them to compete in any race in the world where ORC is used.

10. SAIL STACKING ON WINDWARD SIDE

This issue was raised during last ITC meeting in Annapolis. A discussion paper has been prepared by Yachting Australia and the conclusion was to allow sail stacking below deck. Here below the conclusions of that paper:

A YA prescription altering RRS51 would therefore have limited immediate applicability in Australia unless the requirements of these two major rating rules can be addressed or altered.

Guidance to MYAs and clubs – it is recommended that an explanatory memorandum be prepared by YA and sent to clubs that clearly explains that subject to class rules *only unused and packed sails* excluding storm and heavy weather sails as required by SR4.24 can be moved about below decks so as to improve sailing performance and that they shall be effectively restrained against falling at all times except when being moved in order to fulfil existing Special Regulations requirements, especially noting SR1.03.1. In races lasting longer than (say) 24 hours it could be stated that 1/3 of the bunks (where fitted, quantity rounded up) shall be left vacant for the use of crew to rest, rather than occupied by sails.

Notice of Race and/or Sailing Instruction inclusions – the NoR and/or SI should include reference to any adopted prescription and include notice of the variation to RRS51 that is effective for the race or event as follows:

RRS51 remains in effect except that where class rules permit, sails other than storm and heavy weather sails that are not set may be moved to improve performance provided they are effectively restrained below-decks (see 1.03.1 securely fastened) against falling and do not introduce any additional hazard to crew.

The committee acknowledged that practice, but it looks more of an RRS subject than a technical matter. The option of weighing sails and take into account their effect in the VPP was discussed, but considered impractical due to the lack of information about the boat's interior layout that strongly influence the potential ability to move the sails to windward of the centreline..

11. UNIVERSAL MEASUREMENT SYSTEM UPDATE

ORC Chief Measurer reported on the UMS status. A joint submission by ORC+USSA+IRC has been submitted to ISAF to support the concept of UMS. The IMS rule has all the features to become the UMS platform, with some work to be done in unifying a few measurements and their names in sails and rig.

The hull geometry is represented by an OFF file, from which to take integrated measurements - as the ORC does – or by interpolation also point measurements as draft, beam, girths, overhangs needed by one or another rating rule.

The latest ORC manager has implemented 2 conversion tools that calculate from ORC certificates data a sheet and a CSV file with all the necessary inputs for IRC. More recently another addition of the Manager allows to print HPR certificates. More can come, as the DH conversion, or the classes of the International Rule, and the classic boats.

Regarding hull geometry, the STL files format has been indicated as the best and most robust universal standard to provide hull geometry information data, from a design file or direct measurement, but an OFF file needs to be obtained before running the LPP. A conversion software will be prepared to obtain this (see Par. 6).

At present the software already in use can create OFF files from cleaned and properly oriented point clouds, without any post-processing requiring the creation of a surface, or any conversion in different format, like DXF, STL, IGS. With the 3d scanners now becoming increasingly available, the objective is to set up a standard procedure to get good and error-free OFF files. Some standard procedures are being put together, in order to make use of these new tools minimizing the expensive post-processing time.

12. ITC SERVICES

Panoyotis Papapostolou prepared a very good web tool for ITC members called ITC services. The ITC member is now able to upload in the ORC server one or more executables (VPPxx.EXE) to test (may be with any connected MATRIX.IN like the SURFRR.IN) that ORC programmer has provided to him.

Then he can choose a test fleet at the existing world database. This test fleet could be saved/modified/updated each time the member will need. Before launching the test run, an ORP file should be uploaded, and then the test run is started. The final resulting CSV file can be saved and downloaded later when ready. In this manner everybody could be able to prepare his test runs with the reference boats he wants.

This tool will be further developed/modified/updated during the next year to allow ITC members to work quickly on new VPP modifications

13. COMPLETION OF RECOMMENDATION TO THE CONGRESS.

- 1) Introduction of default JH at 5% of LPG
- 2) Increase of maximum Elastic Modulus for carbon in Default Mast Weight
- 3) New OSN
- 4) Reintroduction of "other" propeller type
- 5) Extend Dacron sails allowance in ORCi
- 6) Modification to allowed materials (ORC 101)
- 7) Mast jack allowed on board (ORC 205.2)
- 8) Titanium and Carbon Stanchions allowed
- 9) BIAS for ORC CLUB boats not inclined
- 10) Reduce maximum heel with spinnaker
- 11) Fine tuning of RR
- 12) Fine tuning of Canting Keel with double canard
- 13) Possibility to rate boats with double fixed keel with bulb
- 14) Possibility to rate boats with canting keel + water ballast boats
- 15) Fine tuning of Power function
- 16) Cd-Cl^2 multiplier in the aero model
- 17) New headsail definition and treatment with roached genoa allowed.
- 18) Possibility to rate Parasailor in ORC CLUB

14. STRATEGIC PLANNING FOR WORK AFTER THIS MEETING, MAIN PROJECTS FOR 2014

- a) New LPP developing
- b) Added resistance in waves
- c) Fine tuning of RR
- d) Transom Drag revision
- e) Crew weight trim moment
- f) Evaluation of Dynamic wetted area
- g) Default RM revision
- h) Downwind aero model
- i) New de-powering
- j) STL hull conversion software
- k) Sail stacking on windward side

15. ORC RESEARCH FUND BUDGET PLANNING

The ITC believes that for next year's agenda some further CFD study and wind tunnel tests should be performed. It is difficult to say at this time which budget will be needed, so ManCom will be asked for the establishment of a fund that may be used during the year 2014.

16. NEXT MEETINGS SCHEDULING

In 2013 there have been 3 meetings, but many of the tasks started could not be concluded to result in useful VPP changes for 2014. Nonetheless, there was general agreement amongst the Committee that the face-to-face meetings were important in providing direction to the technical projects in hand. For 2014 it is suggested to have 4 meetings instead of 3 to encourage this.

12th November 2013