SCHRS Technical Review for 2019

From: William Sunnucks SCHRS Technical Committee   30th December 2018
To: SCHRS World Council

Introduction
Each year I report to the World Council on the activities of the SCHRS technical committee making recommendations on changes to the formula needed to respond to concerns we are aware of. This year most of the work has been done by Jean-Claude Rouves and Geoff Balfre, with helpful contributions from others on specific subjects.

All contributors work on a volunteer basis. SCHRS has no budget. We get tremendous encouragement from our worldwide contacts and enjoy the communication with them.

USA
Will Rottgering and Mark Schneider have been actively promoting SCHRS in North America, and we are getting a rising number of queries and contacts – from Florida, Texas, Virginia Beach, Lake Michigan and Ottawa.

We hope that in due course US Sailing will recognise SCHRS as a complementary handicapping system to its Portsmouth Yardstick performance system. In the UK the two systems – measured and performance - work well together, and the same could apply in USA.

Europe
We have had several meetings and skype calls with the Swiss handicappers this year and Yorick Klipfel has been appointed as an SCHRS measurer. We will supply handicaps for small catamarans to populate their Manage2Sail software.

SCHRS committees

The World Council includes
- Jean-Claude Rouves (President)
- Pierre-Charles Barraud (Official measurer FFV)
- Olivier Bovyn (F18 Class President)
- Mark Schneider (USA)
- Colin Whitehead (South Africa)
- Brian Chapman (Australia)

The Technical Committee includes
- William Sunnucks (Chairman)
- David Chivers (UK Measurer)
- Andrew Gallagher (Ireland)
- Olly Harris (Naval Architect)
- Simon Longstaff (former SCHRS Chairman)
- Will Rottgering (USA)
- Jason Smithwick (RORC)
- Geoff Balfre (Webmaster)

Performance review

As in previous years we have analysed the available race data, mostly from France. We calculate notional ratings based on performance and compare them to SCHRS. SCHRS remains a <u>measured</u> system and these notional figures are used for comparison only. The SCHRS numbers are based on measurements. We never change any individual rating based on performance: but we look at results and try to optimise the formula for all classes.

It is encouraging to see how closely the results are correlated <u>within</u> both the C1 and the C3 groups. We would like to have better data on relativities <u>between</u> the groups.

In C1 the F18 continues to outperform its 2018 handicap by 0.7% compared to the Viper. The 2019 ratings partially correct this with the Viper (and similar F16s) enjoying a 0.4-0.5% improvement in their relative rating. The change arises mainly from the remeasurement of the F18 mainsail luff, not because we want to be kind to Vipers.

The A class classic underperforms by 1.3%. This may be because some of the keenest sailors have moved to the foiling A class which has a different rating. The A class classic continues to show formidable speed in light winds, but weaker performance in breeze. The 2019 formula will reduce the difference by 0.6%.

Summary chart 2018	AHPC Viper Double	Nacra 20 carbone	Formula 18	A Class classic	Nacra 17 "C" Ex.Olympic
Ratings SCHRS 2018	1,040	0,877	1,000	1,002	0,991
Ratings on average performances 2018	1,040	0,885	0,993	1,015	0,988
Gap ratings SCHRS 2018 / performances	0,000	0,008	-0,007	0,013	-0,003
Conversion time per hour	00:00:00	00:00:32	00:00:25	00:00:47	00:00:20

In the C3 group (smaller skeg catamarans) the SL16s are outperforming and the HC16 spi is underperforming. For many years the observed performance on the water of these two classes was identical. The difference may be explained by the migration of many capable young French teams to SL16s. The continued outperformance of the hotly contested Dart 18 class should cause no surprises.

Summary chart 2018	Ref 15.5	SL16	HC16 spi	HC16	Dart 18
Ratings SCHRS 2018	1,225	1,140	1,143	1,193	1,215
Ratings on average performances 2018	1,225	1,122	1,149	1,193	1,204
Gap ratings SCHRS 2018 / performances	0,000	-0,018	0,006	0,000	-0,011
Conversion time per hour		00:00:56	00:00:20	00:00:00	00:00:32

The overall conclusion is that SCHRS continues to model performance surprisingly well. Most differences are under 1% in a world where one design race times typically vary by 20% or more. We can cautiously claim that over a series with a variety of weather conditions the best sailors should win.
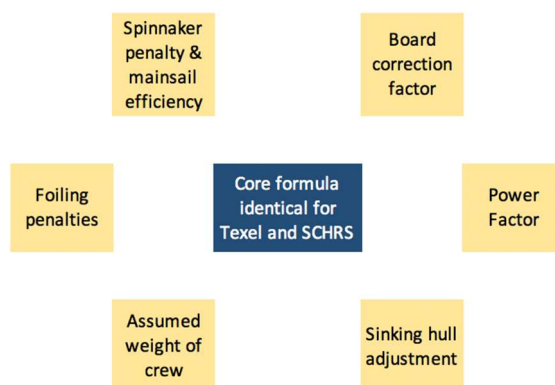
The formula for calculating SCHRS handicaps
The 2017 formula adopted a new power function formula based on all-up sailing Weight (W), Length overall (L) and Adjusted sail area (A). It produces remarkably similar results to the previous SCHRS formula, but uses a much simpler calculation

$$\frac{1.111 \times W^{0.3}}{L^{0.325} \times A^{0.41}}$$

We share this core formula with Texel but the "appendages" are different as illustrated in the diagram below.

Relationship between Texel and SCHRS
Core formula is identical, appendages differ

Spinnaker penalty & mainsail efficiency		Board correction factor
Foiling penalties	**Core formula identical for Texel and SCHRS**	**Power Factor**
Assumed weight of crew		Sinking hull adjustment

Proposed changes for 2019

LTM (Length of top of mainsail)

We recommend dropping the LTM penalty and replacing it with a simpler 0,1,2 system.

LTM was introduced to penalise square top mainsails when they were outperforming pinheads. They were thought to have three potential advantages: i) an aerodynamic advantage due to less tip vortex, ii) an advantage (especially downwind) from the top of the sail being in more wind iii) a potential advantage from self-regulating twist as the boat moves in the waves.

The trend towards big square tops is partially reversing. We are seeing smaller LTM measurements on deck-sweepers with a lower centre of effort and more power in breeze.

We now recommend classifying mainsails into three types as follows:

    SMS = 0 – Pinheads
    SMS = 1 – Square tops
    SMS = 2 – Deck-sweepers

The formula will work as follows:

Mainsail Area (M) = Measured Area (CM) x Mainsail Efficiency (ME)

    Mainsail efficiency (ME) = Sail Efficiency (SE) x CMS

        CMS = IF (SMS=0;0.88; MIN(0.92;1-(CM/VLM^1.5*0,127)))

        Sail efficiency SE = $40.1 + (18.31 \times X) - (2.016 \times X^2) + (0.07472 \times X^3)$ where X is the respective sail aspect ratio, as shown below.

        Mainsail Aspect ratio $XM = VLM^2 / CM$

IF SMS = 2 (ie there is a decksweeper) then a [0%] penalty is applied directly to R (the SCHRS rating).

Deck-sweepers

We have seen some theoretical evidence on the impact of deck-sweeper mainsails. A study by Kevin Ellway[1] for the Vampire Project suggests that the vmg gains from a deck-sweeper mainsail are 0.7%-1.0% with the greatest gains in light winds.

However there are significant practical problems with introducing a penalty for 2019. How do we define a deck-sweeper when designs are changing? Should we give a bigger penalty to boats with non-porous trampolines? How do we take into account the righting moment benefits of end-plating? Should we have an additional penalty for end-plated jibs?

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[1] Ellway Hydrodynamic designs

For 2019 we therefore recommend a zero penalty for deck-sweepers. Instead we should focus on measuring the luff lengths in classes with deck-sweepers, an activity that will harden their relative ratings.

For 2020 and beyond we recommend a fixed penalty for any catamaran with a deliberately end-plated jib or mainsail as in the formula above. By then we will have another year's experience to inform the quantum and we will have had time to find a suitable definition.

Formula 18 Deck-sweepers
Almost all[2] the top formula 18s are using deck-sweepers and it is time to remeasure the sails. As usual we measure "best practice" and luff length has thus increased from 8.6m to 9.05m[3], an increase that increases "mainsail efficiency" and thus reduces the rating by 0.3%. We will do the same for any other class that adopts deck-sweepers, including F16. We have rebased the whole series to leave the F18 rating at 1.000.

Number of trapezes
We have made a minor change to the calculator to raise a query if single handed catamarans are entered with than one trapeze. Obvious perhaps, but the change is needed to reduce the potential for errors.

Conclusion
This review will go to the World Council for approval, and the changes will then be published on the SCHRS website. We will try not to make any further changes until 2020.

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[2] 55% of the participants in the 2018 World Championships in Argentina had decksweepers, and all of the top 13 boats had them.
[3] Based on 9 measurements from leading boats at the 2018 World Championship by Pierre-Charles Barraud