SMALL CATAMARAN HANDIPAP RATING SYSTEM

WORLD COUNCIL REVIEW 2015

(Draft 9/2/2015)

Introduction

This is the annual review of the Small Catamaran Handicap Rating System Formula. The system is reviewed every autumn to ensure that any changes are agreed in good time for the next season. We try to resist pressures to make mid-season changes.

SCHRS is the ISAF recognised method for rating small catamarans; thus it is important that all properly informed views are considered and that decisions are balanced and based on the best available evidence.

During 2014 the appointment of Jean-Claude Rouves as President was formally approved by the ISAF Equipment Committee, and he has now fully taken over from Nick Dewhirst who died unexpectedly in July 2013.

Consultation

We are grateful to those who have made considered contributions during the year. These include:

Peter Vink	Nacra, Holland
Jean Richard Minardi	Nacra, Switzerland
Nico Boon and Geert Ruesink	Texel Rating System, Holland
Gill de Bruhne	Falcon, Belgium
Brian Chapman	Australia

In addition we have strengthened our links with national sailing Federations. In the UK we are working more closely with the RYA on improving linkage between SCHRS and their performance based Portsmouth Yardstick rating system. In France Olivier Bovyn and Jean-Claude Rouves have liaised with the FFV, and in Holland we have an annual meeting with representatives of the Netherlands Sailing Federation and the Texel Rating system during Texel week.

Performance monitoring

SCHRS is a formula based system: classes don't get a worse rating just because they outperform. Nevertheless we need to keep in touch with reality and monitor how the formula is performing. We have two sources of information to reassure us on this:

1. **Data from France:** We have reviewed results of the leading boats in 10 classes over a sample of 308 races run in France between 2011 and 2014. Given the >20% time spread typically seen even in one design racing it is very encouraging that on average most boats are within 1% of their predicted performance. There are just two classes outperforming by more than 1% and there are good reasons for both:

    - The Nacra 17 has outperformed by 4.1%. This is not surprising given the number of aspiring Olympic sailors in the class.
    - The SL16 has outperformed by 1.4%. This is the ISAF youth class, and attracts many talented young sailors: it would be surprising if its actual performance was in line with predictions.

    One class has underperformed by 2.5%. This is the Nacra 20 carbon whose results lend weight to the view that the curved board penalty of 3% is too harsh.

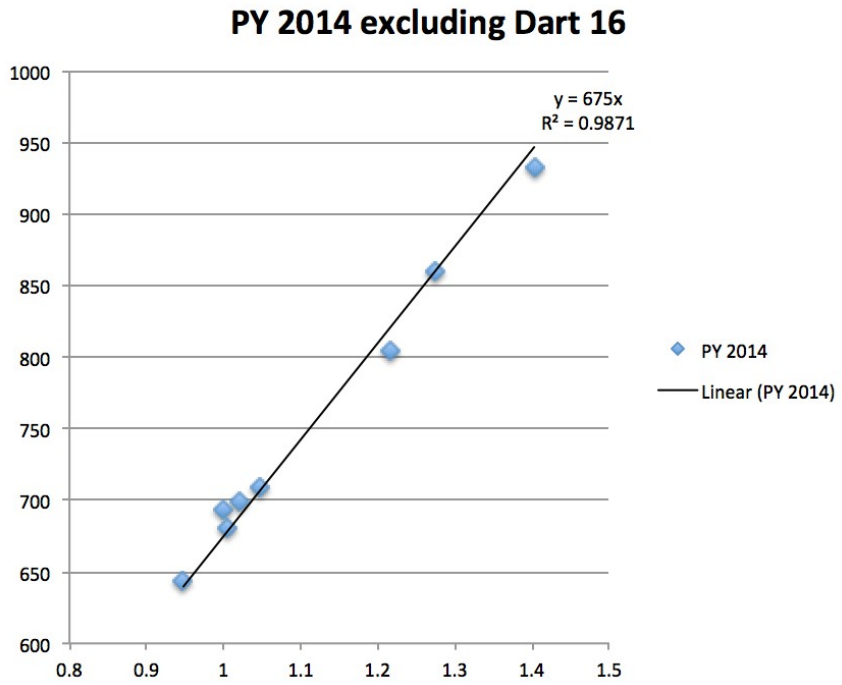
    In the interests of openness we attach the results analysis to this paper. Note that under performance does <u>not</u> lead to a more favourable rating: it is merely an input when considering changes to the formula.

2. **Data from the UK:** most UK club dinghy racing is done using the Portsmouth Yardstick system supported by the RYA. This is a performance system, corrected annually in the light of returns prepared by the major UK sailing clubs. It obviously differs from SCHRS which has no allowance for the ability of the sailors in each class.

    Portsmouth numbers are published for about 9 catamaran classes where there are sufficient numbers. It is encouraging to note that the correlation between the two systems is very close (.9871) – see the graph below. As you would expect very competitively sailed classes (Dart 18, Sprint 15) are below the line. Less competitive classes are above. The Dart 16, which is often a training boat for beginners, is well above the line and is excluded as an outlier.

    The slope of the line gives the PY conversion factor, which was reduced from 692.7 to 675 in 2014. The PY figures for 2015 would justify an increase to 683, but we recommend keeping 675, in line with the views of the PY committee. If Dart 16s were included it could be higher (easier for cats to win).

    The two systems can work well together: the PY data gives us reassurance that our formula reflects reality. The SCHRS data enables many more catamaran types to compete with dinghies in handicap races.



Class rules

A lot of work on improving the data has been done this year. We have identified many anomalies between our ratings database and the one used by the Texel Rating system.

There have been material differences in the figures for the weight of the boat ready to sail (WS). We are resolving this with reference to the class rules, wherever possible using the minimum allowed even if some older boats weigh more. This may cause differences with the Texel system which weighs boats on the beach rather than using class rules.

Specific data changes

The F16 minimum weight of 107kgs is significantly below the weights of the main constituent classes such as the Viper and Nacra 16: after extensive communication, we have decided to use the class rules for the established individual F16 classes, including the Viper, Nacra F16 and Falcon. Other F16s either have their own individual rating certificates or are assumed to weigh 107kgs.

Nacra 16s with curved boards are treated as a separate class from the Nacra F16 with straight boards. There is an extra 2% penalty.

We also list two ratings for the A class, reflecting the divergence within the class: the 'A class flying' is given the full 5% penalty, while the 'A class classic' is only given 2%, which assumes curved dagger boards and rudder fins are fitted.

The Nacra FCS and Flying Phantom have been added to the list. We are trying to get figures to support a provisional number for the Whisper.

Foiling

Foiling continues to pose a challenge to SCHRS. Foilers typically underperform in light winds due to high wetted surface: but once flying the speed increase is dramatic.

For 2014 we penalised full foilers with a 7% penalty in addition to the penalty from measuring the full length of their foils as if they were dagger boards. We have had emphatic feedback from Nacra that these penalties are too harsh. We still have very little hard data, but no foiler has yet come near to winning on handicap.

For 2015 we propose three changes:

1. To adjust the foiling penalties as below, and keep under review in 2016

Foiling penalties	2014	2015
Semi lifting - only curved daggerboards with constant radius	3.0%	1.5%
Semi lifting - curved daggerboards with stabiliser fins on rudders	3.0%	2.0%
Full lifting foils (including all boards with variable radius)	7.0%	5.0%

2. We propose a cap on LB at 30% of hull length. This won't affect any conventional or "archimedean" catamarans, but it will reduce the penalty for the very long foils used by some foilers.

3. We propose a rule change to make it clear that foilers "may be ranked apart". This leaves race committees with the option of publishing separate results, and offering separate prizes for foilers where there are sufficient numbers.

Class	LF 2015	2015 rating	2014 rating
Nacra 17	1.5%	.993	.964
Nacra 20 Carbon	1.5%	.877	.858
Nacra 16 with curved foils	2.0%	1.019	.996
Nacra 16 single handed	2.0%	1.041	1.020
A class classic	2.0%	1.002	1.002
A class flying	5.0%	.970	.959
Flying Phantom	5.0%	.878	.835
Nacra 20 FCS	5.0%	.839	.803

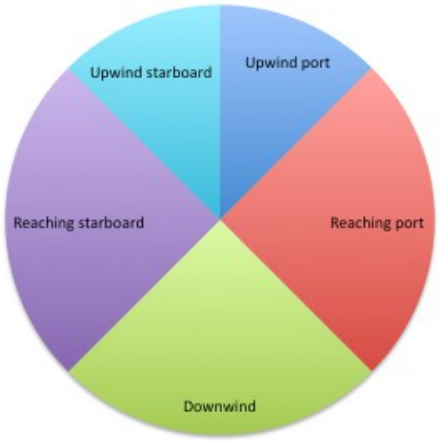
4. We recommend changing the C0 rule. At present any catamaran which is not from a recognized class "may" be ranked apart as C0 rather than C1. This rule has been applied inconsistently, and has sometimes resulted in the exclusion of innovative boats. The fear that extraordinary craft would start winning has proved unfounded. The proposed revised wording is attached.

Increasing spinnaker penalty

It has been suggested that spinnakers should be penalised more heavily. At present we add only 10% of the spi area to the jib area and the suggestion is that this is increased to 15%.

In theory 1sqm of spinnaker area could be as effective as 1sqm of "white" sail. But of course it can be only used part of the time, thus the hefty discount. It is fully effective downwind, which (for an F18, F16 or similar) covers about 25% of wind directions. This is the argument for an increased penalty.

Diagram representing % of time on each point of sailing



However in practice we are not seeing anomalies and no change is recommended. We should reconsider this if we get good statistical evidence that boats without spinnakers are disadvantaged. At present the comment below, from an experienced cat sailor:

> "I agree that whist it seems the spi should be more heaviliy penalised, the ratings as they are do work well when spi races non spi. My experience is from racing Shadows against Unicorns and A Classes. I also think that as you get to slower boats such as Darts and Hobie 16s, (where the majority of racing between spinnaker and non-spinnaker boats takes place), the spi advantage diminishes due to lower apparent wind effect and ability of the slower cats to sail very deep angles downwind."

Power Factor

The power factor is the ratio between heeling moment and righting moment. Overpowered boats (ie. With narrow beams and big sails) benefit. We have always capped the power factor, first at 1.032 then at 1.04. This year we recommend capping it at 1.027, a figure which leaves the A class classic with the same rating as last year.

Jib efficiency correction

We have had a comment that the jib efficiency adjustment is theoretically unsound and should be dropped. At present we penalise high aspect ratio jibs by adjusting the area by a quadratic factor related to aspect ratio. We are told that the efficiency of the jib in isolation is not a determinant of performance: we need to look at the aspect ratio of the whole rig.

This is a new point and should be considered for at least 1 year before changes are made. No change is proposed this year.

Rounding

We have been urged to do reduce the number of decimal places in the ratings from 3 to two. This is because 3 decimals are difficult to remember, and the accuracy from the third decimal place is spurious. However the testing showed that two digits upsets well established relationships between the ratings of some classes, and we recommend continuing with three.

LTM penalty (Length of Top of Mainsail)

At present we penalise square top mainsails heavily by increasing ME (Mainsail Efficiency) by a factor related to LTM (Length of Top of Mainsail) as a proportion of VLM (Vertical Luff of Main) and CM (Mainsail area). Last year we reduced the penalty significantly by applying a power factor of .5 rather than .8.

The advantages and disadvantages of square top mainsails are thought to be:

- a closer approximation an elliptical wing shape (as per the Spitfire wing)
- less tip vortex than pinheads (increases efficiency)
- better gust response as the sail twists
- more sail area in more wind higher up
- BUT more heeling moment (disadvantage)

The LTM penalty was reduced last year, but it is still thought to be too harsh. We have had emphatic comments from Nacra/Performance Sails, and the Hurricane fleet has realised that there are handicap gains to be made from reverting to a pinhead.

Nacra comments: "You will get 0.7 % extra penalty if you go from 70cm to 100 cm in head. Can you explain how you came to this conclusion?"

Proposal:

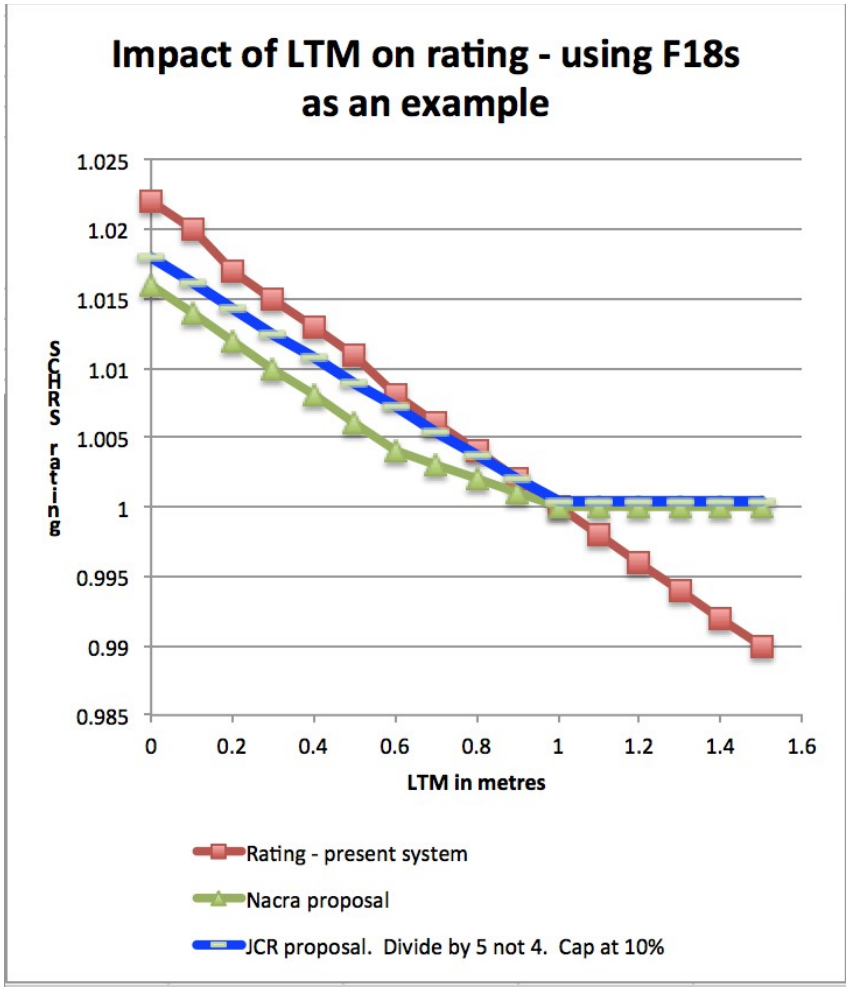
- Head sizes until 60 cm 0.4% each 20 cm
- Head sizes 60 to 100 cm 0.2% on top of the first 60 cm
- Head sizes over 100 cm 0%

Recommendation: we recommend a moderate reduction in the penalty moving towards the NACRA recommendation. The graph below illustrates – the steeper the line the harsher the penalty.

It is not practical to implement the NACRA proposal exactly as they have suggested as it will upset the way the spread sheet works.

The more moderate penalty is calculated in the same way as the previous one, but the RTMS (Coefficient for the Top of the Main Sail) calculation contains a divisor of 5 rather than 4. Also RTMS is capped so that there is no extra LTM penalty when LTM*VLM/5 > 10%.

$$RTMS=IF\ (LTM="no\ LTM",0,MIN(0.1,(LTM*VLM/5)/CM))$$



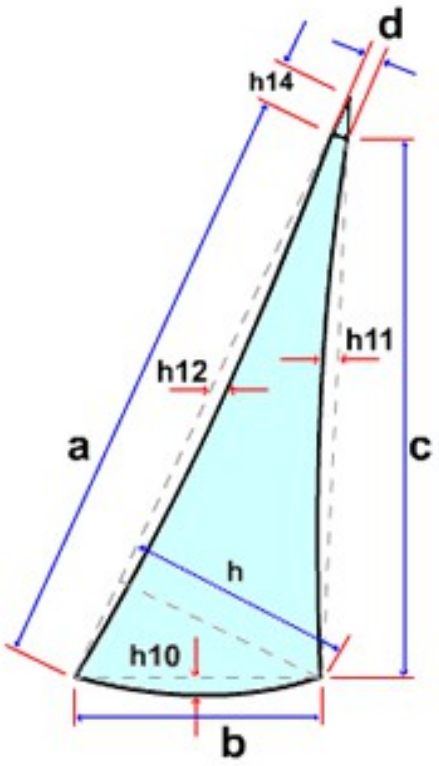
Jib area measurement

The SCHRS website includes a diagram showing how the jib should be measured. But it makes no provision for square heads which are beginning to appear on some boats. We therefore propose the following changes (in red) to the formula, referring to a clearer diagram.

CJ - Area of Jib

S9 = a+h14 x h / 2
S10 = 2/3 b x h10
S11 = 2/3 c x h11
S12 = 2/3 a x h12
S13 = h14 x d/2

CJ = (S9 +or- S10 +or- S11 +or- S12 - S13) m²



Summary of changes for 2015:

- New foiling penalties
- Rule change to allow race organisers to rank foilers apart
- Further reduction in LTM penalty
- Data improvements based on class rules
- Clarification of jib measurement method shown on website

Anomalies with Texel Rating data table per Geert Ruesink analysis

Boats where SCHRS weight is higher than Texel by 10kgs

Hobie 21 Formula	Already corrected
Hobie Pacific (with wings)	
Hurricane 4,9	Texel figures look too low. This boat is 133kgs
Mattia 20	
Nacra 5,0	
Falcon F16 - cat boat	120kgs accepted for Falcon F16s other than “specials”
Falcon F16 - 2 crew	120kgs accepted for Falcon F16s other than “specials”
Hurricane 5,9 SX	Confident with SCHRS number
Nacra 5,8	
Mattia Flash F18	
Tropic GTI	
Topcat Spifire 2,3	
Prindle 19	
Condor 16	
Hurricane 5,9 Sport	Confident with SCHRS number
Prindle 19 Pacer	

Boats where SCHRS weight is lower than Texel by 10kgs

Ventilo 20 CB	
Mattia Esse Sport	
Dart TSX	
Hobie FX One Cat Boat	
KL 17 Regate	
Dart 6000	
Miracle 20	
Thundercat 18	
Hobie 18 Magnum	

Beam varies by more than 10cms between Texel and SHCRS

Ventilo 20 CB
Catapult
Tropic GTI
Topcat Spifire 2,5
New Cat F2
New Cat F1

Mattia 18 104
KL 17 Regate
KL 15,5
Mattia Esse Sport
Hobie 18 Magnum
Mystere 6,0

VLM (Vertical projection of Luff of Main) varies by more than 50cms

Hobie 14 Turbo	-0.62
Hobie 14 LE	-0.62
Nacra 5,8	0.50
Nacra 6,0	0.60
Javelin 18HT	0.66
Stealth R Solo	0.67
Stealth R	0.67
KL 15,5	0.96
Mattia Esse Sport	1.02
Shearwater	1.05

MSAM (Main Area) varies by more than 1sqm

Topcat Spifire 2,3	-2.07
Topcat Spifire 2,5	-1.59
Mystere 5,5 Fun	-1.28
Mystere 5,0 XI	-0.94
Mattia 20	-0.78
Tornado	-0.75
Hobie 18	-0.70
Hobie 18 Magnum	-0.70
Hurricane 500	1.07
Miracle 20	1.10
Stealth R	1.16
Stealth R Solo	1.16
Nacra Inter 17 Solo (without spinnaker)	1.41
Topcat F2	1.51
Topcat F1	1.51
Thundercat 18	1.62
KL 15,5	1.75

MSAG (Measured Sail Area of Jib) varies by more than 1sqm

Hurricane 500	-2.01
Thundercat 18	-1.95
Stealth R	-1.20
Hobie Max	-1.07
Mystere 6,0	1.47
Miracle 20	1.69

Extracts from SCHRS rules, with proposed changes:

B. ADMITTANCE

These rules are intended to allow a wide range of catamarans to race together. Boats from established classes with class rules must comply with their class rules and can use the ratings on the SCHRS list.

Any catamaran of a type not listed on the SCHRS list must have an individual SCHRS rating certificate signed by a measurer recognized by ISAF or a National Authority.

B.2 Rating Certificate

To be permitted to race, unlisted boats shall provide a Rating Certificate recognised by the ISAF (SCHRS) as described below:

The Rating Certificate is obtained as follows:

- The request will be accepted only for the catamarans, or variants, not listed in the SCHRS ratings Table for the current year.
- No competitor will be granted more than one individual certificate per calendar year
- The request for a Rating Certificate should be made by the owner, on the form which is downloadable from the SCHRS website. It must be completed and signed by a measurer recognized by the ISAF or a National Authority and must be sent by e-mail in pdf format to the Technical Committee of SCHRS. It is helpful (but not necessary) if a copy of the calculator is also attached.
- Within fifteen days after receiving the request form, correctly completed and signed by a measurer, the Technical Committee will send the "Individual Rating Certificate " to the owner, with a copy to the measurer
- The Rating Certificate will be registered on the SCHRS website
- The Rating Certificate is valid for the current calendar year. The SCHRS committee makes annual changes to the formula, and a new certificate will be therefore be required each year
- The Rating Certificate should be presented at registration for official sailing races. Any changes which modify the data or characteristics of the boat would lead to the invalidity of this certificate
- The Rating Certificate is not invalidated by change of ownership, providing the data remains constant. It is the current owner's responsibility to ensure compliance.

N.B. A National Authority or recognized measurer may require a fee.

E. RACING RESULTS

E.1 Corrected time

The racing results are calculated by dividing the sailing time by the rating (or time dividing factor) to obtain corrected time.

E.2 One-design classes and subgroups

As mentioned in the preamble, National Authorities or organisers may consider separate arrangements or rankings with one-design or level rating classes or subgroups present in sufficient numbers.

E.3 Foiling catamarans

An event organiser or race committee should consider scoring foiling boats separately. Foiling boats are defined as boats with lifting foils of non-constant radius that are capable of flight above the water