SCHRS Review 2015

From: SCHRS Technical Committee
To: SCHRS World Council

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Introduction

This is the annual review of the Small Catamaran Handicap Rating System Formula. The system is reviewed every winter to ensure that any changes are agreed in good time for the next season. We 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 on the formula are balanced and based on the best available evidence.

Consultation

The big achievement this year is to improve the data in our ratings table. We have worked closely with the Texel Handicap Committee to resolve differences, including a meeting before the Round Texel Race, and a further meeting in Paris on October 26th 2015.

SCHRS increasingly uses class rules rather than a measured sample of boats: in this way much of the policing is outsourced to class associations. Texel is taking the same approach.

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

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

In addition we have strengthened our links with national sailing Federations. In the UK we are working with the RYA on improving linkage between SCHRS and the performance based Portsmouth Yardstick rating system. In France we have improved communications with the FFV and with YCC Carnac whose Eurocat regatta at the end of April is the first major testing ground for any changes made.

Performance monitoring

SCHRS is a formula based system: this means that poor race results don't justify a more generous rating for one specific class: but they may cause us to look at the formula. We have two main sources of information available to us:

1. Data from France:

We attach some analysis of 2015 results from major classes sailed in France. Its encouraging to see how well the formula is working. Most differences are under 1% which

is immaterial when the range of times between the leaders and the competent tail-enders is typically around 20%.

Differences of more than 1% are:

1. The Nacra 17 outperforms its SCHRS by 3.2%. This is no surprise given the high quality of the Olympic sailors in the class
2. The Nacra 20 Carbon underperforms its SCHRS by 1.4%. This is the curved foil version, not the full flying one. It has a 1.5% penalty for its curved foils, and this could be taken as evidence that the penalty is too harsh. However there may be other factors at work as some of the stronger sailors move over to the foiling Nacra FCS. No adjustment planned.
3. The SL16 outperforms by 2.4% . This is no surprise given the number of top French youth sailors which have moved into this class, which is used for the ISAF Youth Worlds
4. The Dart 18 outperforms by 1.1%. Again no surprise given the highly competitive fleet.
5. The A class (with full foiling penalty) has underperformed by 1.1%.

The paper also shows the evolution of performance over a five year period, and compares it to the evolution of the ratings.

2. Data from the UK:

The RYA has an elaborate data capture system which feeds into the performance based Portsmouth numbers. We use regression analysis on these numbers to give us a conversion factor from SCHRS to PY, thus providing “PY lookalike” numbers for the 250+ classes on the SCHRS list.

We can use the PY numbers to inform us when SCHRS is out of line. The correlation for the 9 classes covered by both systems is high, and the variances are comprehensible: for example we can see that the PY is over-generous for the Dart 16 which is popular with beginners, and harsh for the Dart 18 which has a highly competitive race circuit. These are differences you would expect to see between a measured system and a performance one. PY rates boats and average sailor skill, whereas SCHRS measures only the boats.

The two systems can work well together with SCHRS which widens the reach of PY through its lookalikes.

We recommend keeping the conversion factor at 675 for 2016. In other words an F18 which is rated at 1.000 under SCHRS will rate at 675 under PY.

2016 formula changes

1. **Foiling penalties**

The SCHRS approach to foiling boats has been pragmatic. It started with a blanket 7% penalty. As results have come through the penalty has been reduced. It is still early days and we will continue to amend the penalties in the light of experience. For 2016 we recommend a slight reduction in the full foiling penalty from 5% to 4% as follows:

	2014	2015	2016
Semi lifting – only curved daggerboards with constant radius	3.0%	1.5%	1.5%
Semi lifting – curved daggerboards with stabiliser fins on rudders	3.0%	2.0%	2.0%

Full lifting foils (including all boards with variable radius	7.0%	5.0%	4.0%

Various alternative approaches have been considered and discounted:

1. We could try to develop a detailed theoretical model to predict foiling performance. Such models exist (or are claimed to exist) in the hands of a few designers. But it will be some years before there is sufficient consensus on what is fast to have a model which is usable by SCHRS.
2. We could try to choose one or two key parameters (such as total foil length or righting moment) which would be a rough indicator of foil performance. Texel have taken this approach but it doesn't have any theoretical or empirical proof yet.
3. It has been suggested that we have a special category for foiling boats designed within a restrictive rule. This would work for an A class, but the definitions make it difficult to apply more widely.

Two other changes affect foilers: we are recommending a harsher penalty on screechers, and a reduced cap on the rated length of daggerboards, which for foilers includes the horizontal as well as vertical components. Overall the impact on a Flying Phantom is:

Analysis of changes on Flying Phantom	SCHRS	Change
2015 rating	.878	
Change foiling penalty from 5% to 4%	.888	+1.0
Limit LB in BC formula to 25% of hull length	.895	+0.7
Include 2015 screecher penalty (error in 2015)	.893	-0.2
Increase screecher penalty ^2	.890	-0.3

Impact of the changes on other classes	**A-Class**	**A-Classic**	**Flying Phantom**	**Nacra 15**	**Nacra 16**	**Nacra 16 solo**	**Nacra 17 Olymp.**	**Nacra 20 Carbon**	**Nacra 20 FCS**
Dagger boards	Foils	Const. curve	Foils	Const. curve	Const. curve	Const. curve	Const. curve	Const. curve	Foils
SCHRS ratings 2015 before update	0,970	1,002	0,878	1,088	1,019	1,041	0,993	0,877	0,839
SCHRS ratings 2016 update+change 5% to 4%	0,981	1,002	0,890	1,088	1,019	1,041	0,993	0,875	0,849
Change in rating for 2016 in %	1,13%	0,00%	1.36%	0,00%	0,00%	0,00%	0,00%	-0,23%*	1,19%

* the Nacra 20 Carbon rating has changed because the weight has changed from 168kgs to 165kgs in line with the class rules.

2. **Change the gap between SL16 and HC16 spi**

Over the last two years the SL16 has started to outperform the HC16 spi. This is at least partly due to a shift into the SL16 by some of the top youth teams. Also more top HC16 teams are using the version without spi.

Last year the handicaps of the SL16 and HC 16 spi were equalised using a "sinking hull adjustment" of 1.4%. We are recommending no change to this.

This year we have changed the waterline length of the HC16 following our discussions with the Texel handicappers. This helps the Hobie 16 spi – for the first time it will have a more favourable handicap than the SL16 by 0.79%

HC16 spi versus SL16	SL16	HC16 spi	Gaps	Gaps in %
Ratings SCHRS 2015	1,144	1,144	0,000	0,00%
Ratings on average performances 2015	1,120	1,138	0,018	1,61%
Ratings SCHRS 2016 after update data	1,137	1,146	0,009	0.79%

3. **How to reduce the gap between the Dart 18 and Dart 18 cat boat?**

We are recommending a change to the heeling moment formula to reduce the gap between these two boats to 0.013

Background: The Dart 18 English and French Associations have been complaining that the Dart 18 cat boat (with one person and no jib) needs to be rated more harshly against the standard Dart 18. They are recommending a difference of 1 - 2%. Last year it was 4.4% which was much too much.

Research: We therefore examined 43 races where the Dart 18 solo and Dart 18 double were mixed and confirmed that this conclusion is supported by the data. The grid below shows that the Dart 18 solo is outperforming. In practice it is 2.19% slower than the Dart 18 double but the rating makes it 3.62% slower.

Comparison of rating gap between SCHRS 2015 and performances ratings				
	D18 double	D18 solo	Ecart	Time/ h
Ratings SCHRS 2015	1,217	1,261	3,62%	00:02:10
Ratings on performances	1,217	1,244	2,19%	00:01:18

Reasoning: a number of theories for this well established observation have been put forward. One, that the Dart 18 jib is too small to be effective, is not supported by established theory. Another is that in normal racing conditions neither boat is over-powered and that the power factor is therefore over-stated. This has some theoretical validity and thus we recommend adjusting the heeling moment calculation.

Adjusted formula: we recommend changing the heeling moment calculation for all single handers with no jib or spinnaker as follows:

HM=IF(AND(AL>5.15;CJ="";CSPI="";LB="";CREW=1);((((0,42*(VLM+1))*CM) + ((0,33*(VLJ+1))*CJ))*9,7037)-100;((((0,42*(VLM+1))*CM)+ ((0,33*(VLJ+1))*CJ))*9,7037))

This formula says " if length is over 5.15m and there is no jib spinnaker or dagger board and there is only one sailor, then 100kgms will be taken off the heeling moment calculation". In other words the boat is assumed to be "stiffer". The effect is to reduce the gap between the ratings to 0.013 as follows:

Assessment of impact:

Comparison of the SCHRS ratings 2016 between Dart 18 and Dart 18 solo after update data and after the changing of the formula of "heeling moment"

	Dart 18	Dart 18 solo	Gaps	Gaps in %	Time/ h
Ratings SCHRS 2016 after update of the data	1,213	1,258	0,045	3,71%	00:02:13
Ratings 2016 after update and changing heeling formula	1,213	1,226	0,013	1.07%	00:00:38

4. **Spinnaker – Screecher**

We recommend that the penalty for screechers is increased as follows:

Existing formula: =(1+((0.75-SMG/SF)/2))

Proposed formula: =(1+((0.75-SMG/SF)/2)) ^ 2

Background: A screecher is any spinnaker which doesn't meet the rule that the mid girth must be at least 75% of the foot. The 75% rule is needed because only 10% of spinnaker area is included as sail area, whereas 100% of jib area is included. A very flat spinnaker could in theory be used as a jib. Two Tornadoes tried this in the 2008 Olympics but it proved unsuccessful.

A 75% spinnaker is useless when foiling because the apparent wind comes too far forward. Even at 55% they can only be used in a narrow range of wind speeds (under 11 knots) and in a very small segment of the compass (about 90° out of 360°)

Texel comparison: Nevertheless it is thought that the existing screecher penalty is too mild, and steps are needed to make it harsher. We looked at the Texel formula but decided not to use it for two reasons: firstly it has an undesirable "discontinuity" between 75% and 74% and secondly because it adds on an absolute amount in square metres which is harsh on the smaller boats. The Texel formula (not to be used) is: Additional spi area =IF(SMG/SF<0.75,12.7*0.01*(185-220*SMG/SF),0)

Reasoning: to harshen our existing formula to roughly the Texel level we need to apply a power factor of 2 to our existing penalty as shown above. The impact is as follows:

Spinnaker area calculations

SCHRS 2015 spinnaker calculation				
Small cat e.g. Whisper Mk1				
SL1	**7.500**		% = SMG / SF	55.65
SL2	**6.690**		Unadjusted area	19.35
SMG	**1.853**		Screecher penalty	1.194
SF	**3.330**		**CSPI**	**15.161**

SCHRS 2016 spinnaker calculation				
Small cat e.g. Whisper Mk1¨ (with coef ^2)				
SL1	**7.500**		% = SMG / SF	55.65
SL2	**6.690**		Coef.screecher	1.203
SMG	**1.853**		**Ref.spi. area**	**12.702**
SF	**3.330**		**screecher pen.**	2.577
			Spi. + penalty	**15.280**

SCHRS 2015 spinnaker calculation				
Flying Phantom				
SL1	**10.220**		% = SMG / SF	60.43
SL2	**9.340**		Unadjusted area	14.57
SMG	**2.550**		Screecher penalty	1.146
SF	**4.220**		**CSPI**	**26.930**

SCHRS 2016 spinnaker calculation				
Flying Phantom (with coef ^2)				
SL1	**10.220**		% = SMG / SF	60.43
SL2	**9.340**		Coef.screecher	1.151
SMG	**2.550**		**Ref.spi. area**	**23.505**
SF	**4.220**		**screecher pen.**	3.550
			Spi. + penalty	**27.055**

CSPI = SFx(SL1+SL2)/4+(SMG-SF/2)x2/3(SL1+SL2)/2 m²

Board Correction Factor
We recommend reducing the cap on LB (the length of dagger boards below the hull) from 30% to 25.5% of AL. the overall length of the boat.

Background: the 2015 formula penalises LB harshly (1% + LB/35). There is a cap at 30% of overall length which never bites except for foilers.

Reasoning: Following criticism that ever longer boards show diminishing returns we have considered reduceing the penalty on extra length. However this was producing a number of anomalies. So we just recommend reducing the cap from 30% to 25.5% which still won't bit except for foilers.

The impact on the Flying Phantom is shown in the paragraph on foiling penalties above.

Formula 16 classes:
Bimare X16 Fplus: we have agreed with Lalo Petrucci and Antoine Meunier that the new batch of Bimare X16 Fplus boats be assumed to weigh 125kgs. This is only a provisional rating because there are no class rules as yet and there is a risk that boats will be produced with lower weights. We have based 125kgs on the lowest weight of 3 boats formally measured. This is similar to the pragmatic approach taken for the Falcon F16s.

Data changes:
We've conformed the data for 120 boats between Texel and SCHRS.

We've changed waterline length for many classes. Waterline length is very difficult to measure accurately and consistently – it involves floating the boat with crew in "normal sailing positions". It only affects classes introduced before 2007 so rather than debating each class we agreed to take the average of the numbers in the two systems.

We've changed weights for many classes to the minimum allowed in their class rules.

One small data difference remains: SCHRS still includes the mast area below the mainsail. whereas Texel doesn't.

AHPC has requested that it be rebranded "Goodall Design". This means that their boats have moved position in the table.