

Sailing Program comparison

SailSys	Sail100
Not transparent	All data displayed
Does not show rTCF.	Shows “echo” ideal TCF for each race.
rTCF calculation not known. Many past systems were flawed if using median boat or factors.	ECHO system used by us ensures that there is no inflation.
Old method of handicapping using all races rTCF. Superseded 20 years ago.	Latest method using weighted averages. (Exponential system)
Next race handicap can go down for winner. See CSC 4-11-2023 or 18-11-2023.	Next race handicap follows performance. All PHS results-TCF follows performance.
Makes assumptions till all races sailed as recommended averages over the last 7 races.	Works from race 1.
Unclear why it uses 6 out of 7. Does it drop highest or lowest?	Perfectly clear.
Not possible to manually check.	Easily checked to verify result.
Does not show TCF progression	Shown TCF progression and performance.
Does not show time to win.	Shows time to win adjusted for TCF
Does not show extra columns	Can show 4 programable columns
Pursuit starts based on length & unknown boat.	Pursuit starts based on time
Annual cost say, \$800.00+	No cost.
Don't think it can show sponsors	Shows sponsors.
Display unwieldy compared to Sail100	Overall result directly linked to races.
Entry process more complicated.	Entry very simple.
Payment could be a problem as SD no bank a/c.	Entry to member and RMYC accounts.
Requires Sailsys web to display results?	Results displayed on sailing race pages.
Not sure how pursuit start time are displayed?	Pursuit times displayed automatically.
Not sure how Wednesday starts displayed?	Wednesday starts in dedicated column.
Setup more complicated than Sail100 and a very small part of the overall tasks.	Sail100 easier to setup integrates better considering overall tasks
Crew lists need to be submitted by each crew member.	Crew lists filled by skipper (easy) and can be tailored to suit each race type.
Needs internet connection.	Can run from the cloud or stand alone.
Not sure about inflation as method undisclosed.	No inflation.
Limited information on races	Displays time to win, rTCF, calculation method next TCF + info in columns etc
No facility for untimed races.	Supports untimed races (Wednesday races).
TCF races using recommended SailSys adjustment requires 7 races before fully working.	Supports TCF with exponential adjustment.
How does SailSys handle initial races?	Our system works from race 1.
Does SailSys provide a work sheet?	Sail100 provides a work sheet.
No facility to print screen or illegible result	Screen prints clearly

Comments

- We have managed races without a starter or a starting boat.
- We have overcome buoys using boats or a procedure for GPS rounding.
- Finish times can be automatic and accurate with the development of RaceLogger.
- We have a method to lay and retrieve buoys from yachts with untimed finishes in our very successful Wednesday series.
- All of this has been an innovation by us and been very successful.
- We have the best race management program, and it's free.
- If the above, web sites, starters and starting boats had to be paid for over the last 20 years it would have cost much more than \$50,000. How much?



An Introduction and overview to handicapping.

Handicapping is used by clubs in a range of methods, generally with a view to achieving specific club goals. When conducting a competitive keelboat regatta this will be to achieve the fairest results without contention. However, for most, if not all club events, the goal is likely to ensure that the maximum number of competitors achieve a podium finish over the course of the series, a social twilight for example.

At its heart handicapping aims to equalise each competitor's chance of winning.

Core to the thesis of SailSys's proprietary PHS handicapping is that every compliant yacht (paid up and safe) should be eligible to win on the day. Importantly this is not subject to the competitor's ability versus other competitors in the fleet, but relative to their past performance. If the conditions and the course suit the yacht, and the crew sail the boat above their norm, they should enjoy a good result.

Two applications can help confirm if the handicapping is fair and supported by sound mathematical logic:

1. If you were to re-run the race with the new resultant handicaps, then the results shouldn't be that dissimilar; if the winning boat now comes in the lower half of the fleet, then the handicapping is likely too punitive.... the corollary is;
2. If the same course is set next week, the conditions are the same, and the crew sail the yacht as well as the previous week, then while we would rather not see last week's winner getting the wine, they should most certainly be in contention and not handicapped to the back of the fleet.

SailSys handicapping is the oldest "algorithm-driven" logic in Australia, starting with a concept in 1971. Over that time, the methodology has been refined into one of the simplest and most reliable handicapping methodologies, trusted by many. While some have attempted to replicate the underlying logic, it has never been reproduced accurately.

At its heart, there are several core tenets:

- Every boat deserves its day - if the course and conditions favour a particular yacht, then we should not be attempting to handicap them out of contention;
- Changes in handicaps week-to-week should not be aggressive. Not only does this disincentive competitors, but it can also encourage sandbagging;
- Handicaps don't have to move every week. Light and changeable winds, strung out fleets or below-par performance can be automatically excluded from weekly updates with ease using SailSys, be it, a single boat, a division or the entire fleet;
- It is founded in sound mathematical logic and not arbitrary weekly movements;
- Executed correctly, a handicapping system should remove the weekly burden from the sailing office and the long-suffering volunteer, who, as a handicapper, is all too often a target for all competitors to harass.

Handicapping can appear complicated, but the nuance and finesse of the SailSys mathematical algorithms driven by only a few minor yet powerful settings make SailSys brilliantly simple and rewarding to use.

Underpinning the platform's handicapping is the most extensive and trusted data centre of historic handicap data, which can be searched while processing entries, whether it is the yacht's past handicap at your club or another, or the past handicaps of a similar yacht discoverable by name, sail number, make or model.

Notably, all of these handicaps adhere to a consistent scale, not too dissimilar to how IRC adheres to a scale. This means that handicaps for a competitor sailing at multiple clubs are more consistent, that divisional allocation is more straightforward and handicaps from other clubs are transferrable to yours and visa versa.

This is especially important when clubs wish to combine events for mutual benefit. Competitors find comfort in handicapping consistency, and the handicapper's job of bringing together a disparate fleet from multiple clubs is now a breeze. When coupled with SailSys's unique Series-In-Series, the future of combined fleets is here today. SailSys has been responsible for the successful Sydney Harbour

Combined Winter racing for five years and has been running such “Combined” events as the Australia Day Regatta on Sydney Harbour for over 20 years.

Will SailSys share the inner workings of the algorithms?

No. While the SailSys handicapping is the oldest “algorithm-driven” logic in Australia, many have tried to copy it, and hence there remains some core proprietary logic. It is why we do not publish a Race TCF (rTCF).

However, each Club has at its disposal five key settings that enable them to achieve the Club’s chosen desire. Most Club’s chase some stability in handicaps; some want more aggressive movements.

These variables are:

1. Races to consider,
2. Races to count,
3. The upper limit,
4. The lower limit, and
5. whether to include or exclude a lower limit breach.

While SailSys provides defaults for these settings, many clubs will adjust these as they see fit. Clubs can do this at the start of a series and, if required, during a series.

Your pursuit start time is calculated by the system using;

- the handicap (TCF) allocated to your boat by the a club (which is often commensurate with your handicap across other series),
- the estimated or average course length,
- the start time of the slowest boat in your division, and
- a speed factor which is proprietary to SailSys.

Your start time will be relative to that of the slowest boat in your division, so if the course length or the handicap of the slowest boat changes, then so to will the start times of all the boats in that division.

At the end of the race your TCF handicap will be recalculated based on your elapsed time to sail the course and hence your performance relative to the boats in your division. It is this new TCF handicap that will be used to recalculate your start time for the next race.

Start times are rounded to whole minutes achieved by rounding up when the calculated time is greater than or equal to 30 seconds.

How are pursuit start times calculated.

A brief summary of how SailSys calculates pursuit start times

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TopYacht - How the Next Handicap is Calculated.

Necessary Definitions

- **AHC:** – the “Allocated Handicap” i.e. the handicap Allocated to a boat for a particular race.
- **Elapsed Time:** - Finish Time - Start Time¹.
- **Corrected Time:** - Elapsed Time * AHC.
- **BCH:** – the “Back Calculated Handicap” for each boat. This is the handicap the boat needed for this race to end up with the same handicap corrected time as that of the reference boat. This can only be calculated after the race – hence the terminology “Back” calculated. If each boat had started the race with their BCH as their AHC then all boats would have a virtually identical handicap- corrected times.
- **CBCH:** – the “Clamped” Back Calculated Handicap. The BCH is passed through a clamping algorithm that applies some ‘sanity checks’ to the BCH. These checks endeavour to cull out BCHs which are not truly representative of that boat’s performance. The set points used in the sanity checks as supplied in TopYacht Standard handicapping maths are empirically derived but have withstood the test of time. See [Appendix 1](#). This indicates how the clamps manipulate the BCH before the being used to compute the CHC.
- **CHC:** – the “Computed Handicap” for each boat. This is the projected handicap to be allocated to each boat for the next race.
- **TCF:** - or “Time Correction Factor”, being a number that the elapsed time is multiplied by computing the corrected time. Also known as an **AHC**
- **Mark (or Reference) Boat** – is the boat chosen that is about mid-fleet within the finishing Group.

Handicap Types

There are 4 main handicap types, selected as follows:

Handicap type

- Time On Time
- Time On Distance
- Time (pursuit)
- Time

- **Time on Time:** - where the handicap value is expressed as a Time Correction Factor, usually whose value is around 1.0 +/- 0.5
- **Time on Distance:** - Usually expressed in minutes (or seconds) per mile
- **Time (Pursuit):** - a per-boat time offset which is added to the reference start time of a pursuit race to compute the start time of each boat.
- **Time:** - Expressed in minutes, it is a per race time penalty, regardless of the elapsed time of the race, or the winning margin.

TopYacht **strongly recommends** the use of Time of Day in 24-hour format for the Start and Finish time. “I finished at about 3:25 (15:25)” is much more meaningful to a competitor instead of “105 minutes after the start (assuming a 13:30 start time)

So How to Derive the Next-Race Handicap for Each Boat

This is essentially a five-step process. The following discussion assumes that the previous race has been completed, and the race results have been computed. The **CHC** is calculated as part of the computing process.

Step 1

Determine the **Mark Boat**.

- The boats in the handicap group are ranked in corrected time order.
- Parameter 1 in the handicap recipe is user selectable. Typically it is $45\%^2$. The boat selected is this percentage from the top of the list. The **Corrected Time** is ear-marked. See Appendix 4.

Those towards the top of the fleet are considered to have sailed above their handicap and those towards the bottom of the fleet are considered to have sailed below their handicap.

Step 2

Calculate the **BCH**.

- For each boat, the BCH is calculated by dividing the **Corrected Time** of the **Mark Boat** by the **Elapsed Time** of each boat in the Group. Note that the **BCH** and the **AHC** for the **Mark Boat** are equal in value

Step 3

Clamp the **BCH**.

- For each boat, some sanity checks are applied to the BCH to calculate the **CBCH**. See [Appendix 1](#).

The set-points used in the algorithm have been derived empirically and withstood the test of time. They are designed to moderate (or reject) **BCH** values that are extreme (The competitor was in the right place at the right time when the breeze changed, or in the wrong place at the wrong time!)

Step 4

Calculate the **CHC**.

While various parameters all significantly impact on the generation of the next race handicap, probably the key element is the amount of CBCH used in calculating the next race handicap.

There are three primary ways the **CHC** is calculated:

- **Weighted Average** of the last N CBCH's.

In essence this averages the last (say) 4 race's CBCHs.

So after Race No. 4, Race No. 5's **CHC** is $(CBCH1 + CBCH2 + CBCH3 + CBCH4)/4$. After Race 5, Race 6's **CHC** is $(CBCH2 + CBCH3 + CBCH4 + CBCH5)/4$

At each new race the oldest **CBCH** is dropped and the last race CBCH added into the averaging process. This can have some apparently weird outcomes where a boat can win a race (or be in the top place getters) and have the next race handicap go down. Likewise a boat towards the bottom of the fleet can actually have their handicap go up after the race.

When there are less than N races, the start-up works like:

R1 CHC = $3/N$ AHC1 + $1/N$ CBCH1;

R2 CHC = $2/N$ AHC1 + $1/N$ CBCH1 + $1/N$ CBCH2

The 45% boat has been shown through time to provide most stable handicap adjustments over a season.]etc until there are N CBCHs.

Exponential Average with a 'Gain' of X.

This form of handicapping has been shown to provide a very similar outcome to weighted-average handicapping over the duration of a Series. To achieve this similarity the various parameters need to be appropriately set.

For Gain Numbers less than 10

As an example, let's use a 'gain'³ of 3, (the default value used in TopYacht as downloaded) the next race **CHC** = $\frac{1}{3}$ of the **CBCH** plus $\frac{2}{3}$ of the **AHC**.

For Gain Numbers greater than 10

The mathematics changes. TopYacht treats the value as a percentage.

Instead of the case where increasing numbers make the system more sluggish, for values increasing in value increases the percentage of the **BCH** used in computation of the **AHC**

$$\mathbf{CHC} = (\text{gain} / 100) \times \mathbf{BCH} + ((100 - \text{gain}) / 100) * \mathbf{AHC}$$

This system does not suffer from the issue of winner's handicaps having the potential to actually drop or loser's handicaps actually going up!

It is also very easy to understand; and if a boat performs well, their handicap goes up and conversely.

It also enables the club handicapper to quickly address boats that were given an inappropriate initial handicap as altering the **AHC** for a race has a significant impact on the next race handicap whereas under weighted average, the handicap is only affected by the running sum of the **BCHs** and can take quite a number of races to attain a sensible handicap for a boat. See [Appendix 2](#).

➤ Place Based Handicapping.

This technique is a recipe-driven system where the handicap adjustments are made based on some rules the user enters into the handicap recipe. The size of each adjustment is based on the boat's place in each race. For details, see [Appendix 5](#) and [Appendix 6](#)

Notes from Sail100 over last 20 years

The Handicapping and Calculation Steps

Start - Establish the initial handicap from an average of TCF's from the last series

1. Establish the reference (Median Corrected Time)
 2. Calculate each yacht *TCF to give the corrected time of the median time
 3. Do we want to restrict the new TCFs deviation from the last *TCF?
 4. Set up the filter for averaging the past *TCFs.
 5. This average becomes the progressive Handicap
 6. Do we want to restrict the deviation of the new Handicap from the previous?
- *TCF Time Correction Factor established after each race.

What are we trying to do with Progressive Personal Handicaps?

1. Produce a handicap that incorporates Yacht, Crew, course and wind conditions
2. Provide each yacht with a personal progressive handicap that gives all starters an equal opportunity to win in the next race.
3. Provide a system that can average varying sea and wind conditions.
4. A system that monitors performance of each yacht and crew combination.
5. A system that copes with one off out of the ordinary performance.
6. A system that can be easily explained.
7. A system that provides the same relative adjustments automatically throughout the fleet.
8. A System that ultimately will favour Yacht and crew that sail consistently and generally improve their performance over a series.
9. We want a system that doesn't penalises past good performance in order to favour poor performing yachts and crew.

How to derive a Performance Based Rating (PBR) from the PPH system?

1. The PPH system has been designed for minimum inflation.
2. Each PPH result produces an ECHO factor that was the yacht's performance on that day.
3. The highest four ECHO ratings are found for each yacht.
4. The period to gather this information should be long (say 10 races).
5. The highest ECHO is discarded, and an average taken for the remaining three races. This is to illuminate any unusually high ECHO's than can sometimes occur.
6. The average becomes the (P)erformance (B)ased (R)ating for the next series. This system uses performance figures already achieved and illuminates the subjective guesses that offend occur. It is a figure mathematically derived and therefore undisputable. The formula may need reviewing from time to time but should reflect the capability of each yacht.

Extract from Jim Teeters 12/2002

(Head, Offshore Ratings Office at US Sailing
Middletown, Rhode Island, United States)

The goal of any boat handicap system is to provide an equal opportunity to all the members of its fleet to win races. (PPH). Equal opportunity does not guarantee equal results. There are always differences in boat preparation, sailing skills, tactics, and luck that can determine the winners.

The systems currently in use tend to fall into one of the following 2 categories:

1. Those that attempt to handicap boats by observing actual performance. (PPH)
2. Those that take measurements and use formulas to predict performance. (PBR)

These are two very different philosophical viewpoints. The former, the observational, is intended to fairly handicap any and all boats. Race results are reviewed and ratings adjusted so that all boats have a reasonable chance at winning. Handicappers of observational systems must attempt to separate the inherent speed of a boat from the skills of the sailors, who could easily make a design look better or worse than it actually is. The second approach, the predictive, takes measurements of those parameters that are thought to be important (length, weight, sail area, stability...) and uses formulas to assign ratings.

Accurately predicting sail boat performance is quite complex and no set of measurements and formulas can be expected to treat all boats fairly, although that often is the stated goal.

Extract from Bob McPherson (Programmer);

Progressive/Personal Handicaps including ECHO, Median Boat, Standard Boat Could Sailing be as successful as golf if we all used Progressive/Personal Handicapping.

Computer settings for the Progressive Personal Handicap System (PPH) (Current setup)

This is now a choice that Bob has added which eliminates all the complexity of the old system. This has become a world standard and incorporates most of the original setup (in blue below). It is generally known as an exponential adjustment system where the handicap follows performance.

It uses the ECHO system to establish the median time and has virtually no inflation.

For series with 6 races and over we use 65% of old handicap and 35% of the calculated TCF.

For series of less than 6 races we use 50% for both to provide a faster adjustment.

Click here to go to the previous method of calculating race results.

The current method is almost identical but has been streamlined by Bob as it is the most widely used.

Handicapping for Timed Starts (John Barter using sail100)

There are two adjustment methods that could be used, each will give similar results. In both cases we score as yachts cross the finish line.

1. Method using TCF

a. We use time correction factors (TCF) as we do for summer series and calculate new TCF's by averaging the race TCF with the calculated TCF.

b. At this point DNF's DNC's etc remain unchanged.

c. The starting times are then calculated as a pursuit time by giving the start time and the expected finish time.

d. The program does the rest and adjusts the slowest boat time to the start time.

e. DNC and DNF boats then get adjusted relative to the start boat.

Emails to Bob to solve web page problem displaying TCF adjustment.

What I think you could do to solve that issue is;

On the series you transfer to is to Go to Handicap Page Select Item select Organise Handicap sheet Un-tick Show handicap changes OK.

I think that could be the solution, Bob.

From: John Barter Sent: Monday, November 7, 2016, 1:08 AM To: Robert McPherson Cc:

Pete Risby (Impulsive); Michael Wolf Subject: Sail100 Australia

Hello Bob,

The modifications you did for us to calculate elapsed times from a pursuit start are going well except for one minor issue related to creating a web page.

If you look here http://www.rmycph.com.au/sailing/Results_html/ns_tcf03.html for our results and then go to "Next Race Handicap" I get two "ECHO Index" columns in place of the column with the details of calculation. When I transfer the results above to a shorter series I get this http://www.rmycph.com.au/sailing/Results_html/ns_spr03.html then going to "Next Race Handicap" all looks well.

It's only a minor issue but might have an easy solution? I have also attached my two files.

This is the base page for these

results; http://www.rmycph.com.au/sailing/Bate_Bay_Series.html

Kind regards, John

Handicapping for timed Starts (Rod McCubbin TopYacht)

TopYacht has several different ways of calculating the offset times for the next race. Some are based on the AHC eg 0.850 of a boat; others are based on the "Time AHC" or "Tahc" eg 5 minutes. In general terms one of the common methods is along the lines you outlined below. A boat has an AHC for a race eg 0.850

The results of the pursuit race are based on finish time. Before the race (more below) each boat is given an offset time. Because we know the nominal start time, offset time and actual finish time we can calculate the BCH (AHC of the boat in that race. If it was to have finished at the same time as the reference boat. Ref boat is normally the 45% boat on finish time in the pursuit race.) Let's say this BCH is 0.800. Given the AHC (0.850) and the BCH (0.800) and HC can be calculated for the next race ie the CHC. This math is very flexible (via a number of parameters) and I have no idea how Cronulla calculate this CHC value. The offset time for each boat can be calculated in two basic ways in this scenario.

1/ The elapsed time for the slowest boat is set to a realistic value say 100 minutes. Based on this and the relativity of each boats AHC against the reference boats AHC, a new offset is calculated.

2/ The elapsed time of the boat with a nominated AHC is set to a realistic value say 100 minutes. Based on this and the relativity of each boats AHC against the reference boats AHC, a new time is calculated.

Option 2 above provides more stability provided the reference AHC used is a bit smaller than the slowest boat. If option 1 is used, then all boats new offsets will change after each race if the lowest AHC changes. Attached a [spread sheet](#) that can also be used to calculate offsets.

Wednesday Course

The system of handicapping for Wednesdays is known as 'Time on Distance'. However, this can be modified if the first boat hasn't finished within 1.5 hours. When this happens the handicap, system become 'Time on Time'. The 1.5 hours and starting time have been chosen to ensure the leading boat always finished before sunset.

Is therefore most important that the course be set with a windward leg of 0.6 nM (3646 feet). The distance around the course then equals 4.3nM.

This system has been used for over 10 years with the starting times strictly adjusted to the published formula. This system has zero inflation and has never required the times to be adjusted to have the starting boat at the nominated time. This is possible as long as the formula and distance is observed.

If the course length is changed the times should be adjusted by the ratio of the distances. The time adjustments can remain as published. The setting up of the result program requires knowledge of the sail100 system and web creation.

For detailed explanation contact John Barter who will take you through the process.

Pursuit starts PPH results by Bob McPherson

The way it works is as follows;

I already had a facility in the program that involved having a start time for every boat.

That is if you have say 3 IRC races starting at different times and you want an overall If you put the results into each of the 3 individual race and then transfer the results from the 3 races to an overall race then each boat will have its own start time.

The Overall could then if you wanted have progressive. So what I have done is as follows;

1 set up your series to be progressive if you wish to do progressive.

2 set up your series to be timed.

3 Generate the Pursuit start times as you did before in Entrants.

4 When you do that it will ask if you want to round to whole minutes.

5 When you are ready to put the data in, put in start date and time of the nominal boat as the start time.

6 Having completed that the program looks to see if you have start times set up in Entrants.

7 It will ask you if you want to use the start times if they are there.

8 Answer yes.

9 Now input the finish times as usual.

10 It should now calculate everything from the start times of the boats.