Interpreting The Scratch Sheet Page for PHRF Time-on-Time Handicapping

SPSC 2015 Spring Series as an Example

PHRF B

Boat	PHRF	GPS(mm:ss)	Δ
Spitfire	99	656(10:56)	-66
Mai Toi	150	707(11:47)	-15
Wave Equation	165	722(12:02)	★
Prost	174	731(12:11)	+9
Dynamo Hummm	180	737(12:17)	+15
Shenanigans	183	740(12:20)	+18

South Port's scratch sheets are published on the web in a form that makes it easy to compare your progress against your competitors while on the water. The scratch sheet publishes PHRF handicaps as well as PHRF handicaps shifted by 557 s/mile. A short explanation is called for.

Pace and the General Purpose Handicap

Pace is a measure of how many seconds it takes to complete a mile and varies inversely to speed measured in knots. So, for example, an average speed of 6 knots corresponds to a pace of 600 seconds per mile and an average speed of 4 knots corresponds to a pace of 900 seconds per mile — pace and speed multiplied together always results in 3600 seconds/hour. A slower pace is represented by a greater number of seconds per mile. Pace is the natural measure of performance prediction and handicapping.

A general purpose handicap GPH is a boat's expected pace as averaged over all races — it can be used for either time-on-distance or time-on-time handicapping. The zero-rated PHRF boat has a general purpose handicap of $^{\text{zero-rated}}\text{GPH} = 557\,\text{s/mile}$. The GPH of any PHRF boat is simply

$$\text{GPH} = \text{PHRF Rating} + 557\,\text{s/mile}$$

All PHRF ratings are implicitly converted to a GPH for use in time-on-time handicapping. You need not know the GPH of any of your competitors but you should know your own GPH as well as you know your own PHRF rating. Even better you should know the expression of you GPH in minutes and seconds per mile and not just seconds per mile.

Your Boat Relative to Your Competitors

Denote your own boat with a star. For this example assume this is Wave Equation: the PHRF rating is 165 s/mile, ★GPH = 722 s/mile or 12 min 2 s/mile and the "deltas" are the differences in each competitor's handicap from your own. Note that a difference in GPH is the same as the difference in PHRF rating so we will denote both as ΔRating to avoid unnecessary specificity.

To determine which of either you or your competitor has won at the finish line (or any mark rounding) at an elapsed time $\bigstar t$ you would calculate the time allowance Δt, which is difference in elapsed time necessary for you to tie, using this proportionality

$$\Delta t : \Delta\text{Rating} \quad = \quad \bigstar t : \bigstar\text{GPH}$$

This states that the ratio of the time allowance to the difference in ratings is equal in proportion to the ratio of your elapsed time to your GPH. Note that we have implicitly dropped *per mile* from all the paces on the right hand side of the ratios to balance the units.

But attempting to perform long division in your head while racing is not recommended; instead, we will prepare a table of time allowances beforehand. Or you could simply visit the scratch sheet web page on the club web site; it can prepare for you a table of values (increasing in proportion) of elapsed times for your own boat and time allowances against each of your competitors (skipping those who have the same rating as you).

The Sixth Race of the 2015 Spring Series

Let's work an example. The other boat Dynamo Hummm has a ΔRating of +15 s from your own. We have dropped *per mile* from the ratings for convenience. Your boat's ★GPH is 722 s or 12 min 2 s. You finished with an elapsed time of 1 h 8 min 26 s which is approximately $5^2/_3 \times 12$ min 2 s so you needed to win by $5^2/_3 \times 15$ s which is 1 min 25 s. Or you could simply look up the closest time in the provided table. In this case Dynamo Hummm was only a 1 min 5 s behind at the finish and won the race.

For Each of Your Competitors

You can calculate time allowances for any boat you are racing against by adding the ΔRating appropriate for the competing boat every 722 s or 12 min 2 s of elapsed time (hence the name time-on-time). The time interval is only dependent on your own ★GPH making it easy to track all of your competitors simultaneously with only a little bit of preparation.

And you don't need to know the elapsed time of your competitor at her finish, simply whether she has finished earlier or later than the time allowance you had determined for her at your own finish.

But simply looking at the provided table to the right should make it clear, not only how to determine a time allowance from your own elapsed time, but also how to reproduce such a table — it doesn't really require explanation — it is as simple as it seems.

Conveniently

You can also calculate time allowances in parts. Knowing the time allowance at 1 h 10 s to be simply five times the ΔRating, and knowing the time allowance at 4 min ⅔ s to be ΔRating over three, you can add the former to twice the latter to get a time allowance at 1 h 8 min 11⅓ s. This is sufficiently close to your actual finish of 1 h 8 min 26 s for our purposes.

Those awkward thirds in elapsed times arise because, although PHRF ratings are divisble by three, 557 is not. So when the table rounds to the closest second in the elapsed time column the row of time allowances are exact at a time that mightn't be precisely as displayed. Having the precomputed table means we don't have to worry about the small stuff.

Stepping by unit thirds, the table is complete from zero up to ten. But for a large ΔRating we may still need to interpolate between rows of the table. The complete table helps us with that. For Dynamo Hummm we note that a time allowance of exactly 1 min occurs at 48 min 8 s of elapsed time. This is very close to 1 min every 48 min or 1 s every 48 s allowing us a very fine-grained interpolation. Subsecond precision isn't need for this giving us a fair bit of freedom in how we refine our time allowances between rows of the table.

Time Allowance Tabulation on the Web

★ 165 + 557 (2:45 + 9:17) = 722 (12:02)

★ Wave	Equation	+Prost	−Mai Toi +Dyn Hm	+Shenan	−Spitfire
⅓	4:01	3	5	6	22
⅔	8:01	6	10	12	44
1	12:02	9	15	18	1:06
1⅓	16:03	12	20	24	1:28
1⅔	20:03	15	25	30	1:50
2	24:04	18	30	36	2:12
2⅓	28:05	21	35	42	2:34
2⅔	32:05	24	40	48	2:56
3	36:06	27	45	54	3:18
3⅓	40:07	30	50	1:00	3:40
3⅔	44:07	33	55	1:06	4:02
4	48:08	36	1:00	1:12	4:24
4⅓	52:09	39	1:05	1:18	4:46
4⅔	56:09	42	1:10	1:24	5:08
5	1:00:10	45	1:15	1:30	5:30
5⅓	1:04:11	48	1:20	1:36	5:52
5⅔	1:08:11	51	1:25	1:42	6:14
6	1:12:12	54	1:30	1:48	6:36
6⅓	1:16:13	57	1:35	1:54	6:58
6⅔	1:20:13	1:00	1:40	2:00	7:20
7	1:24:14	1:03	1:45	2:06	7:42
7⅓	1:28:15	1:06	1:50	2:12	8:04
7⅔	1:32:15	1:09	1:55	2:18	8:26
8	1:36:16	1:12	2:00	2:24	8:48
8⅓	1:40:17	1:15	2:05	2:30	9:10
8⅔	1:44:17	1:18	2:10	2:36	9:32
9	1:48:18	1:21	2:15	2:42	9:54
9⅓	1:52:19	1:24	2:20	2:48	10:16
9⅔	1:56:19	1:27	2:25	2:54	10:38

Click on your boat in the scratch sheet web page to make the ΔRating's relative to you and to create a table of time allowances keyed on your own elapsed time. Double click to collapse other divisions and to expand the time allowance tabulation section. Note that divisions and whole sections can be expanded or collapsed at any time by clicking on the appropriate header — do use this facility when printing.