

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

South Port's scratch sheets are published on the web in a form that makes it easy to compare your progress against competitors on the water. Consider yourself as the scratch boat with elapsed time $\star t$ and rating $\star \text{PHRF}$. Then ΔPHRF is the difference between a competitor's PHRF rating and your own. To determine which boat has won at the finish line (or any mark rounding) you calculate the time allowance Δt , which is difference in elapsed time necessary for you to tie, using this proportionality

$$\Delta t : \Delta \text{PHRF} = \star t : (\star \text{PHRF} + 557 \text{ s/mi})$$

This states that the ratio of the time allowance to the difference in PHRF ratings is equal in proportion to the ratio of your elapsed time to your PHRF rating offset by 557. The scratch sheet web page can give you a table of values (increasing in proportion) of elapsed times for your own boat and time allowances against each of your competitors.

An Example from the Spring Series for Wave Equation

We can safely multiply out the PHRF ratings by one mile to change all the units in the proportionality to those of time. Let's work an example using finishes from the sixth race of the spring series — the other boat Dynamo Hummm has a 180 s/mi PHRF rating — the scratch boat is Wave Equation with a 165 s/mi PHRF rating — then for every $165 \text{ s} + 557 \text{ s} = 722 \text{ s} = 12 \text{ min } 02 \text{ s}$ of elapsed time Wave Equation must gain $180 \text{ s} - 165 \text{ s} = 15 \text{ s}$ on Dynamo Hummm. If Wave Equation finishes with an elapsed time of $1 \text{ h } 08 \text{ min } 26 \text{ s}$ which is approximately $5^{2/3} \times 12 \text{ min } 02 \text{ s}$ then it needs to win by $5^{2/3} \times 15 \text{ s} = 1 \text{ min } 25 \text{ s}$.

$$\begin{array}{l} 1 \text{ min } 25 \text{ s} : 15 \text{ s} \approx 1 \text{ h } 08 \text{ min } 26 \text{ s} : 12 \text{ min } 02 \text{ s} \quad \text{in hours, minutes and seconds} \\ 85 \text{ s} : 15 \text{ s} \approx 4106 \text{ s} : 722 \text{ s} \quad \text{the same in seconds only} \end{array}$$

In this case Dynamo Hummm was only a $1 \text{ min } 05 \text{ s}$ behind at the finish and won the race.

Wave Equation can calculate time allowances for all the boats it is racing against by adding the ΔPHRF appropriate for each boat every $722 \text{ s} = 12 \text{ min } 02 \text{ s}$ of its own elapsed time (hence the name time-on-time). The time interval is only dependent on its own handicap making it easy to track all its competitors simultaneously with only a little bit of preparation.

An Example from the Spring Series for Spitfire

We can safely multiply out the PHRF ratings by one mile to change all the units in the proportionality to those of time. Let's work an example using finishes from the fifth race of the spring series — the other boat Mai Toi has a 150 s/mi PHRF rating — the scratch boat is Spitfire with a 99 s/mi PHRF rating — then for every $99 \text{ s} + 557 \text{ s} = 656 \text{ s} = 10 \text{ min } 56 \text{ s}$ of elapsed time Spitfire must gain $150 \text{ s} - 99 \text{ s} = 51 \text{ s}$ on Mai Toi. If Spitfire finishes with an elapsed time of $1 \text{ h } 09 \text{ min } 29 \text{ s}$ which is approximately $6^{1/3} \times 10 \text{ min } 56 \text{ s}$ then it needs to win by $6^{1/3} \times 51 \text{ s} = 5 \text{ min } 23 \text{ s}$.

$$\begin{array}{l} 5 \text{ min } 23 \text{ s} : 51 \text{ s} \approx 1 \text{ h } 09 \text{ min } 29 \text{ s} : 10 \text{ min } 56 \text{ s} \quad \text{in hours, minutes and seconds} \\ 323 \text{ s} : 51 \text{ s} \approx 4169 \text{ s} : 656 \text{ s} \quad \text{the same in seconds only} \end{array}$$

Spitfire can calculate time allowances for all the boats it is racing against by adding the ΔPHRF appropriate for each boat every $656 \text{ s} = 10 \text{ min } 56 \text{ s}$ of its own elapsed time (hence the name time-on-time). The time interval is only dependent on its own handicap making it easy to track all its competitors simultaneously with only a little bit of preparation.

Scratch Sheet: Δ PHRF against Scratch in PHRF B ★ Spitfire

In this context it will be convenient to break down units of time into hours, minutes and seconds. Writing $557\text{ s}/\text{mi} = 9\text{ min } 17\text{ s}/\text{mi}$ is precise but writing 9:17 for nine minutes and seventeen seconds per mile is unambiguous in the context, easier to read and compact enough to fit into a table.

PHRF B Boat	PHRF	(min:s)	Δ PHRF	(min:s)
★ Spitfire	99	(1:39)		
Mai Toi	150	(2:30)	+51	(0:51)
Wave Equation	165	(2:45)	+66	(1:06)
Prost	174	(2:54)	+75	(1:15)
Dynamo Hummm	180	(3:00)	+81	(1:21)
Shenanigans	183	(3:03)	+84	(1:24)

$$\star 99 + 557 (1:39 + 9:17) = 656 (10:56)$$

A Tabulation of the Critical Proportionality for Spitfire

Let us tabulate the proportionality for Spitfire to determine time allowances that must be given to some competitors (these tables are easy to do by hand)

★ Spitfire		Mai Toi	★ Spitfire		Prost	★ Spitfire		Shenanigans
×	★ t	Δt	×	★ t	Δt	×	★ t	Δt
1	10:56	0:51	1	10:56	1:15	1	10:56	1:24
2	21:52	1:42	2	21:52	2:30	2	21:52	2:48
3	32:48	2:33	3	32:48	3:45	3	32:48	4:12
4	43:44	3:24	4	43:44	5:00	4	43:44	5:36
5	54:40	4:15	5	54:40	6:15	5	54:40	7:00
6	1:05:36	5:06	6	1:05:36	7:30	6	1:05:36	8:24
7	1:16:32	5:57	7	1:16:32	8:45	7	1:16:32	9:48
8	1:27:28	6:48	8	1:27:28	10:00	8	1:27:28	11:12

The elapsed times $\star t$ are the same in every table, so we can combine all the competitors to Spitfire into a single table keyed on $\star t$. Here each boat has a separate column, but in real use, several boats may share a Δ PHRF. Also a column for positive and negative Δ PHRF of the same magnitude will differ only in sign, and may be collapsed into a single column.

Using the fact that PHRF rating differ by three seconds a mile we make our table vary over finer increments by stepping over thirds. Here we restrict the range of elapsed times to those more representative of a South Port race to keep the table a workable length.

Scratch Sheet: Time Allowances for ★ Spitfire

Time Allowances for ★ Spitfire 99 + 557 (1:39 + 9:17) = 656 (10:56)

★ Spitfire	Mai Toi	Wave Equation	Prost	Dynamo Hummm	Shenanigans	
1 656	51	66	75	81	84	
4	43:44	3:24	4:24	5:00	5:24	5:36
4 ¹ / ₃	47:23	3:41	4:46	5:25	5:51	6:04
4 ² / ₃	51:01	3:58	5:08	5:50	6:18	6:32
5	54:40	4:15	5:30	6:15	6:45	7:00
5 ¹ / ₃	58:19	4:32	5:52	6:40	7:12	7:28
5 ² / ₃	1:01:57	4:49	6:14	7:05	7:39	7:56
6	1:05:36	5:06	6:36	7:30	8:06	8:24
6 ¹ / ₃	1:09:15	5:23	6:58	7:55	8:33	8:52
6 ² / ₃	1:12:53	5:40	7:20	8:20	9:00	9:20
7	1:16:32	5:57	7:42	8:45	9:27	9:48
7 ¹ / ₃	1:20:11	6:14	8:04	9:10	9:54	10:16
7 ² / ₃	1:23:49	6:31	8:26	9:35	10:21	10:44
8	1:27:28	6:48	8:48	10:00	10:48	11:12
8 ¹ / ₃	1:31:07	7:05	9:10	10:25	11:15	11:40
8 ² / ₃	1:34:45	7:22	9:32	10:50	11:42	12:08

Click on your boat in the scratch sheet web page to make the ΔPHRF's relative to your rating and to create a table of time allowances keyed on your own elapsed time.