# 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 $^\star$PHRF. Then $\Delta$PHRF 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 $\Delta t$, 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

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 $165\,\text{s} + 557\,\text{s} = 722\,\text{s} = 12\min 02\,\text{s}$ 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 $1\,\text{h}\,08\min 26\,\text{s}$ which is approximately $5^2/_3 \times 12\min 02\,\text{s}$ then it needs to win by $5^2/_3 \times 15\,\text{s} = 1\min 25\,\text{s}$. In this case Dynamo Hummm was only a $1\min 05\,\text{s}$ 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 $\Delta$PHRF appropriate for each boat every $722\,\text{s} = 12\min 02\,\text{s}$ 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.

## Scratch Sheet: $\Delta$PHRF against Scratch in PHRF B ★ Wave Equation

In this context it will be convenient to break down units of time into hours, minutes and seconds. Writing $557\,\text{s/mi} = 9\min 17\,\text{s/mi}$ and $165\,\text{s/mi} + 557\,\text{s/mi} = 2\min 45\,\text{s/mi} + 9\min 17\,\text{s/mi} = 722\,\text{s/mi} = 12\min 02\,\text{s/mi}$ is precise but $557\,(9{:}17)$ and $165 + 557\,(2{:}45 + 9{:}17) = 722\,(12{:}02)$ is unambiguous in the context, less awkward to read, easier to interpret, and compact enough to fit into a table.

PHRF B

| Boat | PHRF | (min:s) | $\Delta$PHRF | (min:s) |
|---|---|---|---|---|
| Spitfire | 99 | (1:39) | -66 | (1:06) |
| Mai Toi | 150 | (2:30) | -15 | (0:51) |
| ★ **Wave Equation** | **165** | **(2:45)** | | |
| Prost | 174 | (2:54) | +9 | (0:09) |
| Dynamo Hummm | 180 | (3:00) | +15 | (0:15) |
| Shenanigans | 183 | (3:03) | +18 | (0:18) |

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

# A Tabulation of the Critical Proportionality for Wave Equation

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

| × | ★ W.E. $\star_t$ | Mai Toi $\Delta t$ | | × | ★ W.E. $\star_t$ | Dynamo... $\Delta t$ | | × | ★ W.E. $\star_t$ | Shenan... $\Delta t$ |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **12:02** | -0:15 | | 1 | **12:02** | +0:15 | | 1 | **12:02** | +0:18 |
| 2 | **24:04** | -0:30 | | 2 | **24:04** | +0:30 | | 2 | **24:04** | +0:36 |
| 3 | **36:06** | -0:45 | | 3 | **36:06** | +0:45 | | 3 | **36:06** | +0:54 |
| 4 | **48:08** | -1:00 | | 4 | **48:08** | +1:00 | | 4 | **48:08** | +1:12 |
| 5 | **1:00:10** | -1:15 | | 5 | **1:00:10** | +1:15 | | 5 | **1:00:10** | +1:30 |
| 6 | **1:12:12** | -1:30 | | 6 | **1:12:12** | +1:30 | | 6 | **1:12:12** | +1:48 |
| 7 | **1:24:14** | -1:45 | | 7 | **1:24:14** | +1:45 | | 7 | **1:24:14** | +2:06 |
| 8 | **1:36:16** | -2:00 | | 8 | **1:36:16** | +2:00 | | 8 | **1:36:16** | +2:24 |

The elapsed times $\star_t$ are the same in every table, so we can combine all the competitors to Wave Equation into a single table keyed on $\star_t$. Here each boat has a separate column, but in real use, several boats may share a ΔPHRF. Also a column for positive and negative ΔPHRF 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 ★ Wave Equation

### Time Allowances for ★ Wave Equation 165 + 557 (2:45 + 9:17) = 722 (12:02)

| Elapsed Time 1 | 722 | Prost (+) 9 | M.T. (-) / D.H. (+) 15 | Shenan... (+) 18 | Spitfire (-) 66 |
|---|---|---|---|---|---|
| 4 | **48:08** | 0:36 | 1:00 | 1:12 | 4:24 |
| 4$^{1}/_{3}$ | **52:09** | 0:39 | 1:05 | 1:18 | 4:46 |
| 4$^{2}/_{3}$ | **56:09** | 0:42 | 1:10 | 1:24 | 5:08 |
| 5 | **1:00:10** | 0:45 | 1:15 | 1:30 | 5:30 |
| 5$^{1}/_{3}$ | **1:04:11** | 0:48 | 1:20 | 1:36 | 5:52 |
| 5$^{2}/_{3}$ | **1:08:11** | 0:51 | 1:25 | 1:42 | 6:14 |
| 6 | **1:12:12** | 0:54 | 1:30 | 1:48 | 6:36 |
| 6$^{1}/_{3}$ | **1:16:13** | 0:57 | 1:35 | 1:54 | 6:58 |
| 6$^{2}/_{3}$ | **1:20:13** | 1:00 | 1:40 | 2:00 | 7:20 |
| 7 | **1:24:14** | 1:03 | 1:45 | 2:06 | 7:42 |
| 7$^{1}/_{3}$ | **1:28:15** | 1:06 | 1:50 | 2:12 | 8:04 |
| 7$^{2}/_{3}$ | **1:32:15** | 1:09 | 1:55 | 2:18 | 8:26 |
| 8 | **1:36:16** | 1:12 | 2:00 | 2:24 | 8:48 |
| 8$^{1}/_{3}$ | **1:40:17** | 1:15 | 2:05 | 2:30 | 9:10 |
| 8$^{2}/_{3}$ | **1:44:17** | 1:18 | 2:10 | 2:36 | 9:32 |

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.