

Fundamentally, handicapping provides a way to equalize opportunity to win despite having boats with different speed potentials. This is done by providing a correction to elapsed times (finish time of boat minus start time of race) such that a slower boat gets a larger correction than a faster boat.

There are two schemes in general use for describing the relative speed potential of two boats:

~One is to say that, for a given distance, a faster boat can sail it in a shorter amount of time than a slow boat. For example, *QUICK* can sail a nautical mile distance 20 seconds faster than *SLOW* can. For these boats, then, it should be clear that *QUICK* ought to be able to sail a 9 mile course 20 x 9 or 180 seconds less time than *SLOW*. That's the underlying principle of ToD (time-on-distance) scoring.

~The other is to say what is the ratio of the times it takes the two boats to sail a given course. For example, it takes *SLOW* 1.15 times as long as *QUICK* to sail a mile -- she is about 13% slower. So, if *QUICK* can sail a given course in 2 hours, then we'd expect it should take *SLOW* 1.15 times as long, or 2.3 hours*, that is 2 hours and 180 seconds. That's the underlying principle of ToT (time-on-time) scoring.

For PHRF ToD scoring, the PHRF number for each boat describes the number of seconds longer that it takes a boat to sail 1 nautical mile than it does a mythical "scratch" boat with a PHRF of 0. Note that if A's PHRF is 180, and B's PHRF is 150, then it takes A 30 seconds longer than B to sail a mile. So two boats speed potentials are compared by simply subtracting their PHRFs. In scoring a race, a corrected time is computed by subtracting:

$$\text{corrected_time} = \text{elapsed_time} - \text{PHRF} \times \text{Distance}$$
and boats are ranked according to corrected time.

For ToT scoring, a Time Correction Factor (TCF) is used to describe how much slower each boat is than a mythical scratch boat with a TCF of 1 (note: the smaller the TCF, the slower the boat). Again, a corrected time is obtained for each boat, but this time by multiplying:

$$\text{corrected_time} = \text{elapsed_time} \times \text{TCF}$$
And again, boats are ranked according to corrected time.

In this scheme, two boats' speed potentials are compared by taking the ratios of their TCFs. Although there are several ways to specify TCFs, one common way is to derive the TCF from a boat's PHRF by using a formula. The one generally in use is

$$\text{TCF} = 650 / (550 + \text{PHRF})$$

The two numbers mentioned in this formula are fairly general purpose, but they are sometimes adjusted for conditions. Most scoring programs, including Sailwave, allow them to be specified. Basing the TCF on PHRF has the advantage of benefiting from all the work that has been, and continues to be, done in developing valid PHRF handicaps.

Based on several studies, it has been demonstrated that ToT can be a better fit to fleets that have large differences in speed potential (large PHRF splits in each fleet). Another advantage is that accurate distances are not required in the computations since distance by itself plays no role.

While racing, it is desirable to compare your current performance by that of a competitor. When scoring by ToD, you do that by multiplying the distance sailed by the difference in your PHRFs and comparing that to the difference in your times. When scoring by ToT, you do the same by comparing the ratios of your two times to the ratio of your TCFs.

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