



# Performance Handicap Racing Fleet

## PHRF PRIMER

A GUIDE TO UNDERSTANDING HOW IT ALL WORKS

The following is a general description of PHRF and how it works. The original was published in 1986; this revision has been mildly edited to reflect today's scene.

### WHAT IS PHRF ?

PHRF (Performance Handicap Racing Fleet) is a system used to handicap racer/cruiser type of sailboats by observed racing performance. Any measurements taken (spinnaker poles, sails, etc.) are used only to identify the boat and to quantify any differences or modifications from what is considered standard. Deviations due to sail or power selection are corrected by adjustments to the "standard" boat base rating. PHRF (unlike IOR, MORC, or MHS) does not use measurements to calculate the standard SP (speed potential) of a boat.

### WHAT IS A "STANDARD BOAT"?

A standard boat is basically an unmodified boat with PHRF "standard equipment" (defined later). It is possible however, that a boat may not be considered "standard" even if it hasn't been modified. What can happen is that the first boat rated becomes the standard by default and subsequent boats, even if completely unmodified, may be slightly different and therefore not considered "standard".

For example, later built boats might have improvements that change the rig or hull. It's common to have a variety of masts heights for a single type of boat over five or ten years of production.

If the later boats still fit in within acceptable tolerances they may be considered standard, but if a significant change occurs, a new class category is generally initiated. We have, for example, four versions of Saber 28's, four versions of C&C 27's (the old type), and three versions of C&C 33's. Unfortunately manufacturers do not generally publicize these manufacturing changes so PHRF Handicappers must continue to come on board to make measurements just to keep the "standard" up to date.

### WHAT IS A MODIFIED BOAT?

A modified boat is a standard boat that has been changed in some way that might affect its performance. Some boat modifications" are ignored by PHRF and some require that a rating change be considered.

Some of the modifications which must be considered are:

1. Modification to the shape of the hull, keel, or rudder.
2. Changes to the sail plan. This includes larger sails and bigger spars.
3. Structural changes that affect boat weight or weight distribution.
4. Changes in mechanical propulsion.

Boat modifications that are generally not considered are:

1. Headfoil systems.
2. Fairing and smoothing of the bottom.
3. Addition of sail handling gear such as winches, blocks, lines or sail track.
4. Additional sails no bigger than the maximum standard.
5. Sail material such as Mylar, Kevlar, Dacron, etc.
6. Cosmetic changes to the hull, interior, or rigging of the boat not affecting the speed of the boat.

## **IS PHRF REALLY FAIR?**

This is the bottom line question and the answer is yes or no, depending on your particular philosophy, "Yes" if you can afford or wish to spend enough money to equip your boat as well as the best in the fleet, and "no" if you are racing with equipment that is not as up to date or extensive as your competition and expect to beat them on a one to one basis.

As well, in common with every other rating system, PHRF makes no allowance for racing ability.

*For example:*

We both race the same type of sloop, a TUB 330, both boats are in super condition and are well maintained.

My boat, TUB #1, has a 150% general purpose genoa, a 100% jib, a storm jib, a main, and a .75 oz Tri-Radial spinnaker, all the sails are six years old but are the best the discount sailmaker had to offer. TUB #1 has all the standard equipment which came from the factory including the wheel steering option, which really adds room in the cockpit. I take pride in TUB #1 and have added a refrigeration unit, a propane stove, and pressurized hot water. Because I always want to be seaworthy, I carry spare parts for nearly everything on board and always fill my fuel and water tanks before I leave the dock. My anchor, with 150 feet of all chain rode, is always ready for any emergency in a roller bow chock. My uncle and three young nieces enjoy racing on her.

Your boat, TUB #2, is equipped with a light mylar 150% genoa, a heavy mylar 150% genoa, a 135% genoa, a 110% mylar/kevlar jib, a multiweight mylar/kevlar main, a staysail, a 0.75 oz Tri-Radial, 0.5 oz Tri-Radial, and a 1.5 oz Starcut spinnaker. None of the sails are more than 2 years old. In addition TUB #2 has an extra set of cockpit winches, rod rigging, backstay adjuster, extra genoa track, barberhauls, cunninghams, wire halyards, kevlar sheets, headfoil, Loran-C, and more computerized electronics than the aircraft carrier Enterprise. A lightweight tiller replaces the wheel steering unit. The water and fuel tanks are filled only if required in the sailing instructions. TUB #2 also has a glass smooth bottom professionally faired and painted and cleaned before each race. For crew, half the employees of the local sail loft are on TUB #2 whenever raced.

In a PHRF fleet TUB #1 and TUB #2 both rate the same. The question is: Who do you think has the best chance of winning? Better yet, who should win? (the answer obviously depends on your frame of reference). PHRF assumes that you have a boat in top condition with "good equipment". On Lake Ontario, the level for "good equipment" has been steadily rising over the past few years especially at the regional levels. The "standard boat" is assumed to include many of the go-fast items mentioned above that might have been considered "exotic" a few years ago. Like it or not, if you sail with less, don't expect any sympathy (in the form of additional handicap) from PHRF-LO.

In defense of this philosophy I once read a book on sailboat racing and the first paragraph was devoted to selection of the proper boat to race. The best boat to race, in the authors opinion, was the boat which you can afford to equip to the level at which the local fleet is being sailed. With one-design boats that might mean a two hundred fifty dollar new sail once a year. With an IMS OR MORC racer, that might mean many thousands of dollars. Fair or not, if you want to win you must be willing to "pay the freight" (this incidentally is not a concept new to yacht racing).

## **SOME COMMON QUESTIONS TO HANDICAPPERS:**

### *#1. WHAT DOES MY RATING NUMBER MEAN?*

It always surprises me how many people who are already racing really don't know what their rating number signifies or have not taken the time to really figure out what a 3 or 6 second a mile change might really mean to them. So here are a few definitions as best as I can explain them.

**SPEED POTENTIAL (SP)** is the base rating given to a boat. The number is given in seconds/mile of handicap relative to the imaginary scratch boat of "0 seconds/mile". In PHRF this number assumes that the boat and all equipment is "standard" as PHRF defines it. In Lake Ontario that's basically a sloop with a 150% genoa, a 180% spinnaker, a spinnaker pole no longer than the "J" sail dimension, a folding propeller on an inboard, or a retracting motor on an outboard powered boat.

**ASSIGNED SPEED POTENTIAL (ASP)** is the SP plus any adjustments for non-standard sized sails, non-folding prop, or miscellaneous items. The ASP is the number actually used for race correction.

### *#2. HOW ARE RACES CORRECTED?*

We are fortunate on Lake Ontario to have two methods of race correction at our disposal, the time-on-distance method that uses the ASP for correction, and the time-on-time method, which uses another number, also found on the rating certificate, the time-on-time multiplier. The time-on-time multiplier is derived from the ASP by means of a mathematical formula and is therefore directly related to that number.

### *#3. MY BOAT RATES (XXX) IN OTHER PARTS OF THE COUNTRY, WHY NOT HERE?*

PHRF ratings are locally derived and may be different in other areas. The difference may be real (because of local sailing conditions) or merely reflect a difference in local sailing skills or in perception of the local handicappers. In general, PHRF-LO tends to keep within the national rating extremes but if a particular rating does not seem correct, PHRF Lake Ontario is free to rate a boat completely independently. In fact it is absolutely necessary that regions act independently or the ratings would never change and therefore never improve. No PHRF rating is ever considered "carved in stone" and is always subject to ongoing improvement as the complexion of the fleet changes.

### *#4. MY RATING IS INCORRECT! (never a question-always a statement)*

You are probably correct! Since the ratings are based (or should be based) on observed performance we are at the mercy of "experimental error". That is one reason ratings are given in 3 sec/mile increments, we know we can't calculate any closer. There is a measure of uncertainty in all the ratings but if we think there is a higher probability of a new rating being more correct than the old one - we make a change. If not enough evidence exists to make the change, the old rating usually remains. If there is a question on a boat's rating -- the handicapper must always favor the fleet and not an individual boat. The theory being: If you under handicap a boat, one boat suffers. If you over handicap a boat, the whole fleet suffers.

### *#5. HOW ARE RATINGS CHANGED?*

Ratings are changed in a waterfall sequence, first the club handicapper brings up a boat for change at a regional handicappers meeting. The boat is discussed and if the observed data evidence points to a change, the region will recommend the change to PHRF-LO. If the boat is unique to a region the change will go through without further discussion. If a sistership exists elsewhere on the lake the boat will be brought up for discussion at the next lake wide handicappers meeting.

There is nothing stopping a club from setting it's own rating for a boat. Within a club, boats can race with a club-generated handicap, but elsewhere have to race with the lake-wide handicap. While this may have a good initial effect on introducing people to racing, it can also have its pitfalls when these people venture out into interclub or regional or higher events.

*#6. I NEED A RATING ADJUSTMENT TO BE COMPETITIVE! (another statement)*

Let's take a look at a typical club evening race and the effect of a 6 sec/mile change:

The winds are pretty good and you complete the course in 1 hour and 20 minutes. Your boat has a rating of 162, which means a multiplier of 1.0133. Your corrected time is (1.0133 x 1 hr.20 min.) or 1 hr. 21 min. 04 sec. If your boat rated 168 (6 seconds more) you would have a multiplier of 1.0044) and your corrected time would be (1 hr. 20 min. x 1.0044) or 1 hr. 20 min. 21 sec. By subtracting the two corrected times you find you would have gained an additional 43 seconds of corrected time on your opponents.

At four knots (your approximate boat speed) that time difference translates to about 10 boat lengths. To answer the initial question, if you are losing races by 40 seconds or 10 boat lengths, a 6 second/mile additional handicap might be important to you. If you are generally losing by more, look for reasons other than your rating. Without throwing stones, many people lose two or three times that amount of time before they even cross the starting line just by being late at the start, or by not noticing the port end is highly favored.

Having corrected and analyzed many races, I know only the top couple of people in each fleet could really be affected by a 6 sec/mile change. A lot of people lose by 5 to 15 minutes which translates into a 45 to 130 sec/mile handicap difference from first place.

*#7 DOES PHRF WORK?*

PHRF has become the dominant handicapping method in sailboat racing in the North America. On Lake Ontario alone, about 2000 boats are registered. Nationally the number is in the tens of thousands. PHRF corrects many of the problems associated with measurement rules such as the complexity and cost of measurements and the outdating of boat designs. Although not without some problems, PHRF appears to be one of the fairest ways of rating such a large and diversified group of boats.

**ABOUT THE AUTHOR**

Steve Corona has served as Assistant Chief Handicapper for PHRF-LO and is the Genesee Yacht Club Handicapper. He is an important contributor to PHRF-LO, and worked diligently to develop the Race Results Analysis System for PHRF-LO, allowing handicappers to have an ongoing, annually updated assessment of the race performance of all boats racing on Lake Ontario.