

# **TIME ON TIME SCORING**

## **THE PANACEA**

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Much has been written in the past several years regarding Time-on-Time (TOT) scoring, which to most of us, sounds like foreign intervention into our American way of life. However, with the emergence of much faster boats such as the J35, who often race against much slower boats over fixed courses especially at the local club level, the race results have become somewhat predictable. In light winds over windward/leeward courses, the fast boats win; and for windy reaches, it's the slow boats that come out on top.

With our technical interest raised and with a need to “do something,” IMS was used first to try to better understand the problem and issues, and secondly, it was used to examine solutions to the problem. First the problem:

### **THE PROBLEM**

PHRF issues a single handicap to each boat which typically represents the speed potential of a boat at approximately 10 knots wind speed for an Olympic course or one which has approximately 30% beating.

Problems can arise due to:

1. Wind speed being different than approximately 10 knots.
2. Course content being different than the 30% beating
3. Differing sailboat designs which are affected by wind speed or by course content.

To quantify the problem, we used IMS predictions to predict the results of an extremely varied group of boats in five separate and distinctly different races.

Our group consists of boats ranging from the J44 (PHRF of approximately 25) to a C&C27 (PHRF of approximately 200) ( See Table 1) We have handicapped the boats with a PHRF equivalent to the IMS GP rating. Each of the five races are one mile in length. Race #1 is an IMS Race. Since all ratings are base on the GP rating, all boats come perfectly tied for first place. Race #2 is an IMS Circular Random, 6 knot wind speed race. Again, IMS is used to predict boat performance, but the original GP derived PHRF ratings are used to handicap the boats, which now no longer tied for first. Race #3 is a Circular Random 20 knot wind speed race. Race #4 consists of a 16 knot wind speed 80° true wind angle reach. Race #5 consists of a one mile beat in 8 knots of time wind. In all races, IMS is used to predict boat performance, but the GP derived PHRF ratings are used to handicap the boats. Prediction accuracy is about six seconds/mile at best.

A review of Table 1 indicates no real surprises. Fast Boats do much better in slow races (#2 and #5). Slow boats do much better in fast races (#3 and #4). Within rating spreads of approximately 25 seconds/mile, handicap differences are small; and really represent differences in boat design/performance.

For example, the Frers 36 appears to like light air better than heavy and beating as opposed to reaching. The Ericson 36, PSN 30, and C&C 27 do not beat as well as the J24, J29, or C&C 35-3. The J-24 is a good heavy air boat. Most of these IMS predictions seem consistent with real world experience.

The real surprise is the magnitude of the handicapping problem when boats with significantly different PHRF ratings (difference of 30 or greater) race in conditions other than GP conditions. The differences between the J44 and the C&C 27 are huge, but even the other boats exhibit significant handicap discrepancies:

The J24 loses to the J35 by approximately 43/36 seconds/mile in the slow races (#2 and #5), yet beats the same boat by 28/41 seconds/mile in the fast races (\*#3 and #4). Differences between the J37 and the C&C 35-3 (rating spread of approximately 50 seconds/mile) are 16/25 seconds/mile and 12/6 seconds/mile for the slow races (#2 and #5) and fast races (#3 and #4) respectively.

Time on Time Scoring has the potential to correct the handicap differences due to course content and wind speed, but not due to boat design. We will now examine two Time-on-Time scoring formulas to see how well they fix the problem.

#### Time-on-Time . . . . The Panacea ?

Two Time-on-Time formulas were examined – the first is the Pacific NW formula whereby the Time Correction Factor ( $TCF = 600/480 + PHRF$ ). The second formula is the author's modification of the first:  $TCF = 650/550 + PHRF$ . In either case, corrected time equals the elapsed time multiplied by the TCF; length does not enter into the calculation.

For our evaluation, we have taken the same 11 boats on the same five races, but now have scored the races using Time-on-Time formulas. Table 2 presents the results (seconds behind first place for each of the five one-mile races, 0 represents a first place finish).

The results of scoring with the original Time-on-Distance (TOD), (PHRF handicap); the Time-on-Time 1 (TOT1) and Time-on-Time 2 (TOT2) are presented for each race.

For Race #1, the IMS GP race, TOT1 clearly favors the slow boats. Instead of all boats tied for first place, the C&C 27 comes in first with the J44 21 seconds behind. This trend is evident in all five races with TOT1 scoring, where even in the slow races (#2 and #5), the slow boats consistently beat the faster boats. TOT1 does reduce the overall handicapping error by 50% compared to TOD. However, we felt that Time-on-Time should not affect the typical PHRF race, therefore, TOT2 was developed to insure fair handicapping for all boats over the full range of PHRF ratings, and to ensure that we are not changing the handicapped results for "typical races". The results for Race #1 indicate that we achieved this for the IMS GP race. All boats would tie for first place. Results of the other races also indicate no bias towards the fast or slow boats. Although handicap errors exist in all the races, they appear to represent how

different boats perform under different conditions (as predicted by IMS) e. g. the J44 appears to excel in heavy air reaching and not light air beating; while the F36 is the opposite.

In reviewing Table 2, we have reached the following conclusion:

1. Within small PHRF ratings bands, all scoring methods rate boats equally well for all five races.
2. For large PHRF rating spreads (30 or more):
  - a. For TOD, fast boats will win slow races, slow boats will win fast races.
  - b. TOT1 favors the slower boats and appears to over compensate the TOD problem.
  - c. TOT2 provides a significant correction to the TOD method without biasing one group of boats versus another and without affecting the normal race results.
3. Neither TOT1 or TOT2 adjust for boat design differences.
4. All of the results are based on IMS predictions and use GP as the baseline race. Other course baselines would result in different TOT formulas.

In summary, use of TOT2 is recommended when PHRF rating spreads are 30 or greater; especially where courses around fixed marks (e.g. place to place) may result in course content differing greatly from GP or Olympic conditions.

**TABLE 1**

BOAT	DERIVED PHRF	RACES									
		#1 GP		#2 CR6		#3 CR20		#4 16 KT 80° Reach		#5 8 KT Beat	
		PL	TIME	PL	TIME	PL	TIME	PL	TIME	PL	TIME
J44	27	1	--	1	--	8	29	10	42	1	--
J37	68	1	--	2	06	8	29	8	40	3	07
Frers 41	72	1	--	5	09	8	29	7	37	2	04
J35	77	1	--	2	06	7	28	9	41	3	07
Frers 36	93	1	--	4	08	11	32	11	44	6	19
J29	116	1	--	6	16	5	24	6	35	5	14
Eric 36	116	1	--	8	24	5	24	4	32	8	41
C&C 35-3	120	1	--	7	22	4	17	5	34	7	32
PSN 30	165	1	--	9	43	3	13	3	15	18	81
J24	171	1	--	10	49	3	15	1	--	9	43
C&C 27	196	1	--	11	54	2	07	2	04	11	90

Notes: All races are one mile in length. Placement and seconds behind first place are indicated.  
Derived PHRF is equal to IMS GP-550.

**TABLE 2**

BOAT	DERIVED PHRF	Race Results (Seconds Behind First Place)														
		#1 GP			#2 CR6			#3 CR20			#4 16 KT Reach			#5 8 KT Beat		
		TOD	TOT1	TOT2	TOD	TOT1	TOT2	TOD	TOT1	TOT2	TOD	TOT1	TOT2	TOD	TOT1	TOT2
J44	27	0	21	0	0	41	19	29	05	0	42	9	0	0	43	23
J37	68	0	15	0	06	21	08	29	12	11	40	17	11	07	23	12
FRERS 41	72	0	14	0	09	22	10	29	13	12	37	15	10	04	17	07
J35	77	0	13	0	06	16	05	28	13	12	41	20	15	07	17	08
F36	93	0	11	0	08	18	01	32	19	20	44	27	23	19	20	18
J29	116	0	08	0	16	04	0	24	14	18	35	22	21	14	01	0
Eric 36	116	0	08	0	24	12	08	24	14	18	32	19	18	41	28	26
C&C 35-3	120	0	08	0	22	08	04	17	08	09	34	22	21	32	17	16
PSN 30	165	0	03	0	43	05	08	13	11	18	15	13	15	81	38	43
J24	171	0	03	0	49	08	12	0	0	08	0	0	3	43	0	06
C&C 27	196	0	0	0	54	0	07	07	10	19	04	09	13	90	29	38
<p>Note: TOD is the original time on distance handicapping. TOT1 utilized the Time-On Time formula <math>TCF = 600/480 + PHRF</math>. TOT2 utilized the formula <math>TCF = 650/550 + PHRF</math>. Number indicates second behind first place.</p>																