ORC

TCF tombola

Back in the day with Team New Zealand we were treated to a motivational session hosted by the head coach of the Auckland Blues Rugby League team. He told us how he viewed the versatility and skillsets of his players like the contents of a golf bag. The muscle-bound second row had only a couple of clubs in their bag, perhaps a driver (tackling) and a 3 wood (pushing). The wingers perhaps carried a couple of extra clubs, a 3 iron and 7 iron, because they had to be more versatile, while the scrum half and fly half needed to add a putter and a pitching wedge to do what they needed to do.

The coach didn't regard the lack of clubs in a player's bag as necessarily a bad thing. He just needed the players to remember which clubs they had, so that in the heat of battle they did not try to play a delicate chip when the club they had in their hand was a driver. I was minded of this reading the 2025 RORC handbook:

'*Why use a complex rating system when you can achieve the same results with a simple, single-number system? Easy for clubs, organisers and sailors to understand and use. Focus on the racing with straightforward calculated corrected time while on the water, no waiting for complex and unnecessary scoring calculations.*'

It's a fair question: offshore races that have been dual scored using a single-number IRC time-correction factor (TCF) and the ORC All Purpose Handicap (APH) produce similar results. A well-sailed boat wins and the places shuffle a bit mid-fleet. It is possible to complete a round of golf using only a 6 iron – both IRC and ORC have very serviceable 6 irons in their bag. But the ORC handicap system needs many more clubs in its bag to deliver our product:

- a VPP predicting speed on all sailing angles in 4-24kt TWS (not a calculation mainly based on length, weight and sail area)
- an aerodynamic force model that sets handicaps based on the available sail wardrobe, or sail chart
- a definition of hull and keel shape to separate the drag due to wetted area and wave making
- an allowance for pitch inertia differences
- an accurate position for each boat's vertical centre of gravity and righting moment.

In 2024 the development of Weather Routing Scoring (WRS) added a new club to the ORC golf bag, making Polar Curve Scoring available for offshore racing as an alternative to the All-Purpose Handicap (APH, a single-number rating comparable to the IRC TCC).

The methodology of WRS has been extensively debated in this magazine. Now, having streamlined the process of race simulation with our partners PredictWind, we can try to quantify the degree to which WRS levels the field for a mixed fleet in an offshore race…

As a thought experiment, imagine a race around the English Channel, Cowes to Weymouth, CH1 mid-Channel and finish at the Nab Tower. If the whole fleet sailed a perfect race, and the single-number handicap was an accurate reflection of performance, then all the boats would record the same Corrected Time (CT).

In the black-edged section of Table 1 there are six typical boat types, and their Time Correction Factors (TCF) based on this ORC All-Purpose Handicap. The race was started at midday, and I entered into the scoring program an Elapsed Time (ET) for each boat that would produce the same Corrected Time for every boat, 23h:07m:41s. This is how time-on-time racing works.

Next, I simulated the race the evening before the putative race start. Each boat was raced around the course using ORC Weather Routing. The certificate polar table was fed into the PredictWind weather forecast and optimum routeing software. This simulation returns, for every boat, the predicted track, the Predicted Elapsed Time (PET) and, most importantly, the distribution of True Wind Speed (TWS) and True Wind Angle (TWA) experienced during the race.

Now we can score our simulated race using the tabulated TCFs. The simulated results are in the red part of the table 'Weather Routing Scoring. Clockwise'. The TP52 had a predicted elapsed time of 00:14:03:44, winning the race with the lowest corrected time of 00:17:35:21 (CT=ET x TCF). The Landmark 43 completed the course in 00:21:50:11. giving a corrected time of 00:21:31:56, for a third-place finish. The 'Corr. T delta to winner' column shows how far behind the winner each boat was on corrected time.

Using the APH TCF gave the TP52 a four-hour headstart over the Landmark 43. This difference arises from race conditions not under the crew's control: the wind was dropping as they approached the finish, the TP52 being able to use its headsail-set-flying for a long leg of the course while the Landmark 43 was only able to set a jib, the TP52 also seeing less adverse current as a result.

The difference between the times in the 'Corr. T delta to winner' column for any pair of boats shows the help or hindrance 'handed out' by the single number. This is inevitable when the race conditions do not match those inherent in the calculation of the APH.

Taking our experiment further, a second race was simulated with the course sailed in reverse, finishing in Cowes. The start time was the same; finish times to give a dead heat must be the same because the course length is the same. But now the WRS simulation delivers a different scenario from the clockwise race (in the green section). The TP52 wins again, but the free lunches (Corr. T delta to the winner) have smaller portions and shuffle the mid-fleet places.

In a single race, across our diverse fleet, the 'horses for courses' effect is in the order of hours. Reversing the course direction distributes these not insignificant gifts quite differently. Table 2 shows how TCFs (with the Landmark 43 as scratch boat) should change to give every boat an even chance in our two races, around the same course, at the same time, but in different directions.

Finally, 40-plus years after the IMS project began, we see the degree to which a single-number handicap, blind to prevailing race conditions, gifts or steals time allowances among the fleet.

Don't for a second think these simulations are a worst case – every race simulation produces a variation on this theme. It's hard to unsee this analysis (I'm glad I wasn't aware of the single-number TCF tombola going on as I bounced around the Channel in my youth). So ORC now offers a range of well-defined scoring options:

- For cruiser-racers using ORCi at championship level, the inshore races use Polar Curve Scoring. The 'scoring wind' is derived after the finish and the results are calculated as the last boat finishes. The offshore races are scored using WRS.
- ORC multihulls and the J Class, racing a mix of W/L and round-the-buoy races, prefer PCS with a constructed course.
- ORC Superyachts use pre-calculated handicaps based on the anticipated windspeed range and course geometry.
- In the USA local fleets have adopted a similar approach that offers a TCF for 25 constructed courses and wind band ranges.

The apparent complexity of ORC scoring, and certainly some

All Purpose Handicap						Weather Routing Scoring. Clockwise.				Weather Routing Scoring. Anti-Clockwise.			
Boat Type	TCF (APH)	Start Time	Finish Time	Elapsed Time	Corr. Time	WRS Pred. ET	WRS Corr. T	Corr. T delta to winner	Pos	WRS Pred. ET	WRS Corr. T	Corr. T delta to winner	Pos
		[dd/hh:mm:ss]				[dd/hh:mm:ss]		[hh:mm:ss]	[]	[dd/hh:mm:ss]		[hh:mm:ss]	[]
JPK 10.10	0.859	00/ 12:00:00	*01/ 14:54:40*	01:02:54:40	00:23:07:41	01:01:30:43	00:21:55:32	**04:20:11**	4	00:22:18:00	00:19:09:55	**02:07:45**	5
FIRST 40.7	0.887	00/ 12:00:00	*01/ 14:03:55*	01:02:03:55	00:23:07:41	01:01:11:33	00:22:21:13	**04:45:52**	6	00:22:06:46	00:19:37:15	**02:35:06**	6
J 120	0.934	00/ 12:00:00	*01/ 12:46:03*	01:00:46:03	00:23:07:41	00:23:34:47	00:22:01:09	**04:25:47**	5	00:19:38:27	00:18:20:27	**01:18:18**	2
Landmark 43	0.986	00/ 12:00:00	*01/ 11:27:18*	00:23:27:17	00:23:07:41	00:21:50:11	00:21:31:56	**03:56:35**	3	00:18:36:33	00:18:21:00	**01:18:50**	3
TP 52	1.251	00/ 12:00:00	*01/ 06:29:13*	00:18:29:13	00:23:07:41	00:14:03:34	00:17:35:21	**00:00:00**	1	00:13:37:02	00:17:02:09	**00:00:00**	1
Maxi 72	1.446	00/ 12:00:00	*01/ 03:59:35*	00:15:59:35	00:23:07:41	00:12:32:38	00:18:08:24	**00:33:03**	2	00:12:41:46	00:18:21:36	**01:19:27**	4

Table 1 – Channel race simulations

missteps along the way, have handed our detractors a heavy stick with which to beat us. Most ORC sailors have got the hang of how all this works but common misconceptions persist. For example:

'*Under ORC, ratings in each class are now calculated relative to the "scratch" boat in the class and this can change on a daily basis depending upon the conditions. Thus it is not possible to back-calculate this, nor fully understand the calculation of the daily rating. This therefore makes delta comparisons very difficult and makes combining fleet results from the same course less meaningful, as the ratings are in effect based on a different scratch boat.*'

Every system that uses a Time Correction Factor (TCF) has a scratch boat with a TCF of 1.000. The ORC certificate shows an All-Purpose Handicap which is the equivalent of the IRC TCF. The APH and polar speed curves are fixed for the life of the certificate. Choice of scratch boat makes no difference, but it is helpful to normalise the TCFs based on the speed of the fleet; some multihull fleets would have an average TCF as high as 2.0, which makes corrected time deltas double the time on the stopwatch.

'*Reviewing corrected times is meaningless. IRC TCCs are based on the worldwide fleet, whereas a comparable ORC PCS baseline is only set from boats in that class at that time.*'

A lack or presence of a 'worldwide fleet' is of no consequence for individual races; every ORC certificate uses the same VPP.

'A further shortcoming is the accuracy of measurements from the racecourse, especially wind speed at different heights, knowing that wind shear seen along a 50m maxi rig will not be comparable to that seen on the committee boat.'

Wind speeds on an ORC certificate are for 10m above the water. The VPP assumes a vertical wind speed distribution (shear) to account for the wind getting stronger as the height above water increases. This is a fixed formulation based on typical conditions.

Scoring is never based just on the committee boat anemometer or masthead data. The exam question for the scoring software is 'what was the windspeed and direction on each leg of the course?'

There are several answers depending on the type of race: Where windspeed is set to a particular band before the start, or a WRS-based scratch sheet is calculated, observations are unnecessary to score the race. For windward-leeward or triangular courses aligned to the True Wind axis, Polar Curve Scoring gives results at the end of the race based on the calculated 'scoring wind'. No observations are needed to complete the scoring, but onboard observations are compared to the published wind speed. For round-the-cans racing the options are to pick a wind band and pre-constructed course type, or use the course geometry and observed wind direction and speed, taken from mark boats etc.

'Competitors in ORC will not know their rating, and therefore their results, until after the scorer has completed their calculations.'

True, if the organiser has chosen to use Polar Curve Scoring. Results should still be available shortly after the last boat finishes.

'The full data used is not going to be available.'

Scoring wind conditions and associated TCF for the race are published in the results, as are the WRS simulated tracks etc.

'In ORCi individual onboard weather data may be used, so a competitor who sees their light-air performance as better than the predictions could hunt for holes in the wind rather than avoid them…'

No race is scored using any one competitor's data; good luck to a competitor seeking out wind holes to improve their chances. The goal is to offer an equal chance to win. Well, a bit more equal.

Andy Claughton, Chair, ITC ❑

Boat Type	APH	WRS Clockwise	WRS Anti-Clockwise
JPK 10.10	0.859	0.844	0.823
FIRST 40.7	0.887	0.855	0.830
J 120	0.934	0.913	0.934
Landmark 43 n	**0.986**	**0.986**	**0.986**
TP 52	1.251	1.532	1.348
Maxi 72	1.446	1.717	1.445

Table 2 – TCF for same corrected time using WRS