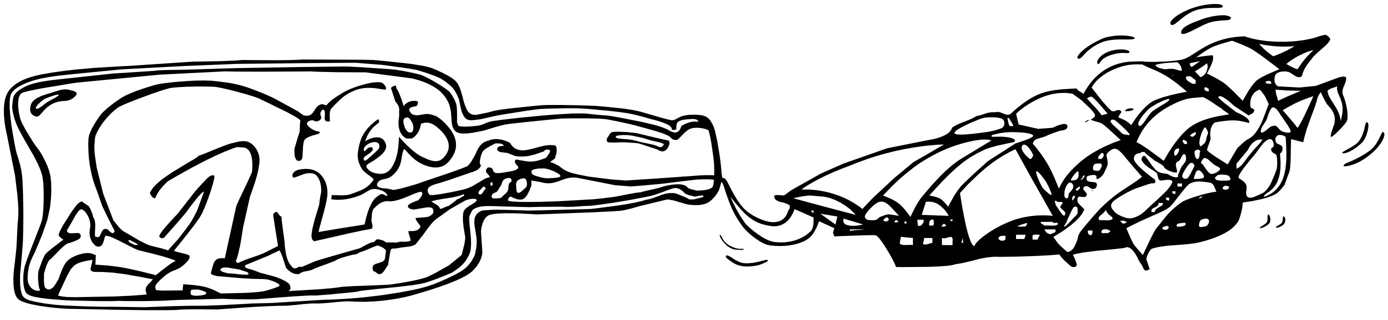
Observed Results Computer Analyzed

An Optimizing Time Correction Method For Yacht Racing

by

Jacob van Heeckeren

Compute the tightest grouping of corrected times.
No subjective evaluation of actual race conditions required.
Scoring Committees cannot influence results.
Established and readily available ratings are used.
Calculations are based on elapsed times and ratings only.
Results are optimized in closed form.



Calculating optimized corrected times is no more difficult than putting a boat in a bottle.
Once you find the right way to do it, it is really quite simple ..... with a computer, of course.

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General Thoughts

It is well known that bigger boats tend to sail faster than smaller boats, and that lighter boats tend to sail closer to hull speed in heavier air, while heavier boats tend to sail closer to hull speed in lighter air. How do we take differing boats, and race them together? Rest assured that there is no clear and equitable way to do this. All methods devised leave much to be desired, and are subject to a great deal of controversy. Sailboat races are frequently won by fractions of a percent, while at the same time well qualified and equal one design races will vary by considerably more in their results. Frequently small inequities in ratings are dwarfed by superior handling and equipment, while gratuitous ratings are readily squandered through unfortunate judgment of the crew.

Why Bother With Ratings And Time Corrections?

1. The purpose of sailboat ratings is to provide a quantitative estimate of boat performance.
    - What should boat ratings do:

        Allow differing boats to race together with the expectation of having a fair shot at winning.
    - What should boat ratings not do:

        Attempt to predispose of, or skew, race results.
2. The purpose of time correction methods is to take boat ratings and convert them into corrected times.
    - What should time correction methods do:

        Convert elapsed times of boats with differing ratings into corrected times which reflect how well each boat was sailed, and therefor how boats should place in the race.
    - What should time correction methods not do:

        Attempt to predispose of, or skew race results.
3. What kind of ratings are there
    - Equivalent length -- ft - meters - CCA - IOR - MORC
    - Equivalent speed -- time to go a mile -- PHRF - Portsmouth - IMS
    - Equivalent speed -- based on conditions -- IMS ‘Bingo Card’
4. What kind of time correction methods are there
    - Time On Distance
    - Time On Time
    - Times analyzed on observed performance

Let’s Go Sailboat Racing.

Let’s see how time correction methods measure up to Father Neptunes uncharted ways.

Sample Race Scenarios - Food For Thought

The following simplistic scenarios are presented to evoke thought about the *de facto* working of time correction methods.

1. You are offered the opportunity to sail a match race between Bob Johnson's magnificent *Windward Passage* and *4040*, Steve Seal's supremely successful Cal-20.
    - Which boat do you pick? Why?
    - What rating system do you prefer? Why?
    - What time correction method do you prefer? Why?
    - What happens when *Windward Passage* gets around the upstream mark, and *4040* sits for a considerable amount of time before getting around?
    - What happens when *Windward Passage* is becalmed in a wind hole just short of the finish, *4040* catches up and both boats finish close together.
2. There is a fleet of boats which, although not true one designs, have very similar characteristics, and have ratings which differ by only a few percent.
    - How do the time correction methods treat this fleet.
3. There is a fleet of boats with widely differing characteristics, ranging from big to small, and from light to heavy.
    - How do the time correction methods treat this fleet.
4. There is a fleet of nine big boats with similar ratings and nine small boats with similar ratings. The ratings are fair, and the boats are reasonably well sailed.
    - How do the different time correction systems treat the boats.
    - What happens when all boats sit in a wind hole just after the start. Eventually the wind fills in and everybody finishes as though the race had started just after the wind filled in. How do the different time correction systems treat the boats.
    - One small boat is well sailed and finishes up with the big boats. One big boat is poorly sailed and finishes back with the small boats. How do the different time correction systems treat the boats.
    - Shortly before the finish, light air and an adverse tide create a parking lot where all boats gather and are randomly bobbing around amongst each other, regardless of size. When finally the wind fills in and the tide begins to turn, all boats sprint the short distance to the finish. The finishing distribution is pretty much as it would have been, had all boats belonged to a one design class. How do the time correction systems treat the boats.
    - The big boats finish grouped as a typical one design class would, but the small boats finish with quite a spread between them. On the average, the small boats were sailed comparably as well as the big boats. How do the time correction systems treat the boats.
    - The big boats finish grouped as a typical one design class would. The wind drops and the small boats finish much later, grouped as a typical one design class would. How do the time correction methods treat the boats.

- The big boats finish well spread out. The small boats sit in a hole after all the big boats have finished. Eventually the wind fills in and the small boats finish virtually overlapped. How do the time correction systems treat the boats.

5. A set of ratings is in use which seems to do a good job of establishing the relative performance between boats of similar size. These same ratings appear to favor bigger boats over smaller boats, as the smaller boats don't appear to win as many races as the bigger boats do. The smaller boats are sailed equally well as the bigger boats, and the equipment they use is certainly comparable.

   - How do the time correction methods treat these boats.

6. The fleet consists evenly of big boats, and small boats. The ratings are fair, and under normal sailing conditions it is difficult to bet on a winner of the race with the hopes of beating the odds. It really doesn't matter what time correction method is used under these conditions, as all provide a fairly scored race.

   On one occasion the weather is unsettled. It changes by, geography, there are wind holes, and currents constitute a significant influence on the outcome of the race. The finishing times are quite scrambled, reflecting Father Neptune's successful efforts at randomizing the outcome of the race. Big boats and small boats are equally randomly affected, and there is nothing to indicate that boat size has anything to do with the statistical mess of the results. It has been one of those days .....

   - How do the time correction methods treat these boats and conditions.

7. The fleet is broken down into three classes. Big boats, medium boats, and small boats. Class placings are calculated, and then overall placings are calculated.

   - How do the time correction methods treat these boats.

8. The fleet is broken down into big boats with tall rigs, and small boats with short rigs. The local conditions are such that there is a strong wind gradient from the surface upward. There is considerably more breeze aloft, and the tall rigged boats effectively sail in more breeze than the small boats do. This phenomenon is sometimes referred to as the Long Island Sound Syndrome.

   - How do the time correction methods treat these boats.

Descriptive analysis of sample race scenarios. Do you agree or disagree. Why?

1. You are offered the opportunity to sail a match race between Bob Johnson's magnificent *Windward Passage* and *4040*, Steve Seal's supremely successful Cal-20.

   - Which boat do you pick? Why?

     There is no basis on which to pick a boat. The best suggestion so far was to pick *Windward Passage*, because their lunches are better. If it is true, that is likely to be the only reason for picking one boat over the other at this point.

   - What rating system do you prefer? Why?

     The reason for picking one rating system over another, is because one presumes to better the chance of winning. It means one assumes the rating system not to be fair, and thus to be able to predispose the race outcome in ones favor.

- What time correction method do you prefer? Why?

  The reason for picking one time correction method over another, is because one presumes to better the chance of winning. It means one assumes the time correction method not to be fair, and thus to be able to predispose the race outcome in ones favor.

- What happens when *Windward Passage* gets around the upstream mark, and *4040* sits for a considerable amount of time before getting around?

  Time On Distance: *Windward Passage* wins. *4040* adds to her elapsed and corrected time all the time she sits and can't get around.

  Time On Time: *Windward Passage* wins. *4040* adds to her elapsed time all, and to her corrected time part of the time she sits and can't get around. The break she gets from Time On Time is less than all of the time she couldn't get around.

  Time On Time gives a better result, but doesn't solve the problem.

- What happens when *Windward Passage* is becalmed in a wind hole just short of the finish, *4040* catches up and both boats finish close together.

  Time On Distance: *4040* wins. Both boats have the same elapsed time, and *Windward Passage* gives time to *4040*.

  Time On Time: *4040* wins. Both boats have the same elapsed time, and *Windward Passage* gives time to *4040*. However, because both boats sat for a substantial amount of time just before the finish, *Windward Passage* gives a far greater amount of time to *4040* than she would had they not sat in the wind hole.

  Time On Distance gives better results. Time On Time only makes matters worse.

2. There is a fleet of boats which, although not true one designs, have very similar characteristics, and have ratings which differ by only a few percent.

   - How do the time correction methods treat this fleet.

     For closely rated boats, any reasonable rating system works well. When ratings vary by 5% or less, the boats are sailing much as though they were a one design.

     In one design racing the statistical spread of finish times normally exceeds 5% of the elapsed times.

     Although we do not suggest to ignore rating differences of less than 5%, we do suggest that Father Neptune's influence on the results of sailboat races can easily exceed this figure.

     There is no preferred rating system or time correction method, so long as whatever system is in use, is reasonable.

3. There is a fleet of boats with widely differing characteristics, ranging from big to small, and from light to heavy.

   - How do the time correction methods treat this fleet.

This is the most difficult fleet to rate and to correct for. The extremes need to be tended to.

First of all the ratings used must be reasonable. Are they?

> During the selection of ratings, one is in essence deciding who will get the prize. Ratings should be such that they are not subject to heuristic interpretation. They should not be decided by the time correction committee. If at all possible, ratings with a history of review and calculation should be used. They should not be modified on the spot, for the occasion. PHRF, IMS, MORC, IOR, etc. all are valid ratings, and are well founded, either on calculation, or on established historical review procedures.

Second, the ratings must be reasonable for the conditions. Are they?

> The only ratings at present which address the differing performance of boats under differing sailing conditions is the IMS Bingo Card system. Regional PHRF ratings address this problem but on a regional basis, not on a race by race basis.

Third, time corrections must be applied to the ratings in a meaningful way. Are they?

> When conditions are typical, most time correction methods perform reasonably well. In twelve knots of breeze under moderate sea conditions in open water on an Olympic course, it matters little whether Time On Distance or Time On Time correction is used. The disparities arise when conditions become extreme, or different for different size boats, or if conditions change when the second part of the fleet gets there.
>
> Time On Distance time correction provides a fixed time allowance for a race length. This method does not adapt itself to varying conditions, but its allowances do not become unlimited under extreme conditions. Time allowances may be boundedly unreasonable.
>
> Time On Time time correction provides an unbounded time based time allowance. This method adapts to varying conditions and/or performance, but is unlimited under extreme conditions. Time allowances may be unreasonable, and may become unboundedly so.
>
> Observed Result Computer Analyzed (ORCA) time allowances look at the elapsed times and ratings of the finishers. It then statistically calculates a length value (L-Value) which, when applied to the individual ratings (the same L-Value for every boat in the race) to compute individual corrected times, gives the tightest possible grouping of corrected times for that race.
>
> The ORCA method does not need to know anything about the conditions of the race, or the course length. It does not need to know if the small boats got left behind, or if the big boats waited in a parking lot just short of the finish. It simply looks at the individual elapsed times

and the individual ratings, and then applies a common L-Value to the individual ratings which statistically optimizes the race results.

In the case of the big boats waiting in a parking lot near the finish line, it finds a short L-Value. In the case of the small boats getting left behind, it finds a long L-Value.

Established ratings may be used, ratings which have been subjected to many years of historical review. No operator or scoring committee input is required (or is even possible) to obtain optimized results.

Over many races under many conditions with many differing boats, this method will give the closest racing possible.

4. There is a fleet of nine big boats with similar ratings and nine small boats with similar ratings. The ratings are fair, and the boats are reasonably well sailed.

- How do the different time correction systems treat the boats.

  For the typical race, all time correction methods treat the boats fairly. There is little preference for any rating or time correction system.

- What happens when all boats sit in a wind hole just after the start. Eventually the wind fills in and everybody finishes as though the race had started just after the wind filled in. How do the different time correction systems treat the boats.

  Time On Distance does well. The race is, in fact, sailed over the actual course length which is used to calculate the time corrections.

  Time On Time bombs out. Small boats win. Time allowances are distorted by the amount of time the boats sit after the start.

- One small boat is well sailed and finishes up with the big boats. One big boat is poorly sailed and finishes back with the small boats. How do the different time correction systems treat the boats.

  All three correction methods find that the small boat wins, and the big boat loses. All boats place as they normally would under their time correction system.

  ORCA, as usual, finds the analytically optimized results.

- Shortly before the finish, light air and an adverse tide create a parking lot where all boats gather and are randomly bobbing around amongst each other, regardless of size. When finally the wind fills in and the tide begins to turn, all boats sprint the short distance to the finish. The finishing distribution is pretty much as it would have been, had all boats belonged to a one design class. How do the time correction systems treat the boats.

  Time On Distance has the small boats win and the big boats lose, because the actual course length over which the race was sailed was the short distance to the finish, and the time allowance was based on a much longer course length.

Time On Time has the small boats win and the big boats lose by considerably more, because the time allowances increased unrestricted for the duration that the boats were sitting in the parking lot.

In these cases, the course length should have been the distance from the parking lot to the finish, and the elapsed time should have started when the wind filled in.

ORCA finds the L-Value which makes for the tightest grouping of corrected times, and it could happen that a small boat or a big boat wins. Since the boats will be finishing grouped closely, there will be a good mix of corrected results.

- The big boats finish grouped as a typical one design class would, but the small boats finish later with quite a spread between them. On the average, the small boats were sailed comparably as well as the big boats. How do the time correction systems treat the boats.

  All three methods will have a small boat winning, a small boat losing, and the remaining boats grouped in the middle.

- The big boats finish grouped as a typical one design class would. The wind drops and the small boats finish much later, grouped as a typical one design class would. How do the time correction methods treat the boats.

  Time On Distance has big boats winning and small boats losing. Small boats cannot make up for the time they sailed in less wind.

  Time On Time has big boats winning and small boats losing. Small boats cannot make up for the time they sailed in less wind. Even though their corrected times are less than under Time On Distance, their time corrections do not make up for all the time Father Neptune added to their elapsed time.

  ORCA groups the corrected times as closely as possible. It is equally reasonable to guess that a small boat would win as it is that a big boat would win.

- The big boats finish well spread out. The small boats sit in a hole after all the big boats have finished. Eventually the wind fills in and the small boats finish virtually overlapped. How do the time correction systems treat the boats.

  Time On Distance has the big boats winning, and the small boats losing.

  Time On Time has the big boats winning, and the small boats losing, but by a lesser amount.

  ORCA groups the corrected times as closely as possible. In essence it superimposes the corrected times of the small boats on the corrected times of the big boats. Because the spread among the big boats is greater than the spread among the small boats, it is likely that a big boat will end up with the lowest corrected time, and that a big boat too, will end up with the longest corrected time. Since the small boats finished virtually overlapped, their corrected times will most likely constitute the middle of the distribution.

5. A set of ratings is in use which seems to do a good job of establishing the relative performance between boats of similar size. These same ratings appear to favor bigger boats over smaller

boats, as the smaller boats don't appear to win as many races as the bigger boats do. The smaller boats are sailed equally well as the bigger boats, and the equipment they use is certainly comparable.

- How do the time correction methods treat these boats.

  Time On Distance time corrections don't deal with the issue.

  Time On Time time corrections don't deal with the issue.

  The ORCA time correction method finds the corrected times which produce the closest statistical spacing of corrected times. In doing so, it automatically considers the skew of the ratings, and deals with the problem.

6. The fleet consists evenly of big boats, and small boats. The ratings are fair, and under normal sailing conditions it is difficult to bet on a winner of the race with the hopes of beating the odds. It really doesn't matter what time correction method is used under these conditions, as all provide a fairly scored race.

   On one occasion the weather is unsettled. It changes by, geography, there are wind holes, and currents constitute a significant influence on the outcome of the race. The finishing times are quite scrambled, reflecting Father Neptune's successful efforts at randomizing the outcome of the race. Big boats and small boats are equally randomly affected, and there is nothing to indicate that boat size has anything to do with the statistical mess of the results. It has been one of those days .....

- How do the time correction methods treat these boats and conditions.

  Time On Distance doesn't deal with the issue, but forms a stable platform on which to base corrections.

  Time On Time doesn't deal with the issue, and actually produces an adverse affect. A similar boat which sailed a worse race gets rewarded for this because the system gives her a greater time allowance for her inferior performance.

  ORCA time corrections don't to help much either, but still provide the tightest grouping possible under the difficult race conditions.

  The race was a statistical mess. There is no correction method which will reverse the affects of Father Neptune's stirring of the waters. The scramble of finishing times had nothing to do with an inequity between boats of differing characteristics. There is nothing to suggest the statistics of the race will identify any trends in the race results on which to base a correction. In this case, the spread of statistically corrected times will be large, and small boats and big boats will have their placings scattered throughout the results depending on how fortunate they were in anticipating and dealing with the Good Father's idiosyncrasies.

  The ORCA method actually does not fail to deal with the problem, as suggested above. Rather, as usual, it finds the most closely matched corrected times for the race, and finds a good mix of corrected times for small and big boats. It does not, however, undo the influence of the Good Father on a race. Sometimes you just can't get there from here .....

7. The fleet is broken down into three classes. Big boats, medium boats, and small boats. Both class placings and overall placings are calculated.

   - How do the time correction methods treat these boats.

     Time On Distance uses the previously established corrected times, and merges these identical times into overall standings.

     Time On Time uses the previously established corrected times, and merges these identical times into overall standings.

     When calculating class places, ORCA established an optimized L-Value for each of the three classes, and optimally scored the boats in their individual class, using the L-Value established for the individual class. When calculating overall places, ORCA establishes an optimized L-Value for the overall fleet, and then optimally scores the boats on an overall basis.

     All boats will have different corrected times in the overall standings than they did in their respective classes. This is because the overall optimized L-Value differs from the L-Value of their respective classes. It is entirely possible that one boat may beat another boat in the overall standings, while she lost to that same boat in the class standings.

     If the overall L-Value differs sufficiently form the class L-Value, and the corrected times of the two boats in class were close enough, and in the right (or wrong - depending on which boat you represent) direction, then such a change is entirely possible. It is also quite reasonable that this should happen. In class one is competing against somewhat closely matched boats. For overall, one competes against widely differing, and substantially mis-matched boats. Optimizing race results for overall is addressing quite a different problem from optimizing race results for thoughtfully matched classes.

8. The fleet is broken down into big boats with tall rigs, and small boats with short rigs. The local conditions are such that there is a strong wind gradient from the surface upward. There is considerably more breeze aloft, and the tall rigged boats effectively sail in more breeze than the small boats do; the Long Island Sound Syndrome.

   - How do the time correction methods treat these boats.

     This example is practically speaking identical to an earlier example where the small boats get left behind.

     Time On distance does not deal with the problem. The small boats lose. One can, however, increase the course length by an arbitrary amount, to enhance the strength of the time corrections to effectively deal with the problem. On any one day the effect will differ from the "standard", so that the amount the course length is adjusted needs to be evaluated accordingly. If done correctly, the race can be made fair.

     Time On Time pretends to deal with the problem by recognizing that the smaller boats are sailing disproportionately longer before finishing. The added time allowance given the smaller boats, however, is substantively less than the added time they sailed, and the little boats still lose. There is no means of correcting the situation such as in the Time On Distance case where course length can be arbitrarily increased.

ORCA deals with the problem inherently. As usual, it finds that L-Value which causes the corrected times to be most closely distributed. As a result, a small boat is equally likely to win as a big boat is. The statistical evaluation of the race results addresses the statistical disparities of the race conditions. The individual performance of any one boat does not affect her own time allowance as it does in Time On Time. Boats with equal ratings have equal time allowances, and the better sailed boat wins. The individual performance of a boat only affects her own time allowance in the sense that her performance is considered in the determination of the L-Value fairest to all boats in the fleet. In many ways this is equivalent to adjusting the course length under Time On Distance. The significant difference is that the ORCA method itself determines the optimal L-Value, by evaluating the results of the race, as recorded on the committee boat. It uses the individual ratings, and the individual elapsed times to determine the optimal L-Value.

The best choice the committee can make for an adjusted course length in the Time On Distance case cannot produce better corrected times than the ORCA method routinely calculates.

Does The ORCA Method Ever Break Down?

It certainly does.

1. When all boats have the same identical rating, then no L-Value can be found which will optimize the corrected times. All corrected times will respond identically to the change in the L-Value, and negate any ORCA activity. But then, we already knew that time corrections do not apply to boat for boat racing.
2. When only two boats participate in the race, we intuitively know that an L-Value can be concocted which equalizes the corrected times, and the boats will thus always tie. The statistical method gratifyingly confirms this result. It also reminds us that statistical methods work better as the number of samples in the statistical sample space increases. A sample space of two points is not usually considered to be statistically meaningful.
3. Take the case of a fleet of ten closely matched big boats, ten closely matched medium sized boats, and ten closely matched small boats. All are competently sailed.

    Suppose it is a long race, and starts in the late afternoon. There is a nice sailing breeze, and the big boats are smoking. By about 10 pm, the wind dies, and boats slowly and laboriously work their way towards the finish. The big boats are well ahead, and finish around 8 am the next day, before the wind fills in, resembling a one design class finish. They are well ahead of the others.

    The remaining boats have worked hard, but still have a long way to go. In the late morning the wind fills in, and the fleet is sailing smartly for the finish. Around 6 pm the medium sized boats finish, much as a one design class would.

The wind again drops around 10 pm, and the small boats come drifting to the finish early the next morning.

In this case, the medium sized boats will win. The big boats sailed half and drifted half the time. The small boats too sailed half and drifted half the time, although twice as long. The medium boats sailed two thirds and drifted one third the time. There are 20 boats which drifted half their time, and 10 boats which drifted only one third their time. To their ratings, the medium boats sailed better, since they drifted less. The 20 boats which drifted more will weight the statistics heavier, and consequently equalize well between them, leaving the medium boats likely to run away with the bone.

Do note, however, that it is still entirely possible for a small boat or a big boat to win, depending how she sailed compared to other boats her size, since they did stack the statistics.

In the real world ratings are not usually grouped as discretely, and a preferred winner is not readily identified.

4. Worse yet, take the case of a 20 boat fleet where there is one small boat, and the others are big boats. The big boats all have ratings very close together, so that they are for all practical purposes sailing boat for boat.

   The ORCA system tries to optimize the corrected times. Since 95% of the corrected times and ratings are provided by near one design boats, and only 5% by one small boat, the statistics are going to be governed for 95% by a near one design class.

   To optimize the corrected times in a near one design fleet an extreme L-Value is likely to be found. This is because a large change in the L-Value is needed to materially change the corrected times relative to one another.

   As a result the lone small boat could be unceremoniously deprived of a well deserved win after sailing a brilliant race, or, equally likely, she could be gratuitously handed the trophy on a silver platter after sailing an abominable race.

   In this case the small boat's fortunes are governed almost solely by the many big boats of a near one design fleet, where Time On Distance would have been a more suitable time correction method in the first place.

5. A new boat arrives on the scene. She is unknown, and no-one has ever attempted to provide a rating for the boat. There is no racing history on her. The rating committees are scrambling to arrive at a fair rating which neither is too harsh on the newcomer, nor unfairly disadvantages the many existing boats which have established ratings.

   Time correction methods do not deal with the fairness of ratings per se.

   Ratings based on measurement rules deal fairly with all boats. That does not mean that every boat will end up with a rating which gives her an equal chance of winning. That only means that her rating is based on the same category of measurements as all other ratings under this system. She may end up with a very favorable rating, or a very unfavorable rating. Either way, the rating will have been objectively arrived at, as is the nature of measurement rating rules.

   Rating systems based on observed performance are completely unable to deal with the situation, because there is no observed performance available. The most reasonable approach is to compare the boat with a boat for which a fair rating is known, and make adjustments accordingly. This assumes that a comparable boat can be found given that there is no knowledge what a comparable boat would be. The most objective means of comparing boats under these circumstances is to use a measurement rule, rate both boats under it, find the difference in ratings, and convert the difference back to the units of the observed ratings. A rating, as reasonable as is feasible, has now been estimated.

After a season of sailing, when performance has been established, the ORCA system lends itself well to rating re-evaluation, as described below.

Some Niceties Of The Statistical Analysis Of Time Corrections

After a number of credible races have been optimized, it is possible to derive a reasonable value of a rating based on the optimized race results. The rating so adjusted will be better than the rating which might have been found based on non-optimized races, because the optimized race results represent the actual performance of the boats in the races analyzed under actual race condition.

It is well known that new boats attract the 'rock stars', the acknowledged super sailors, as crew. It is thus reasonable to predict that these boats are being sailed to above average performance. The difficulty lies in the ability to isolate the crew's performance form the inherent performance of the boat. Statistical analysis permits assigning a 'personal' rating to a representative crew member. This personal rating then applies to the corrected times, so as to arrive at a more representative evaluation of the boat herself. This is much like personal handicaps in the game of golf.

An excellent example of the working of personal ratings lies in the statistical evaluation of the observed performance of individual skippers in a one design class.

A personal rating moves from boat to boat with the individual.

It may or may not be desirable to make use of personal ratings in the calculation of race results. Certainly for championship races it is not at all appropriate, while for some club events an affirmative argument might be reasonably advanced.

The primary value of personal ratings is in the determination of valid performance based ratings. Because boat performance is so very dependent on crew performance - as it should be - it is difficult to estimate representative observed performance ratings without being inadvertently influenced by crew performance. Through the statistical process introduced with the ORCA time correction methods, it is possible to isolate to some degree the actual performance of a boat from that of the combination of boat and crew. This provides greater confidence in the validity of a rating assigned to a boat based on observed performance.

It also permits observed data to be treated analytically rather than heuristically, a welcome shield against the appearance of impropriety in rating assignment.

Conclusion

By statistically optimizing observed race results, it is practical to calculate time corrections which give very close race results, over a wide range of conditions, for a wide variety of boats. The difficulties of parts of the fleet sailing under differing conditions is inherently considered by the method. This is achieved by looking at the differences in the performances of the boats, and then calculating a correction factor for the race. This correction factor, when applied to the race, produces corrected times which are statistically optimized.

When existing race results are statistically analyzed and then compared to results obtained by the ORCA correction method, it is found that the ORCA method produces a statistically tighter grouping of race results.

The ORCA time correction method levels the fortunes of yacht racing, and gives the whimsical nature of Father Neptune a run for his money. Furthermore, it does this using readily available and well established ratings, without the need for judgments about race conditions from scoring committees or participants.

In the worst case (races sailed under optimal conditions) we find little if any improvement over other time correction methods. In the best case (races where Father Neptune is out doing his thing) we find a dramatic tightening of race results. We have not yet witnessed the quality of race results decline by using the ORCA method.

Best results, and the most dramatic improvement in race results are found when:

- The fleet is reasonably large (statistics are more meaningful)
- Ratings are well distributed (each boat type weighs equally in the statistics)
- Ratings are diverse (the method breaks down for a one design class)
- Conditions are varied (established popular time correction methods fail)

The ORCA method has little to offer over other methods under conditions where time corrections are not particularly meaningful - one design racing.

The ORCA method has little to offer under conditions where any reasonable time correction method will give good results - nice steady breeze - no wind shifts.

When the fleet is diverse, and the sailing conditions are erratic, the more pronounced the improvement in race results when ORCA time corrections are used.

The ORCA method shines under conditions where other time correction methods have the greatest difficulty producing meaningful results. It rarely, if ever, produces results which are inferior to established time correction methods.

The Observed Results Computer Analyzed time correction method is included as a menu selection option in the Regatta Scoring and Race Management computer program nearing a pre-beta release. It imposes no burden on the Scoring Committee beyond the usual computer entry of finishing times and finishing status required for every manual or computerized time correction system. The ORCA analysis takes place automatically, and is completely transparent to the committee and the computer operator.

We warmly recommend you give the ORCA system a try.