

ECHO Guide for Clubs

ECHO is a performance handicap system for sailboat racing. It was designed and developed by the East Coast Handicap Organisation and the ISA. (It is sometimes referred to as Ernest, Chris, Hal and others after some of the team involved in its origin in the 1970s). It is a long standing and admirable part of Irish sailing and has been copied in other areas.

An ECHO handicap is derived from the performance of the boat and crew and assumes that past performance is a guide to the future! The handicap is a single number referred to as a time correction factor (TCF). After a race the boat's elapsed time is multiplied by the TCF to produce a corrected time. The boat with the lowest corrected time is the winner. It should be noted that IRC (International Rating Certificate) is a velocity prediction programme (VPP) and IRC ratings are derived from measurement of the hull, rig and sails to produce a Time Corrector IRC (TCC) which predicts the boat's performance. Both are what are known as 'time on time' (TOT) systems. Other systems may use 'time on distance' (TOD)

The basic premise is that a boat and crew have a consistent performance level which can be quantified by their results in a number of races. Two principles follow from this assumption:

- 1) The fastest boat and crew have the highest handicap and vice versa.
- 2) Every boat should have an equal chance of winning an individual race.

In practice of course not every boat sails to its handicap in every race so results will vary. ECHO certificates are issued by Irish Sailing (IS) and are mandatory for racing under ECHO. The annual cost is €50.

Progressive ECHO

In its original form ECHO handicaps were assigned by the ISA based on results from the previous month or year. However the advent of personal computers and their ever increasing performance and decreasing costs meant that more sophisticated statistical methods could be applied with ease to any set of results. This allowed club handicap committees to adjust ECHO handicaps on a regular basis e.g. after each series. The ultimate outcome is the development of progressive ECHO (pECHO). In this system handicaps may be adjusted after each race and applied to the next race in a series. There is no interference or adjustment required from the committee.

Performance index

The heart of the system is the performance index of each boat. This can be calculated after each race and is defined as:

$$PI = \frac{\sum H_s}{T_E \{ \sum (1/T_E) \}}$$

Where $\sum H_s$ is the sum of the handicaps of the boats which finished the race, note that this handicap is the starting handicap for that race, T_E is the elapsed time of the boat in question and $\sum (1/T_E)$ is the sum of the reciprocals of the times of the boats which finished the race. It follows that boats which did not finish or did not start do not affect the performance index and their handicap remains unchanged for the next race. Boats which finish far ahead or behind the fleet may have a disproportionate effect on the handicaps for the next race. It is possible to exclude one or more results or even an entire race from handicap calculation, ideally this should be referenced in the sailing instructions for the event.

Worked example

Boat	Elapsed time	Reciprocal time	Handicap	PI	New handicap
1	60	0.01666	1.001	1.026	1.007
2	61	0.01639	1.015	1.009	1.013
3	66	0.01515	1.02	0.937	0.999
4	59	0.01695	1.02	1.043	1.026
5	56	0.01786	1.115	1.099	1.111
6	70	0.01429	1	0.879	0.952
7	56	0.01786	1.02	1.099	1.040
8	59	0.01695	1.01	1.043	1.018
9	61	0.01639	1.005	1.006	1.005
10	57	<u>0.01754</u>	<u>1.015</u>	1.079	1.031
Totals (Σ)		0.16604	10.221		

(Note that $\sum H_s = 10.221$ and $\sum (1/T_E) = 0.16604$)

We are not really concerned with the corrected times or results as these have no effect on the handicaps for the next race! What is important is the relative performance of each boat to all of the other boats and her performance against her own handicap. We can see that no. 9 sailed almost exactly to their handicap, nos. 3 and 6 had a bad day at the office and nos. 7 and 10 did really well. The new handicap is derived from $(H_s \times 0.75) + (PI \times 0.25)$. You will notice that the new handicap is increased or decreased by one quarter of the difference between the starting handicap and the performance index. As a series proceeds the original handicap for the first race contributes less to the new handicaps and performance indices contribute more. In practice the opening handicap contributes 75% of the race 2 handicap, 56% of the race 3 handicap and so on until after 5 races it accounts for less than 25% of the next race handicap.

The 75/25 split is arbitrary but is recommended by Irish Sailing for club racing. If a 50/50 split is used then after 5 races the original handicap accounts for only 6% of the next race handicap. However using a 50/50 split may lead to large changes in handicap from race to race. DBSC used 68/32 for many years but has now reverted to 75/25. NHC (v.inf) uses a 70/30 split for club racing.

Opening Handicaps

The question of assigning an opening handicap reflects the principle that the fastest boat on the water has the highest handicap. It must be noted that boats which win regularly in IRC may not be the fastest boats in a club. ECHO handicaps should be based on elapsed time rather than corrected time in another rating system.

A club handicap committee/officer should be au fait with the performance of all of the club's boats which race regularly. An opening handicap may be assigned on this basis. In practice any errors will correct out quickly when using progressive ECHO.

Problems may arise with occasional participants and new boats. In general you should seek to protect the regular fleet and handicap occasional participants accordingly. However a distinction needs to be made between bandits who are protecting their handicap and occasional participants who are out for a day's sailing in mildly competitive form! (If it was easy we'd all be experts) Such handicaps may be based on Standard ECHO or IRC ratings. A value of Standard ECHO + 5% will usually be enough to protect the fleet. DBSC uses standard + 3% for new entries.

A new boat may be a new entry in which case it can be dealt with as above. A new boat may also include an existing owner and crew in which case the handicap assigned may reflect their performance in the previous boat.

Adjustment of Handicaps

Handicaps may be adjusted after each race, each series or after a whole season. All of the commonly used results programmes will do the calculations required to produce a new handicap for the next race provided that the series switches in the programme are set correctly. This usually means ticking a box (handicaps may vary) or setting up as a progressive ECHO series. Handicaps may be carried forward to the next series or revised as in the next paragraph. Each programme also allows the results officer to set the ratio between handicap and performance index to produce the new handicap. IS recommends a 75/25 split as above for club racing. However any combination may be used. IS recommends a 50/50 split for regattas.

To adjust handicaps after a series finishes it is useful to look at the ECHO analysis for each race. A new handicap may then be derived from the mean or median of the performance indices for each boat. The handicap committee may use this average as the new handicap or take note of it when setting new handicaps for the next series.

The use of fixed handicaps (however derived) for a full season is the practice in some clubs. However this is not performance handicapping.

It is essential that the sailing instructions specify how handicaps are assigned and adjusted. This allows the handicap committee to do its job without interference or complaint.

There are many potential changes possible when handicaps are updated after each race but two outcomes are impossible ie all boats go up or go down. This cannot happen. However it is possible for one boat's handicap to go down and all the others to go up or vice versa. This is a most unlikely outcome but is possible. Another unlikely outcome is for all boats to stay the same. I have participated in two races where this actually happened as the result was almost a dead heat with only one or two seconds separating the handicap results of the whole fleet – a handicapper's dream! In practice some boats go up, some go down and some remain relatively unchanged. It is important to note however that a boat which has finished in the bottom half of the fleet (in placing terms) may find that her handicap increases for the following race. The reverse may happen with a boat placed in the top half of the fleet but this rarely produces a complaint from that boat!

Block Adjustment

Progressive ECHO handicaps may show some drift up or down of the whole fleet over time. A block adjustment of all handicaps may be necessary from time to time eg after a long series or each year. This also ensures that new entries are treated fairly and do not receive particularly advantageous or punitive handicaps with respect to the existing fleet. Note that NHC (v. Inf) performs a block adjustment after each race and therefore boats which did not participate in a race may find that their handicap changes slightly.

Problems

Given that so many factors can affect a boat's performance in any single race it is not surprising that anomalous results occasionally occur. This almost always means a poor performance from a boat in comparison to previous races. The software will adjust the next race handicap according to the

results which may give that boat a considerable advantage in the next race or even for several races. It is possible to exclude a boat from the handicap calculations and the handicap then remains unchanged for the next race. As a consequence that boat's result does not affect the calculations for other boats in the affected race. This is a manual intervention and should only be done under specific circumstances. In an ideal world the Sis for the series would indicate when a manual intervention is appropriate.

In some circumstances it may be appropriate to exclude an entire race from handicap calculations. Even though results are calculated they have no effect on handicaps for the next race.

Standard ECHO

ECHO certificates issued by IS will include a Standard ECHO rating. This number is derived somewhat loosely from historical IRC ratings for the boat type in question. It is not performance derived. Examples for well known boats include the J109 at 1.015 and the Sigma 33 at 0.910. A well sailed Sigma could easily achieve a handicap of 0.975 or even higher in a season of club racing using a progressive system. Similarly a J109 which is underperforming could drop to 0.950 or less over a season. Initial handicaps should be based on known performance whenever possible and not Standard ECHO ratings.

RYA National Handicap Cruisers (NHC)

The RYA's NHC system is an almost exact copy of ECHO. Standard handicaps are issued for each boat type similar to Standard ECHO handicaps. The performance Index is also calculated in the same way but changes to handicaps are limited for extreme performance – good or bad.

Regattas and events

As a season progresses the handicap for an individual boat will reflect her performance against other boats in a specific fleet. This number should not be used in a different fleet or at an interclub or major event.

Assigning opening handicaps at these events is difficult and always open to accusations of bias.

The easy approach is to start each boat at standard ECHO and use a 50/50 split. However this favours the better sailed boats and in practice the ECHO results are usually almost identical to the IRC results. This violates both of the principles above in that the fastest boat does not have the highest handicap (and vice versa) and each boat does not have an equal chance of winning the first or indeed subsequent races.

ICRA (Irish Cruiser Racing Association) has attempted to mitigate this problem by assigning opening handicaps based on performance in IRC at previous events. Full details of this approach are available at <https://cruiserracing.ie/technical/echo-handicap/>. It should be noted that this approach is somewhat different to that used in a club but it is a reasonable compromise for a large fleet drawn from many clubs. One of the objectives of this approach is to make it harder for the top performing boats in IRC to win in ECHO as well. This of course is not in line with the basic premises above either!

Sample Sailing Instructions for ECHO

ECHO Sailing instructions

- 1) All races will be scored using a progressive ECHO system. The number of races and the number of discards shall be the same as for the relevant IRC class when boats are racing in both systems.
- 2) For ECHO only classes there shall be 'x' races and discards shall be allowed as follows....
- 3) Boats which intend to participate in ECHO racing must hold a valid Irish Sailing ECHO certificate
- 4) The cut off date for validity of certificates is midnight on the day before the event/series/regatta
- 5) The race committee shall assign initial ECHO handicaps for each boat. Such handicaps shall not be subject to protest or request for redress.
- 6) Initial handicaps shall be based as far as possible on known performance data.
- 7) Handicaps shall be adjusted after each race in accordance with the results programme in use. (Note that SailWave, HalSail and Sail 100 all use the same formula for calculating the ECHO or Performance index)
- 8) After the first race subsequent race handicaps shall be calculated as 75% previous race handicap plus 25% previous race Performance Index.

$$\{(Handicap\ race\ N + 1) = (Handicap\ race\ N \times 0.75) + (performance\ index\ race\ N \times 0.25)\}$$
- 9) The race committee may exclude one or more boats in any race from handicap adjustment. Such boats handicap shall remain unchanged for the next race. Such exclusion shall only apply to unexpected poor performance.
- 10) The race committee may also exclude one or more races from handicap adjustment and all boats shall start the next race with unchanged handicaps.
- 11) Exclusion from handicap adjustment in 9) and 10) above shall not be subject to protest or request for redress.
- 12) Handicaps shall not be adjusted after a race in which two or less boats finish.
- 13) Category 3 (Cat 3) sailors are allowed in all races
 - a. Cat 3 sailors must be declared to the race committee prior to the first race in which they participate.
 - b. A boat which has Cat 3 sailors as part of its regular crew (or owner) shall not have a handicap adjustment other than that their initial handicap shall take account of their status.
 - c. A Cat 3 sailor shall not helm a boat he/she does not own
 - d. A boat which carries a Cat 3 sailor who is not part of their regular crew shall have its handicap adjusted upward by 5% for the first race in which the Cat 3 sailor is carried. Its handicap thereafter shall be subject to the normal adjustment after each race.
 - e. A boat as in 13) d above which carries a Cat 3 sailor in a later (non consecutive) race in the same series shall have a further upward adjustment of 5%.

Notes:

- 4) The OA may specify any cut off date of its choice
- 8) You can use any blend you like at this point but IS recommends 75/25 for club racing and 50/50 for regattas and major events. In practice the handicaps usually settle down after very few (3 – 4)



aces and there is usually little movement thereafter. Extremes of weather or tidal problems may also affect individual race performance but corrected times should converge as the series proceeds.

9) It would be very unusual to exclude a boat for good performance! Usually a good boat will have a bad result for one reason or another. However only really awful performance should be excluded. A good boat which sees its handicap drop by a significant amount will have an unfair advantage in the next race and possibly more races.

10) Some races are just so extreme that they should be excluded eg a tidal gate which favours the first boats home or a drop in wind strength after some boats have finished. In practice exclusions should be rare enough that the competitors understand and accept the rationale for them.

13) In some events eg ICRA Nationals' a boat which carries a cat 3 sailor is excluded from the ECHO section of the event

Note that boats which finish in the bottom half of the fleet may see their handicap go up for the next race. Similarly in a different race boats in the top half may see their handicap go down.

Further help

For more information and assistance please contact the Ratings and Handicapping Steering Group.

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Chair

Ratings and Handicapping Steering Group (RHSG)