

# ECHO 2002

## MANAGEMENT GUIDELINES

### Mission Statement

ECHO is a performance based personal handicapping system provided by the Irish Sailing Association for cruiser racing<sup>1</sup>. The system is centrally controlled to ensure uniformity and continuity of the basic rule and locally administered to ensure efficiency and accuracy of current handicaps.

Recognising the very wide range of boats favoured by owners and the widely differing abilities of different crews **the aims of ECHO are:**

- **By assigning handicaps on the basis of boat and crew performance to ensure that as many competitors as possible in each race, sailing at or near their best, would have an equal chance of winning.**
- To **maximise participation** in cruiser racing by all levels of sailor in as wide a variety of boats as possible.
- To **promote excellence** in racing by encouraging sailors to **strive to improve** their performance from race to race.<sup>2</sup>
- The letter and spirit of ECHO requires that owners would:
  - **Make a genuine effort** in every race, and not seek to earn a handicap that is not a true and fair reflection of the performance potential of the boat and crew.
  - **Make the necessary disclosure** where there has been a material change in the boat or its crew.

---

<sup>1</sup> It is important to understand that the ISA is the ultimate authority for ECHO. This allows it to act as guardian to the rule and to step in and resolve local difficulties as they arise from time to time. It is also important to bear in mind that it is to the ISA that users pay their subscriptions and not to the local club or ECHO officer and consequently it is to the ISA that they look for answers when they have some question or grievance.

<sup>2</sup> ECHO equalises the boats plus their regular crew, so that every competitor has an equal chance of winning and therefore the best effort on the day should win. IRC equalises the boats only so that the most talented sailor should win.

- As personal handicapping systems and boat rating or measurement systems are complimentary to each other, the Irish Sailing Association strongly urges clubs and regatta organisers to give results equally under ECHO and IRC in every race.<sup>3</sup>
- 

---

<sup>3</sup> Because they will generally produce different sets of results for the same race. The ISA does not support the practice in some clubs of having separate ECHO and IRC 'divisions' and giving ECHO results only in one division and IRC results only in the other.

Prime Directive:

Since the handicap list of any fleet of boats should be a ranking of the boats from fastest to slowest, based on their historic order of finishing places, getting the ranking right is the fundamental priority of the ECHO administrator - everything else is subordinate to that task.

Consequently, a particular boat's current ECHO handicap should reflect that boat's actual finishing place relative to other boats, over a number of races. In other words, a boat should not have a higher handicap than a boat that, more often than not, finishes in front of it, or vice versa, a lower handicap than a boat that, more often than not, finishes behind it.

## Administration:

1. Clubs and other race organisers intending to use the ECHO handicapping system shall first obtain a license to do so from the ISA. Only bodies so licensed may purport to operate the system or use the designation 'ECHO'. The license may be revoked for failure to comply with the rules of the system by notice to that effect issued by the ISA.
2. ECHO personnel must demonstrate an appropriate level of understanding and competence before they will be approved to take part in the administration of the ECHO system. The administration of ECHO at a local level is subject to audit and approval may be withdrawn where the ECHO system is mismanaged.
3. Spare [NHO]
4. Spare[Directions]
5. **Only the Handicapping Authority or its nominees may issue or change an ECHO handicap. Any handicap set or altered by any other person or committee shall not be valid. Any race or result based on any such handicaps shall also be invalid.**
6. The 'Handicapping Authority', means in the case of clubs in the Dublin and SCORA regions, the regional committees established by the ISA. In the case of those regions the respective committees shall ensure that there is a club ECHO Officer in each club who shall be, ex officio, a member of the regional committee. In addition the regional committee shall be composed of cruiser class representatives from the various ECHO classes and clubs. The regional committee may delegate its authority, to sub-committees of its members, to review handicaps in accordance with Rule 27, for inter-club or open events.
7. In the case of the other regions the 'Handicapping Authority' means the club ECHO Officer approved by the ISA. In the case of those regions Regional Co-ordinators will be appointed by the national handicap officer to oversee the administration of ECHO and in particular to manage ECHO for inter-club or open events.
8. Spare

## Revisions:

9. Revisions must be systematic, objective and transparent. A copy of the data on which revisions are based should be available to any user who requests it or alternatively it should be published on Club Notice Boards or Web Sites.
10. **ECHO handicap lists should always be published in descending current TCF order.**
11. Revisions should strive for stability in the handicaps of individual boats.
12. Revision meetings/exercises shall be held regularly throughout the sailing season. Revision meetings should be scheduled to match the sailing program<sup>4</sup>. Ideally not less than four weeks nor more than six weeks should elapse between one revision meeting and the next.
13. Revision data shall be prepared in accordance with the procedure set out in **Appendix 1**.
14. Spare
15. Spare

## Request for review

16. Any registered owner may request his handicapping authority in writing, to review his handicap. Where such a request is made, the authority shall review that handicap at its next meeting and it shall inform the owner of the outcome of the review.
17. Spare

## 'Sleepers' and others

18. In any revision, where there is insufficient or no data for a particular boat [a 'sleeper'], and it is proposed to change the handicap of a related boat, the handicap of the related boat shall not be changed without first considering whether the relationship with the 'sleeper' should be maintained. If it is determined to maintain the relationship then the handicap of the 'sleeper' shall be changed by the same amount as the related boat. If it is determined to adjust the relationship then the appropriate adjustment shall be made.
19. Where a boat has not raced for [three] revision periods then that boat, if Active, may be re-designated a Provisional status boat and its handicap may be adjusted at the discretion of the authority.

---

<sup>4</sup> Revisions should be scheduled before and after and not during major events or series.

20. In any revision, where it appears to the handicapping authority that the calculated data for any boat does not reflect the true performance potential of that boat, then the authority shall ignore that data and, at their discretion, shall allocate a handicap that reflects the true performance potential of that boat.
21. Spare

### **Weighting of Races<sup>5</sup>:**

22. After the conclusion of each race the race should be rated on a scale from 0 to 2 i.e. 0, .25, .5, .75, 1, 1.25, 1.5, 1.75, 2.
23. Each club or regional committee should have a stated policy as to how races should be rated on this scale.
24. The aim of the scale should be to ensure that races are weighted so as to reflect the value or merit of each race for handicapping purposes.
25. Spare

### **Inter-Club or Open Events<sup>6</sup>**

26. In inter-club or open events where handicaps from different clubs or handicapping regions have been merged for the event the following sailing instruction should be inserted in the Sailing Instructions:

***ECHO handicaps may be revised during the [regatta/series] by the handicapping authority.***

***Failure to revise a handicap will not be grounds for protest or redress.***

***Revised handicaps will be posted on the official notice board not later than [21.30hrs] on the day prior to coming into effect***

---

<sup>5</sup> It will be seen from the worked example in Appendix 1 that weighting individual races higher than one and then using a ten race block i.e. notional races is a bit of a contradiction; the purpose of weighting is to get a more responsive result and the effect of the notional races is to smooth the response.

<sup>6</sup> See Appendix 2

27. In the above situation corrected handicaps should be calculated, correlated with the order of finishing times<sup>7</sup> and reviewed after each day's racing. Where, upon such a review, it is clear that a handicap or a number of handicaps are **seriously out of line**<sup>8</sup> then those handicaps should be adjusted, at the discretion of the handicapping authority, to reflect the actual performance of the boats concerned.<sup>9</sup> Where such a handicap is revised the revised handicap shall take effect from the next race.
28. Spare

### **Material Change of Boat or Crew**

29. Material change of boat or crew means any change or modification to the boat [hull, sails or rig] or any change of crew from that with which a boat generated its current TCF where it can be anticipated that a boat would have a measurably improved performance due to the change.
30. A competitor is obliged to notify the race committee in a timely fashion of any material change of boat or crew. Failure to fulfil this requirement will render a boat liable to penalty.

---

<sup>7</sup> See Appendix 4, the 'sore thumb' test, pages 20-21

<sup>8</sup> DO NOT USE THIS PROVISION TO CONDUCT A GENERAL REVISION OF HANDICAPS - 'IF IT AIN'T BROKE DON'T FIX IT'

<sup>9</sup> Ideally, such revisions should be based on not less than two races - don't rush to change handicaps or don't change a handicap just because a particular boat is likely to win an event - someone has to win - let the boat concerned take its penalty after the event.

31. The entry form for all cruiser racing [club season or one-off series] organised under the ECHO system should contain a disclosure declaration as follows:

**Material change of Boat or Crew Declaration**

The following change/s to the crew and/or boat are declared for the purpose of the **ECHO material change** rule:

Names:

-----

-----

Boat Mods:

-----

-----

The **ECHO rule** requires a competitor to notify the race committee in a timely fashion of **any material change of boat or crew. Failure to fulfil this requirement will render a boat liable to penalty.**

32. If a declaration is made in accordance with the above rule the race committee shall notify the relevant handicapping authority and furnish them with a copy of the declaration.
33. The handicapping authority shall consider the terms of the declaration and, at its sole discretion, may impose a penalty to account for the likely increase in the boat's performance as a result of the change. In determining the extent of the penalty the authority shall have regard to the following matters:
- a) The relationship of the boat's current TCF to its ECHO standard - the potential for improvement on a relatively highly handicapped boat is not as large as it would be on a low handicapped boat.
  - b) The general standard of the fleet in which the boat is sailing - a person does not have to be a national champion or an international sailor to make a significant impact on a typical club cruiser class.

34. Where a **material change declaration** is made there is **no fixed penalty to be applied** but the following scale is provided as a **GUIDELINE**:

Points allocated & declaration<sup>10</sup>:

**10 points: Minimum adjustment, new main and number 1 jib,**

10-15 points fixed to folding prop.

15- 20 points for new set of sails

**25 points: close to max in any circumstance for boat mods.**

15-30 points upgraded crew on strong boat

20-45 points upgraded crew on weak boat

**50 points: close to max in any circumstance for upgraded crew.**

35. A penalty imposed under the above procedure may be reviewed and revised after racing. Where such a handicap is revised the revised handicap shall take effect from the next race.
36. Spare.
37. Spare.

### Failure to Declare Material Change

38. If a boat fails to declare a material change then that boat ['the boat'] shall be liable to have its handicap formally reviewed at the request in writing of:
- a) A fellow competitor,
  - b) The race committee, or
  - c) The club handicap officer.
39. Where a request for a review is lodged the procedure shall be as near as possible as that for a protest except that the race committee shall submit the question of the validity of the current TCF of the boat to the handicap authority who shall convene a review group [which shall

---

<sup>10</sup> See Appendix 3 for time ready reckoner.

have the status of a protest committee under the Racing Rules of Sailing] of not less than three members of the authority to conduct the review<sup>11</sup>

40. The race committee shall transmit a copy of the request, the race entry form and the full results of the races in which the boat has taken part and any other information required by the authority.
41. As soon as possible thereafter the review group shall prepare a correlation analysis of the race results and shall supply a copy of that analysis to the parties to the review.
42. The review group shall convene a hearing of the parties to be conducted in the same manner as a protest hearing except that the race results and the analysis shall be accepted as evidence.
43. **Where, at the review hearing, the race analysis shows that the boat's performance was out of line with its current TCF then the burden of proving that the improvement in performance is legitimate shall fall on the boat.**
44. Where the review group finds that there was a material change which was undeclared and which resulted in a measurable improvement in performance of the boat then:
  - a) It shall declare the current TCF of the boat invalid and it shall determine, at its discretion, a revised handicap for the boat and it shall notify that handicap to the race committee.
  - b) It shall further advise the race committee whether the races already had in the series should be recalculated using the new handicap for the boat or whether the new handicap should apply prospectively only.
  - c) It shall further advise the race committee of any place penalty **for the series**, [from one to five places] it considers appropriate to be applied. The race committee shall apply the penalty so advised.
  - d) When, in the course of a review hearing, the review committee considers that a breach of rule 69 of the racing rules of sailing may have occurred it shall warn the person concerned and shall then proceed in accordance with the provisions of that rule.
45. Spare

---

<sup>11</sup> The national handicap officer should always be notified when such a review is requested.

46. Spare

## New Handicaps

47. Where a new boat<sup>12</sup> comes into a fleet, then a provisional handicap should be allotted to that boat by the handicap authority.
48. The correct ECHO standard value for the boat type should be established from the official ISA ECHO Standards list<sup>13</sup>. If the boat has been modified then .010 should be added to the standard value. It is the obligation of the owner to furnish full details of the boat as required<sup>14</sup>.
49. In determining the personal element of the handicap, the first requirement is to protect established handicaps to ensure that the new skipper does not win his early races through having too low a handicap. Err [slightly] on the side of caution.
50. Make the best assessment possible of the capabilities of the skipper and crew. If this is already established then only a very slight penalty [if any] should be added to the personal element of that person's previous handicap<sup>15</sup>. In case of doubt, the provisional handicap should be at least as high as the highest handicapped boat of that type in the list.
51. If it proves necessary, provisional handicaps should be adjusted as soon as possible to a more correct number to reflect the actual performance of the skipper and crew. This is the value which corresponds to their place on the water relative to other boats in the fleet.<sup>16</sup> Where such a handicap is revised, the revised handicap shall take effect from the next race.
52. A boat should not be removed from provisional status before its performance profile is well established.

---

<sup>12</sup> In effect, what is meant is any boat in new ownership.

<sup>13</sup> ECHO standards are an approximate value, based on available data, for a boat of the type in question. There is no relationship between a boat's IRC TCC [if it has one] and its ECHO standard.

<sup>14</sup> If in any doubt as to the correct standard to be applied advice should be sought from the national handicap officer.  
<sup>15</sup> Say, a boat with a standard of .910 has a current TCF of .950. The personal element is 40 points or 4.4% over standard. If the owner acquires a different boat with a standard of, say .950, then the new handicap should not be very much higher than  $(.950 \times 4.4\%) = .992$ .

<sup>16</sup> It should not take more than four reasonably genuine races to arrive at a close approximation of the new owner's correct handicap.

# APPENDIX 1

## Calculation of Revised TCFs

### After each race:

- Step 1. Convert the elapsed times of every finisher from time to a primary TCF scale by dividing each elapsed time into 100.
- Step 2. Establish the appropriate adjustment ratio<sup>17</sup> by dividing the sum of the current TCFs [total A] by the sum of the primary TCFs [total B].
- Step 3. Adjust the primary TCFs to the scale of the current TCFs by multiplying the primary TCFs by the adjustment ratio. This gives the CORRECTED TCF for each boat for that race.

### Mathematical Notation

$$100/ET * (\sum TCF_{cu} / \sum TCF_p) = TCF_{co}$$

Where:

ET	=	Elapsed time of each boat
TCF <sub>cu</sub>	=	Current Time Correction Factor
TCF <sub>p</sub>	=	Primary Time Correction Factor (i.e. 100/ET)
TCF <sub>co</sub>	=	Corrected Time Correction Factor

---

<sup>17</sup> Extreme results - particularly bad results - may be excluded from the calculation of the adjustment ratio [but the primary TCF for that boat should be calculated and may be adjusted as for the other boats or ignored completely].

Calculation of CORRECTED ECHO TCFs Sovereign's Cup Class 2 ECHO, Race 6, 2001				
		Total B	Total A	adj.ratio
		24.999	25.635	1.025
		Elapsed	primary	Current
Boat	Time	100/ET	TCFs	TCFs
DUX	1:41:21	0.987	0.995	1.012
OBSESSION	1:42:32	0.975	0.990	1.000
YANKS & FRANKS	1:42:44	0.973	0.965	0.998
JOKER'S WILD	1:44:01	0.961	0.955	0.986
SALSA	1:44:47	0.954	0.950	0.979
ALOHA (p)	1:45:02	0.952	0.980	0.976
JASCAH	1:45:15	0.950	0.945	0.974
KAMIKAZE	1:45:36	0.947	0.955	0.971
MAELSTROM	1:45:49	0.945	0.965	0.969
MAC MAGIC	1:45:55	0.944	0.955	0.968
LUAS	1:47:47	0.928	0.965	0.951
Y KNOT	1:48:04	0.925	0.955	0.949
ALPACA	1:48:08	0.925	0.965	0.948
SCORPIO 11	1:48:13	0.924	0.955	0.948
HYDAWAY	1:48:55	0.918	0.950	0.942
PEPPERBOX	1:49:24	0.914	0.940	0.937
LE BIG MAC	1:49:51	0.910	0.935	0.934
BEAR ESSENTIALS	1:49:55	0.910	0.930	0.933
BULLFROG	1:50:08	0.908	0.920	0.931
SEA HAWK	1:50:32	0.905	0.945	0.928
TIGGER	1:50:34	0.904	0.940	0.927
ENDEAVOUR	1:51:02	0.901	0.940	0.924
AUTONOMY	1:51:36	0.896	0.955	0.919
MATICO	1:51:40	0.896	0.945	0.918
COOL RUNNINGS	1:53:04	0.884	0.920	0.907
AFTICA	1:53:06	0.884	0.920	0.907
DEMI-SEC	1:54:03	0.877	0.900	0.899
RHYTHM IN BLUE	1:59:33	0.836	0.940	0.858
PLUMBAT	1:59:55	0.834	0.915	0.855
CHAMELEON	2:01:56	0.820	0.870	0.841
CHARISMA	2:07:44	0.783	0.905	0.803
Averages		0.926	0.949	0.949

After x races<sup>18</sup>:

Step 4. After x races the average of the corrected TCFs for each boat should be determined taking into account the weighting factor applied to each race. This average may then be adopted as the NEW REVISED TCF subject to the application of the 'sleeper' rules. [Rules 16-21]

<sup>18</sup> X should be a minimum of four races. It is also possible to calculate the average over a greater number of races than has actually been held in the revision period by including the original TCF n times. This will have the effect of damping down the degree of change in the revised TCFs.

**Mathematical Notation**

$$(TCF_{coR1} * WFR1) + (TCF_{coR2} * WFR2) + \dots + (TCF_{coRx} * WFRx) / WFR1 + WFR2 + \dots + WFRx$$

OR

$$\sum_{N=1}^x TCF_{coRN} * WFRN / \sum_{N=1}^x WFRN$$

Where:

TCFco = Corrected Time Correction Factor

WF = Weighting factor

R1 is race one, R2 is race two etc (i.e. TCFcoR1 is Corrected Time Factor for race one)

<b>Sapphire</b>					
	TCF				
Races	1.140			Wtd.	
actual	TCFco	weighting	TCFco		
R1	1.229	2	2.458		
R2	1.174	1	1.174		
R3	1.170	1.5	1.755		
R4	1.203	1	1.203		
R5	1.148	0.75	0.861	wtd.	unwtd
notional	5.924	6.25	7.451	1.192	1.185
R6N	1.140	1	1.140		
R7N	1.140	1	1.140		
R8N	1.140	1	1.140		
R9N	1.140	1	1.140		
R10N	1.140	1	1.140	wtd.	unwtd
	11.624	11.25	13.151	1.169	1.162

**Block adjusting - seasonal:**

Step 5. Establish the ratio of the Current TCFs to the ECHO Standard TCFs by dividing the sum of the Standard TCFS by the sum of the Current TCFs and multiplying each current TCF by the resultant ratio.

This gives the **BLOCK ADJUSTED CURRENT TCFS** for the boats on the list.

The general effect of this adjustment is to ensure that the average Current TCF of the yachts in the class will correspond with their average Standard TCF. It is this relationship which ensures that TCF values remain compatible as between classes and locations.

## Mathematical Notation

$$TCF_{cu} * (\sum TCF_{st} / \sum TCF_{cu}) = TCF_{co}$$

Where:

TCF <sub>cu</sub>	=	Current Time Correction Factor
TCF <sub>st</sub>	=	Standard Time Correction Factor
TCF <sub>co</sub>	=	Corrected Time Correction Factor

## APPENDIX 2

### Inter-Club or Open Event Guidelines

The use of ECHO Standard TCFs to handicap races is strictly prohibited.

In the case of **open regattas** where there are a number of visitors from outside the home fleet then a number of steps are possible:

1. The handicappers from the various fleets participating in the event should meet to share handicapping information or at an absolute minimum information should be sought from the home handicapper of the visiting boats.

2. A common handicap spreadsheet containing all the participating boats should be prepared.

Make the best guesstimate<sup>19</sup> possible to rank the boats. Then do a block adjustment of the complete list.

3. In the final analysis it is the prerogative of the handicapping authority to decide what handicaps should be allocated to the visiting boats. The overriding concern should be to protect the established handicaps of the majority of the boats - this will probably be the home fleet.

Advice should always be sought from the national handicap officer in these situations.

### Joint Revisions

**The basic assumption behind this process is that equivalent classes in participating clubs share the same average level of performance.**

---

<sup>19</sup> Benchmark boats and previous regatta results can be very valuable in this exercise.

1. Clubs which are likely to be involved in **regular inter-club** cruiser racing should, at the outset, make every effort to **agree common class bands**. Joint block adjustments and revisions cannot work properly if these are not mutually consistent.
2. A common handicap spreadsheet should be prepared containing all the boats in the participating classes. [A joint block adjustment should then be carried out - if there are existing handicaps for the boats involved]
3. The revision exercises specified in Appendix 1 should then (race-by-race, and revision-by-revision) also be carried out on a joint basis. This is secured by treating the two (or more) clubs involved as a “superclub”, and races sailed under the burgee of just one of them simply as “superclub” races in which not all yachts sail.

## **APPENDIX 3**

### **Handicap Points Ready Reckoner**

handicap scale	Secs per Hr per handicap point	significance of 5 to 30 point adjustment to handicaps from 1.200 to .750, in seconds per hour					
	3600	5	10	15	20	25	30
1200	3.0	15.0	30.0	45.0	60.0	75.0	90.0
1100	3.3	16.4	32.7	49.1	65.5	81.8	98.2
1050	3.4	17.1	34.3	51.4	68.6	85.7	102.9
1000	3.6	18.0	36.0	54.0	72.0	90.0	108.0
950	3.8	18.9	37.9	56.8	75.8	94.7	113.7
900	4.0	20.0	40.0	60.0	80.0	100.0	120.0
850	4.2	21.2	42.4	63.5	84.7	105.9	127.1
800	4.5	22.5	45.0	67.5	90.0	112.5	135.0
750	4.8	24.0	48.0	72.0	96.0	120.0	144.0

## **APPENDIX 4**

### **How ECHO Works – The ECHO Method**

The way in which ECHO addresses the task of performance measurement in mixed fleet cruiser racing is that **after each race a calculation is performed which ranks the competitors in finishing order by means of a scale of ratios [a performance index] called 'corrected TCFs', with the fastest boat having the highest ratio and the slowest boat the lowest ratio. After a number of races these ratios are averaged to produce a handicap factor or a Time Correction Factor [TCF].**

To understand the validity of this approach it is necessary to have some knowledge of the basic calculations involved and to appreciate the logic behind them.

The mathematical method by which ECHO creates this index or scale of performance is that it divides the time taken by each competitor – the elapsed time [ET] into a common base number – in the case of ECHO this base number is 100. This exercise produces a **scale of ratios which exactly represents the relative time taken by each competitor to finish the course<sup>20</sup>.**

This scale is described as the base scale or primary scale. ECHO then performs a further calculation whereby this scale is rebased or **adjusted to the same average value** as that of the current TCFs of the boats in the race<sup>21</sup>. These values are called the **Corrected TCFs**.

In this scale of ratios the fastest time will have the highest ratio, next fastest will have the next highest ratio, and so on down to the slowest time having the lowest ratio. It is a mathematical certainty of the procedure that the ratios will be in descending order from the first boat to finish to the last.

When the elapsed times are multiplied back by these ratios [primary or corrected - it doesn't matter] they will all correct to a common time i.e. the result in corrected time terms will give a dead heat of all the competitors<sup>22</sup>. There is no magic in this; it is again a simple mathematical certainty that when you divide one sum by another and multiply the result by the divisor you get back the original sum:

$$6 / 2 =_x 3 = 6.$$

This is all that is being done when corrected handicaps are calculated.

---

<sup>20</sup> The significance of this technique is that the time taken by each competitor is transposed from actual recorded time to a more abstract level – a dimensionless level which can be more easily subjected to mathematical manipulation.

<sup>21</sup> The mathematical notation is:-  $100/ET*(\sum TCFco/\sum TCFp) = TCFco$

The significance of the ECHO method of calculating the Corrected TCF is that it ensures that the sum of the corrected TCF's will equal the sum of the original TCF's or, which is exactly the same thing, the average corrected TCF will be the same as the average current TCF. This means that while individual corrected TCFs will invariably be different from their current TCFs the scale in which the corrected values are expressed is the same as that of the original TCFs. This is essential for comparison purposes and therefore for accumulating the results for a series of different races.

	SUM TCFp 10.902	SUM TCF co 13.179	Ratio 1.209 13.179		
Elapsed Time	Primary 100/ET	Current TCF	Corrected TCF	Corrected Time	
				Primary	Corr.TCF
1:55:12	0.868	0.924	1.049	1:40:00	2:00:53
1:58:53	0.841	0.913	1.017	1:40:00	2:00:53
2:02:35	0.816	0.882	0.986	1:40:00	2:00:53
2:09:47	0.771	0.957	0.931	1:40:00	2:00:53
2:11:59	0.758	0.931	0.916	1:40:00	2:00:53
2:12:11	0.757	0.868	0.914	1:40:00	2:00:53
2:15:29	0.738	0.858	0.892	1:40:00	2:00:53
2:19:43	0.716	0.860	0.865	1:40:00	2:00:53
2:20:23	0.712	0.808	0.861	1:40:00	2:00:53
2:26:32	0.682	0.817	0.825	1:40:00	2:00:53
2:29:38	0.668	0.838	0.808	1:40:00	2:00:53
2:31:22	0.661	0.855	0.799	1:40:00	2:00:53
2:31:56	0.658	0.855	0.796	1:40:00	2:00:53
2:37:33	0.635	0.845	0.767	1:40:00	2:00:53
2:40:41	0.622	0.968	0.752	1:40:00	2:00:53
<b>Avg.TCF</b>	<b>0.727</b>	<b>0.879</b>	<b>0.879</b>		

So what's the point, what's being measured, what is being expressed by the ratio? In the first instance it is the elapsed time pure and simple - the ratio is the boat's time expressed in a more abstract form - nothing more nothing less. There is no magic, neither is there any

<sup>22</sup> Corrected TCFs could be described as a prediction that if the same boats were to race again exactly as they had done in the previous race these TCFs/handicaps would result in a dead heat.

qualitative assessment of the performance<sup>23</sup> - whether the boat sailed a good or bad race is not being measured<sup>24</sup>.

**But since the range of ratios also exactly expresses the finish times of the other competitors on the same scale then these ratios express the relative performance of all the competitors in the race** - each performance is being measured in relation to a common number or benchmark and expressed as a ratio of that benchmark.<sup>25</sup>

In this abstracted form the data can now be carried forward from race to race – [ratios are easier to work with than elapsed times or finishing places] and after a number of races the ratios for each boat are averaged<sup>26</sup>. **This averaged ratio then provides the basis for determining the revised TCF of each boat.**

### Conclusion

**Therefore the handicap list of any fleet of boats is a measurement and ranking of the performance of the boats based on their historic order of finishing places and on that basis and on that basis alone it is, in effect, a prediction of the likely order of finish in future races<sup>27</sup> - if every competitor sailed exactly as predicted and if the elapsed times are corrected by the current prediction factors [ECHO TCFs] then the race would end in a dead heat of all the competitors – the perfect race from a handicappers point of view.**

**Consequently, a particular boat's current ECHO handicap should reflect that boat's actual finishing place relative to other boats, over a number of races. In other words, a boat should not have a higher handicap than a boat that, more often than not, finishes in front of it, or**

---

<sup>23</sup> What is being measured is whatever generated the elapsed time, which is the **total performance of the boat and crew - whatever got you from the start line to the finish line**, which in each case was the **boat and its crew sailing to whatever standard they were capable of** on the day. It isn't the boat alone or it isn't the crew alone; it is the totality of the performance that generated the elapsed time and not any single component of it.

<sup>24</sup> Not in each individual race calculation - a single ratio by itself is almost meaningless, it is the determination of a **scale of relativities** that is important and accumulating those from race to race that gives the exercise a qualitative character.

<sup>25</sup> 'things that are equal to the same thing are equal to one another.'

<sup>26</sup> How constant is the ECHO constant? 2 elements, 1, by using the ECHO method, the sum of the corrs. will always equal the sum of the TCFs and 2, revised TCFs are periodically adjusted to the ECHO standards. Is that the role played by the scale of reciprocals [100/ET]? - 100 is a true constant!

<sup>27</sup> This is why the handicap list should be published in TCF order where boats with similar performance are placed next to each other. This enables the relativity of closely related boats to be considered when changes are being made to individual boats. It is quite meaningless to consider handicaps in alphabetical order or sail no. order - or any other order except TCF order.

vice versa, a lower handicap than a boat that, more often than not, finishes behind it.

## Checking ECHO

This analysis of the ECHO calculation suggests a number of tests that can be applied to the results of an individual race [and to a series] to determine how well the handicap system itself is performing.<sup>28</sup>

### 1. **Correlation test**

Because the current handicap list is a prediction of the order of finish in a race, a test of how ECHO itself is performing is to perform a correlation test between the **actual order of finish and the predicted order of finish<sup>29</sup> i.e. the order of current TCFs** used in the race - the ideal would be a perfect correlation of 1. [experience has shown that in a well handicapped fleet it should be possible to achieve correlation figures of .8 plus regularly.]

### 2. **'Sticking out like a sore thumb' test**

A further benefit of the correlation method of analysis is that if there are major anomalies in any handicaps they can be seen straight away. Since a particular boat's current TCF handicap should be reflected in that boat's actual finishing place relative to other boats, a boat that finishes many places above or below its predicted place should stand out.

---

<sup>28</sup> Because of the difference in the basic objective these tests are not relevant to an evaluation of any measurement system such as IRC.

<sup>29</sup> The boats should be listed in finish place order i.e. the first boat to finish is first in the list, the second boat to finish is second, and so on. This order is then compared and correlated with the order of corresponding handicaps.

			Correl	0.45
current TCF	corr. TCF	Finish Time	Finish place	H'cap order
0.931	0.959	12:27:42	1	3
0.882	0.957	12:27:53	2	7
0.913	0.952	12:28:30	3	5
<b>0.924</b>	<b>0.952</b>	<b>12:28:31</b>	<b>4</b>	<b>4</b>
<b>0.809</b>	<b>0.930</b>	<b>12:31:10</b>	<b>5</b>	<b>17</b>
<b>0.957</b>	<b>0.930</b>	<b>12:31:12</b>	<b>6</b>	<b>2</b>
0.868	0.924	12:32:02	7	8
0.830	0.904	12:34:33	8	<b>14</b>
0.886	0.879	12:37:54	9	6
0.858	0.878	12:38:04	10	10
0.838	0.844	12:43:04	11	13
0.860	0.833	12:44:48	12	9
0.826	0.829	12:45:22	13	15
0.855	0.822	12:46:28	14	11
<b>0.808</b>	<b>0.809</b>	<b>12:48:40</b>	<b>15</b>	<b>18</b>
<b>0.968</b>	<b>0.799</b>	<b>12:50:20</b>	<b>16</b>	<b>1</b>
<b>0.817</b>	<b>0.784</b>	<b>12:52:55</b>	<b>17</b>	<b>16</b>
0.845	0.690	13:11:42	18	<b>12</b>

In the example given two handicaps/boats in particular stand out. One boat, on a handicap of .809, sailed as fast as a boat on a handicap of .957. Its handicapping ranking places it 17th and it clearly stands out with handicaps ranked 5th and 4th on one side and 2nd and 8th on the other. What is the significance of this figure? On the basis of one race only - very little. It is dangerous to draw definite conclusions, in handicapping terms, from the results of a single race. There may be a valid reason why a boat would sail so far above its handicap **in a single race**. But if the pattern was repeated for any boat, in **even two races in succession**, then alarm bells should ring. At that point it really does call for explanation as to how a boat manages to sail so significantly above its predicted level of performance in two races in succession. There may be a valid explanation but there has to be an explanation [and the burden of giving that explanation should fall on the boat concerned]. Without it there is a serious question mark over its handicap. There is also a boat in the table which sailed significantly below its handicap. A boat on a handicap of .968 could not sail much faster than boats on handicaps of .808 and .817. Likewise, its ranking of 1st clearly stands out from its companions on 11th, 18th, 16th and 12th. But boats which sail below their handicap are not as big a problem as they hurt only themselves. **It's the**

boats that can sail significantly above their handicap regularly that do the damage; they may have in effect a 20 to 50+ point advantage, as the case may be, over boats of similar ability and are therefore unbeatable<sup>30</sup>.

### 3. 'Losing by seconds' test.

The ideal towards which ECHO is striving is that each boat would finish on equal corrected time i.e. a dead heat of all the competitors. Therefore a test of how well the handicaps performed in any race is the extent to which the corrected times approach this ideal. This would be measured by the differences between the corrected times of the boats. [In a well handicapped fleet a large number of the boats should be separated only by seconds on corrected time]

### 4. Spread of winners test.

Again implicit in the ECHO calculation is that every competitor would have an equal chance of winning so the final test is the extent to which the winners of races are spread around the competitors. [Winners of series might be different because here consistency would be a factor]

### 5. Happy Punters test.

not necessarily implicit in the maths but an obvious and final test would be user satisfaction - are the people using the system generally happy with the system or otherwise?

**Earlier publications in relation to the ECHO system may still be consulted but in the event of a conflict between any part of these guidelines and the terms of any earlier publication these guidelines shall prevail.**

© IRISH SAILING ASSOCIATION, 2002.

---

<sup>30</sup> The benefit of this method of analysis is that if there are one or two boats that are sticking out as having wrong handicaps in a series they can be corrected [after a minimum of two races] without a general revision of all the handicaps. [also it could provide the foundation for a successful 'material change' protest with the burden resting on the over-performing boat to prove that they had not taken illegal steps to improve their performance.]