



## National Handicap For Cruisers (NHC) – Calculations

# NATIONAL HANDICAP FOR CRUISERS (NHC)

## Results Software Calculations 2014



The following is intended to give club handicap officers and sailing secretaries alike an overview of the calculations that the approved softwares use in order to score NHC races and calculate the handicap number to be used in the next race. This document can also be used by software developers that wish to add an NHC plugin to their programme (if you are a developer looking to implement an NHC plugin you are strongly encouraged to contact the RYA Technical & Racing Services Department [technical@rya.org.uk](mailto:technical@rya.org.uk)). As of May 2015 the RYA approved software for NHC are HALs Race results and SailWave.

### **NHC – Scoring Programme Specification 2015**

The NHC Scoring programme has been reviewed after the 2014 sailing season and three principle developments have been incorporated which need to be implemented within the relevant scoring programmes using NHC.

These are:

1. To realign all handicaps at the end of a race irrespective of participation.
2. For the amount of adjustment to be equal irrespective of over or under performance.
3. For the way extreme performance is treated to be reactive based on the severity of over performance.

By referring to the spread sheet “NHC.2015” the implementation of these three new policies can be seen.

### **Basic Race Scoring and handicap calculation**

On opening the spread sheet an overview tab is presented showing the outcomes of the races that have been entered into the spread sheet. By going to the “Calculation” tab the actual calculations can be seen.

The basic scoring of the race is unchanged and can be seen in columns C-F (for race 1) with the base/ first handicap for the series numbers, elapsed times in seconds, corrected times in seconds and race scores.

By continuing with race 1 and reviewing column G and H the Adjustment scale and achieved handicap are given as in the current scoring system:

Adjustment Scale =  $100/E$

Achieved Handicap =  $AS*(SUM(Handicap\ used)/SUM(AS))$

In column I is the comparison of the boats achieved handicap which is expressed as a number with unrestricted decimals [It is essential that it is expressed in this way in order to calculate extreme performance]. This is calculated as currently:

Comparison =  $Achieved\ Handicap / Used\ handicap$

### **Performance analysis**

The next logical process is to carry out a review of each boats relative performance compared to the other competitors in the race. For race one this can be seen in columns G- P, Rows 30 – 77.

The extreme performance analysis is as currently assessed, using standard deviation based on comparing each boats “comparison of boat achieved handicaps”. This standard deviation comparison is carried out by comparing the mean “comparison of boat achieved handicaps” (in race 1 cell I31) against the actual boats “comparison of boat achieved handicaps” plus or minus a standard deviation of the mean.

Taking the example of race 1; in cell J30 and K30 are the standard deviation values for over and under performance based on the “comparison of boat achieved handicaps” for all the competitors in the race. These are then added and subtracted from the mean and compared against each individual boat which is seen in cells J32 – K40.

**[The current set evaluation is 1 standard deviation for both positive and negative performance. However this should be built into a results programme such that it can be easily adjusted at a later time. Additionally the flexibility to have differing numbers of standard deviations for over / under performance must be retained.]**

This evaluation of extreme performance is then used to apply a differing amount of adjustment to boats highlighted as extreme performers to prevent an abnormal result skewing their next race handicap. However, this is no longer based on fixed levels of adjustment.

By referring to cells I56 – P65 this application of extreme performance can be seen. This part of the calculation reduces the amount of adjustment a boat receives by the amount of over / under performance that has been highlighted as extreme based on the standard deviation analysis.

Taking race 1 as the example, in cell J57 the spread sheet looks to see if the boat (in this case the race winner “Charley Farley”) was highlighted as an extreme over performer. If the boat is an extreme over performer as per the standard deviation analysis, the cell returns the difference between the boats “comparison of boat achieved handicaps” and the standard deviation amount for over performance and the mean comparison.

In cell K57 a similar routine is carried out for extreme under performance. If the boat was highlighted as an extreme under performer the cell returns the difference between its comparison and the mean and standard deviation for under performance.

The spread sheet then removes a division of this from the standard adjustment level for over/ under performance to give the actual amounts of adjustment that will be used for each boat. This is seen in cells M57 – P57. The relevant calculation is to divide the difference between a boats comparison and standard deviation by the standard adjustment amount and then subtract this value from the standard adjustment amount.

The amount of used handicap to be used is also calculated by subtracting the previously calculated adjustment value from 1.

**[It should be noted that there are two sets of columns (M and N for over performance / O and P for underperformance), whilst these return the same values due to the standard adjustment levels for over/ under performance being equal the results programmes should allow for future development to have differing standard levels for over and under performance.]**

By referring back to the main calculations table for race 1 (row 3 – 26) these calculated values are used to calculate an extreme performance next race handicap for every boat using the previously calculated adjustment amounts.

All boats highlighted as extreme performers are then removed from a second round of calculating next race handicaps which is unchanged from the current process which, for race 1 can be seen in columns K through O. In this round of adjustment the standard adjustment levels (0.3 of a boats achieved handicap and 0.7 of a boats previously used handicap for both over and under performance) are used to calculate a boats next race handicap.

**[Although the current levels for standard adjustment are set at 0.3 and 0.7 and are the same for over and under performance, these should be built into a result software such that they can be later amended.]**

After this routine either a boats extreme or standard adjusted next race handicap is returned (in race 1 in column P). This is then realigned against the first used handicap in the series whether this be the base number or the boats last used handicap in a previous series.

### **Realignment**

The realignment is applied irrespective as to if the boat takes part in the race or not. HOWEVER it is not applied retrospectively if a boat enters a series part way through. i.e. if a boat takes part in the first and last race of a series its handicap is realigned for every race in between. However if a boat only takes part in the last race in the series it uses its last race handicap/ base number.

The realignment calculations can be seen in column Q for race 1 and are calculated as currently as follows

$$TCF_{nr/a} = TCF_n * (\text{SUM}(\text{Starting handicaps}) / \text{SUM}(\text{next race handicaps}))$$

The procedure for all following races is the same.