Paper for Consideration by DQWG

CATZOC and UKC Compliance

Submitted by:	DQWG Chair on behalf of Synergy Maritime Pvt Ltd
Executive Summary:	Request IHO opinion on considering CATZOC uncertainty value while carrying out UKC Calculations.
Related Documents:	DQWG15-05.1A, DQWG15-05.1B, IHO Publication B-12 Ed. 2.0.0 Guidance on Crowdsourced Bathymetry
Related Projects:	S-101, S-67

Introduction / Background

Synergy Maritime Pvt Ltd has made a request to the IHO Secretariat asking for an opinion on considering CATZOC uncertainty value while carrying out UKC Calculations. “In the days of Paper Charts, ZOC were existing, but there was no consideration of adding any uncertainty value to UKC Calculations. The situation seem to have changed with ECDIS. We would also like to highlight, if ZOC uncertainty is added to UKC calculations, many times there is a non-compliance with minimum UKC requirement as per company Policy.”

Can the CATZOC be incorporated in the UKC as below:

“When the UKC required (the Safe Margin/Bottom Clearance) is greater (or equal) than the ZOC depth uncertainty, there is no need for additional measures. Accordingly, it is recorded in the passage plan and no additional measures are taken.”

Analysis/Discussion

IHO Secretariat has requested both the DQWG and the Under Keel Clearance Project Team to take this request into consideration. The Chair of the UKCPT has forwarded the following response:

Discussion about UKC should be separated into two parts:

1. When using ECDIS with tide predictions there should be consideration of ZOC and an allowance made when determining appropriate UKC limits based on charted depths;
2. When using a shore based UKCM service, in which case there are some important differences that navigators need to understand.

In the first case normal good seamanship should always be exercised. There should have been some consideration given to the accuracy of soundings and the quality of surveys when using paper charts. It is probable that this was not common practice, but that would have been a short coming of previous practice and training. The sounding selection process when compiling charts is ‘shoal biased’, which results in a situation where navigators could use depths from charts without applying an allowance for inaccuracy in cases where the survey was good enough to detect all seabed features.

In the second case the consideration of depth uncertainty is factored into the operation of a shore based UKCM service. When planning passages in areas that have a UKCM service, navigators can refer to information provided by the service provider about how the UKCM system accommodates depth uncertainties and indeed all the other information input uncertainties. After referring to such information, navigators will be able to plan their passages with a good understanding of what the UKCM service is doing for them. In many cases where UKCM systems operate, they are making use of more frequently and more accurately surveyed information than exists in the official ENCs. They are also making use of refined and more accurate tidal height and stream predictions than are generally available to navigators.

So, in any discussions on this topic, I recommend to keep these two cases separate and not to confuse the use of real-time UKCM services with navigation in areas where there are no such services.

Input from DQWG Chair:

S-4 article B-412 states Soundings:
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Charted soundings must represent the depth measured from Chart Datum to the sea floor placed in such a way that the centre of gravity (geometric centre) of the set of numerals coincides with the position referred to.

Rounding of depths, including drying heights, must always be on the safe (shoaler) side (that is: soundings must be rounded down and drying heights rounded up, if necessary). The rounding should be:
For depths

- to the nearest decimetre between 0,1 and 21m:
  0,001 to 0,099 rounds down to nearest decimetre for example: a recorded depth of 4,38m rounds down to 4,3m.
- to the nearest half metre from 21 to 31m:
  0,001 to 0,499 rounds down to 0,0 for example: a recorded depth of 23,49 rounds down to 23m;0,500 to 0,999 rounds down to 0,5 for example: a recorded depth of 23,51 rounds down to 23,5m.
- thereafter, to the nearest metre:
  0,001 to 0,999 rounds down to 0,0 for example: a recorded depth of 31,85m rounds down to 31m.

However, these soundings must be adjusted as a function of the degree of accuracy with which depths were actually measured, so that the precision with which soundings are recorded on charts can never be misleading as to the accuracy of such soundings.
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IHO Publication B-12 Ed.2.0.2 Guidance on Crowdsourced Bathymetry, paragraph 4.2.4.3 Consequences of Uncertainty, provides a very clear explanation of this issue. It states:

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Although the use of uncertainty models and budgets have been a part of modern hydrographic practice since the late 1990s, uncertainties are often computed as part of data processing, but then either forgotten or dropped when the data are presented or interpreted. This is a mistake.

For example, if a depth is reported as 12.0 ± 0.3m (at a 95% confidence interval), it would be unwise to assume that a vessel has at least 12m clearance in this depth area; with the usual probabilistic assumptions of the distribution of the uncertainty this is true only half of the time (Figure 13(a)), which is surely lower odds than any prudent mariner would allow for a navigation decision. A value of 11.74m would be a better choice (Figure 13(b)), but if a mariner wanted a less than 1:1000 chance of the depth being shallower than the declared value, they should use a depth of 11.34m (Figure 13(c)). Clearly, the “safe” depth depends on the user’s needs, and it would be incorrect, and unwise, to report simply the mean depth.
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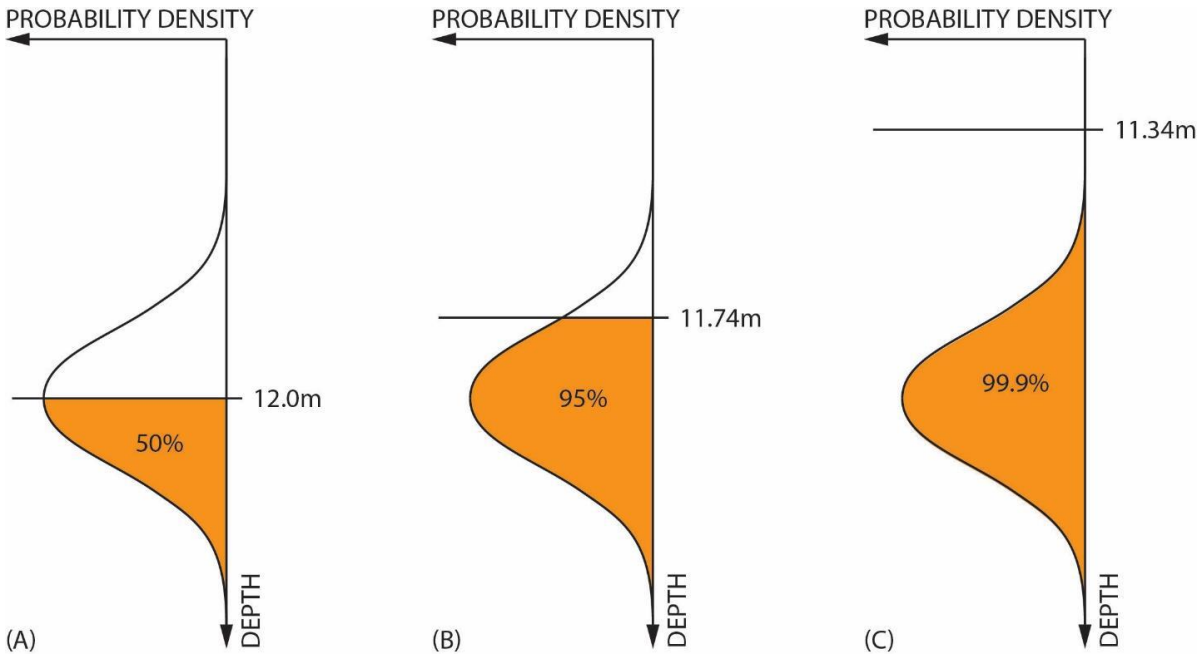

Figure 13. Examples of shoal-clearance depths for different probabilities of excession, based on the same basic uncertainty estimate of 12.0 ± 0.3m (95% CI). Assuming a 12.0m clearance is only true 50% of the time (left); a 5% probability of being shallower requires the depth to be reduced to 11.74m (middle); a 1:1000 chance of being shallower requires a clearance depth of 11.34m (right).

Conclusions and recommendations

To be discussed.

Justification and Impacts

To be discussed.

Action Required of the DQWG

The DQWG is invited to:

a. Note this paper;
b. Discuss the content;
c. Take further actions as deemed necessary.