



## Underkeel clearance

7 March 2011

### 1. Background

In its thinking about how the information in a future Digital Nautical Product will be used, the SNPWG has identified the need for underkeel clearance. This is shown in the SNPWG wiki as the complex attribute UKCLRN.

### 2. Use of definitions

There are a number of definitions for underkeel clearance and underkeel allowance in the Hydrographic Dictionary (S-32), NP100 and elsewhere. None of them really stand up under critical examination. The SNPWG needs definitions on which calculations can be made. The most rigorous demand could come from implementation of the definitions as algorithms to calculate the tidal window for entry or departure and to satisfy all concerned that sufficient water exists for a transit to be made in safety.

### 3. Current definitions

S-32 contains the following definitions:

a) **5731 underkeel clearance.**

The distance between the lowest point of the ship's hull, normally some point on the keel, and the sea bottom.

b) **5732 underkeel allowance.**

The estimated minimum underkeel clearance in a given channel accounting for the ship's squat, movement due to swell, tide height etc.

### 4. Theory

This whole piece of work is designed to take into account everything which could reduce the separation of any part of the vessel from the sea floor, beyond a simple calculation of draft, charted water depth and predicted height of tide. Underkeel clearance begins to apply as soon as the vessel is afloat. However inaccuracies in the chart (such as by siltation) and inaccuracies of tidal prediction could reduce the expected static separation from the sea floor. Similarly dynamic effects due to forward speed and sea state can also reduce the separation. All these constituents can be summarised as inaccuracies in the chart and height of predicted tide; squat, which is the effect of the vessel being drawn more towards the sea floor as speed increases; and all the effects caused by weather and sea state.

### 5. Shortcomings of current definitions

#### 5371

- a) Reference to the keel is not required. The keel is not always the deepest part of a vessel. The S-32 definition of "navigational drafts" within "draft" makes reference to "the lowest appendage" (See annex).

- b) "Sea floor" is the term in S-32 which contains the definition and to which "sea bottom" and "sea bed" are referred. "Sea floor" is therefore the primary term.

**5732**

- a) The definition is over specific by referring to "a given channel". The term can be used more widely: for a whole entry; departure; or a passage through multiple channels.
- b) Reference is made to "tide height". This is probably the most problematic item. Height of tide and draft are normally accounted for separately. To prevent double accounting, height of tide is not part of underkeel allowance.
- c) Negative tidal surges can reduce water levels significantly, particularly in the S North Sea. These occur with the passage of successive depressions and can be forecast. The definition should therefore make reference to weather forecast.
- d) Reference is not made to reliability of the chart nor to inaccuracies of tidal prediction.

## **6. Proposed new definitions**

In the interests of greater clarity, the following new definitions are proposed:

- a) **underkeel clearance:**

The distance between the deepest part of a vessel and the sea floor.

- b) **underkeel allowance:**

The result of a calculation in order to achieve the required underkeel clearance taking into account the vessel's static and dynamic characteristics, sea state and weather forecast, the reliability of the chart and variance from predicted height of tide.

## **7. Recommendation**

SNPWG is recommended to:

- a) Agree the proposed new definitions at paragraph 6.
- b) Approve that they be submitted to the Hydrographic Dictionary Working Group.

Annex A.

Extracts from the on-line S-32 Hydrographic Dictionary

Extracts from the on-line S-32 Hydrographic Dictionary

draft (draught):

The vertical distance, at any section of a vessel from the surface of the water to the bottom of the keel. When measured at or near the bow, it is referred to as draft forward and when measured at or near the stern as draft aft. The mean draft is the mean of the drafts forward and aft. These drafts are more specifically described as displacement drafts as opposed to navigational drafts which are measured to the lowest appendage to the hull as opposed to the keel.

(My underlining)

sea floor:

The bottom of the ocean and seas where there is a generally smooth gentle gradient. Also referred to as sea bed (sometimes seabed or sea-bed), and sea bottom.

underkeel clearance:

The distance between the lowest point of the ship's hull, normally some point on the keel, and the sea bottom.

underkeel allowance:

The estimated minimum underkeel clearance in a given channel accounting for the ship's squat, movement due to swell, tide height etc.