Paper for Consideration by IHO S-129 UKCM PT

A Portrayal Experiment of Under Keel Clearance Service Area

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Executive Summary:	This report summarizes an experimental validation of an algorithm for the calculation and depiction of Under Keel Clearance (UKC), using data from Republic of Korea's coastal waters.

Introduction / Background

At the 7th meeting of the S-129 Project Team, the definition of the UKC (Under Keel Clearance) service area on electronic navigational charts was discussed as a critical issue. Our current research contributes to this field by proposing a maximum steering angle for defining UKC service areas. Building upon the International Standard for Ship Maneuverability Testing, MSC.137(76), which provides guidelines on maneuvering metrics, our study aims to bridge the existing gap by suggesting an algorithm for the definition of the UKC service area.

Analysis/Discussion

The experiment involves using a specialized algorithm to display UKC (Under-Keel Clearance) information on electronic navigational charts. The sequence of the experiment is as follows:

1. The experiment was initiated by systematically collecting depth data from the seabed, which was thoroughly organized geospatially. It offers an important understanding of the difference between waters that can be navigated safely and those that are risky to navigate, considering the specific size and the way the T/S HANNARA is controlled.
2. To determine the UKC service area, an advanced algorithm was utilized. This algorithm considered not only the vessel's current location but also factored in its expected path for the next two minutes, taking into account the maximum allowed steering angle. These important calculations helped to create a changing, diamond-shaped area for Under-Keel Clearance (UKC) services. This area was then added to the electronic navigational chart display.
3. The study was further enhanced by converting the collected depth data into GPS coordinates, which were then projected onto the electronic navigational charts. This integrated data offered a clear visual representation of the various navigation zones, categorized by safety levels, ranging from secure to potentially hazardous. It underscored the invaluable role that real-time data plays in dynamically adjusting UKC service areas, enabling navigational officers to navigate safely and avoid potential groundings or collisions.
4. The effectiveness of the algorithmic approach was evaluated based on how accurately and effectively the designated UKC service area was represented on the electronic navigational charts. Using a system of symbols, the charts could clearly indicate non-navigable areas and areas that were marginally navigable, adapting in real-time to the ship's movements and the consequent changes in the adjacent UKC service area.

Conclusions

The experiment underscores the significance of the S-129 UKCM service as an indispensable navigational instrument, offering a precise and current representation of UKC zones. The T/S HANNARA water depth data collected from the Incheon coast has corroborated the system's efficacy. This dynamic assessment capability empowered mariners to make informed decisions regarding safe operating zones, using continuously updated bathymetric data to avoid hazards. Future research endeavors will aim to enhance the accuracy of UKC calculations by incorporating a broader spectrum of variables that influence a ship's positioning in the water.