



IHO Report on the results of the ECDIS survey conducted by BIMCO and Denmark

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Introduction

1. In early 2013, BIMCO and Denmark conducted a survey to obtain information on the operational performance and use of Electronic Chart Display and Information Systems (ECDIS) at sea. The aim of the survey was to identify issues adversely affecting the mariner in their use of ECDIS and Electronic Navigational Charts (ENC) and to initiate improvements. BIMCO and Denmark reported the results to the 59th session of the Sub-committee on Safety of Navigation of the International Maritime Organization (IMO). At the invitation of the Secretariat of the International Hydrographic Organization (IHO), BIMCO provided an anonymized compilation of the responses for further investigation by the IHO of issues related to ENCs and their use in ECDIS.

2. Of the 613 responses to the survey, 182 contain comments which may relate to ENCs. However, it is not always clear whether the comments result from a misuse or a malfunction of the ECDIS or from an ENC issue. In some cases, the survey responses indicated that the ECDIS was loaded with unofficial chart data (charts produced by a private company) rather than ENCs (official charts produced by a Hydrographic Office or other government organization¹). Only the issues likely to relate to ENCs are reviewed in some detail below.

3. The technical working groups of the IHO have used the survey information received in conjunction with other feedback in their continuing task of reviewing and revising, where appropriate, the main ENC related standards. A new version of the IHO display standard (S-52) is in the process of being issued and additional guidance has been provided to Hydrographic Offices (HO) producing ENCs to improve consistency of ENCs at different scales or issued by different producers.

4. The production of ENCs is still in its infancy compared to the long-standing production, publication and distribution of paper charts. This means that there is still scope for improvement in the production and maintenance methods used by Hydrographic Offices to enhance the way ENCs operate in ECDIS as well as to improve ENC consistency. For this reason ECDIS users are strongly encouraged to continue providing feedback on any issues of concern that they have with ENCs or their operation within ECDIS. Where possible these concerns will be resolved within the current standards or if this is not possible, they will be taken into account in the next generation of ENC and ECDIS. Feedback should be provided in the first instance through the ENC service provider. Alternatively, feedback can also be sent to the ENC producer and as a last resort to the IHO Secretariat at info@iho.int.

¹ For further information, refer to IHO Publication S-66 - Facts about Electronic Charts and Carriage requirements. This publication may be downloaded free of charge from the IHO website at: http://www.iho.int/iho_pubs/IHO_Download.htm.

ENC Symbols

5. A number of responses referred to the difference between paper chart symbols and those used to display ENC symbols. The 'new' simplified ENC symbols were developed more than 20 years ago and a major factor in their design was the limited computer power and low resolution display screens available at the time. All ECDIS today should have the capability to display the ENC using either the simplified or the traditional chart symbols. To assist the mariner most ECDIS have the ability to display a pre-loaded ENC (Chart1) that contains the complete range of simplified and traditional symbols. The *pick report* mechanism can also be used to obtain information that underlies each symbol.

6. A significant difference between the symbols on paper charts and symbols for an ENC is that within ECDIS the symbols are 'dynamic'. This means that some features can be displayed with different symbols depending on the safety and display settings selected on the ECDIS. For example where a paper chart may show a standard wreck symbol, an ECDIS could show nothing, a standard wreck symbol or an isolated danger symbol (magenta disc with white cross), depending on the circumstances. Which symbol is displayed depends on the value of the clearance depth over the wreck in comparison to the safety contour being shown and the display detail (standard/full) that is selected by the user.

7. This flexibility of display allows the hydrographic features which are a danger to the vessel to be emphasised. For example, all features in water deeper than that defined by the safety contour that are potentially hazardous to a vessel (features that have a depth less than the safety contour) will be displayed by the prominent isolated danger symbol.

8. A complication is that for the ECDIS software to determine if a feature is a hazard to the vessel, all the necessary information must be available within the ENC. On paper charts there are many instances where features are shown without specific depth information (for instance, obstructions on the seabed). In these cases, it is left to the mariner to decide if it is safe to approach these features taking into account the depth of water in which they are situated and the draught of the vessel. However, in the case of ECDIS, unless such features are encoded with a clearance value when included in an ENC, the ECDIS will 'fail safe' and display an isolated danger symbol. Where a mariner suspects that a feature being depicted as an isolated danger is not, in fact, a hazard, the ECDIS *pick report* functionality must be used to obtain more information so that a decision can be made.

Features not displayed

9. Many responses gave examples of an ECDIS not displaying ENC features as expected or as required. These included: pilot boarding points, depths in dredged channels, anchorage swinging circles not being shown, features disappearing when the display is zoomed out and difficulty in accessing some information such as magnetic variation. This behaviour is due to a variety of causes.

Fine tuning of standards

10. There are some cases where the IHO Standards used in guiding ENC production and ECDIS displays may need to be re-considered. For instance, depths of dredged areas are generally only available using the *pick report*. This is because when the standards were written it was thought that the safety contour would be sufficient to highlight the 'go' and 'no go' areas and that leaving out the depths would provide a clearer display.

Similarly, the swinging circle for an anchorage is also available only by using the *pick report*. The resolution of these issues is dependent on agreeing revised or second generation standards.

Use of SCAMIN

11. A number of vessels reported problems with the display of features such as nav aids and names ‘dropping out’ of the display as the scale is reduced.

12. Screen ‘clutter’ can be a real problem to the mariner when the ENC display is zoomed out especially if there is no smaller scale (and thus generalized) ENC available. To minimise the clutter, HOs use ‘SCAMIN’ when they encode the data in an ENC. This is an attribute that can be given to features to determine the minimum scale (hence SCAMIN, standing for “scale minimum”) at which the feature should be displayed. When the ECDIS software draws the ENC data on the screen it looks to see if features have a SCAMIN value set and, if the scale of the display being drawn is smaller than that value, the feature is not drawn.

13. Applying SCAMIN to all features in an ENC is a very time consuming task, so many HOs use automated tools to speed up the process. The tools work by allocating the same SCAMIN value to all the individual occurrences of objects in a particular feature class or group (for example all soundings, buoys, important names etc.). This means that all objects within that class are switched off when the ECDIS display scale is less than the SCAMIN value set. The end result is not as good as can be achieved by cartographers who, using their judgment, would select individual objects within a feature class to be shown at a smaller scale than the rest. An example of good selection would be to allocate a different SCAMIN value to the furthest seaward pair of buoys marking a buoyed channel than to the others in the channel. The result being that, at a large scale all the buoys are shown and as the display scale is reduced only the outer buoys are shown and finally at an even smaller scale none of the buoys are shown.

14. The situation is more complex where different values of SCAMIN have been applied to the same feature on ENCs in different scale bands. The result can be that a feature appears and disappears more than once as the operator steps through the display scales.

15. The significant number of reports on nav aids and names being inappropriately or erratically ‘dropped from the display’ as display scale is decreased shows that HOs need to more carefully consider their application of SCAMIN.

Magnetic Variation

16. A number of vessels reported difficulties in obtaining magnetic variation values from the ENC.

17. Not all ENC producers have included magnetic variation in their ENC data. Even where magnetic variation has been included, it is often done in different ways. In some cases, values have been given at specific geographic locations. These values can be difficult to find and even then, the mariner must interpolate between values if the ship is distant from these values. Other HOs have encoded regions within the ENC so that wherever the vessel is located, the *pick report* function can be used to extract a value for magnetic variation value than can be used directly. The IHO has issued encoding guidance to HOs recommending this latter approach. The situation should therefore improve over time.

Display of feature names

18. The names of charted features within an ENC can be encoded in two ways; either as a 'point' feature such as for a light or as an 'area' feature such as the name of a bay. In the first case the text for the name of the feature will always be displayed at the same geographic position; in the second case the position of the name will vary depending on what part of the area is being displayed on ECDIS. This 'dynamic' way of displaying some names is to ensure that important names remain within the display area when the user scrolls the display and only parts of area features are shown on the screen. The two consequences of this are that 1) the name moves in relation to other features as the user pans the display and 2) other text at the same position is likely to be overwritten as ECDIS is unable to 'de-conflict' the texts.

19. Duplication of names can occur when two adjoining ENC cells cover the same area feature. If both cells contain the name of the feature then when the boundary between the cells appears on the ECDIS display, both cells are being displayed the same time and it is inevitable that both names will be displayed and that these will change position as the display is zoomed or panned.

Inconsistencies

20. Many responses referred to inconsistencies between ENCs and paper charts or between ENCs of different scales.

21. Unfortunately there has never been complete consistency between paper charts produced by different HOs, both in terms of the depiction of the same area, and in the types of data included. For example some nations have never shown pilot boarding points on their charts preferring to put this information in their sailing directions; such national differences are now apparent in ENCs and need to be resolved. Based on the feedback from mariners, the IHO is progressively refining its ENC product specification in order to minimize the margins for interpretation. However this is a laborious process as it entails that HOs reconsider their own work practices, modify their production tools and recompile some of their ENCs.

22. Whilst HOs strive to keep their ENCs and paper charts at the same state of update, differences can sometimes exist between them. Some HOs have sophisticated production processes in which ENCs and paper charts can be maintained simultaneously. However, for many HOs, the paper chart is updated first and the ENC (derived from the paper chart) is amended afterwards. Where this is the case, and there is significant change, the update to an ENC can lag behind the corresponding paper chart by a few weeks or in extreme cases months. This situation should improve over time as more HO's adopt a single database approach to the simultaneous maintenance of paper charts and ENCs.

Horizontal Datum Accuracy

23. Some survey responses noted positional differences between ENCs and paper charts.

24. ENCs by definition must be referred to WGS84 datum so that GNSS positions can be transferred directly to them. The paper charts on which the majority of ENCs are based are often referred to a variety of horizontal datums. This means that any shift required to refer them to WGS84 must be taken into account during the ENC production process. Where charts are based on old surveys that are using a local datum this can be complicated and the transformation to the WGS84 may not be very accurate. HOs often quantify the residual error (the maximum offset from WGS84 that may be expected) if it is significant and include this in the ENC

metadata field POSACC (standing for “position accuracy”). This POSACC value may be accessible using the *pick report* function. In some cases where the residual error is likely to be high the HO will insert a text note on the ENC alerting the mariner that GNSS positions may not be plotted correctly and advise the use of traditional (non-GNSS) relative navigation methods.

25. If mariners note significant offsets between GNSS positions and ENC then these should be reported to the ENC producer. A screenshot from ECDIS showing ENC with radar overlay or ship position against a berth will assist the HO in analysing the problem.

Chart Updating

26. An area of concern highlighted in the survey responses referred to temporary and preliminary notices to mariners (T&P NMs).

27. A majority of the HOs producing ENC now incorporate T&P NM information in their ENCs by allocating date/time attributes to chart features. These attributes indicate to the ECDIS software when the relevant chart features should be displayed. In parallel, or alternatively, the ENC may contain a text file that can be accessed by the *pick report*. A potential problem is that it is often difficult to establish where a planned route is affected by T&P information. This is compounded by the fact that not all ECDIS deal effectively with data having time variable attributes. Some ENC service providers supply additional information as listings or in the form of an overlay to assist the mariner to locate T&P NMs that might affect a voyage plan.

28. The IHO is actively encouraging all ENC producers to include T&P NMs within their ENCs. Lists giving details of the policy of specific countries are available from ENC service providers. Feedback from mariners on the use of T&P NMs and any difficulties being encountered is most welcome as this is an area that the IHO consider needs further improvement.

Updating ECDIS

29. The final question in the survey asked if the on-board ECDIS system had been updated to the latest IHO standards. It seems that many respondents interpreted this question as meaning the update to the ENCs rather than of the system software. The question was asked because of concerns that older ECDIS systems, whose software had not been maintained, were unable to display new features agreed by the IMO such as Particularly Sensitive Sea Areas (PSSA), Archipelagic Sea Lanes and the generic new object “NEWOBJ”.

30. The IMO Safety of Navigation Circular SN.1/Circ.266/Rev.1 dated 7 Dec 2010 provides guidance on the need to update ECDIS software. In essence ECDIS is not significantly different from personal computers (PC) which require regular software updates to eliminate bugs and to improve functionalities as new requirements arise.

In Summary

31. The feedback from the survey confirms a number of issues which the IHO continues to address through its technical working groups. The IHO will continue to improve the current ENC standards and guidance to ENC producers and progress the work on the next generation of ENC and ECDIS standards, taking into account the feedback received from mariners. Mariners are strongly encouraged to continue providing feedback on any issues of concern that they have with ENCs or their operation within ECDIS.

32. User feedback should be provided in the first instance through the ENC service provider. Alternatively, feedback can also be sent to the ENC producer (the relevant HO) and as a last resort to the IHO Secretariat at info@iho.int.

For further reference: www.iho.int (Home > ENCs & ECDIS).