

Paper for Consideration by DIPWG

Development of a Combined INT1 / ECDIS Chart 1

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| Submitted by: | United States (NOAA) |
| Executive Summary: | <p>This paper reports the progress being made by the U.S. (NOAA) to create a Paper Chart and ECDIS Chart 1 (P/ECDIS Chart 1), a reference that will show both paper and ECDIS (S-52) symbols side-by-side. Creation of this document has been delayed, but is still making progress and completion of the new Chart 1 is hoped for by the end of 2011.</p> <p>Topics discussed include: background on the desire to create an combined Chart 1 reference, the methodology being used to create the document, the challenges arising from the many-to-many relationship between INT 1 and S-52 symbology, some errors discovered in the S-52 Standard, a preliminary format design for the new Chart 1, and the creation of a full S-52 symbol set in JPEG format. A sample of the new Chart 1 format and the INT1 to S-52 symbol mapping are presented in annexes.</p> <p>Recommendations are made to 1.) consider including S-52 symbol JPEG files created as part of the P/ECDIS Chart 1 effort in the S-52 Presentation Library CD for purchase, 2.) compile the resolutions to S-52 errors discovered while creating the P/ECDIS Chart 1 into a deferred amendment to S-52, and 3.) solicit participation by DIPWG and TSMAD members in reviewing and making recommendations for improving the P/ECDIS Chart 1 as successive portions of the document are completed.</p> |
| Related Documents: | INT1; US Chart No. 1; S-52, Ed. 6.0 |
| Related Projects: | IHO CSMCWG, INT1 Sub-working Group |

Terms

ECDIS Chart 1 - The ECDIS Chart 1 was originally, "intended to familiarize the mariner with the colour and symbol coding used by the ECDIS." It is part of the S-52 Presentation Library and is distributed as graphics and tables within the paper specification and also as digital ENC .000 files encoded with NEWOBJ features that were created specifically to depict various S-52 symbols. Symbols are grouped together in traditional INT1 categories, "familiar to the mariner, but are numbered with a look-up sheet, not labelled." [S-52, Section 3.1.4]. Note that there is not a one-to-one relationship between all ECDIS Chart 1 symbols and INT1 paper chart symbols.

INT1 - Any of the various *INT 1 Symbols, Abbreviations, Terms used on Charts* documents (German/English, French or Spanish) that are associated with the IHO *S-4 Chart Specifications of the IHO and Regulations for International (INT) Charts*.

U.S. Chart No. 1 - The U.S. version of INT1 depicting INT1 and other symbols that are used on U.S. (NOAA and NGA) paper charts. Current version is the 10th Edition, November 1997. Edition 11 will have a similar format with updated content.

P/ECDIS Chart 1 (U.S. Chart No. 1 for Paper Charts and ECDIS) - The U.S. version of INT1 depicting INT1 and other symbols that are used on U.S. (NOAA and NGA) paper charts, which will be augmented with an additional column depicting the S-52 symbols that map to traditional paper chart symbols. This will be produced as U.S. Chart No.1, Edition 12. (See a prototype page from section K in Annex A).

Introduction / Background

As a practical matter, the ECDIS Chart 1 is far less accessible and more difficult to use than the INT1 available for users of paper charts. The Chart No. 1 for Paper Charts and ECDIS (P/ECDIS Chart 1) discussed in this paper is intended to provide a more accessible S-52 symbol reference based on the well-known format of the INT1.

The need for an easy to use S-52 symbol reference for mariners has been acknowledged for quite a while. At the 18th meeting of the CSMWG (Capetown 2008) the paper, "10 Things They Should Have Told You About ECDIS," by David Edmonds, from PC Maritime Ltd was submitted for consideration by the working group. < http://www.iho-ohi.net/mtg_docs/com_wg/DIPWG/CSMWG18/CSMWG18-11.1A_Guide_on_ECDIS_Symbology.pdf >

The resulting discussion, as recorded in the CSMWG-18 minutes is excerpted below:

11.4 Development of the Standard Display [Doc. CSMWG18-11.1A]

MJ remarked that item 3 "Know your Symbology" was the only viable suggestion within the scope of this WG. This being "The IHO should standardize terminology for chart related terms and functions. Suggest a glossary with all standardized terminology, including abbreviations". As an example MJ stated that the isolated danger symbol is not familiar to the mariner or under what conditions it is displayed. Therefore there is a requirement for the WG to prepare a set of symbols for S-52 users.

JP said that NOAA/NGA was preparing a new Chart 1.

SR continued to say that they [U.S.] were going to include an additional column specifically for ENC symbols.

At that time, the U.S. expected to produce a P/ECDIS Chart 1 within the next year. The subsequent turnover in personnel assigned to the project, as well as difficulties encountered with the computer system that is being used to produce the new Chart 1 have had a significant impact on the schedule and the scope of the undertaking.

The minutes of the 1st DIPWG (Ottawa, May 2009) excerpted below, explain that the next U.S. Chart 1 (Edition 11) would not include the S-52 references as originally expected.

Action Item 8 & 9

A8. MJ to supply JP with a digital version of INT 1 with text explanations to PL mechanisms, e.g. CSPs via FTP. [Action closed]

A9. US are to enhance CHART 1 to include the additional column containing additional references to ENC symbols.

CH reported that he had met with NGA to discuss Chart 1. Unfortunately, the next edition of the US Chart 1, which is hoped to be available by December 2009, will not include references to ENC symbology. However, this work was still ongoing and it was still the US intention to change the format from portrait to landscape and add a couple of extra columns for ENC symbols in the near future

While NGA is now making progress on producing a non-ECDIS version of Chart 1 (Edition 11), it is probably still a year away. Nevertheless, NOAA has started moving forward on developing a P/ECDIS Chart 1, which will become U.S. Chart No. 1, Edition 12. NOAA will be using the updates being made for Edition 11 as the foundation on which the new Paper/ECDIS, edition 12 will be built. However, there is a significant amount of work that can be accomplished regarding the S-52 to INT1 symbol mapping and document design that is now underway. These preliminary steps are discussed below

Analysis/Discussion

S-52 to INT1 symbol mapping methodology

The IHO S-52, Addendum to Annex A, Part 1, Users' Manual, Edition 3.4 (2008) provides a detailed description of each S-52 point, line and area symbol. NOAA extracted the following data for each symbol and entered it into a database (a Microsoft SharePoint List):

| Item | Example |
|-----------------------------|------------------------------------|
| Symbol Name | SY(WRECKS04) |
| Reference Number (RN) | 442 |
| Symbol Explanation | non-dangerous wreck, depth unknown |
| Symbol Colours | CHBLK |
| References (INT1) | K26, K27, K29, K30 |
| Simplified Symbol | No |
| Conspicuous/Non-Conspicuous | N/A |
| IEC 61174 | No |
| IEC 62288 | No |

Table 1 (See Annex B for corresponding page of S-52, Part 1, Addendum)

If an S-52 symbol had a reference to INT1 specified, then additional separate records for each INT1 reference were created for each symbol. This resulted in 1764 records. These included over 1500 symbol mappings, as well as one record each for numbers, IEC symbols and other S-52 symbols that do not map to an INT1 symbol. After all the data was extracted from the S-52 Addendum, the data could then be sorted by the INT1 references to determine which S-52 symbols were mapped to each INT1 symbol (see Annex C).

4₆ Wk 25₅ Wk

For example, the INT1 paper chart symbol K26, depending on the attribution of the object and other factors, will be portrayed in an ECDIS with one of the S-52 symbols shown in Table 2 on the next page. **S-52 Symbols mapped to INT1 Paper Chart Symbol K26**







| | | |
|---|--------------|---|
|  | SY(DANGER01) | underwater hazard with a defined depth |
|  | SY(DANGER02) | underwater hazard with depth greater than 20 metres |
|  | SY(ISODGR01) | isolated underwater danger of depth less than the mariner's selected safety contour |
|  | SY(WRECKS04) | non-dangerous wreck, depth unknown |
|  | SY(WRECKS05) | dangerous wreck, depth unknown |
|  | LC(NAVARE51) | boundary of a navigation feature such as a fairway, magnetic anomaly, etc. |

Table 2

The graph below shows the distribution of number of S-52 symbols to which INT1 symbols mapped. Almost one-third of INT1 symbols map to just one S-52 symbol and 88% of INT1 symbols are referenced by four or fewer S-52 symbol specifications in the S-52 Addendum.

The depiction of these symbols should be relatively easy to accommodate with the traditional paper chart INT1 or Chart 1 format, as can be seen in the P/ECDIS Chart 1 prototype in Annex A. However, 53 INT1 symbols map to five or more S-52 symbols, including seven that map to more than 24 different S-52 symbols each. These symbols present a special challenge and additional explanatory text and graphics will have to be developed to adequately portray these relationships to mariners in a manner that is easy to understand and not too unwieldy.

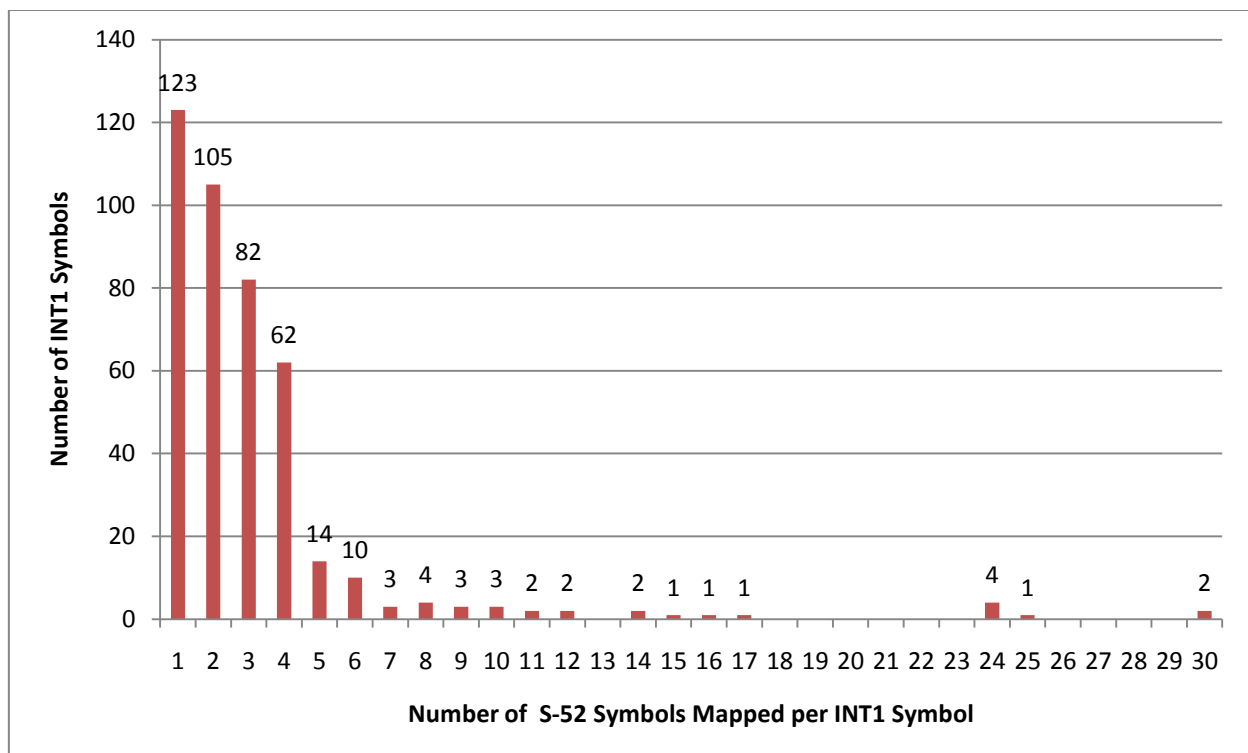


Figure 1

Discovery of Minor S-52 Errors

As NOAA looked at the mapping between the S-52 and INT1 symbols, along with their respective symbol descriptions, it was discovered that the S-52 Addendum may have incorrectly associated some INT1 and S-52 symbols with each other. One example may be seen in the P/ECDIS Chart 1 prototype (Annex A), where the DANGER02, "underwater hazard with depth greater than 20 metres," has been mapped to the INT1 symbol K11, "Rock which covers and uncovers, height above chart datum." As a rock cannot be deeper than 20 meters and also awash, this INT1 is incorrect.

Another error was found in the Presentation Library, Edition 3.4, Annex A, Section 15.3, "List of symbol names & meanings arranged numerically," which listed some older symbol names for symbols that had been replaced with newer versions and incremented symbol numbers in the S-52 Addendum. These errors are shown in the Table 3.

| Old Name in Annex A | New Name in Addendum | Description |
|---------------------|----------------------|---|
| AISDGR01 | AISDGR02 | dangerous AIS target |
| AISSLP01 | AISSLP02 | sleeping AIS target |
| AISTRN01 | AISTRN03 | AIS target turning to starboard |
| AISTRN02 | AISTRN04 | AIS target turning to port |
| AISVES01 | AISVES02 | active AIS target showing vector and/or heading |
| ARPATG01 | ARPATG02 | ARPA target |
| ARPONE01 | ARPONE02 | one minute mark on ARPA vector |
| ARPSIX01 | ARPSIX02 | six minute mark on ARPA vector |
| CURSRA01 | CURSRA02 | ordinary cursor |
| CURSRB01 | CURSRB02 | cursor with open centre |
| ERBLTIK1 | ERBLTIK2 | range mark for an ERBL |
| EVENTS02 | EVENTS03 | mariner's event mark |
| OSPONE02 | OSPONE03 | one minute mark for ownship vector |
| OSPSIX02 | OSPSIX03 | six minute mark for ownship vector |
| OWNSHP01 | OWNSHP02 | own ship symbol, constant size |
| PASTRK01 | PASTRK03 | time mark on past track |
| PASTRK02 | PASTRK04 | time mark on secondary past track |
| PLNPOS02 | PLNPOS03 | cross line for planned position |
| POSITN02 | POSITN03 | own ship position fix |
| TIDCUR01 | TIDCUR05 | predicted tidal stream or current direction |
| TIDCUR02 | TIDCUR04 | actual tidal stream or current direction |
| VECGND01 | VECGND02 | arrowhead for own ship vector for course and speed over the ground |
| VECGND21 | VECGND22 | arrowhead for ARPA or AIS vector for course and speed over the ground |
| VECWTR01 | VECWTR02 | arrowhead for own ship vector for course and speed through the water |
| VECWTR21 | VECWTR22 | arrowhead for ARPA vector for course and speed through the water |
| WAYPNT01 | WAYPNT02 | waypoint on planned route |
| WAYPNT03 | WAYPNT04 | waypoint on alternate planned route |

Table 3

Anticipated Changes to INT1

The Chart Standardization and Paper Chart Working Group (CSPCWG) and its INT1 Sub-working group are in the process of proposing several changes to INT1. One of these proposals is the removal of the Section U, "Small Craft Facilities," and moving some of the INT1 U symbols to other sections, as shown in Table4, below.

| S-52 Symbol | Description | INT1 | Proposed Change for INT1 |
|--------------|-----------------------|----------|--------------------------------|
| SY(SMCFAC02) | yacht harbour, marina | U1.2 | Rename as F11.2 |
| SY(SMCFAC02) | yacht harbour, marina | U1.1 | Rename as F11.1 |
| SY(CHINFO07) | HO information note | U1.1 | Rename as F11.1 |
| SY(SMCFAC02) | yacht harbour, marina | U2 | Rename as F19.1 and F19.2 |
| SY(SMCFAC02) | yacht harbour, marina | U3 | Rename as Q45 |
| SY(SMCFAC02) | yacht harbour, marina | U4 | Rename as F11.3 |
| SY(SMCFAC02) | yacht harbour, marina | U5 - U28 | Delete as Section U is Removed |
| SY(SMCFAC02) | yacht harbour, marina | U29 | Rename as E37 |
| SY(SMCFAC02) | yacht harbour, marina | U30 | Delete as Section U is Removed |

Table 4

All but one of the U symbols affected map to the same SMCFAC02 symbol. Other changes being considered are related to the definition and portrayal of Foul Ground and Foul Area, as well as the replacement of Sections G, O, V, W and X with two unlettered indices, named, "Index of abbreviations (National and International)" and "General Index/Translation of terms."

P/ECDIS Format Design

The U.S. intends to make the new Paper/ECDIS Chart 1 as "INT1-like" as possible, so it is expected that changes to INT1 will be adopted in this new document as well. A few features of the new P/ECDIS Chart 1 design include:

- Document will be oriented in a landscape, not portrait, format
- Unlike previous editions of the U.S. Chart 1, the INT1 symbols will now be shown on the left side of the page, next to the INT1 symbol number and the U.S. national symbols (NOAA and NGA) will be shown on the right side, as is the case for other INT1 documents.
- Section letters will be displayed on both sides of the top of each page.
- Several new narrative sections written especially for ECDIS users. These sections will summarize various important ECDIS concepts from the S-52 standard, such as:
 - Different design requirements for Paper and ECDIS symbology
 - Special types of ECDIS specific symbols (Isolated Danger, Safety Contour)
 - How specific conditions can affect the portrayal of some features
 - Conditions with could change the portrayal of a feature, such as safety contour setting
 - Simplified symbology
 - Colour palettes (Day, Night, Dusk)
 - Viewing groups
 - The **i** and **? families of S-52 symbols**
 - Unknown object
 - Portrayal of area features with centred symbols

The S-52 Symbols

Most of the S-52 symbols that will be used in the P/ECDIS Chart 1 were converted to JPEGs using a screen capture application and the "ECDIS Symbol Editor" tool, provided by Sven Herberg, which was originally used by SevenCs and BSH to create the graphics for the S-52, Addendum. Some minor modifications and the creation of newly adopted S-52 symbols were done using Microsoft® Paint. A complete set of S-52 symbols will be available as JPEGs as a result of the P/ECDIS Chart 1 effort. DIPWG may want to consider releasing these as part of the Presentation Library in the future.

Recommendations

1. Consider including the S-52 symbol JPEG files created as part of the P/ECDIS Chart 1 effort in the S-52 Presentation Library CD for purchase.
2. Compile S-52 errors identified here and any others discovered while creating the P/ECDIS Chart 1 into a deferred amendment to S-52.
3. Solicit participation by DIPWG and TSMAD members in reviewing and making recommendations for improving the P/ECDIS Chart 1 as successive portions of the document are completed.

Action Required of DIPWG

The DIPWG is invited to:

Endorse the work done by the United States

Review and comment on the prototype P/ECDIS Chart 1 format presented in Annex A.

Review and comment on the accuracy of the S-52 to INT 1 symbol mapping presented in Annex C.

Make recommendations for any additional narrative sections of the P/ECDIS Chart 1 that would enhance mariners' understanding of the S-52 symbology.

Compile S-52 errors identified here and any others discovered while creating the P/ECDIS Chart 1 into a deferred amendment to S-52.