

**11th CSPCWG/1st NCWG Meeting
Rostock, Germany, 27-30 April 2015**

Paper for Consideration by CSPCWG/NCWG

Consistency of Information on Paper Charts and ENC's

Submitted by:	CSPCWG Chair
Executive Summary:	Discussions at HSSC6 related to the UKHO Additional Information Overlay (part of its AVCS service) and the application of ENC Updates that are the equivalent of paper chart (T) and (P) Notices to Mariners resulted in a decision to include a new Work Item on the NCWG Work Program to discuss what is meant by “consistency” of the information included on paper charts and ENC's.
Related Documents:	<ol style="list-style-type: none"> 1. HSSC6-05.5D rev1 - Relevance of information overlay services with respect to IHO standards; 2. Minutes HSSC6; 3. S-4 – Regulations of the IHO for International (INT) Charts and Chart Specifications of the IHO.
Related Projects:	S-4 Maintenance

Introduction / Background

Recent papers and discussions related to the identification of differences between the information contained on paper charts and the corresponding ENC's; and investigations as to the level of application of ENC Updates that are the equivalent to paper chart (T) and (P) Notices to Mariners, have raised the question as to the level of information consistency that is required between products. While it may be inferred that the charted information should be the “same” for any paper chart and the corresponding ENC dataset, this is not stated in S-4. Information on paper charts and ENC's will not look the “same” due to the necessarily different portrayal standards, but in terms of content products must be “consistent” so as to not confuse or erode the mariner's confidence when they are utilising both paper charts and ECDIS in route planning and navigation. Hydrographic Offices and nautical cartographers require some guidance in S-4 as to what is meant by “consistency” between the information included on paper charts and ENC's.

This Paper recommends that this guidance should be included in S-4; identifies some of the factors that should be considered in determining what is meant by “consistency” between paper charts and ENC's; and proposes a draft specification for consideration of the CSPCWG/NCWG.

Analysis / Discussion

Discussions at HSSC6 related to the introduction by the UKHO of an Additional Information Overlay (AIO) service as part of its Admiralty Vector Chart Service (AVCS) (ref (1)) raised the question as to what is meant by “consistency” between the content of paper charts and ENC's. The notes from these discussions and the outcome as included in the Minutes of HSSC6 (ref(2)) is as follows:

5.5D Relevance of information overlay services with respect to IHO standards

The IHB proposed that the HSSC should consider including a new work item in the CSPCWG work plan on the relevance of information overlay services with respect to IHO Publication S-4.

Outcome:

- The Committee endorsed the proposal of IHB related to the consideration of standardization issues associated with information overlay services and agreed to include the relevant work item into the work plan.

From a CSPCWG/NCWG perspective, the assumption is that the “relevant work item” referred to in the outcome above is to develop a new specification for S-4 that describes (or defines) what is meant by “consistency” of the information contained in paper charts and ENC's; and amend the specifications to

strengthen the recommendation that ENC Update services include the equivalent of paper chart (T) and (P) Notices to Mariners. This is based on the recommendations from ref (1), which includes the following:

- (i) Clearly stating that the information included in ENCs and on the corresponding paper charts must be consistent, while acknowledging the differences that may exist between the products in regard to content and the different way that the products are used by the mariner. This can be done in S-4, possibly at B-170 (currently unused).
- (ii) Strengthening the specifications regarding chart updating to include the requirement for the equivalent of paper chart (T) and (P) NMs to be included as part of the ENC Update service, in S-4 - B-600. In accordance with action HSSC5/02, ENC Producers should be further encouraged to include the equivalent of paper chart (T) and (P) NMs as part of their ENC Update service and advised that not doing so would be non-conformant with IHO specifications.

The maritime community is going through a major technology-driven transition from navigation based on manual terrestrial positioning on the chart ("paper chart" navigation) to navigation based on interactive GPS ship positioning on the chart ("ECDIS" navigation). Observations made by cartographers within the AHS while participating in ship bridge simulator based ECDIS training have identified that mariners are utilising the ENC in ECDIS in different ways to assist in navigation and situational awareness than the traditional methods used when utilising the paper chart. An additional major contributor to this is the ability for the ENC in ECDIS to be used more interactively with radar and AIS targeting in an integrated bridge navigation system. Given that navigation using ENC and ECDIS is relatively new as compared to navigation using the paper chart, it can be expected that ECDIS navigation methods (the way that ECDIS is used by the mariner) will increasingly diverge from paper chart navigation methods as more familiarity and experience with ECDIS is gained.

With this expected diversion in the way that ENC will be used in comparison to the paper chart, it follows that the nautical cartography, in terms of the structure and content of ENC's, will also need to diverge so as to provide the most appropriate information for ECDIS navigation. The AHS is currently reviewing the structure and content of its harbour and approach ENC's to take into account mariner feedback and the lessons learned from participation in ECDIS training.

However, it is acknowledged that all the critical information required for charts as specified in S-4 to facilitate safe navigation and protection of the marine environment must be included on both paper charts and ENC's. Therefore, where a particular paper chart and its corresponding ENC are intended to be used for the same purpose in navigation, then this critical information must be the same on both products. This should extend to updated information (promulgated by paper chart Notices to Mariners (NM) and ENC Updates), taking into account the methods used to supply this information to the end user.

While it is acknowledged that the critical information must be the same on paper charts and corresponding ENC's, there are a number of factors that may require other "non-critical" information to differ between products. These factors, as considered by the AHS when discussing product data consistency issues, include:

- **Scale:** The compilation scale of an ENC and the corresponding paper chart may be different. The ENC does not have the constraints of paper chart size in determination of the area to be covered by an ENC cell and the optimum compilation scale for use in ECDIS at which it is to be compiled – ENC is only constrained by the 5Mb data size limit. Scale will become a greater issue in S-101 when the allowable compilation scale of ENC's will be restricted to an enumerated list equating to the standard radar range display scales.
- **ECDIS viewing display scale:** The mariner may view a single ENC cell at varying ECDIS display scales (including "overscale" display scales). These may be at display scales that fall between a particular ENC cell compilation scale (which may correspond to a particular paper chart) and the compilation scale of the next "smaller scale" navigation purpose ENC (which may correspond to the next smaller scale paper chart). To avoid screen clutter at these "intermediate" ECDIS display scales, it is recommended that the cartographer use the SCAMIN (scale minimum) attribute in order to cartographically "filter" the information displayed. Such use of the SCAMIN attribute directly effects the information that the mariner sees in the ECDIS, while in terms of the "corresponding" paper chart it is "what you see is what you get".
- **"Product specific" requirements:** Non-critical depths selected for ENC may need to be reselected on the paper chart to allow for positioning of compass roses and other paper chart specific information; or avoidance of other charted features (this may be a factor of the compilation scale as mentioned above).

- Product content display characteristics: The paper chart has no scope for varying the information on a single product that is provided to the mariner, while ECDIS has a range of viewing options that allow the mariner to optimise the information that they wish to view from the ENC to suit their navigational requirements and reduce screen clutter.
- Updating regimes: For paper charts, textual Notices to Mariners (NM), including chart correcting NM's and (T) and (P) NM's, must be manually plotted onto the chart by the end user. NM block corrections must similarly be transferred manually onto the paper chart. When a new edition of a paper chart is published, the mariner is required to purchase the new edition in order to keep their paper chart portfolio up to date. This labour-intensive requirement on the end user and possible additional financial overhead has resulted in a restriction on the chart update information that is recommended for promulgation via the Notices to Mariners system, and placed restrictions as to when a new edition of a paper chart should be published. For ECDIS, all changes to the SENC (System ENC) information are generally included as part of ENC update service provision at no additional cost to the end user (ENC maintenance is generally built into the ENC subscription cost). This includes both ENC Updates and new editions of ENC's. Additionally, the methods for applying these changes are much less labour intensive for the end user – multiple Updates and new editions of ENC's can be applied to the SENC as a single uploading process. This provides Hydrographic Offices with the scope to include much more “non-critical” information in ENC to fully incorporate new source, if they wish to do so. This “non-critical” information would not generally be considered in terms of updating the paper chart, but held back for inclusion in the next new edition of the chart.

An additional factor taken into account during discussions at the AHS is the transmission methods for update information between paper charts and ENC's, which can result in differing receipt times by the end user for paper chart Notices to Mariners and ENC Updates.

Conclusions

It is acknowledged that all the critical information required for charts as specified in S-4 must be included on both paper charts and ENC's, and where a particular paper chart and its corresponding ENC are intended to be used for the same purpose in navigation, then this critical information must be the same. However, due to the form and structure of the chart; the way the chart is used by the mariner to navigate; the requirement to amend non-critical information for product specific purposes; and the differing updating mechanisms, there may be differences between the content of paper charts and ENC's in terms of “non-critical” content.

Recommendations

1) Based on the analysis and conclusions above, it is recommended that a new specification similar to the following, stating what is meant by “consistency” of product content between paper charts and ENC's, be included in S-4:

Providing consistent information to the mariner in terms of corresponding ENC and paper chart content is critical in enhancing their confidence in using these different nautical chart products, particularly where both products may be utilised on the bridge. For paper charts and ENC's to be considered to be “consistent”, all information considered to be critical to navigation by the Hydrographic Office for the usage of the product must be included on both the paper chart and ENC, and this critical information must be same in terms of interpretation by the mariner, taking into account the differences in the structure and format of the product. Where such critical information is required to be amended, such changes must be applied to both the paper chart and ENC as simultaneously as possible, noting the differing maintenance methods used in chart updating (see B-600).

This specification could be included at B-170 (currently unused), or alternatively at B-100.6.

2) In regard to strengthening the specifications relating to chart updating to include the requirement for the equivalent of paper chart (T) and (P) NMs to be included as part of the ENC Update service, it is recommended that the following changes be made to Section S-4 – B-600:

- Remove the 3rd bullet point at the end of clause B-600;
- Add a new specification at the end of B-633.1 similar to:

For ENC, it is strongly recommended that temporary navigationally significant information be promulgated by ENC Update in order to provide the ECDIS user with an up to date System ENC (SENC).
- Add a new specification at the end of B-634.1 similar to:

For ENC, it is strongly recommended that preliminary navigationally significant information be promulgated by ENC Update in order to provide the ECDIS user with an up to date System ENC (SENC).

Justification and Impacts

In order for the mariner to be confident in the quality of the nautical charts that they rely on for safe navigation, it is important that there is a level of consistency between the information shown on paper charts and corresponding ENC's. To date, there is no guidance included in S-4 as to what is defined as "consistency" between the content of paper charts and ENC, which has resulted in some confusion within Hydrographic Offices and the initiation of additional ENC service provision such as the UKHO AIO.

The impact on Hydrographic Offices of ensuring ENC and paper chart consistency in line with the recommendations in this paper is unknown. However, it is hoped that these recommendations equate to "common sense", and therefore there will be minimal resultant impact. While application of ENC Updates that are the equivalent to paper chart (T) and (P) NM has not been mandated, the strengthening of the guidance to do so is in line with the recommendations of the HSSC, but will not invalidate a nation's current ENC service.

Action required of CSPCWG/NCWG

The CSPCWG is invited to:

- a. **Note** this Paper.
- b. **Discuss** the recommendations included
- c. **Determine**, if recommendation (1) is agreed, the appropriate location for the specification for defining ENC and paper chart "consistency" in S-4
- d. **Determine** other appropriate actions (if any)