Paper for Consideration by S-101 PT8
Alerts and Indications in S-101

Submitted by:	S-101PT Chair
Executive Summary:	This paper outlines Alerts and Indications in S-101 and considers how the Project could refine and enhance these in S-101. It presents recommendations on how this work could progress.
Related Documents:	S-52 Presentation Library S-101 Edition 1.1.0 ECDIS Safety Study
Related Projects:	S-101, S-100

Introduction / Background

1. Alerts and Indications provide one of the fundamental differences between vector Electronic Charts, raster charts and paper charts. As we develop S-101 it is necessary to review the alerts and indications ENCs provide both when used in concert with S-57 ENC data and in future when used as part of complete S-101 services. This is a significant topic but one of importance and this paper seeks to prompt discussion and identify further work; it does not form proposals at this stage. It is especially important that changes are done in close consultation with equipment manufacturers and most importantly end users.

2. It is widely understood that the alerts and indications provided by ECDIS can be excessive and this has been supported by evidence from incident reports. This has been well summarised in the qualitative Safety Study recently published by the UK and Danish Marine Accident Investigation Branches.

3. In order to make improvements to ENC data to improve user experience in ECDIS and to shape an improved experience in S-100 ECDIS using S-101 ENCs more quantitative analysis of Alerts and Indications is required.

Analysis/Discussion

4. Alerts and Indications in ECDIS result from a combination of;
   - Software rules implemented in ECDIS systems; these reflect S-52 (Annex A – *IHO ECDIS Presentation Library*) which is based on the IMO PS and through IEC 61174 S-64 provides corresponding test datasets;
   - Vessel inputs such as speed, heading and position from the various sensors connected to ECDIS;
   - ENC data which provides the objects and attributes which are subject to the software rules set out above These are listed in ANNEX A. It is relevant to note that the navigational hazards are a minimum and do not preclude the ability to select individually by object class or groups of objects; and

   Settings applied in ECDIS by the user. The following settings impact alerts and indications:
   - Safety Contour;
   - Safety Depth;
   - Areas for Which Special Conditions Exist;

- Vessel Look ahead/safety cone (object detection when monitoring);
- Cross track distance (object detection when planning).

5. There are also a broader set of alerts and indications which are not based on the ENC data and the recent ECDIS safety study refers to these. These often relate to the planned route. There is currently a lack of quantitative information on these alerts and indications which could be used to inform changes in S-101.

6. Type approval processes include tests which verify performance against these requirements and tests were significantly expanded in S-64 Edition 3.0.0 improving the consistency of Alerts and Indications.

7. Given the transition period where S-57 and S-101 ENC data will be used in the same system it is necessary to ensure that users receive consistent alerts and indications to avoid confusion. However, some steps can be taken in S-101 as follows (and some for S-57);

a) Provide guidance in the DCEG on the production of HD ENC in relevant areas and via RHCs and other organs encourage increased coverage of HD ENC (noting S-65 Annex A).

b) Provide guidance on the encoding of depth information on isolated dangers to encourage population wherever possible. Consider adding a validation check to highlight instances and prompt population.

c) Review and enhance guidance for features within the IMO Special Conditions Exist group highlighting when Information Area may be used to reduce alerts and indications but also setting out clearly that general information need not be included. Often this relates to information included in paper chart notes and which result in areas covering the whole ENC. The S-101 DCEG currently includes the following text:

"Information which may be of use to the mariner, but is not significant to safe navigation and cannot be encoded using other feature types, should be encoded using an Information Area feature (see clause 16.11), and using an associated instance of the information type Nautical Information (see clause 24.4), complex attribute information (see clause 29.9). This encoding is intended to reduce the number of alarms or indications generated in the ECDIS due to the overuse of Caution Area features."

8. The world beyond the transition period is outside the scope of this paper at this time. However, some ideas can be listed;

a) Adopt alerts and indications for vertical obstructions by adopting a new air draft parameter. Noting the planned integration of S-102 and S-104 data this could potentially simplify passage planning.

b) Allow users to deselect the Detection of Areas for which Special Conditions Exist. This approach allows a user to review this information during planning but then not be prompted during monitoring. It reflects that many of these are regulatory in nature and other means exist to make mariners aware of the associated risks/impacts.

c) Reduce the objects listed as Navigational Hazards noting the inclusion of Aids to Navigation, also consider making it a minimum requirement for these to be selectable in groups.

Conclusions

9. There is scope to improve the user experience of S-100 ECDIS by ensuring that S-101 ENCs are optimized in order to generate the minimum appropriate alerts and indications. This can be achieved by including the maximum required bathymetric information and by minimizing additional features which have limited importance to safe navigation. Some of the associated guidance could also be applied to S-57 ENC noting the planned conversion of data from S-57 to S-101. During the transition period it is not realistic to make changes to the associated rules but steps can be taken. As a first step in order to better inform this work more quantitative analysis would be very useful.

Recommendations

A. The Alerts and Indications set out in the S-52 Presentation Library should be used as the starting point for Alerts and Indications in S-101. Although modifications could be made, they must consider the use of S-101 ENC alongside S-57 and the need for a coherent user experience.

B. Explore conducting an analysis of Alerts and Indications based on a sample of typical vessel routes in various locations to provide more quantitative information on the number of alerts and indications currently generated by S-57 ENCs in ECDIS. Using trial S-101 data and HD ENC data compare the results.

C. Based on this analysis review the DCEG content for all relevant features and refine the guidance. Also consider additional validation checks to strengthen the guidance.

D. Review new S-101 features for potential inclusion in Alerts and Indications.

E. Engage with a range of end users on the Alerts and Indications in S-101 utilising testbeds and trials to gain detailed user feedback.

F. After the transition period or for vessels using S-101 ENC data only more significant refinements could be considered; while this is out of scope at this stage it could be useful for trials to explore this.

Objects in S-52 which provide Alerts and Indications

Group	S-52 Ref[1]	S-57 Objects	Geometric Primitive(s)	Type
AtoNs	10.5.9	BCNCAR	POINT	Indication
	10.5.9	BCNISD	POINT	Indication
	10.5.9	BCNLAT	POINT	Indication
	10.5.9	BCNSAW	POINT	Indication
	10.5.9	BCNSPP	POINT	Indication
	10.5.9	BOYCAR	POINT	Indication
	10.5.9	BOYINB	POINT	Indication
	10.5.9	POINT	POINT	Indication
	10.5.9	BOYISD	POINT	Indication
	10.5.9	BOYLAT	POINT	Indication
	10.5.9	BOYSAW	POINT	Indication
	10.5.9	BOYSPP	POINT	Indication
	10.5.9	DAYMAR	POINT	Indication
	10.5.9	LITFLT	POINT	Indication
	10.5.9	LITVES	POINT	Indication
	10.5.9	NEWOBJ	POINT	Indication
Overhead Obstructions	10.5.9	BRIDGE	POINT, LINE, AREA	Indication
	10.5.9	CBLOHD	LINE	Indication
	10.5.9	PIPOHD	LINE	Indication
	10.5.9	CONVYR	LINE, AREA	Indication
Obstructions	10.5.9	MORFAC	POINT, LINE, AREA	Indication
	10.5.9	FSHFAC	POINT, LINE, AREA	Indication
	10.5.9	ICEARE	AREA	Indication
	10.5.9	LOGPON	POINT, AREA	Indication
	10.5.9	OFSPLF	POINT, AREA	Indication
	10.5.9	OILBAR	LINE	Indication
	10.5.9	PILPNT	POINT	Indication
	10.5.9	PYLONS	POINT, AREA	Indication
	10.5.9	OBSTRN	POINT, LINE, AREA	Indication
	10.5.9	UWTROC	POINT	Indication
	10.5.9	WRECKS	POINT, AREA	Indication
	10.5.9	SOUNDG	POINT	Indication
	10.5.10	TSEZNE	AREA	Either
	10.5.10	ISTZNE	AREA	Either

[1] S-52 Annex A – *IHO ECDIS Presentation Library* – Part 1.

[2] RESARE has multiple entries based on attribute values but this table is simplified so these are not shown.

Areas, for which Special Conditions Exist	10.5.10	RESARE[2]	AREA	Either
	10.5.10	CTNARE	AREA, POINT	Either
	10.5.10	OSPARE	AREA	Either
	10.5.10	MIPARE	AREA, POINT	Either
	10.5.10	SPLARE	AREA, POINT	Either
	10.5.10	SUBTLN	AREA	Either
	10.5.10	ACHARE	AREA, POINT	Either
	10.5.10	MARCUL	AREA, LINE, POINT	Either
Safety Contour	10.5.12	DEPARE	AREA	Alert
	10.5.12	DRGARE	AREA	Alert
	10.5.12	FLODOC	LINE, AREA	Alert
	10.5.12	HULKES	POINT, AREA	Alert
	10.5.12	LNDARE	POINT, LINE, AREA	Alert
	10.5.12	PONTON	LINE, AREA	Alert
	10.5.12	UNSARE	AREA	Alert
	10.5.12	SLCONS	POINT, LINE, AREA	Alert