

SUB-COMMITTEE ON NAVIGATION,  
COMMUNICATIONS AND SEARCH AND  
RESCUE  
8th session  
Agenda item 13

NCSR 8/13/1  
9 February 2021  
Original: ENGLISH  
Pre-session public release:

## ANY OTHER BUSINESS

### Report on monitoring of ECDIS issues by IHO

Submitted by IHO

#### SUMMARY

*Executive summary:* This document reports on the status of IHO's ECDIS-related standards, presents a roadmap for the introduction of the next generation of S-101 Electronic Navigational Charts (ENC) and explains the resulting implications for existing and new ECDIS installations. It is part of the continuing monitoring by IHO of ECDIS issues related to the implementation of the carriage requirements in SOLAS regulations V/19.2.10 and 19.2.11.

*Strategic direction,  
if applicable:* 6

*Output:* Not applicable

*Action to be taken:* Paragraph 20

*Related documents:* Resolutions A.817(19) and MSC.232(82); MSC.1/Circ.1503/Rev.1, MSC.1/Circ.1593 and MSC.1/Circ.1595

## Background

1 In accordance with the directive agreed by the eighteenth International Hydrographic Conference (23-27 April 2012), the International Hydrographic Organization (IHO) continues to monitor the implementation of relevant IHO standards in ECDIS to ensure that issues identified with regard to the operation of ECDIS are collated, analysed, communicated and resolved as speedily as possible.

## Introduction

2 The use of ECDIS with official Electronic Navigational Chart (ENC) data sets contributes to the enhancement of the safety of navigation. In conjunction with the mandatory carriage requirements for ECDIS, all the IHO Member States have undertaken the necessary measures to meet their obligations to provide official ENC in the mandated data transfer standard, namely IHO S-57.

3 For the purpose of the cartographic functionality of ECDIS and the proper provision of data services, IHO maintains a suite of ECDIS-related standards, as referenced in the IMO Performance standards for ECDIS (resolution MSC.232(82), annex, appendix 1).

4 IHO's most relevant ECDIS-related standard is the transfer standard for digital hydrographic content S-57. This standard has been used for official ENC's since November 2000 and has not been technically updated since then. This period of consolidation has facilitated a stable technical environment for data production and dissemination services to reliably feed ECDIS installations delivered by a variety of Original Equipment Manufacturers (OEM) in compliance with the applicable IMO regulations on ECDIS. However, in the context of e-navigation and digitalization there is a need for an upgraded technology.

5 In support of digitization on board, the exchange of nautical information and the provision of maritime services in the context of e-navigation, IHO's S-100 Universal Hydrographic Data Model was adopted by IMO in 2011 as the basis for technical harmonization of data services providing navigation related information exchange. S-100 is a contemporary, more versatile standard – it incorporates the requirements of S-57 and is aligned with the ISO 19100 series of geographic information standards.

6 S-100 is the basis upon which a wider range of digital products and transfer standards for hydrographic and maritime services related applications are based. The e-navigation Strategy Implementation Plan (SIP) (MSC.1/Circ.1595, as may be updated) requires that Maritime Services should be S-100 conformant as a baseline. Several of the Maritime Services proposed in the SIP will be dependent on product specifications being developed by IHO within the S-100 standard. Under the IHO domain high-density depth information in a 3D format, real time hydrographical information such as water level and surface currents, maritime safety information (MSI) in ECDIS and sailing direction information could together contribute to high precision Under Keel Clearance (UKC) calculations for maximized loading and route optimization. These additional services and others, actually at the implementation stage, must be able to function in interoperability with a modernized version of the current ENC's.

7 The S-100 framework has matured to an extent that the regular production and dissemination of official ENC's in a new transfer standard, named IHO S-101, can now be envisioned. This new transfer standard is not substantially different from IHO S-57 in terms of cartographic content and maintains the same level in support for safe navigation, but it offers additional, substantial advantages:

- The operational elements of ECDIS software to process cartographic content can be more easily maintained since the display instructions are embedded in the dataset as part of the S-101 ENC delivery.
- S-101 ENC's enjoy a modernized method of encryption to improve robustness against cyber threats.
- The implementation of the capability to read and process S-101 ENC's, including the new encryption mechanism, offers the technical basis for future implementation of e-navigation services relevant to ECDIS as a crucial element of Integrated Navigation Systems (INS), as described above.

8 The enhancement of ECDIS functionality to include S-101 ENC's as a mandated transfer standard is a logical and necessary step towards the implementation of the e-navigation concept of harmonized Maritime Services.

## Status of IHO ECDIS-related standards

9 In accordance with *ECDIS – Guidance for good practice* (MSC.1/Circ.1503/Rev.1), the up-to-date list of all the relevant IHO standards and publications relating to ECDIS can be accessed from the IHO website (<https://iho.int/en/standards-in-force>). The ECDIS-related information on the IHO website was updated on March 2020 to reflect the revision of Edition 1.2.1 of S-63, which includes a minor clarification providing guidance to more formally structure the README.TXT file. There is no impact from this clarification on ECDIS.

**Table 1 – Status of IHO ECDIS-related standards**

<b>Designation</b>	<b>Normative reference for the type approval of ECDIS systems referring to the fourth edition of IEC 61174 (2015)</b>
<i>S-57 – Transfer Standard for Digital Hydrographic Data</i>	Edition 3.1 (November 2000), in conjunction with: - Supplement 3 (June 2014) - S-57 Maintenance Document No. 8 (March 2002)
<i>S-52 – Chart Content and Display Aspects of ECDIS</i>	Edition 6.1(.1) (October 2014 – with clarifications up to June 2015)
<i>S-52, Annex A – IHO Presentation Library for ECDIS</i>	Edition 4.0(.2) (October 2014 – with clarifications up to July 2017)
<i>S-64 – IHO Test Data Sets for ECDIS</i>	Edition 3.0.2 (July 2017)
<i>S-61 – Product Specification for Raster Navigational Chart</i>	Edition 1.0 (January 1999)
<i>S-63 – IHO Data Protection scheme</i>	Edition 1.2(.1) (March 2020)

10 As a way to enhance safe navigation at sea in the current technical circumstance, IHO has released a new publication, *S-67 – Mariners' Guide to Accuracy of Depth Information in ENC*, that provides guidance on the accuracy and reliability of depth information and position in ENCs. S-67 is available for download at: <https://iho.int/en/standards-and-specifications>. This publication will assist mariners to make informed decisions based on the data in their onboard navigation systems with an awareness that the actual location of potential dangers may substantially differ horizontally and vertically from what is charted.

11 In addition, a guidance document has been produced, providing "[Information on ENC Generalization, Over-Scaling and Safety Checking Functions in ECDIS](#)" and published on the IHO website. It focuses on the importance of understanding ENC compilation scale and the safety implications of using ENC data beyond its intended usage, during both the ECDIS route planning and checking and route monitoring phases of navigation.

## S-100 Implementation Roadmap

12 The second session of the IHO Assembly (16-18 November 2020) endorsed the IHO S-100 Implementation Roadmap for a transition plan aiming for the regular and harmonized production and dissemination of S-100 based products. The S-100 Implementation Road map is planned to be reviewed annually by the IHO Council to guarantee

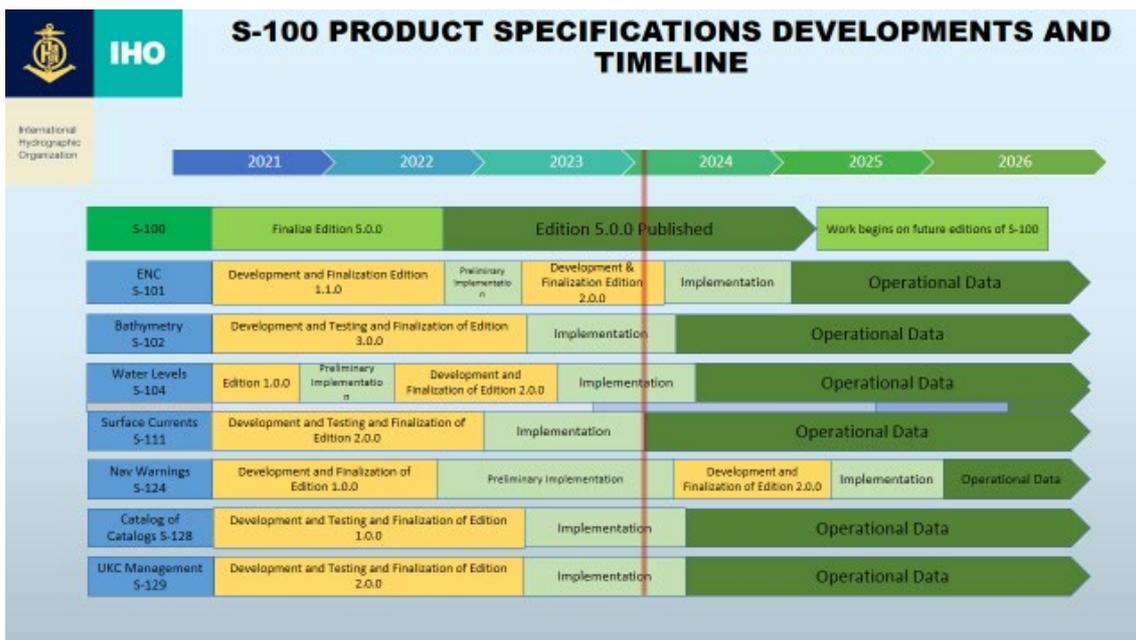
the smooth integration in end user devices such as ECDIS and are composed of two steps covered by the S-98 interoperability specification for ECDIS as follows:

- 1st step: Navigational Route Monitoring Mode
  - S-101 ENC
  - S-102 Bathymetry (High density depth information in 3D)
  - S-104 Water Level
  - S-111 Surface Currents
  - S-124 Navigational Warnings
  - S-128 Catalogue of Catalogues (Control of authoritative services)
  - S-129 UKC Management
- 2nd step: Navigational Route Planning Mode (+ used in Monitoring Mode)
  - S-122 Marine Protected Areas
  - S-123 Marine Radio Services
  - S-125 Marine Navigational Services
  - S-126 Marine Physical Environment
  - S-127 Marine Traffic Management
  - S-131 Marine Harbour Infrastructure

**Implementation decade (2020-2030) for IHO S-101 ENCs as a transfer standard for official charts in ECDIS**

13 The IHO S-101 ENC product specification will be technically ready and exhaustively tested for regular production of S-101 ENCs by the end of 2023 as shown in figure 1. It is expected that from 2024 S-101 ENCs will be produced through export from commercially-developed upgraded database-driven ENC production systems.

14 The IHO Council, at its fourth meeting in November 2020, endorsed the S-100 implementation decade (2020-2030) which includes regular production and distribution services for S-100 based products commencing with the achievement of regular service provision of substantive geographic coverage of S-101 ENC in 2024.



**Figure 1 – S-100 product specification development and timeline**

15 IHO has collaborated closely with industry in the development of data production and encryption software ready to support safe and continuous production and dissemination of S-101 ENC. IHO Member States have started work on a harmonized approach to enable ENC producing hydrographic offices to provide S-101 ENCs for their respective areas of responsibility, in parallel to the established production of S-57 ENCs. S-101 ENC distribution will happen via the established dissemination network in partnership with commercial chart suppliers.

16 In order to make S-101 ENC compatibility legally binding for new ECDIS, IHO proposed to NCSR 7 for the consideration of amendments to resolution MSC.232(82) on *Revised performance standards for electronic chart display and information systems (ECDIS)*, to include references to the S-100 framework and the Product Specification S-101. In order to maintain ECDIS devices already installed on SOLAS ships, which are technically not ready nor required to be upgraded to S-101 ENC compatibility, and to comply with the applicable IMO regulations pertaining to existing navigation equipment, IHO is committed to ensure that identical coverage will be provided for S-57 ENCs and S-101 ENCs for a transition period until there is no significant number of legacy (S-57 based) systems in use at sea and all ECDIS in operation have become S-101 compatible. During the transition period, IHO will support both S-57 and S-101 formats as the 'Dual Fuel' concept, final details of which are to be confirmed.

17 NCSR 7 agreed that the amendments to resolution MSC.232(82) could be considered under the existing output on the Committee's post-biennial agenda on "Revision of ECDIS Guidance for good practice (MSC.1/Circ.1503/Rev.1)" pending approval by the Maritime Safety Committee (MSC). MSC 102 agreed with the recommendations of the Sub-Committee regarding consolidation and renaming of outputs, but the Committee did not approve their inclusion since there would not be sufficient time to address those outputs properly during this biennium, due to the rescheduling of NCSR 8 in view of the pandemic.

18 In view of the decision by MSC 102, which is well understood and respected, IHO will commit to, in preparation for NCSR 9 and to assist the revision process, submit draft amendments for both resolution MSC.232(82) and MSC.1/Circ.1503/Rev.1 under the relevant agenda item, if included, or otherwise under "Any other business" as "Report on monitoring ECDIS issues" to NCSR 9 for consideration by the Sub-Committee.

19 Apart from what is proposed by IHO, it is recognized that, in the context of the e-navigation Strategy Implementation Plan, there could be other initiatives proposing amendments to resolution MSC.232(82). Any such initiative should be coordinated with this IHO initiative.

#### **Action requested of the Sub-Committee**

20 The Sub-Committee is requested to:

- .1 note the maintained status of IHO's ECDIS-related standards;
- .2 acknowledge the S-100 implementation decade of IHO to support the IMO e-navigation Strategy Implementation Plan (MSC.1/Circ.1595) and the ongoing effort to develop and test S-100 based data product specifications;
- .3 acknowledge S-101 ENCs as a transfer standard for official charts in ECDIS;

- .4 consider earlier commencement of the output to amend appendix 1 of resolution MSC.232(82) in preparation for the next biennium, noting the offer by IHO to submit draft amendments for both resolution MSC.232(82) and MSC.1/Circ.1503/Rev.1; and
  - .5 take any other action it considers appropriate.
-