6th MEETING

OF THE IHO COUNCIL

Monaco, 18 – 20 October 2022

REPORT OF THE IHO HYDROGRAPHIC SERVICES AND STANDARDS COMMITTEE, HSSC

**REPORT[1] OF THE IHO HYDROGRAPHIC SERVICES AND STANDARDS COMMITTEE
TO THE 6TH MEETING OF THE IHO COUNCIL**

References*:*

- A. *List of Decisions and Actions from C-5 affecting HSSC*
- B. *List of Decisions and Actions of HSSC-14*
- C. *IHO CL 20/2022 Call for Approval of Amendments to IHO Resolutions*
- D. *IHO CL 21/2022 Call for approval of Edition 2.1.0 of the IHO Publication S-102 "Bathymetric Surface Product Specification*
- E. *IHO CL 24/2022 Call for Approval of Publications S-57, S-58 and S-99*
- F. *IHO CL 25/2022 Call for the approval of edition 6.1.0 of S-44 - IHO Standards for Hydrographic Surveys and Edition 3.0.0 of B-12 – Guidance for Crowdsourced bathymetry*

Annexes:

- A. *Proposed New IHO Resolution xx/2023 on the S-100 Implementation*
- B. *Draft revised version of the Roadmap for the S-100 Implementation Roadmap, Annex 2*
- C. *Proposed Annex 4 to the Roadmap for the S-100 Implementation Decade (2020-2030), Executive Summary of Dual Fuel Concept for S-100 ECDIS*

Introduction

1. The 14th Hydrographic Services and Standards Committee (HSSC) meeting took place from 16 – 19 May 2022 in Denpasar-Bali, Indonesia + VTC (Hybrid Meeting), as announced by the IHO CL 05/2022.

   The meeting was guided by HSSC main principles dealing with the promotion and the coordination of the development of standards, specifications and guidelines for official products and services in order to meet hydrographic information requirements for mariners and other users.

   As consequence of the inputs from C-5 (see Reference A), the 14th meeting of HSSC was characterized by two main levels of discussion:

   1. An <u>operational/strategic level</u>:

      a) The review of the IHO Resolutions as a consequence of the S-100 implementation (C5/05, Reference A-2 PRO 2.3)
      b) The maintenance of the Roadmap for the S-100 Implementation Decade (2020-2030) and the associated Annex 2 related to Work Programme 2 (C5/07 and C5/25)
      c) Dual Fuel Concept for S-100 ECDIS including various options offered to HOs for future production of S-101 ENCs in conjunction with S-57 maintenance/production (C5/10 and C5/13)
      d) Revision of the IMO Resolution MSC.232(82), Revised Performance Standards for ECDIS (C5/11)
      e) The implementation of the recommendations on the Future of the Paper Nautical Chart (C5/12)
      f) Follow up on themes and projects already started and to be considered by the IHO-Singapore Innovation and Technology Lab (Action C5/29)

   2. A <u>technical level</u>:

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[1] Report to C-6 and also Summary Report of HSSC-14. See Action C5/14 that states "*Considering the timelines between HSSC-14 and IRCC-14 meetings in 2022 and the countdown for submission of reports and proposals to C-6, the Council invited HSSC and IRCC Chairs to prepare their 2022 meeting minutes with the view that they will be used/submitted directly as reports and proposals to be considered at C-6*".

a) Progresses in the development of the S-1xx Product Specifications

b) Progress of the work plans (items outside S-100) of subordinate bodies

The list of Decisions and Actions from HSSC14 is provided in Reference B.

Technical Programme Coordination

2. This document reports on the progress of the ongoing implementation of the IHO Work Programme 2022 and the three-year Work Programme for 2021 – 2023 that takes into account HSSC Work Plan inputs provided by WGs/PTs Chairs during the 14th HSSC meeting. It also suggests inputs to the coming IHO Work Programme 2023 – 2026.

Difficulties and challenges yet to be addressed

3. The Covid-19 pandemic has continued to limit face-to-face meetings. Despite the pandemic and the limitations with VTCs most of the actions agreed in May 2021 at HSSC13 and tasked at C-5 progressed successfully anyway, but there have been clear challenges with more complex discussions not being properly addressed due to VTC meeting time constrains. Therefore, the ability to have face-to-face meetings again is most welcomed and is expected to speed up the progress. All Working Groups are expected to have one face-to-face meeting before next HSSC15.

4. The S-100 timeline has been communicated by IHO with other international organisations such as IMO, IEC, INTERTANKO and CIRM. At the IMO NCSR9 Meeting in June 2022 the proposal, initiated by IHO, to include S-100 as a valid format in ECDIS was endorsed. Final agreement to be made by IMO MSC106 in November 2022. The proposal to IMO has been based on the IHO S-100 timeline and it is now of outermost importance to keep the timeline for S-101 and associated S-100 product specifications.

5. To meet the commitments made to other organizations it is a critical to encourage IHO Member States and wider stakeholders to actively support the development of S-101 and other product specifications to secure that IHO can deliver the operational editions in accordance with the current timeline. It will even be a need to accelerate where possible, particularly with delivery of operational versions of S-128, S-164 and S-98.

6. HSSC has a critical vacancy at the position of Data Quality WG Chair and Secretary and there is a risk that DQWG activities are put on hold (Chairpersonship interim by Vice-Chair for urgent matters only). The importance that IHO could handle quality issues properly cannot be underlined enough since S-100 products will be interoperable with each other. An inactive DQWG will hamper the S-100 development and it is critical that IHO MS nominate officer's bearers to this important WG.

Achievements/outputs/conclusions

The implementation of the IHO Strategic Plan

7. The IHO Strategic Plan was agreed upon by the IHO Assembly 2. Subsequently the following Council 4 meeting decided to implement the Strategic Performance Indicators (SPIs). SPIs allocated to HSSC has been reported in January 2022. The dashboard below shows the figures and this format was presented at HSSC14 as good example on how the SPIs could be reported.

	Goal 1 : Evolving the hydrographic support for safety and efficiency of maritime navigation			Goal 2 : Increasing the use of hydrographic data for the benefit of society
	1.1 DELIVER STANDARDS FOR HYDROGRAPHIC DATA AND SPECIFICATIONS OF HYDROGRAPHIC PRODUCTS		1.2 DEVELOP STANDARDS & SPECIFICATIONS	2.2 PROMOTE NEW TOOLS AND METHODS
	1.1.1 Member States produce & deliver products based on S-100	1.1.2 Number of hydrographic data products and services based on S-100	1.2.1 Percentage of Hydrographic data product and services based on S-100	2.2.2 Number of new applications of the new version of Standards for Hydrographic Surveyx (S-44)
Target	2026 : 60% of MS distribute at least 1 product*	2026 : 10** Product Specifications are operational (Edition 2.0.0)	2026 : 100% of PS** includes cyber security and data quality assessment	Number of downloads of S-44 Edition 6.0.0 and following ones
Value 31/12/2021	**0% of MS distibute official products** *Several MS distribute S-102 & S-111 compliant with current editions of PS*	**0/10** *S-100 Edition 2.0.0 approved at HSSC 14*	**0%** *No PS in Edition 2.0.0*	59
	* Based on that 62 of 94 IHO MS produce S-57 ENCs (March 2021) ** S-101, S-102, S-104, S-111, S-122, S-124, S-127, S-128, S-129, S-131			

Figure 1; Dashboard on Strategic Performance Indicators allocated to HSSC. Updated 31st December 2021.

The implementation of the Roadmap for the S-100 Implementation Decade (2020 – 2030)

8. Following a proposal (PRO 2.3) by the ROK at A-2 and Council action C5/05, to review the IHO Resolutions when the operational implementation of S-100 concept becomes mature enough, the IHO Secretariat prepared amendments to applicable resolutions to HSSC14. HSSC endorsed these recommendations and an IHO Circular Letter (CL 20/2022, Reference C) has been distributed to IHO Member States for approval of four amended IHO Resolutions. As a consequence of the implementation of S-100 further amendments and an additional resolution will be required, as described in the mentioned Circular Letter (Reference C). In the case of the new resolution on the S-100 Roadmap and the IHO commitment against IMO, see proposed IHO Resolution in Annex A to this report. **HSSC invites the Council to endorse the new Resolution on S-100 and then to submit the proposal to be adopted by A-3**.

9. The preparation of S-100 product specifications is progressing according to the plan presented at Council 5, with some minor adjustments. In accordance with Council actions C5/07 and C5/25, HSSC is contributing to maintain the S-100 Roadmap. Since C-5 it has become clearer that in order to achieve usage of S-100 products in future S-100 ECDIS it is critical to also develop the supporting framework in accordance with the S-100 timeline and even in some cases to speed up this development. The critical S-100 framework consist of the IHO Geospatial Information (GI) Registry, S-100, the newly developed Interoperability Specification (S-98, Ed. 1.0.0 – see paragraph 21 and 22), the likewise newly developed Catalogue of Nautical Products (S-128, Ed. 1.0.0 – see paragraph 24) and the not yet developed Test Data Set for S-100 and ECDIS Type Approval (S-164). HSSC would like to underline the importance to prioritize also the Critical Framework which is proposed to be reflected in the updated version of Annex 2 to the S-100 Roadmap. **The Council is invited to approve the revised version of Annex 2, including the priority of the Critical S-100 Framework and an updated S-100 timeline.** See Annex B to this report.
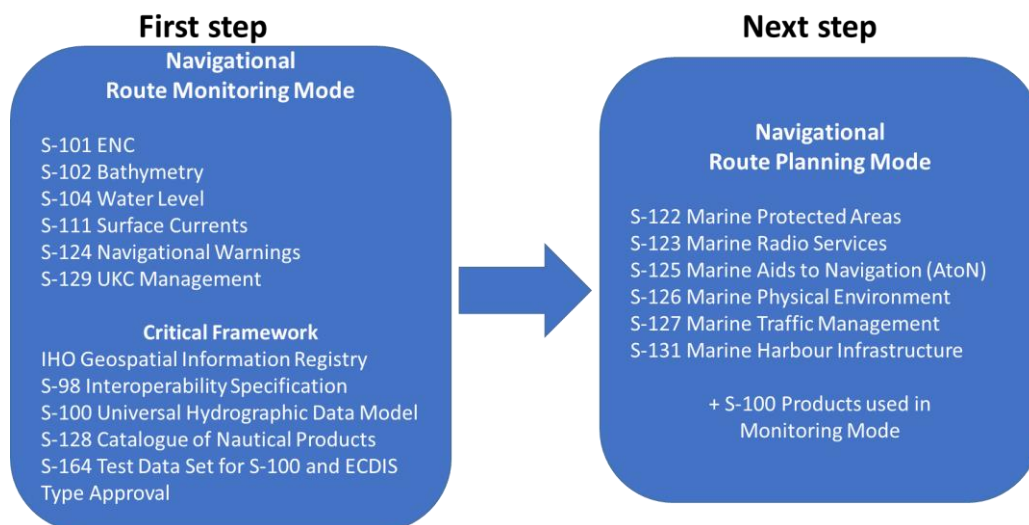

Figure 2; The S-100 Implementation Priorities should also reflect the Critical Framework needed for usage of S-100 products in future S-100 ECDIS.

Table A – IHO list of S-100 products with special focus	
First step – Route monitoring mode	
S-101	Electronic Navigational Chart (ENC)
S-102	Bathymetric Surface
S-104	Water Level Information for Surface Navigation
S-111	Surface Currents
S-124	Navigational Warnings
S-129	Under Keel Clearance Management
Critical Framework	
	IHO Geospatial Information Registry

S-98	Interoperability Specification
S-100	Universal Hydrographic Data Model
S-128	Catalogue of Nautical Products
S-164	Test Data Set for S-100 and ECDIS Type Approval
Second step – Route planning mode	
S-122	Marine Protected Areas
S-123	Marine Radio Services
S-125	Marine Aids to Navigational (AtoN)
S-126	Marine Physical Environment
S-127	Marine Traffic Management
S-131	Marine Harbour Infrastructure

Figure 3 The S-100 Implementation Priorities, as described in the S-100 Roadmap Annex 2, should be updated to reflect the additional priorities on the Critical Framework specifications.

10. The S-100 timeline for the prioritized IHO Product Specifications, available in the S-100 Roadmap Annex 2, has been updated with some minor adjustments. Overall the timelines are in line with the set targets, but resources are needed to keep the timeline and in some cases also speed up the progress in order to meet the commitments IHO has made towards especially IMO and IEC, but also towards other stakeholders. IEC has made clear that the development of the product specifications, as described above as the critical S-100 framework, are especially important for them in order to revise their ECDIS Test Standard (IEC 61174) to include support for S-100. The importance of S-164 Test Data Set for S-100 and ECDIS Type Approval has been highlighted. Close cooperation between IHO and IEC is needed to keep track of this critical path towards S-100 implementation.

11. HSSC has been working with the development of a governance document in support of the Dual Fuel Concept for S-100 ECDIS using S-101 ENCs in parallel to S-57 ENCs. In accordance with Council action C5/10 HSSC can now present the first version of the *Dual Fuel Concept for S-100 ECDIS*. An Executive Summary and the full report is presented as Annex B to this report. **HSSC invites the Council to endorse the Executive Summary and the full report.** If endorsed by the Council, HSSC propose that the Council submit the summary and the report to A-3 for approval by Member States. It is suggested that the Executive Summary will be included as an Annex 4 to the S-100 Roadmap and the full report as an appendix to annex 4. It will subsequently be maintained by HSSC, through the S-100WG, on a regular basis.

12. In addition to the Dual Fuel Concept for S-100 ECDIS it should also be noted that the ENCWG has developed a S-57 ENC to S-101 Conversion Guidance which was approved in its first edition at HSSC14 (S-65 Edition 1.0.0). Since it is the first edition, it is for implementation and testing and then to be further developed. HSSC14 also tasked the ENCWG to develop an encoding guidance for the backward conversion from S-101 to S-57. All these initiatives are aimed to support the transition from S-57 ENCs to S-101 ENCs, so IHO MS can achieve substantial coverage of S-101 ENC in advance of the new IMO ECDIS Performance Standards in force dates.

13. IMO MSC104, agreed in October 2021, upon an output to revise the IMO MSC.232(82) resolution on ECDIS Performance Standards to include support for S-100. As agreed upon at HSSC13 IHO organized a drafting group consisting of relevant parts of the HSSC Chair group, CIRM, IEC, INTERTANKO and a few other relevant stakeholders. The drafting group was chaired by the IHO Technical Director and a draft redline version of a proposed MSC.232(82) resolution was submitted to the IMO NCSR9 meeting, held in June 2022.

14. In addition to the inclusion of S-100, the proposal also included editorial changes and based on user experience, some functional changes aimed to improve safety. The proposal also introduced a mandatory support for standardized route exchange. However, NCSR9 considered that the inclusion of route exchange was outside the scope of the existing output and all text related to route exchange was withdrawn. All other proposed changes were endorsed by NCSR9. NCSR9 also endorsed an implementation phase for the new

resolution, including S-100. A transition period was agreed upon, meaning that S-100 ECDIS will be legal to use after **1 January 2026** and from **1 January 2029** new systems must comply with the new IMO Resolution on ECDIS Performance Standards.

15. The inclusion of S-100 in the IMO regulatory framework should be seen as a major success for IHO, but it also means that IHO with its Member States clearly need to meet the deadlines setup in the S-100 timeline. IHO has now commitments towards IMO and other stakeholders to achieve operational status on the prioritized S-100 product specifications and Member States to achieve substantial coverage of S-101 until 2026. Already A-1, 2017 decided (decision A1/08) that "The Assembly urged Member States to contribute more actively to the implementation of Programme 2 and to maintain the relevant expertise.". More active contribution is certainly needed now, but it is not enough to just maintain relevant expertise, it must be increased. Given that the first into force date, 1 January 2026, is in the end of the coming IHO work programme, **HSSC invites the Council to recommend the A-3 that Goal 1 and its Targets in the IHO Strategic Plan should have the highest priority in the 2023 – 2026 Work Programme.**

The implementation of the recommendations on the Future of the Paper Nautical Chart

16. As requested by Council 5 (C5/12) the HSSC and the Nautical Cartography Working Group (NCWG) has continued to work on the implementation of the recommendations given in the Future of the Paper Nautical Chart report. The NCWG has established a sub-WG (Baseline Portrayal Project Team, BSPT) to develop a Baseline Symbology aiming to support the automated production of paper charts from S-101 data. BSPT had a slight delay initially, but is in progress since December 2021. There are no other status changes on the other recommendations since C-5.

17. At HSSC14 quite a few Member States argued that they were not content with the recommendations given in the Future of the Paper Chart report, which was endorsed by the Council and approved by A-2 (A2/27). A varied approach might be needed to achieve better guidance on the future of the paper chart when the paper chart more and more is seen as a complementary product to ECDIS or other Electronic Chart Systems. HSSC and NCWG is of the opinion that the Chart Specification S-4 gives enough flexibility ("Must", "Should" and "May" is stated). It should also be noted that paper charts are still being used as a primary navigation tool in many parts of the world and by several different user groups, especially outside the SOLAS market. **HSSC invites the Council to discuss if an alternative approach is needed for the future of the paper chart, to be approved by A-3.**

Follow up on themes and projects already started and to be considered by the IHO-Singapore Innovation and Technology Lab

18. The Council tasked HSSC, see action C5/29, to encourage ENCWG and NIPWG to manage their project applications through the IHO-Singapore Lab on S-57 to S-101 conversion and a database for Marine Harbour Information (S-131) respectively. The Marine Harbour Information project has started up with the support of the Lab and for the S-57/S-101 conversion project there are still some discussions between ENCWG and the Lab on how to structure a possible project.

Progresses in the development of the S-1xx Product Specifications

19. As mentioned above the development of the S-1xx product specifications is progressing more or less as expected. The more detailed timeline for all planned S-1xx specifications is found in Annex 2 to the Roadmap for the S-100 Implementation Decade (2020 – 2030).

20. HSSC14 approved the first 1.0.0 editions of the Product Specifications for Interoperability S-98, Water Level S-104 and the Catalogue of Nautical Products S-128. They are now ready for experimenting and testing in liaison with industry partners. HSSC14 also endorsed the new editions of S-99 (Management of the S-100 GI Registry), S-100 ed 5.0.0 and Bathymetry S-102. For S-99 and S-102 IHO Circular Letters have been published in June (CL 21/2022 for S-102, Reference D and CI 24/2022 for S-99, Reference E) for Member States approval. The new edition of S-102 (2.1.0) has a new scope towards navigation, but it could still be used for data exchange outside navigation. The operational version of S-102,

with the navigational scope, will be edition 3.0.0 and is expected in 2024. A Circular Letter for the approval of S-100 edition 5.0.0 is expected in September 2022.

21. It should be understood that S-100 fundamentally changes what is on the ECDIS. The single layer official S-57 ENCs will be replaced by multiple, interacting layers of navigational data. Though, the S-101 ENC will always be the navigational base layer. In the new IMO Performance Standards for ECDIS, which was endorsed at the IMO NCSR9 meeting in June, the term *Electronic Navigational Data Service (ENDS)*[2] is used for the multiple layers to be used in S-100 ECDIS. S-98 is the product specification which will handle how multiple layers are portrayed and how alarms are triggered. An example of a usage with clear potential, in areas with critical under keel clearance, is the combination of S-101 ENC, S-102 Bathymetry and S-104 Water Level Information. S-98 will define how S-104 water level information is used to adjust the S-102 depth values and then further how a safety contour is drawn based on the adjusted depth values. Subsequently this depth information will suppress the depth information in the S-101 ENCs.

22. It should be understood that the functionalities S-98 enables, with interleaving, suppression and replacement of the ENC content is a change from the existing S-57 ENC regime where the ENC content is untouchable. The approved S-98 edition 1.0.0 is for experimentation and testing and it should be noted that the criteria and process for determining what data is superior are yet to be determined. **HSSC invites the Council to note the strategic change in S-100 ECDIS with interacting navigational data layers, enabled by the Interoperability Specification S-98.**

23. The development of the Product Specification of ENC S-101 is still following the timeline presented at Council-5. The operational edition will be ready in 2024. However, there is a critical need to encourage IHO Member States and wider stakeholders to actively support the development of S-101. The Project Team is under pressure. To secure the development as far as possible, the HSSC ISO 9001 cell follows the S-101 progress and has identified challenges on the resilience of the IHO GI Registry. That such challenges have been identified proves the usage of the ISO 9001 Cell. The IHO Secretariat in liaison with KHOA and the ISO 9001 Cell will now consider recommendations for a reliable and more robust situation for the IHO GI Registry.

24. The scope of S-128 has changed from a pure catalogue of products to both a catalogue of products and a service to provide a machine readable way to verify the up-to-dateness of the data in ECDIS. The extended scope comes with an extended responsibility placed on data producers and may move the production of S-128 from optional to mandatory to fully provide the end users an accurate report of up-to-dateness of the onboard data. NIPWG in liaison with S-100WG will provide an input paper to WENDWG13 regarding responsibility of stakeholders in producing and dissemination of S-128 data. It is expected that the RENCs could have an important role to compile S-128 data, but it is still to be determined.

25. For the product specification S-125 HSSC14 approved a name change to *Marine Aids to Navigation.* S-125 is developed in liaison with IALA. It should be noted that a Joint IALA/IHO Workshop on S-100/200 development and portrayal will be arranged in Norway, 5 – 9 September 2022.

26. The MASS PT (Maritime Autonomous Surface Ships) presented their first status report at HSSC 14. A final report is expected at HSSC15 or 16. Regarding the development of S-130 the S-130 PT on Polygonal Demarcation of Global Sea Areas has been established during the first half of 2022 and the PT gave their first status report at HSSC14. An operational edition of S-130 is expected 2024.

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[2] *Electronic Navigational Data Service* (ENDS) means a special-purpose database compiled from nautical chart and nautical publication data, standardized as to content, structure and format, issued for use with ECDIS by or on the authority of a Government, authorized Hydrographic Office or other relevant government institution, and conforming to IHO standards; and, is designed to meet the requirement of marine navigation and the nautical charts and nautical publications carriage requirements in SOLAS regulations V/19 and V/27. The navigational base layer of ENDS is the Electronic Navigational Chart (ENC).

Progress of the work plans (items outside S-100) of subordinate bodies

27. Other work items outside the development of S-100 is progressing well within the HSSC working groups. An updated consolidated HSSC work plan is available at the IHO HSSC website (under Miscellaneous). However, due to the vacancy at the Chair and Secretary position in the Data Quality Working Group, DQWG, it is a clear risk that DQWG activities are put on hold. An inactive DQWG will hamper the S-100 development and it is critical that IHO MS nominate officer's bearers to this important WG.

28. The ENCWG has finalized a revision of the Use of the Object catalogue (S-57 Annex A) and the new edition of the ENC Validation Checks (S-58 edition 7.0.0). An IHO Circular Letter has been published in June (CL 24/2022, Reference E) for Member States approval.

29. The Hydrographic Survey Working Group, HSWG, has been established since June 2021 and they have progressed well during the period. HSSC14 endorsed the Hydrographic Survey Standard S-44 draft Edition 6.1.0 and an IHO Circular Letter (CL 25/2022, Reference F) has been issued in June 2022 for IHO MS approval. HSWG has also established two new Project Teams, one in charge of the revision of C-13 - *Manual on Hydrography* and the second on Satellite Derived Bathymetry. The Project Team on the revision of C-13 will consult the relevant IRCC bodies (IBSC and CBSC) before a revised edition of C-13 is presented to HSSC for approval.

30. In light of discussions in the Hydrographic Dictionary Working Group, HDWG, HSSC14 agreed upon that the term "Hydrospatial" is not a technical term. Within IHO technical standards the term hydrography or other relevant disciplines should continue to be used. Hydrospatial should be considered a slogan. Given this, the term shall not be included in the Hydrographic Dictionary.

Next HSSC Meeting, HSSC15

31. HSSC15 will take place in Helsinki Finland 8-12 May 2023, with one day reserved for a Stakeholder session.

Actions required of the Council

The Council is invited to:

a)   Note the Report

b)   Endorse the new IHO Resolution on S-100 and then to submit the proposal to be adopted by A-3. See Annex A to this report.

c)   Approve the revised version of S-100 Roadmap, Annex 2, including the priority of the Critical S-100 Framework and an updated S-100 timeline. See Annex B to this report.

d)   Endorse the Dual Fuel Concept for S-100 ECDIS Executive Summary and the full report. See Annex C to this report. HSSC also propose that the Council submit the Executive Summary and the report to IHO Assembly-3 for approval by Member States.

e)   Recognizing the commitments made towards IMO, IEC and other stakeholders on the S-100 implementation, that the Council recommends A-3 that Goal 1 and its Targets in the IHO Strategic Plan should have the highest priority in the 2023 – 2026 Work Programme.

f)   Discuss if an alternative approach is needed for the future of the paper chart, to be approved by A-3.

g)   Note the strategic change in S-100 ECDIS with interacting navigational data layers, enabled by the Interoperability Specification S-98.

h)   Take any other action as it may consider appropriate