15th Meeting of the Hydrographic Services and Standards Committee

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C T O, ChartWorld Group

S-100 deployment – the Manufacturer and Service Provider perspective

HSSC-15, Helsinki, Finland, 5 – 9 June 2023

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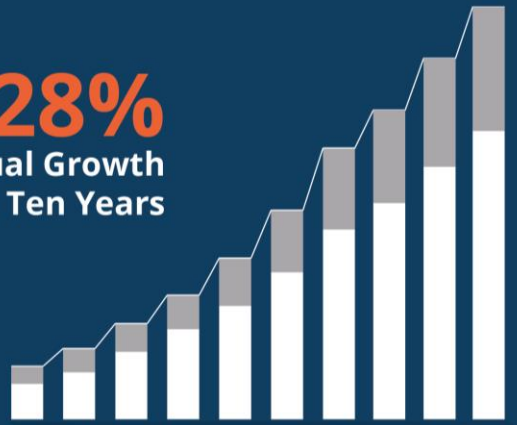
CHARTWORLD GROUP STRUCTURE

TELEDYNE TECHNOLOGIES INCORPORATED

ChartWorld Group

12,150 Active Vessels

+28%
Annual Growth
Last Ten Years



21,350 Subscribed Services

5 Offices

Hamburg	100
Singapore	27
Limassol	16
Vancouver	8
Tokyo	3

3 Solution Teams

OnBoard OnRoute OnShore

Navigation Experts
154

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ECDIS AS A SERVICE

eServe

- A lifetime upgrade program for HW and SW
- Help in adjustments to shipping company SMS
- User training and post-voyage use assessment
- Certified APT
- Maintenance in accordance with **MSC.1/Circ.1503/Rev.2**
- ENC and other digital data supply
- 24/7/365 support

ECDIS Solutions

TO KEEP IN MIND…

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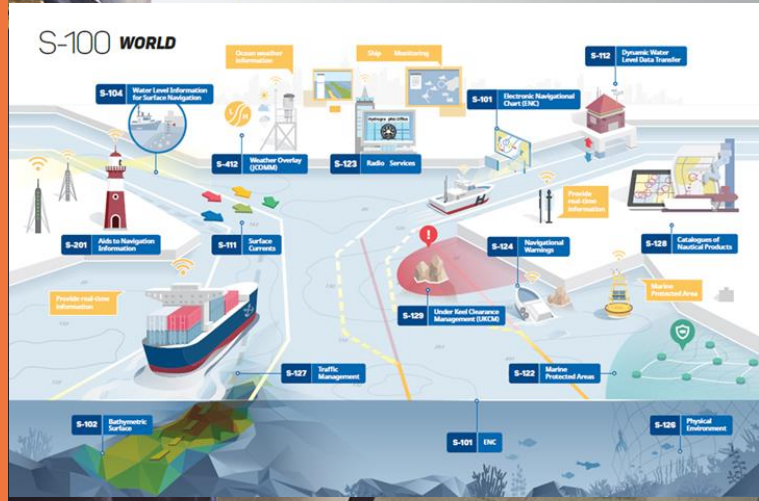
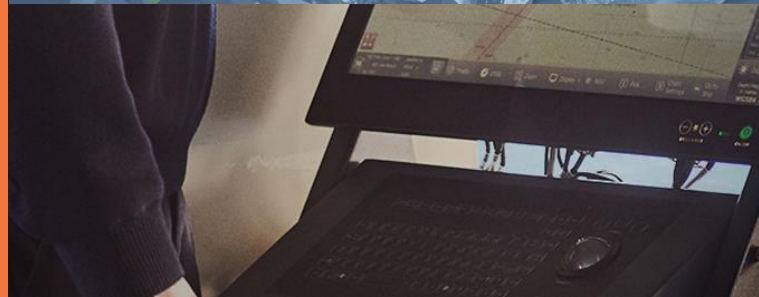
- 25 years ago shipping industry was more tolerant of “trial and error” approach in lieu of new navigation safety benefits while ECDIS was making its first steps.
- Today we have well established level of ECDIS use with a lot of arrangements in place (availability of reliable ECDIS, worldwide S-63 data coverage and well-established distribution, ECDIS training and familiarisation for mariners, etc.)
- Shipping industry has high expectations for S-100 ECDIS introduction, regarding “maturity” of the whole solution.





NEW REQUIREMENTS IN IMO PERFORMANCE STANDARD MSC.530 (106)

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- IMO MSC.530 (106): “5.10 It should be possible to use dynamic water level adjustment and an indication should be provided.”
- IMO MSC.530 (106): “4.8 ECDIS should be capable of accepting ENDS in accordance with the IHO Data Protection Scheme” Reference to footnote 3: IHO Publication S-63 – Data Protection Scheme (for S-57 ENCs) and S-100, Part 15 – Data Protection Scheme (for S-100 products) (see appendix 1).
- IMO MSC.530 (106): “11.3.6 It should be possible for the mariner to select that the indications of 11.3.4 and 11.3.5 take into account accuracy information of relevant hydrographic information, as defined by IHO standards”
- IMO MSC.530 (106): “11.4.9 It should be possible for the mariner to select that the indications of 11.4.3, 11.4.4, 11.4.6, 11.4.7 and 11.4.8 take into account accuracy information of relevant hydrographic information, as defined by IHO standards.”

NEW REQUIREMENTS IN IMO MSC.530 (106) - DYNAMIC WATER LEVEL

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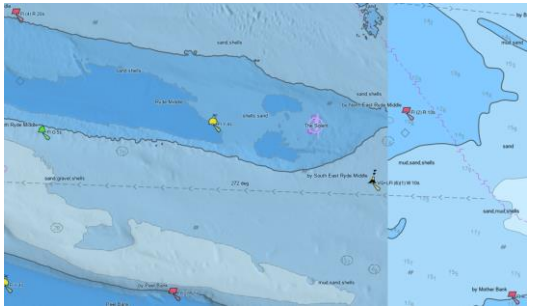
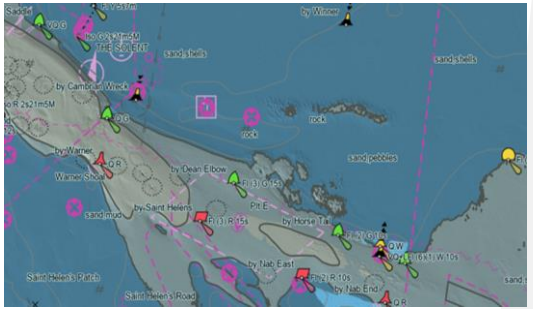
- User Selected Safety Contour and WLA (C-12.9.11) must be clearly defined as a mandatory function for a combination of ENC with S-104 and S-102/S-104 data.
- Default colour definition for the display of S-102 (+ S-104) areas is the same or close enough to S-52 (two/four DS).
- It is highly desirable that Safety contour line generation is there to fit User Selected Safety Contour to maintain display and functionality like legacy ECDIS. Accuracy requirements are to be defined.
- Contours from datasets other than S-101 (C-12.12). Simultaneous display of contours from S-101 may be misleading to the user. 12m safety contour example:





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NEW REQUIREMENTS IN IMO MSC.530 (106) - DYNAMIC WATER LEVEL

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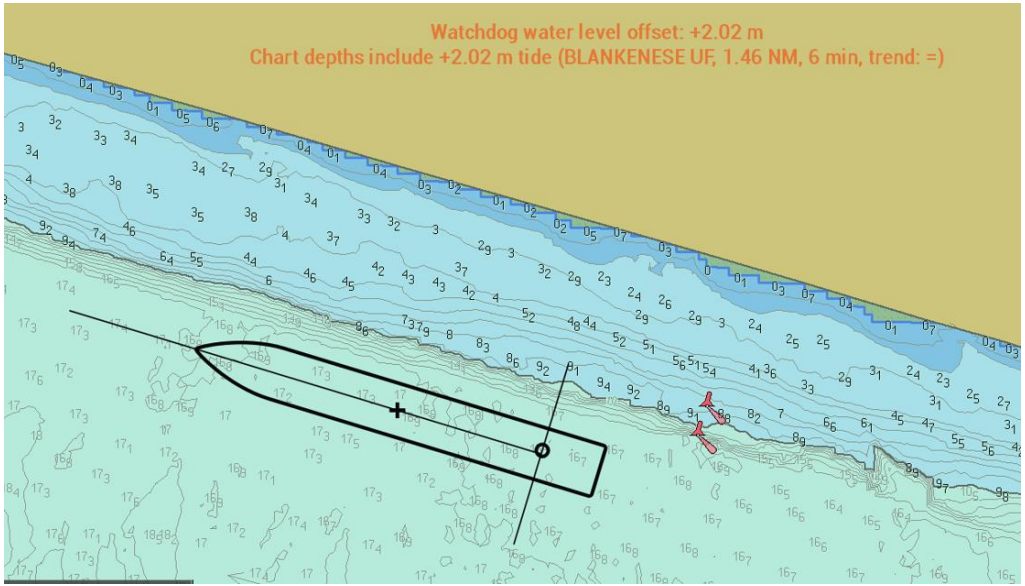
- Display scale Limit to be defined for DWLA mode (Time component). E.g. 1:50000.
- Display of Water Level value applied at ship´s position can support integrity checks.



NEW REQUIREMENTS IN IMO MSC.530 (106) - DYNAMIC WATER LEVEL

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- S-102/S-104 Data cross-check requirement at production (They must match in vertical datums, be of appropriate resolution and coverage).
- It is NOT an option to have User control(s) on ECDIS to manage/select data.
- S-104 Product Specification already addresses this issue, but S-98 should be adjusted:

Data Requirements:	• High quality water level forecast (with adequate spatial and temporal resolution). • Astronomical prediction. • Near real time observational data. • S-102 bathymetry data (with adequate spatial resolution). • Availability of underlying ENC data. • Vertical datums in S-102 and S-104 data should match.
Technical Aspects and Post Processing:	• S-104 data must be provided as a continuous coverage (data coding format 2 (regular grid), 3 (ungeorectified grid) or 7 (TIN)). • ECDIS must implement S-98 interoperability in order to integrate S- 101, S-102, and S-104 data. • ECDIS must have functionality to implement route planning with respect to forecasted water levels.

NEW REQUIREMENTS IN IMO MSC.530 (106) – "DUAL FUEL"

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- IHO S-98 Ed. 1.0.0, May 2022: "17.8 Interoperability in the presence of legacy data formats The interoperability aspects of dealing with cases where S-57 and S-101 + S-1xx data are both on the navigation screen are not addressed in this draft, pending determination of the path forward with respect to dual-fuel ECDIS. The same applies to interoperability with raster ENCs."
- IHO S-98 Annex C Ed. 1.0.0, May 2022: C-18: "Note that some things required for complete compatibility of S-57/S-52 and S-101 presentations cannot be controlled in this Annex, depending as they do on the harmonization of Portrayal Catalogues with S52 symbology, colour tables, and lookup tables."
- PRO-2.1 Adoption of Dual Fuel Concept for S-100 ECDIS executive summary and the full report, Findings on page 2: 3. A number of gaps were noted, mainly in the areas of:
  - b. Detailed specifications for ECDIS portrayal loading strategy in respect of Dual Fuel
  - d. Technical, distribution and regulatory clarification of the equivalence between S-57 and S-101 datasets, and between existing nautical publications and S-100 product specifications.
- Goal: to provide consistent and seamless functionality for the ECDIS end-user

NEW REQUIREMENTS IN IMO MSC.530 (106) – ACCURACY OF HYDROGRAPHIC INFORMATION

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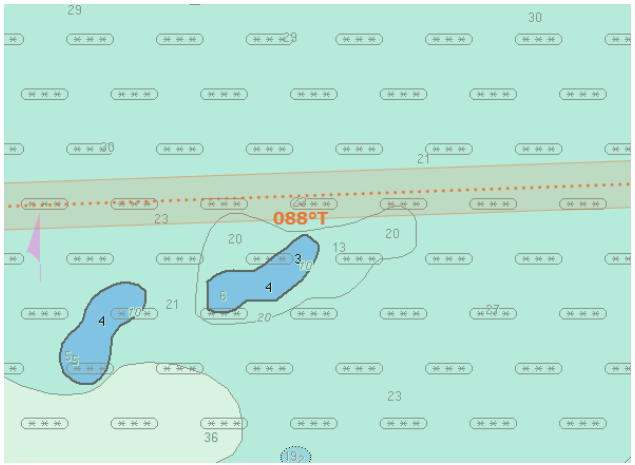
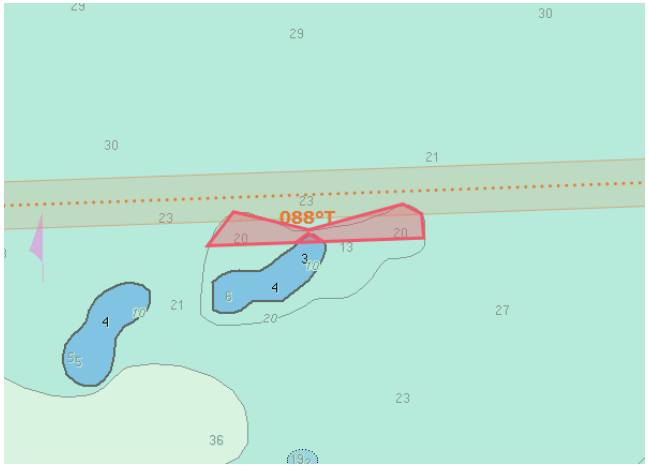
- IMO MSC.530 (106): “11.3.6 It should be possible for the mariner to select that the indications of 11.3.4 and 11.3.5 take into account accuracy information of relevant hydrographic information, as defined by IHO standards” (for Route Planning)
- IMO MSC.530 (106): “11.4.9 It should be possible for the mariner to select that the indications of 11.4.3, 11.4.4, 11.4.6, 11.4.7 and 11.4.8 take into account accuracy information of relevant hydrographic information, as defined by IHO standards.” (for Route Monitoring)





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BUSINESS CASE BEHIND THE TRANSITION TO S-100 ECDIS

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PRO-2.1 Adoption of Dual Fuel Concept for S-100 ECDIS executive summary and the full report, page 18:

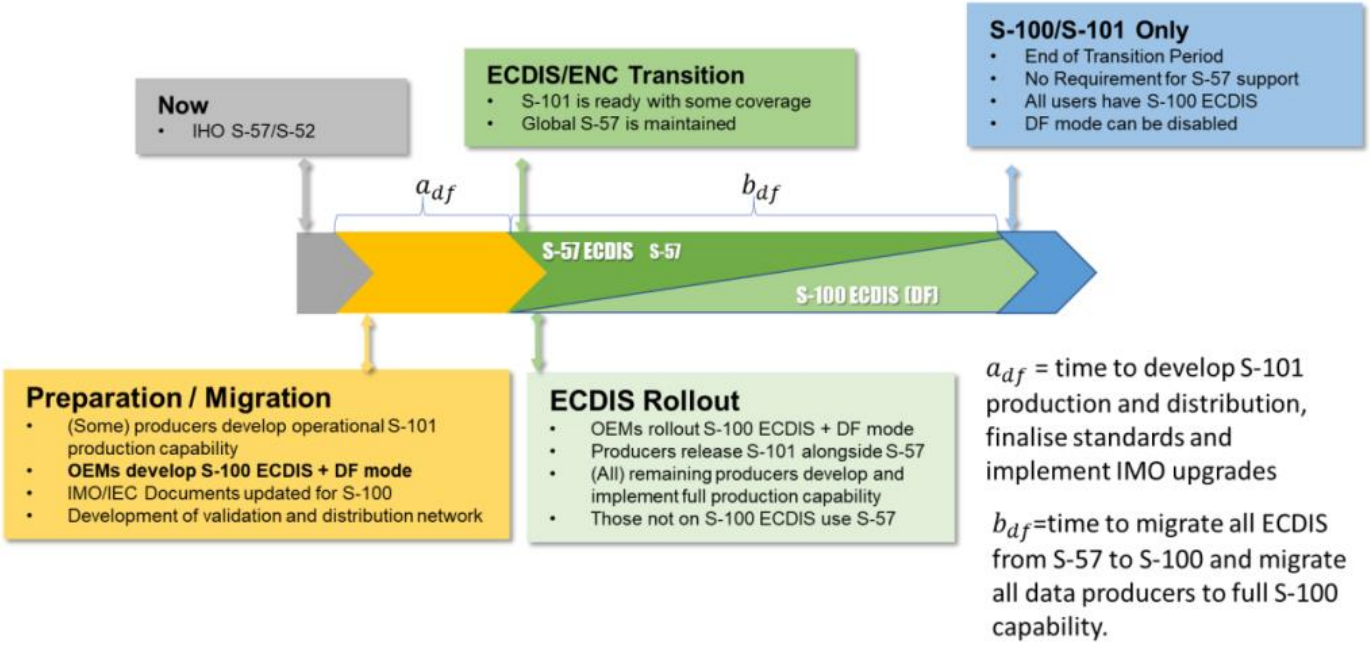

Figure 3: S-100 and S-100 ECDIS Dual Fuel Mode timeline

BUSINESS CASE BEHIND THE TRANSITION TO S-100 ECDIS

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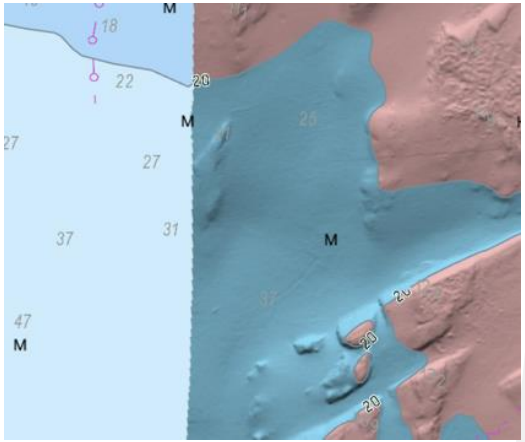
- Now the business case is not entirely clear on OEM side.
- The same for shipping companies.
- No S-10x ECDIS carriage requirements for vessels with a legacy ECDIS in service.
- No clarity yet on S-10x products carriage requirements.
- In most sailing areas, no substantial S-10x data coverage to be expected to have functional benefits of S-100 ECDIS.
- Implications regarding ECDIS-Related training for the crew.
- Implications for Safety Management System adjustments especially for use in “Dual-Fuel” regime (S-100 or Legacy ECDIS).
- Indirectly, some benefits of S-10x data availability already in place, via use of alternative technical solutions (PPU, UKC management systems etc.)



POSSIBLE RISK MITIGATION MEASURES TO APPLY (1):

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Consistent test data, including S-101, S-102, S-104, S-111, S-124, S-57/63 supported by S-128, is needed ASAP. Best is a combination of :

- Real-world data, (cross check and sea trial options to be kept open)
- Artificially created areas/objects to cover specific test cases (edge cases, etc.)
- Overlapping coverage of a new S10x and legacy S-57/S-63 data for dual-fuel tests
- S-10x exchange sets (S-100 edition 5.x) and plain files for validation purposes
- All test data to comply with the latest, and long-term frozen, Product Specifications.

POSSIBLE RISK MITIGATION MEASURES TO APPLY (2):

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Focus of work in support of the new functional requirements introduced by the IMO in the revised Performance Standard for ECDIS - MSC.530 (106) - and deployment-critical aspects of S-10x standards:

- Dynamic Water Level, IMO MSC.530 (106), 5.10.
- “Dual Fuel”, IMO MSC.530 (106), 4.8.
- Hydrographic data accuracy in Route Planning, IMO MSC.530 (106), 11.3.6.
- Hydrographic data accuracy in Route Monitoring, IMO MSC.530 (106), 11.4.9.

POSSIBLE RISK MITIGATION MEASURES TO APPLY (3):

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"Soften" requirements on S-100 ECDIS functionality implementation in case when a lack of wide practical experience does not allow technical requirements to be finalized with confidence. Leave it explicitly open to the industry to solve – it is industry´s interest to deal with this is safe and user-friendly way.

- Dynamic load of PC and IC should not be required at least for a transition period 2026-2029. In any case, OEM should be involved in process before PC and IC releases.
- Requirements for Manual Corrections as defined in current S-52 and S-98 Annex C (C-12.6.4, C-12.6.5). Requirement "Manual updates of ENC information should be displayed using the same symbology as ENC information" is highly recommended to be revised or removed.
  - ECDIS Connectivity is a mandatory requirement from now on supported by development of daily updates.
  - Does not go in line with Clause 1.5 IMO MSC.530 (106) "reduce the workload"…
  - Does not go in line with Clause 4.5 IMO MSC.530 (106) "… data entered manually"....

POSSIBLE RISK MITIGATION MEASURES TO APPLY (4):

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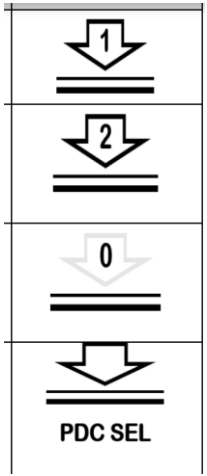
Clarifications to be provided from the IHO side:

- Carriage Requirements of S-10x data products must be defined.
- Retirement deadline for S-57 should be defined by IHO, as the consequences are very significant.
- Possible gap in tests for operational specific requirements (especially new ones from IMO), must be evaluated and addressed. Currently the MED of EU does not list IHO standards as requirements or testing methods
- IHO use edition numbering: major.minor.clarification. This is quite clear. But it is not clear whether a clarification level change requires re-certification. Also, it is not clear if a minor level change requires re-certification. More stability in standards are needed in general.

POSSIBLE RISK MITIGATION MEASURES TO APPLY (5):

Focus on ECDIS average End-User while finalising requirements:

- Implementation of S-100 ECDIS will require new ECDIS training, the existing ECDIS course certificate will become invalid. „Application and usability of ECDIS“ MAIB – DMAIB.
- There are far too many new requirements for User Control: many of those are to cover edge-case situations. 20+ new settings! Examples of newly required user controls:
    - User selection in case of data Overlap
    - User control over loaded set
    - Interoperability controls



SUB-ECDIS: SIMPLICITY IN THE USER EXPERIENCE

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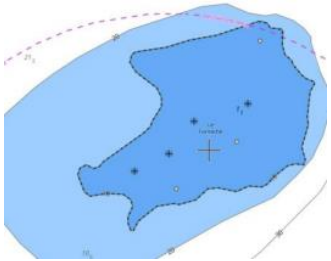
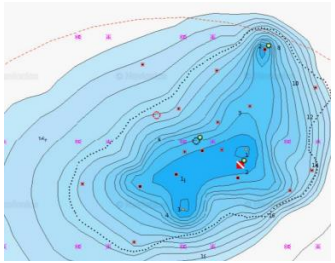
Different fusion of data for a tailored functionality:

- Additional layers, other than ENC
- Additional coverage





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SUB-ECDIS: WHAT ARE REALLY THE ISSUES TO SOLVE?

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Different presentation styles and related functions

- For decades, in non-SOLAS shipping, digital navigation has been considered a proven case.
- Is unified presentation (e.g.S-52) applicable to all segments? Different vessels (OSV/CG down to motor or even rowing boat) to be addressed.
- What are implications for innovations if display and functionality gets standardized?

SUB-ECDIS: WHAT ARE REALLY THE ISSUES TO SOLVE?

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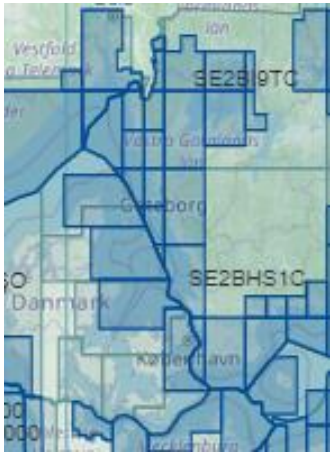
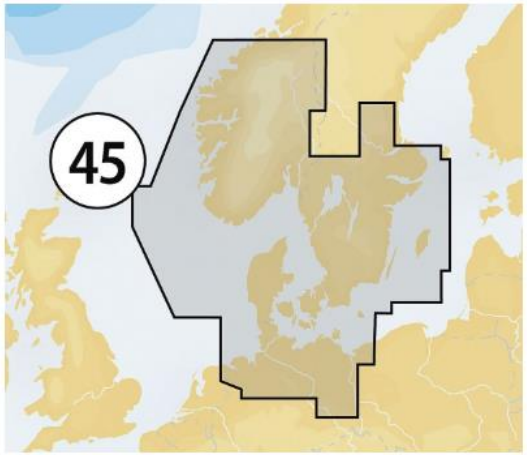
Availability of the official data for non-SOLAS shipping

- NON-ECDIS Technical capability to use official data (S-63)
- Updating of the data is a (technical and licensing) challenge.
- Pricing….Sailing holiday (Germany to Norway):

874 DKK (124$) of Diesel Fuel, 486$ Paper Atlases (NV)

4553$ cost of ENC for 3 months (would have been…..)





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SUB-ECDIS: POSSIBLE APPROACH

Segment	commercial or state-owned	Private, high end recreational	Middle and low end recreational
Note:	services may involve liability	Up to Flag (e.g. boat size, PAX)	All others…
Minimum requirements:	Mandatory/TA	Mandatory/TA	Design guide/SA
Data Product (HO):	Official (e.g. ENC)	Official (e.g. ENC)	Derived
HO data liability:	Yes	Yes	No
Licensing model:	Same as ECDIS	Same as ECDIS	Royalty based


Thank you!

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