



Brussels, 25 June 2021
(OR. en)

10163/21

MAR 120
OMI 56
DIGIT 75

'I' ITEM NOTE

From:	General Secretariat of the Council
To:	Permanent Representatives Committee (Part 1)
No. Cion doc.:	9978/21
No. prev. doc.:	9980/21
Subject:	Draft submission by Member States and the Commission to the 104 th session of the International Maritime Organization's Maritime Safety Committee proposing a new output to amend the revised ECDIS Performance Standards to facilitate a standardised digital exchange of vessels' route plans – <i>Endorsement</i>

I. INTRODUCTION

1. On 18 June 2021, the Commission transmitted to the Council a Staff Working Document containing a draft submission to the 104th session of the Maritime Safety Committee (MSC 104) of the International Maritime Organization (IMO) proposing a new output to amend the revised Electronic Chart Display and Information System (ECDIS) Performance Standards to facilitate a standardised digital exchange of vessels' route plans. The deadline for transmitting the draft submission to the IMO Secretariat is 2 July 2021.
2. Several e-navigation projects, including the EU-funded MONALISA and MONALISA 2.0 projects, have studied exchange of route plans. The positive effects of such exchange, namely increased safety, reduced administrative burden and more efficient operations, combined with reduced environmental impact, have been validated. The results of those projects are the bases for this proposal for a new output aiming to regulate the technical ability for digital exchange of route plans by amending the ECDIS Performance Standards.

II. WORK WITHIN THE COUNCIL

3. The draft submission was presented by the Commission to the Shipping Working Party on 14 June 2021, based on an informal advance copy. After that meeting, delegations were given the opportunity to make written comments, which were taken into account when preparing the final version of the text. No delegation raised objections to that final version, as set out in the Annex.
4. The Shipping Working Party also agreed that the Presidency would be allowed to indicate at the time of transmission that the document may be released to the public by the IMO secretariat prior to MSC 104.
5. However, there is no agreement on who should submit the draft submission. The Commission maintains the view that the draft submission should be made by "the European Commission on behalf of the European Union", while the Member States consider that it should be made by the Member States and the European Commission.
6. Given the importance and urgency of the matter, it was agreed at working party level to propose to transmit the submission in the name of the Member States and the European Commission, while taking good note of the position of the Commission.
7. Finally, the Shipping Working Party reiterates its request to the Commission that proposals for submissions to the IMO should be presented in such time as to allow for a proper examination of procedural and substantive issues in at least two working party meetings.

III. CONCLUSION

8. In the light of the above, the Permanent Representatives Committee is invited to endorse the text of the draft submission in the annex, with a view to its transmission by the Presidency to the International Maritime Organization by 2 July 2021.



E

MARITIME SAFETY COMMITTEE
104th session
Agenda item 15

MSC 104/15/xx
xx xx 2021
Original: ENGLISH
Pre-session public release: ☒

WORK PROGRAMME

Proposal for a new output to amend the Revised ECDIS Performance Standards (resolution MSC.232(82)) to facilitate a standardised digital exchange of vessels' route plans

Submitted by Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the European Commission

SUMMARY

Executive summary: This document proposes the establishment of a new output for the Committee's work programme to amend *The Revised ECDIS Performance Standards* (resolution MSC.232(82)) to facilitate a standardised digital exchange of vessels' route plans.

Several e-navigation projects have studied exchange of route plans. Its positive effects, namely increased safety, reduced administrative burden and more efficient operations, combined with reduced environmental impact, have been validated.

An international standard format for route plan exchange has been developed and it is considered an appropriate next phase to also adapt the regulatory aspects to facilitate standardised exchange of route plans.

As an alternative, the Committee may decide to include the work under the existing post-biennial output 164 "Revision of ECDIS Guidance for good practice (MSC.1/Circ.1503/Rev.1) and amendments to ECDIS performance standards (resolution MSC.232(82))", which would then have to be included in the biennial agenda of the Sub-Committee for 2022-2023 and in the provisional agenda for NCSR 9, as proposed by NCSR 8.

Strategic direction, if applicable: 2 and 6

Output: post-biennial output 164

Action to be taken: 12.1

<i>Related documents:</i> MSC.1/Circ.1593, MSC.1/Circ.1595, MSC.1/Circ.1610, MSC 102/24, NAV 59/INF. 8, NCSR 1/INF. 18, NCSR 7/22/5, NCSR 8/13, NCSR 8/13/1, HGDM 2/5, HGDM 2/10, MSC-MEPC.2/Circ.12/Rev.1, MSC103/20, NCSR 8/WP.1/Rev.1
--

Introduction

1.1 This document is submitted in accordance with MSC-MEPC.1/Circ.5/Rev.2 on *Organization and method of work of the Maritime Safety Committee and the Marine Environment Protection Committee and their subsidiary bodies*, taking into account resolution A.1111(30) on the Application of the Strategic Plan of the Organization.

1.2 This document proposes the establishment of a new output for the Committee's work programme to amend *The Revised ECDIS Performance Standards* (resolution MSC.232(82)) to facilitate a standardised digital exchange of vessels' route plans (MSC.1/Circ.1595, Annex, Table 6 and MSC.1/Circ.1610, Annex, Pages 1 and 4 refer). An initial draft amendment proposal is presented in annex 1 in order to facilitate an understanding of the scope and intended amendments.

1.3 As an alternative, the Committee may decide to include the work under the existing post-biennial output 164 "Revision of ECDIS Guidance for good practice (MSC.1/Circ.1503/Rev.1) and amendments to ECDIS performance standards (resolution MSC.232(82))", which would then have to be included in the biennial agenda of the Sub-Committee for 2022-2023 and in the provisional agenda for NCSR 9, as proposed by NCSR 8. If the Committee decides on this option, it may also consider if the output should also make reference to strategic direction 2 – Integrate new and advancing technologies in the regulatory framework.

1.4 The proposal relies on international standards, e.g. within IHO (International Hydrographic Organization) and IEC (International Electrotechnical Commission) domains, for technical details regarding how the exchange of route plans should be implemented.

1.5 The proposed digital exchange of route plans is envisaged to be used ship-shore and shore-ship in the voyage planning and execution phase. The proposal does not include ship-ship exchange of route plans.

1.6 The proposed amendment to *Revised Performance Standards for Electronic Chart Display and Information Systems (ECDIS)* would only apply to new installations.

Background

2.1 Maritime transport is a global business that to a great extent relies on an international framework of regulations and technical standards. It is only through global cooperation, commitment, standards and joint coordinated action that global shipping can be taken into a more organized form of integrated transport system with the help of digitalization and information sharing. In that process, maritime transport can also be made more energy efficient, cost effective and at the same time avoid accidents, including the negative impact on the marine environment, and save lives.

2.2 As part of the outcomes from the EU-funded MONALISA (2010-2013) and MONALISA 2.0 (2013-2015) projects, an industry standard for a route plan exchange format was developed. The route plan exchange format (RTZ) was standardised by IEC and included in the IEC 61174 ed.4 standard (*Electronic chart display and information system (ECDIS) – Operational and performance*

requirements, methods of testing and required test results). This provided a standardised data format that could be used for exchange of route plans (route information, route geometry and route schedule) between different systems onboard as well as for exchange of information between different manufacturers' in ship-shore and shore-ship communication e.g. between ship and VTS, route optimisation service providers etc. The RTZ format has since been updated by CIRM (Comité International Radio-Maritime) and made available in an IEC Publicly Available Specification (PAS), IEC PAS 61174-1:2021.

2.3 The outcomes of these projects have been reported to NCSR 1 in document NCSR 1/INF.18 on "Development of an e-navigation strategy implementation plan; Results and recommendations from the MONALISA and MONALISA 2.0 projects", submitted by Italy and Sweden.

2.4 The route exchange format is currently being updated by IEC to become S-100 compliant. The IHO S-100 Standard is a Universal Hydrographic Data Model that is intended for the development of digital products and services for hydrographic, maritime and GIS communities¹. The new standard, IEC 63173-1 *Maritime navigation and radiocommunication equipment and systems - Data Interface - Part 1: S-421 Route Plan Based on S-100*, is expected to be approved and published in the end of 2021 as have been reported to NCSR 8 in document NCSR 8/13 on "Progress on standards development by IEC", submitted by IEC. The S-421 format will secure compliance and interoperability with the expected future S-100 products.

2.5 The EU-funded STM Validation Project (2015-2019) took the standard data format (RTZ) as a starting point but to reach the full potential of a standardised exchange of route plans it was necessary to specify not only what format (i.e. RTZ/S-421) the data should have but also how the exchange should be done. This is crucial in order to achieve interoperability in machine-to-machine communication which allows users to connect seamlessly even on their first encounter which is necessary in the shipping domain since shipping is often a series of first-occasion encounters, e.g. a ship visiting new terminals and ports. Accordingly, a generic information service/Application Programming Interface (API), based on IALA's Service Guideline G1128² for maritime services, was developed and provided an interface for how to exchange route plans. The interface was implemented in the project testbed with approximately 400 ships and a dozen shore centers.

2.6 After refinement and validation of the interface in the project, IEC initiated the work on a new standard IEC 63173-2, *Secure communication between ship and shore* (SECOM) that describes how the exchange of, e.g. route plans should be done. The standard, expected to be released towards the end of 2022, will enable wider technical interoperability where the same service interface can be used for exchanging information regardless of operational use. This can thus support the *E-navigation Strategy Implementation Plan – Update 1* (MSC.1/Circ.1595) of the IMO and the delivery of maritime services in the context of e-navigation, as means of providing electronic information in a harmonized way. SECOM is also recommended in IALA G1157³, Web service based S-100 data exchange, for the technical realization of maritime services. SECOM is referenced as an explicit implementation of a S-100 Web Service API and as a means to harmonize and make distribution services interoperable.

2.7 As described in the above sections, the objective has been to create the technical ability for digital exchange of route plans and validate the effects. It is considered an appropriate next phase to also adapt the regulatory aspects to allow and facilitate standardised exchange of route plans. Standardised in this context is to be understood as electronic exchange, machine-to-machine, including cyber security measures to prevent unauthorised access.

¹ <https://iho.int/en/s-100-universal-hydrographic-data-model>

² <https://www.iala-aism.org/product/g1128-specification-e-navigation-technical-services/>

³ <https://www.iala-aism.org/product/g1157-web-service-based-s-100-data-exchange/>

2.8 It is recognized that the IHO has proposed to NCSR 7, *Report on monitoring of ECDIS issues by IHO* (NCSR 7/22/5), and NCSR 8, *Report on monitoring of ECDIS issues by IHO* (NCSR 8/13/1), to amend *The Revised ECDIS Performance Standards* (resolution MSC.232(82)) as a consequence of the introduction of the next generation of S-101 Electronic navigational charts (ENC) and S-100 as such. As an outcome of NCSR 8, IHO was invited to prepare draft amendments for both MSC.232(82) and MSC.1/Circ.1503/Rev.1 and submit a draft proposal to NCSR 9. The proposal to facilitate route plan exchange should be coordinated with the ongoing IHO initiative.

2.9 Furthermore, it is also recognized that MSC 102 decided to agree with the recommendations of the Sub-Committee regarding consolidation and renaming of outputs, as well as the expansion and renaming of output No.164 – to include work on draft amendments for to MSC.232(82) (MSC 102/24, paragraph 21.14).

IMO's objectives

3.1 This proposal relates to digital exchange of route plans which contributes to Strategic Direction 2 ("Integrate new and advancing technologies in the regulatory framework") and is clearly within the scope of IMO's objectives.

3.2 Furthermore, this proposal is also understood to be consistent with IMO's Strategic Direction 6 ("Ensure regulatory effectiveness"), which aims to "ensure that a universally adopted, effective, international regulatory framework is in place and implemented consistently, embracing and integrating new and advancing technologies, without causing unnecessary burdens."

Need

4.1 Various statistics and well-known accidents, available in the IMO GISIS database, Marine Casualties and Incidents, show that navigational related accidents occur at regular basis.

4.2 According to a Formal Safety Assessment (FSA)⁴, exchange of route plans can reduce the risk for navigational accidents. The FSA is in accordance with the format provided by the *Revised Guidelines for Formal Safety Assessment (FSA) for use in the IMO rule-making process* (MSC-MEPC.2/Circ.12/Rev.1) and performed by an independent consultant team in order to provide un-biased and fully transparent results and recommendations.

4.3 The FSA concluded that exchange of route plans are principally considered to have a preventive influence on accidents caused by human factor related failures but are not expected to reduce navigational accidents caused by technical failures or external factors. The preventive effects of exchange of route plans are anticipated to reduce navigational accidents in open, coastal waters, archipelagos, and port approaches whilst accidents in ports and inland waterways are less affected.

4.4 Further need and supporting evidence are presented in [section 6,] Analysis of implications and [section 7,] Benefits.

Analysis of the issue

5.1 The existence of supporting international technical standards and the foreseen limited necessary changes to include digital exchange of route plans in the resolution MSC.232(82) *The*

⁴ <https://s3-eu-west-1.amazonaws.com/stm-stmvalidation/uploads/20160502131247/ML2-D2-FSA-Formal-Safety-Assessment.pdf>

Revised Performance Standards for Electronic Chart Display and Information Systems (ECDIS), henceforth referred to as “ECDIS Performance Standards”, supports its practicability and feasibility.

5.2 Given the validated benefits with exchange of route plans and the various potential areas of use as part of the Maritime Services (MSC.1/Circ.1595, Annex, Table 6 and MSC.1/Circ.1610, Annex, Pages 1 and 4 refer) supports the proportionality of amending the ECDIS Performance Standards.

Analysis of implications

6.1 The proposal for a new output to amend the ECDIS Performance Standards aims to regulate the technical ability for digital exchange of route plans while the actual usage of the functionality is voluntary. It is the actual usage of the functionality rather than the technical ability that drives running costs, e.g. communication costs and user fees, while enhancing current performance standards would result in minimal additional costs to the maritime industry.

6.2 The ECDIS Performance Standards amendment proposal would only apply to new installations. As a result, both benefits and implications arising from the proposal will be sequenced over a number of years. However, a voluntary industry driven retrofit could speed up the adoption process. Further, voluntary retrofit would also benefit from the stability provided by the ECDIS Performance Standards referencing IEC standards as a stability assurance that the investments of shore actors and shipowners will not be lost.

6.3 IEC standards are often supported by maritime system providers even if they are not mandatory to implement. As an example, IEC 61174 ed.4 standard (*Electronic chart display and information system (ECDIS) – Operational and performance requirements, methods of testing and required test results*) does not mandate route exchange capability. However, *if* routes are to be exchanged between different proprietary devices on a bridge of a ship, e.g. radar and autopilot, the route exchange format (RTZ) is required.

6.4 For manufacturers that already plan to support IEC standards, referenced by the ECDIS Performance Standards, the envisaged proposed amendment would not add any additional need for development. However, if some ECDIS manufacturers would not implement IEC standards on a voluntary basis, the amendment proposal would imply development work to support the new functionality. This development effort is decided by the status and architecture of current systems and therefore it is difficult to provide any generic figures but the development effort is expected to be low based on testbed experiences within the STM Validation Project. Eventually these limited costs for the ECDIS manufacturers development work would be transferred to the end-customers, i.e. shipowners, but distributed per installed ECDIS they would be minimal.

6.5 Results of studies and testbed validations

The effects of standardised digital exchange of route plans have been studied in several e-navigation projects. Costs have been calculated by Cost Benefit Analysis (CBA) and validated in testbeds for e-navigation, where standardised digital exchange of route plans has been the main enabler for achieving the described benefits amongst the included actors e.g. for ship and port to share mental model for better planning conditions and Just In Time Arrivals (JIT). Thus the outcome of projects and studies are of relevance for the proposed amendment of the ECDIS performance standards.

6.6 The CBA of the effects of implementing route plan exchange related maritime services in the Northern parts of the EU⁵, performed by researchers at Linköping University, Sweden, concentrated on analyzing the possible gains for society as a whole. Although the studied area focused on Northern Europe the result was extrapolated to encompass all European waters. The study was divided into three main areas; route optimization supported by better information sharing, adjusted arrival times (Just-In-Time Arrivals) resulting from better ship-shore communication and savings in ports from having a system support for real-time sharing of each actor's readiness to perform services to enable higher resource utilization and shorter turn-around times.

6.7 The results from this CBA show that the break-even reduction in distance for making route optimization profitable is as little as 0.2% when the effect on lower emissions is included. The CBA study expected this threshold to be exceeded by making route optimization services more effective by standardizing how the information should be exchanged between ships and route optimization providers.

6.8 For the adjusted arrival times, ships lying at anchor outside ports waiting for service in the port were included. Ships awaiting orders, waiting for bunkering etc. were excluded from the calculations. The selected main alternative for bunker savings assumed a ship could make a 25% reduction of speed on the last 4 or 12 hours before original ETA.

6.9 The port section of the CBA indicated potential benefits but better knowledge remained to be developed regarding the potential in larger and smaller ports and thus the effect of the lower figure was set to 0 i.e. no positive effects were included in the CBA.

6.10 In addition, effects of increased safety are also included in the CBA. The value of increased safety is based on the outcome of the Formal Safety Assessment (FSA)⁶.

6.11 The cost calculations included investments for ships, investments for training, communication costs, governance costs, port costs and costs for shore-based service and control centers. Not to underestimate costs all assumptions made were conservative. In conclusion, the results of the CBA indicate that the net benefits are positive.

6.12 In the STM Validation Project⁷, an additional CBA was carried out. This CBA followed the methodology included in the Guide to Cost Benefit Analysis of Investments Projects⁸ elaborated in December 2014 by the European Commission's Directorate-General for Regional and Urban Policy (DG REGIO). The guide includes the following steps: description of the context, definition of objectives, identification of the project, technical feasibility and environmental sustainability, financial analysis, economic analysis and risk assessment.

6.13 The STM Validation Project CBA was performed in order to evaluate the net benefits that maritime services related to route plan exchange could produce, if implemented, in terms of economic welfare. The purpose was to determine net positive effects from a European Union perspective as the project was co-funded by the Trans-European Transport Network through its Connecting Europe Facility Programme (CEF).

⁵ <https://s3-eu-west-1.amazonaws.com/stm-stmvalidation/uploads/20160420144655/ML2-D2-CBA-Cost-Benefit-Analysis.pdf>

⁶ <https://s3-eu-west-1.amazonaws.com/stm-stmvalidation/uploads/20160502131247/ML2-D2-FSA-Formal-Safety-Assessment.pdf>

⁷ https://s3-eu-west-1.amazonaws.com/stm-stmvalidation/uploads/20190715120828/STM_ID_5.3.6_STM-VALIDATION-COST-BENEFIT-ANALYSIS.pdf

⁸ https://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/cba_guide.pdf

6.14 The data comes from the approximately 400 ships that took part in the testbed and their related port calls on the eight ports included in the STM Validation Project. The testbed data, even from a conservative point of view, offer positive results for society in terms of reduction of GHG emissions as well as the reduction of accidents at sea which has an important impact on the reduction of environmental costs due to accidents.

6.15 The main results obtained in the CBA are the reduction of operating costs and the potential reduction of the negative externalities (GHG emissions) because of optimized routes and port call synchronization. The socio-economic analysis shows that the included services are generating a positive welfare change. Further the obtained results show that the related maritime services are desirable from a socio-economic perspective meaning that the society would benefit if they were to be implemented. This is backed up and demonstrated by the economic analysis results and by achieving a positive Economic Net Present Value (ENPV).

6.16 Legislative burden

Any associated legislative and/or administrative burden, such as making amendments to national legislation to include new/revised Performance Standard for ECDIS, have been assessed to be minimal.

6.17 Training needs

No revision of the IMO ECDIS model course 1.27 on Generic ECDIS Training is considered necessary. However, a limited training need is to be anticipated and ECDIS familiarisation would need to include the new functionality of standardised digital exchange of route plans. The estimated time needed for familiarisation and training for ship's officers is in the order of one (1) hour. No separate courses or training is anticipated.

6.18 The completed checklist for identifying administrative requirements (MSC-MEPC.1/Circ.5/Rev.2) is set out in annex 2.

Benefits

7.1 As part of the improved provision of services to ships through e-navigation, maritime services have been identified as the means of providing electronic information in a harmonised way. The exchange of route plans could act as support and an integrated part of several of the Maritime Services (MSC.1/Circ.1595, Annex, Table 6 and MSC.1/Circ.1610, Annex, Pages 1 and 4 refer), namely VTS Information Service (INS), VTS Navigational Assistance Service (NAS), Traffic Organization Service (TOS), Port Support Service (PSS) Maritime Safety Information Service (MSI), Pilotage Service, Tug Service, Vessel Shore Reporting, Ice Navigation Service, Meteorological Information Service and Search and Rescue Service (SAR).

7.2 Currently, there are 16 IMO adopted Mandatory Ship Reporting Systems (MRS) and more than 100 VTS areas in European waters where ships are required to report data, according to resolution A.851(20) on *General principles for ship reporting systems and ship reporting requirements, including guidelines for reporting incidents involving dangerous goods, harmful substances and/or marine pollutants*, to shore-based authorities. Most of the information is reported via voice communication and recorded by the coastal stations' operators in their respective databases. The route plan (sailing plan) of a ship must be reported to a coastal station in some of the MRS/VTS areas e.g BELTREP and SOUNDREP. Digitally exchanged route plans shall be re-used to minimise the reporting burden. This is being tested under the "Facilitation of ship to shore reporting" pilot project which is executed under the "Interoperability Project" of the European Maritime Safety Agency (EMSA). At an initial phase the route plan will be made available to coastal stations participating in the pilot project and at a later stage this data would be

included in the Integrated Ship Report (ISR) which will be provided to Member States Authorities by the new Integrate Report Distribution system developed for the pilot project.

7.3 During discussions on Maritime Autonomous Surface Ships (MASS) it has been identified that it is crucial for other ships to know the intentions of MASS ships. Although not in focus in this proposal, sharing of route plans between ships could be one of the solutions to share intentions.

7.4 The benefits, related to the Maritime Services in the context of e-navigation, in terms of safety, environmental improvements and efficiency have, as mentioned briefly above, been studied and validated in large-scale testbeds⁹ with approximately 400 ships and a dozen shore center systems from several different manufacturers. The benefits with implementation in real systems used in everyday operations is evident as it pushes the solutions developed to be as mature as possible, facilitates future implementation and safeguards that the chosen technical solutions are not proprietary, as they have to be accepted and approved by others.

7.5 Examples of operational services that have been digitalised and distributed by new means, where digital exchange of route plans have been an enabler, include route optimization (weather routing), pilot routes, ice routes, enhanced monitoring from shore, SAR search patterns, selected navigational warnings and Just In Time Arrivals.

7.6 The findings mainly come from end-user feedback collected within the STM Validation Project and indicate that sharing of route plans both ship-shore and shore-ship can enhance common situational awareness and improve port call processes. According to questionnaires and interviews with navigation officers and shore centre operators, the exchange of route plans directly from ECDIS has been useful. For navigation officers the benefits of integrating information of higher quality (i.e. accuracy and timeliness) are similar for most services. For example, the route optimization services have been found useful to insert the optimised routes directly into an ECDIS without having to use stand-alone applications. This is also the case for winter navigation where ice-waypoints and ice routes are made available directly in the navigation system.

7.7 The operational benefits are related to easier route planning which generates reduced administrative burden, and human errors in form of misunderstandings. For example, an average of 75% of test-bed participants perceived navigational operational safety to be increased and 74% experienced that route plan exchange supported tools and services assisted their ordinary bridge duties¹⁰. At the same time, shore centers and VTS centers can improve the quality of services and information to ships.

7.8 Sharing route plans from ships to VTS clearly indicated a positive change in the work of the VTS that participated in the STM Validation Project. Given the possibility to review the intentions of the ships well in advance before entering the surveillance area of the VTS made it possible for the VTS to work more proactively. The fact that the same data, the route plan, is used on board and ashore creates a common situational awareness that can be used to make operations and monitoring more effective.

7.9 The service with the biggest potential impact on efficiency in terms of reduced costs is port call synchronisation between ship and port, to achieve JIT. It has been demonstrated in testbeds by the possibility to provide updated arrival times in a digital two-way communication,

⁹ <https://s3-eu-west-1.amazonaws.com/stm-stmvalidation/uploads/20190709125520/STM-Validation-Final-report.pdf>

¹⁰ https://s3-eu-west-1.amazonaws.com/stm-stmvalidation/uploads/20200225090150/STMVal_D2.6-D2.10-D2.12-Voyage-management-testbed-report-1.pdf

which means that both the ship and port can inform each other about planned and preferred arrival times.

7.10 The arrival time of a ship is taken directly from the source in the route plan and presented in the planning system of the port. This has proven the ability to provide earlier information about ports earliest possible time to handle the ship. An efficient, digitalized and automated exchange of planned, requested and estimated arrival times is an enabler for the implementation of new standard contracts¹¹ for JIT recently established by BIMCO. The information can be used to reduce the speed of ships to eco-speed, thereby reducing costs for bunker consumption, and at the same time reduce emissions of greenhouse gases (GHG).

7.11 A bi-directional exchange of route plans would also be able to provide and suggest real time ETA information to a wide variety of other functions such as Maritime Single Window and time slot allocation in dense traffic areas. Given the variety of services that require not only ships' geographical routes but also planned arrival times it is essential to share not only route plan geography but also route plan schedule (ETA at waypoints/arrival) information.

7.12 The underlying technology for the exchange of route plans could also facilitate and support transmission, receipt and response of information required for the arrival, stay and departure of ships, persons and cargo, including notifications and declarations for customs, immigration, port and security authorities, via electronic data exchange, making the transition to full-fledged Maritime Single Windows.

7.13 The suggested amendments could also contribute to other IMO initiatives such as the Global Industry Alliance (GIA), the Just In Time Arrival (JIT) Guide and the GreenVoyage-2050 Project as it would complement to a certain extent the project activities by encouraging JIT steaming and consequently lead to less GHG emissions.

Industry standards

8.1 The suggested amendments of the Revised ECDIS Performance Standards rely on international standards, e.g. within IHO and IEC domains, for technical details regarding how the exchange of route plans should be implemented.

8.2 A route plan exchange format (RTZ) is standardised by IEC and included in the IEC 61174 ed.4 standard (*Electronic chart display and information system (ECDIS) – Operational and performance requirements, methods of testing and required test results*). The RTZ format is also updated by CIRM (Comité International Radio-Maritime) and made available in an IEC Publicly Available Specification (PAS), IEC PAS 61174-1:2021. The two versions of RTZ have preserved compatibility and provides standardised data formats that could be used for exchange of route plans.

8.3 The route plan exchange format is currently being updated by IEC to become S-100 compliant and has been assigned as the S-421 Route plan. The new standard, IEC 63173-1 Maritime navigation and radio communication equipment and systems - Data Interface - Part 1: S-421 Route Plan Based on S-100, is expected to be released by end of 2021.

8.4 To reach the full potential of a standardized exchange of route plans it is necessary to specify not only what format (i.e. RTZ/S-421) the data should have but also how the exchange should be done with which cyber security measures. This is crucial in order to achieve information security and interoperability in machine-to-machine communication. This is within scope of a new

¹¹ <https://www.bimco.org/contracts-and-clauses/bimco-clauses/current/just-in-time-arrival-clause-for-voyage-charter-parties-2021>

standard being elaborated within IEC. IEC 63173-2, Secure communication between ship and shore (SECOM). In addition, the new standard, expected to be released towards the end of 2022, will enable wider technical interoperability where the same service interface can be used for exchanging information regardless of operational use. This can thus support the e-navigation *Strategy Implementation Plan – Update 1* (MSC.1/Circ.1595) of IMO and Maritime Services in the context of e-navigation, as means of providing electronic information in a harmonised way.

Output

9.1 The proposed output is to amendment resolution MSC.232(82) *The Revised Performance Standards for Electronic Chart Display and Information Systems (ECDIS)* to facilitate a standardised digital exchange of vessels' route plans.

1. Specific: Amend resolution MSC 232(82) - Revised performance standards for *Electronic Chart Display and Information Systems (ECDIS)* to facilitate a standardised digital exchange of vessels' route plans.
2. Measurable: Completed, approved and adopted standard.
3. Achievable: MSC's subsidiary bodies have the expertise required.
4. Realistic: Ample time is proposed to complete the work.
5. Time-Bound: The work should take place in 2022-2023 in order to be approved by the MSC in 2022-2023

9.2 The suggested amendments to include digital exchange of route plans in the Revised ECDIS Performance Standards are of limited number. Given the limited amendments, it is estimated that the work can be completed in one session. The proposal to facilitate Route Plan Exchange should also be coordinated with the ongoing IHO initiative to submit a draft amendment to NSCR9 on ECDIS Performance Standards due to the new ENC format S-101 and S-100, which was approved by NCSR 8 but awaits the subsequent approval by MSC 104.

9.3 As an alternative, the Committee may decide to include the work under the existing post-biennial output 164 "Revision of ECDIS Guidance for good practice (MSC.1/Circ.1503/Rev.1) and amendments to ECDIS performance standards (resolution MSC.232(82))", which would then have to be included in the biennial agenda of the Sub-Committee for 2022-2023 and in the provisional agenda for NCSR 9, as proposed by NCSR 8. If the Committee decides on this option, it may also consider if the output should also make reference to strategic direction 2 – Integrate new and advancing technologies in the regulatory framework.

Human element

10.1 Risks associated with the introduction and misuse of technology as a new aid to navigation, for example so called "radar and ECDIS assisted collisions and groundings", are well known and must be taken into account. The envisaged digital exchange of route plans is meant to be used ship-shore and shore-ship where testbed results have validated reduced risks related to insufficient route planning and better possibilities for monitoring of ships reduces the overall navigational risks. The testbeds on exchange of route plans that have preceded the envisaged amendment proposal have followed recommended Software Quality Assurance (SQA) and Human-Centred Design (HCD) principles to further minimise potential risks. These methods are described in the IMO guideline on *Software Quality Assurance and Human-Centred Design for e-navigation* (MSC.1/Circ.1512).

10.2 It is also recognised that harmonisation of the user interface for navigation equipment and information used by seafarers to monitor, manage and perform navigational tasks will help to enhance common situational awareness and consequently enhance safe and effective navigation.

10.3 For some functions, related to exchange of route plans, the variations across different equipment of manufacturers of ECDIS should be minimal. The functions should be incorporated as detailed in SN.1/Circ.243/Rev.2 on *Guidelines for the presentation of navigational-related symbols, terms and abbreviations*, amendments to the *Recommendation on performance standards for the presentation of navigation-related information on shipborne navigational displays* (resolutions MSC.466(101) and MSC.191(79) as appropriate) and also MSC.1/Circ.1609 on *Guidelines for the standardization of user interface design for navigation equipment*.

10.4 Any associated legislative and/or administrative burden, such as making amendments to national legislation to include the envisaged amended/revised Performance Standards for ECDIS, have been assessed to be minimal.

10.5 The completed checklist for considering human element issued by IMO bodies (MSC-MEPC.7/Circ.1) is set out in annex 3.

Urgency

11.1 With direct relevance to the objective of enhancing technical, operational and safety standards, it is believed that this work is important to be undertaken in the near future.

11.2 The Organization clearly defined e-navigation is for safety and security at sea and protection of the marine environment. The co-sponsors believe that the delay of the implementation of e-navigation may cause a negative effect for safety and security at sea and protection of the marine environment.

11.3 Considering that the technical standards for digital route exchange are being developed by the IEC and that the IHO has declared 2020-2030 the S-100 Implementation Decade, IMO performance standards are needed to support the operation of those technical standards and to harmonize their implementation worldwide.

11.4 For the above reasons, although the co-sponsors are well aware of the heavy workload of the NCSR Sub-Committee, it is proposed to complete the work on possible amendments at NCSR 9 or 10 with a view to its approval by the subsequent MSC.

11.5 It is recommended that a new output be included in the work programme of the NCSR Sub-Committee for the upcoming biennium and the completion of the work in one session, or, alternatively, to decide to include the work under the existing post-biennial output 164, which would then have to be included in the biennial agenda of the Sub-Committee for 2022-2023 and in the provisional agenda for NCSR 9, as proposed by NCSR 8.

Action requested of the Committee

12.1 The Committee is invited to consider the proposals in paragraphs 9.1 to 9.3 and 11.5 and take action as appropriate.

ANNEX 1

ANNEX 24
RESOLUTION MSC.232(82)
(adopted on 5 December 2006)

ADOPTION OF THE REVISED PERFORMANCE STANDARDS FOR ELECTRONIC
CHART DISPLAY AND INFORMATION SYSTEMS (ECDIS)

*[Annex containing Resolution MSC.232(82) not reproduced here for technical reasons; refer to
ST 9978/21]*

Amendments to paragraph 11.3.5:

11.3.5 The exchanged route plan should consist of both route geometry, route info and a route schedule ~~as soon as~~ **with estimated** time of departure, ~~and~~ estimated time of arrival **and, once available, actual time of departure and actual time of arrival** ~~can be determined with reasonable accuracy.~~

ANNEX 2

CHECKLIST FOR IDENTIFYING ADMINISTRATIVE REQUIREMENTS

This checklist should be used when preparing the analysis of implications required in submissions of proposals for inclusion of outputs. For the purpose of this analysis, the term "administrative requirements" is defined in resolution A.1043(27), i.e. administrative requirements are an obligation arising from future IMO mandatory instruments to provide or retain information or data.

Instructions:

- (A) If the answer to any of the questions below is **YES**, the Member State proposing an output should provide supporting details on whether the requirements are likely to involve start-up and/or ongoing costs. The Member State should also give a brief description of the requirement and, if possible, provide recommendations for further work (e.g. would it be possible to combine the activity with an existing requirement?).
- (B) If the proposal for the output does not contain such an activity, answer **NR** (Not required).
- (C) For any administrative requirement, full consideration should be given to electronic means of fulfilling the requirement in order to alleviate administrative burdens.

1. Notification and reporting? Reporting certain events before or after the event has taken place, e.g. notification of voyage, statistical reporting for IMO Members	NR X	Yes <input type="checkbox"/> Start-up <input type="checkbox"/> Ongoing
Description of administrative requirement(s) and method of fulfilling it: (if the answer is yes)		
2. Record keeping? Keeping statutory documents up to date, e.g. records of accidents, records of cargo, records of inspections, records of education	NR X	Yes <input type="checkbox"/> Start-up <input type="checkbox"/> Ongoing
Description of administrative requirement(s) and method of fulfilling it: (if the answer is yes)		
3. Publication and documentation? Producing documents for third parties, e.g. warning signs, registration displays, publication of results of testing	NR X	Yes <input type="checkbox"/> Start-up <input type="checkbox"/> Ongoing
Description of administrative requirement(s) and method of fulfilling it: (if the answer is yes)		
4. Permits or applications? Applying for and maintaining permission to operate, e.g. certificates, classification society costs	NR X	Yes <input type="checkbox"/> Start-up <input type="checkbox"/> Ongoing
Description: (if the answer is yes)		
5. Other identified requirements?	NR X	Yes <input type="checkbox"/> Start-up <input type="checkbox"/> Ongoing
Description of administrative requirement(s) and method of fulfilling it: (if the answer is yes)		

ANNEX 3

CHECKLIST FOR CONSIDERING HUMAN ELEMENT ISSUES BY IMO BODIES

Instructions: If the answer to any of the questions below is: (A) YES , the preparing body should provide supporting details and/or recommendation for further work. (B) NO , the preparing body should make proper justification as to why human element issues were not considered. (C) NA (Not Applicable) – the preparing body should make proper justification as to why human element issues were not considered applicable.	
Subject Being Assessed: (e.g. Resolution, Instrument, Circular being considered) The Revised Performance Standards for Electronic Chart Display and Information Systems (ECDIS), resolution MSC.232(82)	
Responsible Body: (e.g. Committee, Sub-committee, Working Group, Correspondence Group, Member State) Sub-Committee on Navigation, Communications and Search and Rescue (NCSR)	
1. Was the human element considered during development or amendment process related to this subject?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
2. Has input from seafarers or their proxies been solicited?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
3. Are the solutions proposed for the subject in agreement with existing instruments? (Identify instruments considered in comments section)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
4. Have human element solutions been made as an alternative and/or in conjunction with technical solutions?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
5. Has human element guidance on the application and/or implementation of the proposed solution been provided for the following:	
• Administrations?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA
• Ship owners/managers?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA
• Seafarers?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
• Surveyors?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA
6. At some point, before final adoption, has the solution been reviewed or considered by a relevant IMO body with relevant human element expertise?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> NA
7. Does the solution address safeguards to avoid single person	<input type="checkbox"/> Yes <input type="checkbox"/> No

errors?	<input checked="" type="checkbox"/> NA
8. Does the solution address safeguards to avoid organizational errors?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA
9. If the proposal is to be directed at seafarers, is the information in a form that can be presented to and is easily understood by the seafarer?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA
10. Have human element experts been consulted in development of the solution?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
11. HUMAN ELEMENT: Has the proposal been assessed against each of the factors below?	
<input type="checkbox"/> CREWING. The number of qualified personnel required and available to safely operate, maintain, support, and provide training for system.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
<input type="checkbox"/> PERSONNEL. The necessary knowledge, skills, abilities, and experience levels that are needed to properly perform job tasks.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
<input type="checkbox"/> TRAINING. The process and tools by which personnel acquire or improve the necessary knowledge, skills, and abilities to achieve desired job/task performance.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
<input type="checkbox"/> OCCUPATIONAL HEALTH AND SAFETY. The management systems, programmes, procedures, policies, training, documentation, equipment, etc. to properly manage risks.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA
<input type="checkbox"/> WORKING ENVIRONMENT. Conditions that are necessary to sustain the safety, health, and comfort of those on working on board, such as noise, vibration, lighting, climate, and other factors that affect crew endurance, fatigue, alertness and morale.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA
<input type="checkbox"/> HUMAN SURVIVABILITY. System features that reduce the risk of illness, injury, or death in a catastrophic event such as fire, explosion, spill, collision, flooding, or intentional attack. The assessment should consider desired human performance in emergency situations for detection, response, evacuation, survival and rescue and the interface with emergency procedures, systems, facilities and equipment.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA
<input type="checkbox"/> HUMAN FACTORS ENGINEERING. Human-system interface to be consistent with the physical, cognitive, and sensory abilities of the user population.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
<p>Comments: (1) Justification if answers are NO or Not Applicable. (2) Recommendations for additional human element assessment needed. (3) Key risk management strategies employed. (4) Other comments. (5) Supporting documentation.</p> <p>(1) 7. The solution will have no effect on single person errors. 8. The solution will have no effect on organizational errors. 9. The proposal is intended for amendment of ECDIS Performance Standards and thus not directed directly to seafarers. 11.D, 11.E, 11.F The solution will have no effect on these human element factors.</p>	

(5)

1. Human element considered by testbeds that have preceded the amendment proposal following the recommended Software Quality Assurance (SQA) and Human-Centred Design (HCD) principles as described in IMO guideline on Software Quality Assurance and Human-Centred Design for e-navigation (MSC.1/Circ.1512).
2. Input from seafarers have been collected by questionnaires and interviews. The input is positive and available at https://s3-eu-west-1.amazonaws.com/stm-stmvalidation/uploads/20200225090150/STMVal_D2.6-D2.10-D2.12-Voyage-management-testbed-report-1.pdf
3. The proposal is in agreement with the International maritime law framework and existing instruments such as SOLAS, STCW and Colregs. The assessments are available at https://s3-eu-west-1.amazonaws.com/stm-stmvalidation/uploads/20200225090052/STMVal_D5.23.pdf
4. Human elements solutions have been an integrated part when developing and validating technical solutions. See 1.
5. See 1. and 2.
10. Human elements experts have been involved in the testbeds referred to in 1. and 2.
11. A, No effect on crewing and number of qualified personnel anticipated.
- 11.B, No revision of the IMO ECDIS model course 1.27 on Generic ECDIS Training is considered necessary. However, a limited training need is to be anticipated and ECDIS familiarisation would need to include the new functionality of standardised digital exchange of route plans. The estimated time needed for familiarisation and training for ship's officers is in the order of one (1) hour. No separate courses or training is anticipated.
- 11.C, See 11.B.
- 11.G, See 1. And 10.