Time to Revise the IMO's Guidance on Good Practice for the Use of Electronic Chart Display and Information System (ECDIS)

A. Weintrit
Gdynia Maritime University, Gdynia, Poland

ABSTRACT: In the course of developing the publication "Recommendations on usage of ECDIS and preventing incidents" [19] by members of the Oil Companies International Marine Forum (OCIMF), they have identified the importance of sharing information on a malfunction of an ECDIS. The problem was discussed in the forum of the International Maritime Organization (IMO). As a consequence, there was a necessity to modify the IMO's ECDIS – Guidance for Good Practice. This guidance is intended to assist smooth implementation of ECDIS and its ongoing safe and effective use on board ships. In the new version of this document (second revision), new important terms appear, such as: type approval authority (TAA), type approval certificate (TAC), letter of acceptance (LOA), declaration of conformity (DOC). In this article, the author tries to present the problem and describe the actions taken by the appropriate IMO bodies.

1 BACKGROUND

ECDIS is a complex, software-based, safety-relevant navigation system with multiple options for display and integration. The ongoing safe and effective use of ECDIS involves many stakeholders including seafarers, equipment manufacturers, chart producers, hardware and software maintenance providers, shipowners and operators, maritime administration, classification societies, and training providers. It is important that all these stakeholders have a clear and common understanding of their roles and responsibilities in relation to ECDIS [20].

In 2002, ECDIS was accepted as meeting the chart carriage requirements of SOLAS regulation V/19 [17]. Over the years, IMO member states, hydrographic offices, equipment manufacturers and other organizations contributed to the development of guidance on a variety of ECDIS-related matters and IMO issued a series of complementary circulars on ECDIS.

Over the last two decades, there have been several significant navigational incidents where one of the contributory factors has been ECDIS-related. It is sure that with an increase in the number of vessels now using Electronic Navigation Charts (ENCs) as primary as well as secondary navigational charts, the appropriate use of ECDIS is critical to ensure the safety of navigation and safety at sea.

An ECDIS is one of the essential tools of a modern navigator. This tool displays digital charts and other navigational information, which improves organization and efficiency compared to traditional nautical charts. To get the most out of your ECDIS, it's essential that best practices are followed.

It's easy to find guidelines on best practices, though, thanks to the International Maritime Organization. Their dedicated safety committee

released a guideline on best practices for ECDIS use. It contains a fairly comprehensive guide on using your ECDIS for navigation.

The IMO's Maritime Safety Committee in 2015, at its ninety-fifth session, approved the circular, drawing together relevant guidance from seven previous ECDIS circulars into a single, consolidated document. The consolidated guidance termed "ECDIS – Guidance for Good Practice" [1] is set out in the annex to this circular. The ship operators, masters and deck officers on ECDIS-fitted ships were encouraged to use this guidance to improve their understanding and facilitate safe and effective use of ECDIS.

The IMO Maritime Safety Committee (MSC), at the 98th session in 2017, approved the first revised version of consolidated guidance (MSC.1/Circ.1503/Rev.1) [2] taking into account all proposed changes, updates and modifications.

In relation to ECDIS – Guidance for Good Practice (MSC.1/Circ.1503/Rev.1) [2], annex, part E (ECDIS Training) and F (Transitioning from paper chart to ECDIS navigation), as well as document MSC 100/17/5 [3], NCSR 7/22/5 [4], and NCSR 7/INF.20 [5], the OCIMF has developed its publication "Recommendations on usage of ECDIS and Preventing incidents" [19].

The summary of the findings relevant to the work of the IMO's NCSR Sub-Committee was presented to NCSR 8 for information (NCSR 8/INF.2) [6]. The publication aims to provide owners, operators, masters, navigating officers, bridge team members, including pilots and ECDIS manufacturers with recommendations to enhance policies and procedures regarding the safe use of ECDIS. In developing the publication, OCIMF members have identified some key issues relevant to the discussion at the NCSR Sub-Committee. Interested bodies, institutions and persons are also encouraged to download the publication as it presents a lot of useful best practice guidelines for the use of ECDIS on board.

2 INTRODUCTION

As was mentioned, the Maritime Safety Committee in 2017, at its ninety-eighth session, based on a recommendation made by the Sub-Committee on Human Element, Training and Watchkeeping, at its fourth session, and noting the need to clarify the requirement of ECDIS familiarization as specified in the STCW Convention, 1978 [18], as amended, and the ISM Code, approved the revision 1 of the ECDIS – Guidance for Good Practice, which was disseminated as MSC.1/Circ.1503/Rev.1 [2].

But this is not the end of the story. Unfortunately, new reports about the use of the ECDIS system, difficulties and abnormalities in functioning are still coming. There is also a technological progress that can be used. Further modification of the document was necessary, taking into account reported needs. The first signals took place in 2018 [3] and 1019 [4],[5],[6].

In the end of this year the Maritime Safety Committee, at its 106th session most probably will approve the revision 2 of the ECDIS – Guidance for Good Practice, based on a recommendation made by the Sub-Committee on Navigation, Communications and Search and Rescue (NCSR), at its ninth session (in June), and noting the need to clarify the general principle, procedures and documentation for onboard ECDIS updates to demonstrate ongoing compliance.

Members states of the IMO and all contracting governments to the SOLAS Convention will be invited to bring this circular to the attention of all entities concerned. In particular, port states will be invited to make the guidance available to their port state control inspectors, and flag states to shipowners, masters, recognized organizations, flag state control inspectors and surveyors. Developed document – IMO's circular MSC.1/Circ.1503/Rev.2. will supersede MSC.1/Circ.1503/Rev.1 [2].

Parallel to the revision of the ECDIS guidelines for good practice, a new version of performance standards for ECDIS was developed [8], [11], [12].

3 IMO CIRCULAR MSC.1/CIRC.1503

IMO Circular MSC.1/Circ.1503, also known as ECDIS – Guidance for Good Practice, is a combination of several prior ECDIS circulars. Each of those documents dealt with a certain aspect of ECDIS use, and MSC.1/Circ.1503 provides a comprehensive guide on this field by merging them. The document is meant to help educate navigators, captains, deck officers, and other relevant personnel in the proper use of their ECDIS.

While the document emphasizes navigators and sailors, its relevance expands much further. Any field that relies upon ECDIS equipment should understand these guidelines. This includes VTS and SAR operators as well as those who man offshore installations.

The International Maritime Organization divided the original document into seven sections plus three appendices. Chart Carriage Requirement of SOLAS is the first section, and it lays down performance standards for ECDIS units.

3.1 *Chart Carriage Requirement of SOLAS*

The original IMO Circular MSC.1/Circ.1503 defines two performance standards for ECDIS units and requires that any ECDIS unit must comply with one or the other, depending on when the original installation occurred. The IMO resolution A.817(19) and resolution MSC.232(82) [16] elaborate on each of these standards. If a user is relying on their ECDIS to meet SOLAS charge carriage requirements, then the maritime standards entail the following requirements:
– an ECDIS must first go through type approval, which will certify it as compliant with IMO regulations;
– the electronic nautical charts in use must be up to date;
– the user must maintain their ECDIS in line with the latest standards as developed by the International Hydrographic Organization;

– there must be sufficient preparation to replace the ECDIS in case of technical failure.

SOLAS regulation V/19.2.1.4 [17] states that ships must have all nautical charts necessary to complete their voyage before embarking. In the case of a ship that chooses to use ECDIS, it should carry the complete suite of electronic navigational charts. If it's impossible to fill the requirements with ENCs, then Raster Navigational Charts (RNCs) and paper charts are acceptable supplementary resources. To date, ENC coverage is not all encompassing across the world, so it's advisable to identify any areas that lack ENC coverage in advance.

One related standard is SOLAS regulation V/27, which states that ships must use up-to-date nautical charts. While raster charts and paper charts are acceptable, they must also be sufficiently recent as to be relevant and reliable. Additionally, the software on an ECDIS needs to remain in line with the latest IHO standards on displays and chart content.

Even when an ECDIS and its electronic navigational charts are fully updated and well maintained, IMO performance standards necessitate that a ship maintains backup measures. The arrangements necessary to satisfy the requirement that a ship can complete its journey without ECDIS include:
1. Prepared facilities to safely replace the functions of the ECDIS. This way, the ship will be able to safely continue its voyage in the event of an ECDIS failure;
2. A navigational replacement for the ECDIS in case of technical failure. A backup ECDIS is acceptable, as are paper navigational charts. Keeping both of these backup resources on hand is advisable but not necessary.

3.2 *Maintenance of ECDIS Software*

The second section of IMO Circular MSC.1/Circ.1503 deals with ECDIS software maintenance. Software maintenance is essential, as an ECDIS with outdated software may be unable to display recent charts correctly. Additionally, non-compliant software may be unable to trigger alarms, notifications, warnings, and other critical information present in the latest electronic navigation charts. In the worst case, an ECDIS without the proper software updates may even fail to install or load up-to-date charts.

The International Hydrographic Organization lays down the latest requirements for ECDIS software as part of the ENC Product Specification, as this page describes.

3.3 *Operating Anomalies Identified within ECDIS*

The International Maritime Organization defines ECDIS anomalies as unintended or unexpected actions on part of an ECDIS unit. These anomalies may impact the function of the equipment, inputs from the user, and other elements of ECDIS function. While there are many possible anomalies that may occur, some examples include:
1. Alarm failures

– ECDIS does not detect objects in the path of a voyage,
– Alarms do not activate when they should or activate when they should not,
– The system fails to manage multiple alarms correctly;
2. Navigational feature failures
– Incorrect display information which may result in misrepresentation of hazards,
– Complex navigational lights appear incorrectly or not at all,
– Absence of lone hazards, underwater features, and detailed information.

The user of the ECDIS should consult the equipment manufacturer in case of these or any other anomalies. Equipment failures of this sort underline the importance of maintaining a backup to the ECDIS.

The ECDIS Data Presentation and Performance Check that IHO has developed is a useful tool to check for proper function. Sailors, mariners, and other operators can use it to create artificial electronic navigation chart cells and run them through the ECDIS to test various elements of technical performance. This can provide for the advance recognition of potentially dangerous anomalies or confirm proper function before a voyage. The IHO website and major electronic chart providers offer this data set as well as guidance on using it properly.

ECDIS anomalies present serious risks to mariners, which is why the International Maritime Organization puts a priority on investigating and resolving them. Administrations may take several measures to help this process, such as encouraging vessels to report any anomalies that occur with their ECDIS equipment. Any report should come with details on the charts and equipment that involved the anomaly, which will make it easier to reproduce and fix the error. Additionally, governments and international organizations should share information with one another upon request. This will help to proactively warn any sailors who may be at risk due to an anomaly that another crew recently discovered.

3.4 *Differences Between Raster Chart Display System and ECDIS*

An operator can use their ECDIS in ECDIS mode or RCDS mode. While the former setting uses electronic navigational charts, the latter makes use of raster navigational charts. Depending on the area where a ship operates, it may or may not have easy access to ENCs. Raster charts are, at their core, digitized paper charts. They lack the deeper technical functionality of modern digital charts and must be supplemented by relevant, up-to-date paper charts [20].

4 REVISION OF ECDIS GUIDANCE FOR GOOD PRACTICE

4.1 *Amendments to ECDIS Guidance for Good Practice (MSC.1/Circ.1503/Rev.1)*

During the ninth session of the IMO's NCSR Sub-Committee which was held remotely from 21 to 30

June 2022 under chairmanship Mr Nigel Clifford (New Zealand) in Agenda item 16 entitled "Revision of ECDIS Guidance for good practice and amendments to ECDIS performance standards", the NCSR Sub-Committee considered the proposed amendments to ECDIS Guidance for good practice (MSC.1/Circ.1503/Rev.1) [2] set out in documents NCSR 9/16 [7] and NCSR 9/16/2 [9], taking into account the comments in document NCSR 9/16/3 [10].

The Sub-Committee recalled that MSC 100 had agreed to include in its post-biennial agenda an output on "Revision of ECDIS – Guidance for good practice (MSC.1/Circ.1503/Rev.1)" [2], assigning the NCSR Sub-Committee as the coordinating organ, with two sessions required to complete the output, in association with the III Sub-Committee as and when requested by the NCSR Sub-Committee (MSC 100/20).

The Sub-Committee recalled also that NCSR 7, having considered a proposal by IHO (NCSR 7/22/5) [4] concerning amendments to the Revised performance standards for electronic chart display and information systems (ECDIS) (resolution MSC.232(82)) [16] to include references to product specifications IHO S-98, S-100 and S-101, with regard to ECDIS equipment installed on or after 1 January 2024, had invited the Committee to expand the scope of the above output to include also amendments to ECDIS performance standards.

The Sub-Committee had for its consideration documents:
– NCSR 9/16 (OCIMF) [7] proposing amendments to MSC.1/Circ.1503/Rev.1 [2] concerning the update of requirements for backup arrangements, ECDIS anomalies and malfunctions and related actions, and the need for type-specific training;
– NCSR 9/16/2 (China and CIRM) [9] discussing the general principle, procedures and documentation for onboard ECDIS updates to demonstrate ongoing compliance and proposing a new chapter B-1 on onboard ECDIS updates and a new appendix 4 listing examples; and
– NCSR 9/16/3 (CIRM) [10], commenting on document NCSR 9/16 [7], proposing modifications to the draft amendments proposed in that document.

During the discussion, the proposals in document NCSR 9/16 [7], as modified in document NCSR 9/16/3, were supported in general, subject to further detailed consideration. In this respect, a concern was expressed regarding the proposed requirement for manufacturers to inform users about ECDIS malfunctions, which might be difficult in some cases [13].

Regarding the proposals in document NCSR 9/16/2 [9], which were supported by some delegations, a view was expressed that type approval requirements for onboard ECDIS updates should be governed by the SOLAS Convention [17], given that SOLAS required ECDIS to be type approved to the applicable standards at the time of installation and that no requirements were given for ECDIS updates during its lifetime. A concern was also expressed regarding the practicability of the reapproval process for ECDIS updates and testing requirements.

In response to the above, other delegations indicated that the proposals in document NCSR 9/16/2 [9] provided a practical way for ships to demonstrate compliance with ECDIS updates and would reduce the administrative burden. ECDIS updates type approval should not be subject to SOLAS regulation V/18 and type approval authorities should have the competence to assess the extent to which an ECDIS update would require testing or reapproval.

After consideration, the Sub-Committee referred documents NCSR 9/16, NCSR 9/16/2 and NCSR 9/16/3 to the Working Group on Navigation for detailed consideration and advice.

During the session established working group (Group) considered the proposed amendments to ECDIS Guidance for good practice (MSC.1/Circ.1503/Rev.1) set out in documents NCSR 9/16 [7] and NCSR 9/16/2 [9], taking into account the comments in document NCSR 9/16/3 [10].

While recognizing the importance of training of seafarers on board for the ECDIS type specific training as part of ECDIS familiarization, noting differing views of some delegations over the interpretation of training aspects proposed in document NCSR 9/16 [7], the Group could not agree on the proposed way forward in this document for the training part within the limited time available.

Having also deleted some of the obsolete references made to the Data Presentation and Performance Check (DPPC) dataset of IHO in relation to anomalies, the Group finalized the draft MSC circular on ECDIS Guidance for good practice, set out in annex 6, to be disseminated as MSC.1/Circ.1503/Rev.2, which then were accepted by the Sub-Committee and transferred to the MSC committee for approval [13].

Owing to time constraints, the Group was unable to review the whole Guidance comprehensively. Nevertheless, the Group agreed that a further revision would be necessary in the future to keep up with advancing technologies. However, the Group recognized that such work would require a dedicated output.

4.2 *Draft of the Second Revision of IMO's ECDIS Guidance for Good Practice*

The undeniable safety benefits of navigating with Electronic Chart Display and Information Systems (ECDIS) were recognized through Formal Safety Assessments (FSA) submitted to the IMO and experience gained by the voluntary use of ECDIS for many years. ECDIS was mandated for carriage by High-Speed Craft (HSC) as early as 1 July 2008. Subsequently, the mandatory carriage of ECDIS for ships other than HSC (depending on the ship type, size and construction date, as required by SOLAS regulation V/19.2.10) was carried out between 2012 and 2018 in a phased and responsibilities in relation to ECDIS.

This ECDIS – Guidance for Good Practice, referred to as "Guidance" hereafter, draws together relevant guidance from seven previous ECDIS circulars into a single, consolidated document. The draft guidance

(the second revision) was laid out now in eight sections, namely:

A. Chart carriage requirement of SOLAS,
B. Maintenance of ECDIS software,
C. Onboard ECDIS updates,
D. Operating anomalies identified within ECDIS,
E. Differences between raster chart display system (RCDS) and ECDIS.
F. ECDIS training,
G. Transitioning from paper chart to ECDIS navigation,
H. Guidance on training and assessment in the operational u use of ECDIS simulators.

The previous version of guidance was specified in seven sections only. Section C entitled "Onboard ECDIS updates" is a new section. The letter markings of the subsequent sections have been renamed

Although this guidance replaces seven IMO ECDIS-related circulars, there remain several other IMO circulars that also address ECDIS matters to varying degree and reference should also be made to these circulars where necessary. Therefore a list containing the IMO ECDIS performance standards and the other IMO circulars that relate to ECDIS, has been placed in the reference section of the document [14].

4.2.1 *Proposed amendments to the document*

The proposed amendments to the document are significant in many places, although at the same time many fragments of the text of guidance are practically unchanged

There are no changes in Section A of the document, entitled "A Chart Carriage Requirement of SOLAS". Only one sentence has been added at the end of the section that the update requirements mentioned in section applies to the back-up arrangements as well.

One sentence has been added to Section B entitled "Maintenance of ECDIS software": Any updates, essential to make an ECDIS compliant with the performance standard, should be particularly identified and be actively communicated to identified users of the system.

As we know, a number of ECDIS operating anomalies have been identified. Due to the complex nature of ECDIS, and in particular because it involves a mix of hardware, software and data, it is possible that further anomalies may exist. These anomalies are particularly apparent in ECDIS units that have been built and type-approved to ECDIS Performance Standards (resolution A.817(19), as amended), (i.e. before 2009). However, ECDIS units type-approved to the revised ECDIS Performance Standards (resolution MSC.232(82)) [16] are still vulnerable to the various limitation.

In Section D entitled "Operating Anomalies Identified within ECDIS" one sentence has been added: A manufacturer should notify the flag state administration, ROs and identified ECDIS users at the earliest possible opportunity to communicate if the ECDIS presents a risk to maritime safety, to health or to the environment due to a malfunction of software

or hardware including appropriate mitigation measures.

However, the following fragment was deleted: "HO has produced an ECDIS dataset that allows mariners to check some important aspects of the operation of their ECDIS. This dataset contains two fictitious ENC cells which deck officers can load into their ECDIS units to assess operating performance and to determine whether there may be any display anomalies that either need to be remedied or otherwise managed in the way that the ECDIS is operated. If the check highlights a problem, the accompanying guidance notes with the check dataset offer suggested courses of action. The check dataset and accompanying instructions can be obtained from ENC service providers, or can be downloaded from the IHO website at: http://www.iho.int/".

Sentence: "Given the widespread use and the implementation of the ECDIS carriage requirement, the Committee considered it important that any anomalies identified by mariners are reported to and investigated by the appropriate authorities to ensure their resolution" was supplemented with the following statement: "Manufacturers should have a mechanism in place to ensure they notify identified users of their ECDIS systems about any noted anomalies and close-out subsequently with relevant upgrades. Masters, shipowners and operators should use the software maintenance arrangements provided by the manufacturer to check if such upgrades are available" [14].

4.2.2 *Section C - Onboard ECDIS Updates*

Prior to the onboard ECDIS units being updated, whether required to be compatible with the in force IHO standards or initiated by the manufacturer to improve functions or fix minor bugs, the manufacturer should notify the type approval authority (TAA) named on the type approval certificate (TAC) of any modification or changes to the equipment, together with the relevant information and technical documentation. Accordingly, after assessment, the TAA decides if and what level of additional testing is required in each individual case [14].

Depending on the assessment and judgement of the TAA:
a) if additional testing is needed and performed and conformity is demonstrated, the TAA should issue one of the following documents:
   − a new TAC with the updated software and/or hardware details on it; or
   − a Letter of Acceptance (LOA) with the updated software and/or hardware details on it to supplement the old TAC.
b) if no additional testing is required and no new TAC or LOA is necessary, the TAA should inform the manufacturer of the decision in writing, via email or other means of notification.

In cases of paragraph a) above, the manufacturer should issue a new declaration of conformity (DOC), declaring the product concerned is in conformity with the requirements of the international instruments that apply to it. When no new TAC or LOA is issued by the TAA as indicated in paragraph b), the

manufacturer should keep a copy of the written notification by the TAA. Examples of onboard ECDIS updates are listed in appendix 4.

To prove that an ECDIS update on board is conformant, one of the following should be made available:
- a new TAC with the updated software and hardware details on it and new DOC;
- the old TAC supplemented by an LOA and new DOC; or
- the old TAC and DOC.

Manufacturers should provide a copy of the documents above and an updated user manual, if applicable, to the ship to be carried on board until the equipment is removed from the ship and make available the written decision taken by the TAA regarding the minor changes as described in paragraph b) above, if so requested. In addition, such information should also be made available by the manufacturer using a website. The need for safe navigation requires that manufacturers should provide a mechanism to ensure that software maintenance arrangements are adequate. This may be achieved through the provision of software version information using a website. Such information should include the IHO standards which have been implemented.

Manufacturers are also encouraged to provide a copy of the documents listed above to the ship via a QR code, email or field engineer. A QR code for each ECDIS unit would be particularly useful to provide easier access to information in relation to the hardware/software updates of each equipment.

4.2.3 *Examples of onboard ECDIS updates*

Examples of onboard ECDIS updates are presented in new appendix 4 [14] – Table 1.

In the following, examples of onboard ECDIS updates and documentation are provided:

Example 1
The TAC lists the release number for software 5.03.xx and the current manufacturer software release number is 5.03.02 and is to be updated to 5.03.03.
Manufacturer report: The manufacturer reports small bug fixes or changes for the last digit of the IHO standards.
TAA decision: The TAA decides that the reported changes are minor changes and do not need re-certification or LOA.
Documents provided: The old TAC, DOC. The software release number changes from 5.03.02 to 5.03.03 which is covered by 5.03.xx in the existing TAC.

Example 2
The TAC lists the release number for software 5.03.xx and the current manufacturer software release number is 5.03.02 and is to be updated to 5.04.00.
Manufacturer report: The manufacturer reports additional functionality or changes in existing functionality.
TAA decision: The TAA decides that the changes are TAC relevant and requires additional testing and consequential re-certification.
Documents provided: New TAC, new DOC. The software release number changes from 5.03.02 to 5.04.00 and 5.04.xx is taken over into the new TAC.

Table 1. Examples of onboard ECDIS updates

	Example 1	Example 2	Example 3	Example 4
Description	The TAC lists the release number for software 5.03.xx and the current manufacturer software release number is 5.03.02 and is to be updated to 5.03.03.	The TAC lists the release number for software 5.03.xx and the current manufacturer software release number is 5.03.02 and is to be updated to 5.04.00.	The TAC lists the IHO standard edition 3.0.x and the current manufacturer IHO standard edition is 3.0.(1) and is required to be updated to edition 3.1.(0)	Manufacturer manufactures ECDIS with software version 5.0, and then changes the manufacturing to software version 6.0. The hardware remains unchanged. In this case a new TAC listing v6.0.xx replaces the previous TAC listing v5.0. xx.
Manufacturer report	The manufacturer reports small bug fixes or changes for the last digit of the IHO standards	The manufacturer reports additional functionality or changes in existing functionality.	The manufacturer reports updates to meet the latest IHO requirements.	The manufacturer reports software updates from 5.0 to 6.0.
TAA decision	The TAA decides that the reported changes are minor changes and do not need re-certification or LOA.	The TAA decides that the changes are TAC relevant and requires additional testing and consequential re-certification.	The TAA decides that the changes are a major change and TAC relevant and requires retesting.	The TAA decides that the changes are a major change and TAC relevant and requires re-certification.
Documents provided	The old TAC, DOC The software release number changes from 5.03.02 to 5.03.03 which is covered by 5.03.xx in the existing TAC	New TAC, new DOC. The software release number changes from 5.03.02 to 5.04.00 and 5.04.xx is taken over into the new TAC	The old TAC supplemented by an LOA, new DOC. The IHO standard edition changing from 3.0.(1) to 3.1.(0) is mentioned in the LOA.	New TAC, new DOC. The software release number changes from 5.0 to 6.0 in the new TAC.

Example 3
The TAC lists the IHO standard edition 3.0.x and the current manufacturer IHO standard edition is 3.0.(1) and is required to be updated to edition 3.1.(0).
Manufacturer report: The manufacturer reports updates to meet the latest IHO requirements.
TAA decision: The TAA decides that the changes are a major change and TAC relevant and requires retesting.
Documents provided: The old TAC supplemented by an LOA, new DOC. The IHO standard edition changing from 3.0.(1) to 3.1.(0) is mentioned in the LOA.

Example 4
Manufacturer manufactures ECDIS with software version 5.0, and then changes the manufacturing to software version 6.0. The hardware remains unchanged. In this case a new TAC listing v6.0. xx replaces the previous TAC listing v5.0. xx.
Manufacturer report: The manufacturer reports software updates from 5.0 to 6.0.
TAA decision: The TAA decides that the changes are a major change and TAC relevant and requires re-certification.
Documents provided: New TAC, new DOC. The software release number changes from 5.0 to 6.0 in the new TAC.

5 DISCUSSIONS

5.1 *ECDIS reliability*

In addition to the anomalies introduced in MSC.1/Circ.1503/Rev.1, annex, part C [2], OCIMF identified that the following factors can affect ECDIS accuracy and reliability, for example, but not limited to [6],[7]:
– issues with ECDIS hardware and software;
– improper application of software update/patches;
– improper change management for hardware or software upgrades;
– ENC programming and accuracy with regard to scales, datums, point features versus area features, the survey data and survey techniques used;
– ENC database management and updating procedures;
– slow response/refresh rates;
– look-ahead feature not identifying or alarming grounding risk; and
– freezing of ECDIS monitors.

Some software patches are installed to rectify issues related to ECDIS software by respective manufacturers. The OCIMF is aware that these patches include rectification of an essential function the ECDIS, i.e. restoring a non-compliant system into a compliant system.

Therefore, in the opinion of OCIMF, these essential software patches should be treated as part of the type approval process. The Performance standards for electronic chart display and information systems (ECDIS) (resolutions A.817(19)), annex, paragraph 1.4, and the Revised performance standards for electronic chart display and information systems (ECDIS) (resolution MSC.232(82), annex, paragraph 1.3 [16], clearly state that ECDIS should be capable of displaying all chart information necessary for safe and efficient navigation.

Pending the completion of re-type approval process, OCIMF in its publication, recommended that manufacturers should disseminate any known problem and mitigating measures to users. However, OCIMF is of the view that this re-type approval process will not be required for simple enhancement of usability or other performance improvement related updates.

While update of basic software (e.g. Windows 10) may not require type approval, any known malfunction caused by outdated basic software should be actively communicated to known users by the manufacturers.

5.2 *The latest applicable IHO standards*

According the Guidance, an ECDIS is being used to meet the chart carriage requirements of SOLAS Convention [17], it must be maintained to be compatible with the latest applicable IHO standards. As indicated in document NCSR 7/INF.20 [5], there are different understandings of the latest applicable IHO standards. IHO website specifies that the up-todatedness of the ECDIS in regard to the installation of the latest edition of the standards is represented by the first two digits of the edition number, and the third digit of the edition number (in brackets) indicates a clarification version of the standard and has no impact on the safety of navigation or ECDIS performance. This means that not every latest IHO standard will require ECDIS updates onboard. Therefore, it would be beneficial if the definition of IHO standards Edition number is referenced in the Guidance via a footnote to harmonize interpretation by stakeholders [15]: be maintained so as to be compatible with the latest applicable International Hydrographic Organization (IHO) standards [4],[8].

The up-to-datedness of the ECDIS in regard to the installation of the latest edition of the Standards is represented by the first two digits of the edition number. The third digit of the edition number (in brackets) indicates a clarification version of the Standard; clarifications have no impact on the safety of navigation or ECDIS performance. For details, see www.iho.int/en/standards-in-force

5.3 *Procedures for onboard ECDIS updates to be compatible with the latest applicable IHO standards*

After reviewing the ECDIS-related standards developed by IHO, IMO and IEC (see Table 2) and bearing in mind the IHO's Roadmap for the S-100 Implementation Decade (2020-2030), with the newly revised ECDIS performance standards expected to enter into force on 1 July 2025, it is foreseeable that relevant IHO standards will continue to be improved and revised, taking into account that S-100 is a new technology [15].

Table 2. Different application or publication dates for ECDIS-related IHO/IMO/IEC standards [15]

IHO		IMO		IEC	
Reference/ Edition in force	Publication date	Application date	IMO document	Publication date	Standard version
S-57 Edition 3.1	November 2000, in conjunction with: Suppl. 3 (June 2014), S-57 Maintenance Doc. No. 8 (March 2002)	2009.01.01	MSC.232(82)	2015.08.20	IEC 61174 2015-08 (E 4.0)
S-52 Edition 6.1.(1)	October 2014- with Clarifications up to June 2015	2000.01.01- 2008.12.31	A.817(19) as amended by MSC.86(70)	2008.09.26	IEC 61174 2008-09 (E 3.0)
S-52 (annex A) Edition 4.0.(3)	October 2014 – with Clarifications up to December 2020	1999.01.01- 1999.12.31	A.817(19) as amended by MSC.64(67)	2001.11.27	IEC 61174 2001 (E 2.0)
S-64 Edition 3.0.(3)	December 2020	1996.01.01- 1998.12.31	A.817(19)		IEC 61174 1998 (E 1.0)
S-61 Edition 1.0	January 1999				
S-63 Edition 1.2.(1)	March 2020				

Based on the past experience gained from the S-57 related onboard ECDIS updates, it is considered that the implementation of a general procedure for onboard ECDIS updates is vital to ensure smooth organization of S-100 updates onboard worldwide and that shipowners are well prepared to update onboard ECDIS to be compatible with the latest applicable IHO standard.

6 CONCLUSIONS

Today's mariner is looking for something with the same standards of quality as the traditional standard paper chart, but which meets the demands of a new navigational era. Traditional navigation methods are being replaced by computers. Electronic Chart and Display Information Systems (ECDIS) become mandatory on every ship. ECDIS not complying with regulations is an existing problem and a hazard for people and the environment. Unfortunately, there is a lack of rules and procedures for checking whether ECDIS meets related performance standards, and those that have already been introduced are not enough. Regulatory bodies of the maritime industry are now contemplating how to tackle this problem. The document presented in this article MSC.1/CIRC.1503/Rev.2, developed by the International Maritime Organization, seems much more to increase the safety and credibility of the operational use of ECDIS for today than its previous version.

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