COMPOSING A STANDARD FOR ELECTRONIC CHART DISPLAY AND INFORMATION SYSTEM TYPE SPECIFIC TRAINING

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Abstract. Electronic Chart Display and Information System (ECDIS) training is accepted as extremely important for safety in modern navigation. At present, two types of training are required for deck officers. Operational use of ECDIS is mandatory training for deck officers and it is conducted according to the International Maritime Organization (IMO) Model course 1.27. This course provides general knowledge about ECDIS. Type specific training is indispensable for the officers to know all the capabilities, functions, and limitations of the ECDIS used onboard. The lack of regulations for this type of training allows the manufacturers of ECDIS to apply their own requirements. This can result in improper and insufficient training.

Based on research of the opinion and experience of deck officers, the authors of the paper propose a model of a standard for type specific training.

Keywords: ECDIS; type specific training

Introduction

The introduction of the ECDIS system as mandatory has revived the debate on "active" and "passive" navigation. The use of ECDIS is considered to encourage "passive" navigation, while paper charts, where still available, are used solely for reference and less and less for actual positioning of the vessel (Belev et al. 2019). The dominant role of the ECDIS system expectedly generated interest among manufacturers of navigation equipment. There are currently more than 30 manufacturers offering officially approved ECDIS systems, some of which have more than one model. As a result, there are more than 40 models in service, with some key features varying significantly between manufacturers. The significant variation in how different manufacturers display the information has been a source of concern for several years, and at the same time a prompt for common default settings across all models. However, this idea has not yet been realized, and ECDIS manufacturers are constantly improving their systems and offer new models (Belev & Daskalov 2019).

1. Requirements for the qualifications and competences of deck officers for the different types of training in the use of ECDIS systems

Regarding the use of ECDIS, both STCW (International Convention on Standards of Training, Certification and Watchkeeping for Seafarers) and the International Safety Management (ISM) Code state that full and appropriate training is required for the correct and safe operation of ECDIS, and it is recommended that the preparation consists of:

1) Operational use of ECDIS (generic training) – required by the 2010 STCW amendments.

2) Type specific training – required by Regulation I/14 of STCW, as well as by sections 6.3. and 6.5. of the ISM code[1].

The generic training is conducted regarding the IMO model course 1.27 "Operational use of electronic chart display and information system ECDIS". The main objective of this course is for the trainee to understand the possibilities, characteristics and limitations of the ECDIS system, as well as the ways of its correct use. This course consists of 40 teaching hours – lectures and practice on a simulator and is mandatory for all deck officers as of January 01, 2017. The contents of the course are based on the navigation operations carried out on board the ship and include the training objectives, both at operational and management level. The model course presents the full description of the training, and it includes: scope, objective, entry standards, certification, delivery, intake limitations, staff requirements, teaching facilities and equipment as well as all the topics included in this course[2].

The conduct of type specific training is not strictly regulated, which allows it to be conducted:

– in a different form – in a training center with an instructor; in a training center online; by a specialized software installed on the trainee's computer, on the site of the manufacturer company, etc.

– with a different duration, which depends on: the manufacturer's requirements; the form of training; the learner's capabilities, etc.

– in a different format – lectures and exercises on a real console; video training and virtual console exercises, etc.

– with a different test format – a theoretical test and a practical exam on a real console; a combination of theoretical and practical skills in online learning; theoretical and practical exam at the manufacturer's site, followed by an online interview, etc.

Resolution MSC.232(82) of the International Maritime Organization is the document that establishes the standards for ECDIS systems. The first clause of this document states that "the primary function of ECDIS is to contribute to safe navigation"[3]. It is part of the overall policy of the International Maritime Organization, whose work "covers all aspects of international shipping – including

ship design, construction, equipment, manning, operation and disposal – to ensure that this vital sector remains safe, environmentally sound, energy efficient and secure"[4].

Every year, the European Maritime Safety Agency (EMSA) prepares a report on the incidents that have occurred at sea. Data for the period 2011 – 2018, which coincides with the schedule for the introduction of ECDIS as the main navigation system, shows that there is no downward trend in the number of incidents at sea[5]. The group of incidents that occurred during ship operations also includes those in which the ECDIS system is involved (Lusic et al. 2017). For these situations, a separate term has been introduced, which is used in cases where the incorrect use of ECDIS is identified as one of the factors that led to the ship's grounding – "ECDIS assisted groundings" (Cockerell et al. 2017). This most often includes: incorrect system setup, insufficient deck officer experience, poor knowledge of the system, non-compliance with the Safety Management System (SMS), relying solely on ECDIS or operating the system at a very low level of functionality, with important safety-related settings disabled or bypassed. This is practically expressed in the following actions by deck officers (Androjna et al. 2021):

– incorrect work with the charts – suitable charts for the upcoming voyage are not used or missing, or chart updates are not installed regularly and correctly;

– the system is not updated according to the manufacturer's requirements;

– incorrect use of safety settings, including those related to checking the route;

– incorrect setting of the screen, filters and scale;

– not using the route check function or using it with an inappropriate route deviation (XTD) setting. Neglecting the visual inspection of the route or performing it on an inappropriate scale;

– lack of knowledge about the specific ECDIS model installed on board;

– overreliance of ECDIS and the position displayed by GPS;

– inability to use the function to determine the position of the ship by independent means;

– incorrect change of the watch between the deck officers, which is expressed in the lack of information about the current state and operation of the system, safety settings, etc.

The reasons that lead to these actions are complex, but often highlighted among them is insufficient and ineffective ECDIS training. Some of the reports recommended that additional training must be provided to avoid future incidents (Belev et al. 2020). According to the authors, the creation of a standard for conducting of type specific training would increase the level of training of deck officers. This is because the standard will cover all mandatory elements of working with the ECDIS system. In this way, the risks of insufficient and ineffective training will be minimized.

2. Survey of the status of ECDIS type specific training to create a standard

For the purpose of the research, a survey was compiled to ascertain the opinion and experience of active deck officers in relation to ECDIS type specific training. The survey is completed in electronic form, and respondents must answer 5 questions, one of which is open-ended, and the rest offer a multiple choice.

228 deck officers took part in the survey. 60% of the participants are currently in the position of Officer on Watch (OOW). Their opinion is especially important since the work with ECDIS is their direct responsibility. On the other hand, 40% are officers on management level – Chief officers 21% and Masters 19%. They have already had experience as OOW and at present they use ECDIS to ensure navigational safety.


WHAT IS YOUR POSITION ON BOARD THE SHIP?

Master 19%

Chief officer 21%

OOW 60%

Figure 1. Answers of the officers regarding their position on board
Source: Own research.

As mentioned earlier, training is a mandatory element in the process of working with ECDIS (Belev 2019). To find out how many trainings the respondents had already completed, they had to answer the following question: "How many certificates for type specific training do you have? Please, note the name of the system and if the course was conducted by instructor or it was Computer Based Training (CBT)". 218 officers answered this question and they have passed 475 courses in total on 20 different ECDIS systems. 164 of the courses are conducted by instructor and 311 are CBT. The significant number

of completed trainings and the number of ECDIS models used during these trainings are important for the purpose of the present study, as this will provide it with greater representativeness.

To create a standard for type specific training, one of the most important questions to be answered is "What should be the format of the course?".
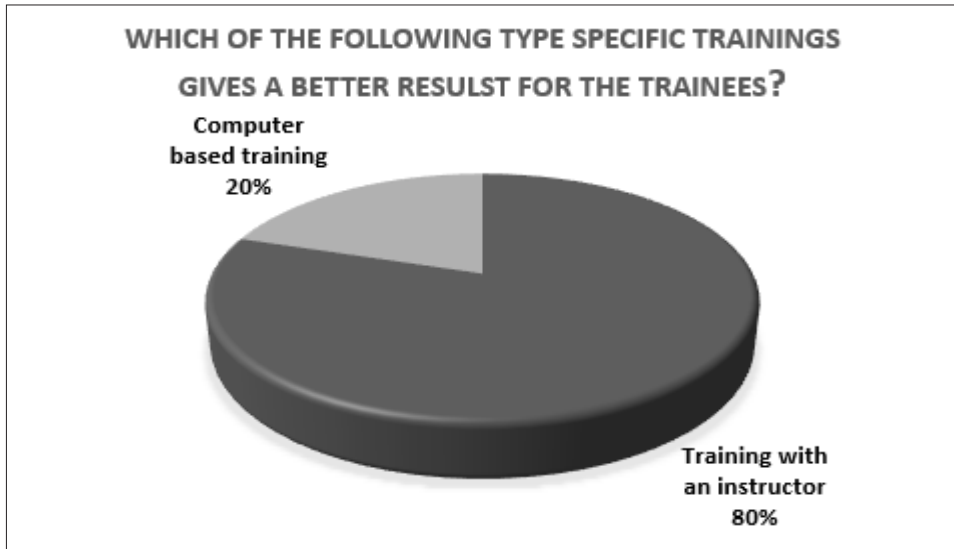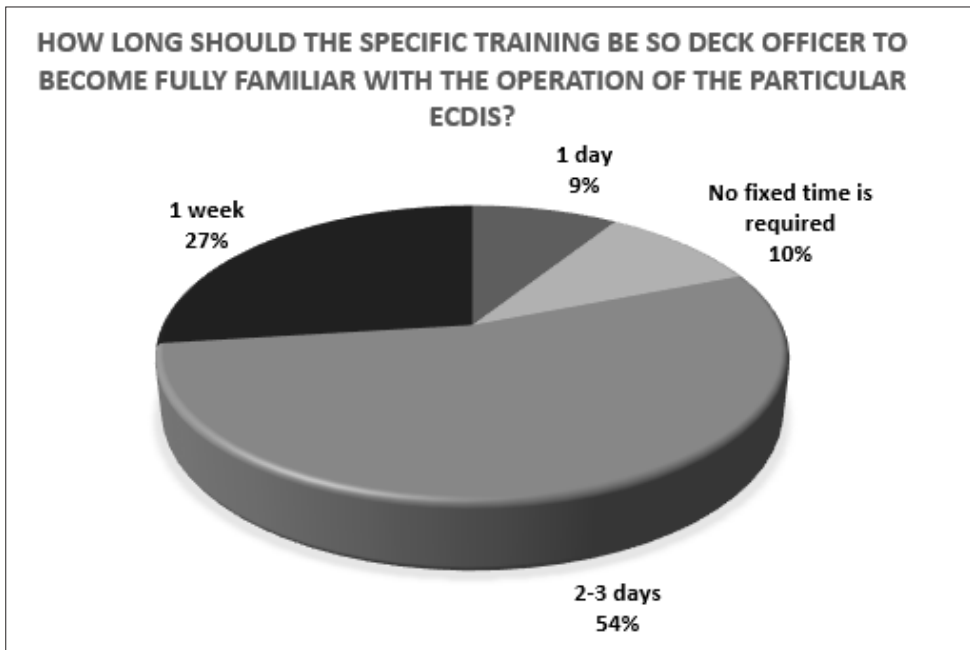

Figure 2. Answers of the officers regarding format of the course
Source: Own research.

Despite the greater number of computer-based courses completed by the respondents, for 80% of them the more effective method of conducting training is with an instructor. From the comments left by the officers, it is evident that the main reason for that result is the possibility to communicate with someone who is familiar with the system. It means that the trainee could ask a question or additional explanation about any function. The instructor, thanks to his experience, would give practical advice to the trainee about the features which require more attention (Belev 2021).

Another very important issue related to the development of uniform rules for the ECDIS type specific training is duration. At present, the duration varies from 90 minute to one or two-days course. From the results obtained, it is clearly seen that more time is needed for training of the deck officers to be sufficiently prepared. It is important to note that deck officers undergo a range of training

prior to receiving a Certificate of Competence (CoC), as well as in the course of their active duty at sea. It should also be said that these trainings happen during the time of their rest days. In other words, they are overloaded and tired of taking any type of course.
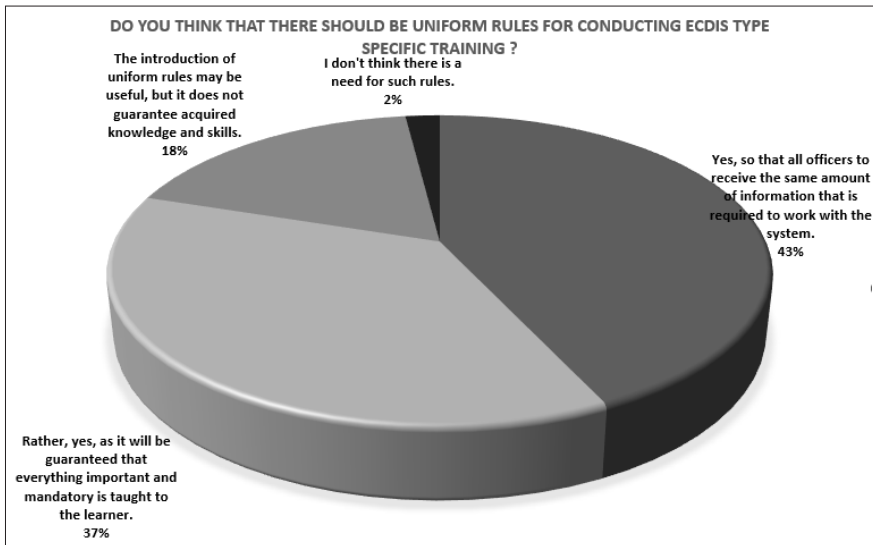

Figure 3. Answers of the officers regarding the duration of the course
Source: Own research.

Therefore, the fact that almost 1/3 of the officers shared that one week is the time needed to fully carry out the specific training means that they find it extremely important, but insufficient.

The main motive for carrying out a study which examines the opinion and experiences of active deck officers in relation to type specific training is to assist in the development of a standard that will improve the effectiveness of knowledge acquisition and proficiency testing for a specific ECDIS model. For this reason, the main and most important question answered by deck officers participating in the survey is to what extent they consider it important for uniform rules for type specific training to be developed and introduced.

Figure 4. Answers of the officers regarding the uniform rules

Source: Own research.

The results strongly indicate that the introduction of a standard for this type of training is necessary. According to 43% of deck officers, this will mean that they will receive the same amount of information regardless of where and how the training is conducted. Another 37% of those who participated in the study believed that having a standard for specific training would ensure that all mandatory elements of working with the system were included in the training process. This means that for 80% of the respondents, conducting specific training according to uniform rules is imperative and necessary.

3. Composing a standard for ECDIS type specific training

In connection with the conducted survey of the opinion of active deck officers regarding ECDIS type specific training, it was concluded that the development of a standard is necessary. This conclusion is due to the opinion of 80% of the survey participants, who say that such a standard is needed to improve the quality of this type of training. The form of the developed standard follows the structure of the model courses issued by the International Maritime Organization (IMO). The standard was developed with a duration of 16 hours. This is in response to the expectations of more than half of the respondents, for whom one-day training is not enough. Training is intended to be conducted on a real ECDIS console. This way of conducting eliminates the possibility of conducting training at home, but four out of five participants in the survey are of the opinion that this is the right way to conduct this type of training. The

classes are conducted by management-level officers who have undergone mandatory training from the system manufacturer, as well as training for marine instructors and assessors. This guarantees the possibility of communication, specifying details of working with the system, as well as receiving an answer to a question that has arisen. After completing the training, an exam is held, which consists of a theoretical part in the form of test questions, as well as a practical exam to demonstrate skills in working with the system. A checklist has been developed for the assessment of practical skills, which the trainees must fill out. Every task consists of several units which are included in the syllabus of the course.

Table 1

Trainee (Name)														
Working place №														
Task		**Assessment**												
1.	Using basic system functions and settings (10 units)													
2.	Settings for working with electronic navigation charts (5 units)													
3.	Installing updates and licenses (2 units)													
4.	Manual correction of the charts (4 units)													
5.	Settings of sensors connected with ECDIS (7 units)													
5.	Settings of alarms of the system (6 units)													
7.	Route planning (2 units)													
8.	Settings and additional features in route planning (4units)													
9.	Route monitoring (3 units)													
10.	Voyage recording (3 units)													
Total score:														

* Each successfully completed task is marked with a "V" symbol, and each unsuccessfully completed task with an "X" symbol. A task in which all elements are fulfilled is considered successful. To successfully pass the practical exam, 100% completion of the tasks is required.

The combination of theory and a practical exam aims to check the overall knowledge of the trainees. The requirement for a 100% pass rate on the practical exam is imposed because each of the elements, included in the check list, is essential to the operation of the system.

Conclusions and summary

The training of deck officers to work with ECDIS is a key element for safe and efficient navigation. Due to the lack of clear rules for conducting ECDIS type specific training, manufacturers apply their own training and certification rules. This creates difficulties for a large part of the officers, as evidenced by the data from the survey carried out in relation to the ECDIS type specific training. The problems, related to training, are directly connected to the incidents that occur due to the incompetent use of ECDIS (Belev et Daskalov 2019). When analyzing this type of incidents, it is established that the most common reasons for their occurrence are: incorrect system setting, insufficient experience of the deck officers, poor knowledge of the system, non-compliance with the safety management system (SMS), reliance only on ECDIS or operating the system at a very low level of competence.

In conclusion, it must be said that in the coming years the number of ECDIS models will increase and so will the number of vessels without paper charts. This significantly increases the role of training for working with these systems, so it is not a good approach to leave it solely to the conscience of the trainees. The pragmatic solution is to introduce minimum training standards to ensure that every trainee who meets these standards is able to operate the particular ECDIS model, is aware of its specific features that distinguish it from other similar models, knows well the indications of the system and any specific settings that would ensure the safety of navigation.

NOTES

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