ECDIS Users Genuine Qualification in Maritime Industry Great Demand

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ABSTRACT: In this paper author summarizes present maritime industry growing preference for highly qualified officers in the field of ECDIS operation. Current ECDIS training internationally recognised requirements are described including Manila amendments and Polish approach to the IMO Model course 1.27. Various forms of training available nowadays are presented within the paper. Advantages and disadvantages of each method are identified. Author outlines the necessity of improving ECDIS trainers' competency.

1 INTRODUCTION

Technology growth is incredible nowadays. Many ideas deemed to be unrealistic twenty years ago became part of our real world. Levitating trains can transport passengers in a low pressure tubes with speed of 1200km/h [11], electric cars are about to beat legends powered by combustion engines [14], electric energy to our houses could be supplied by perovskite-coated surfaces [10]. Theoretical physicist, co-founder of String Field Theory Dr. Michio Kaku said "Although humans have existed on this planet for perhaps 2 million years, the rapid climb to modern civilization within the last 200 years was possible due to the fact that the growth of scientific knowledge is exponential; that is, its rate of expansion is proportional to how much is already known. The more we know, the faster we can know more. For example, we have amassed more knowledge since World War II than all the knowledge amassed in our 2-million-year evolution on this planet. In fact, the amount of knowledge that our scientists gain doubles approximately every 10 to 20 years." [7] Maritime world is no exemption to global technological advance trends and nowadays ships are equipped with high-tech devices leaving paper charts, hard copy publications, navigational triangles and dividers behind. Navigating officers, more than ever before need to be computer literate and has to go along with development of new technologies. The future progress of maritime industry will be increasingly dependent on officers' education, scientific research, innovation and technology.

2 INTERNATIONAL ECDIS REGULATIONS

In May 2009 International Maritime Organisation Maritime Safety Committee updated SOLAS Convention with ECDIS mandatory carriage requirements [5]. In July 2018 last group of worldwide fleet (Existing ships of size between 10000 and 20000GT) will be equipped with ECDIS and implementation period will ends. As a result of ECDIS introduction on board the ships, seagoing personnel qualification requirements had to be reviewed.

2.1 Manilla Amendments

The IMO Convention on Standards of Training, Certification and Watch keeping for Seafarers (STCW) is a comprehensive set of international regulations with regard to officers' competence. In June 2010 during Diplomatic Conference in Manila, STCW Convention has been updated with additional rules in order to cope with technology advance in maritime world [9] Set of revised rules was given name of "*Manila Amendments*". Among the others significant changes, ECDIS related requirements have been updated. The most important modification is that officers performing navigational watch must be competent in use of ECDIS and be in possession of appropriate certificates. From February 2017 all officers must adhere to above changes and hold valid STCW certificate covering duties performed on board. To fulfil updated STCW ECDIS related requirements Officer in charge of Navigational Watch needs to comply with set of competencies described in details in Table A-II/1 of STCW Convention. In consequence of the adoption of the Manila Amendments to the STCW Convention, three Polish maritime academies/universities present common position on what necessary steps should be taken to revise and update existing ECDIS IMO model course on Operational Use of ECDIS [15]

Manila Amendments revealed noticeably trend in reducing sea-time required to gain certain competence. Unlike with STCW Convention from 1978 where sea-going service was a base for upgrade to higher qualification, at present more pressure is exerted on completion of approved education and training programme. The emphasis on qualification will allow officers to be promoted to the higher rank in shorter time. Officers' motivation mostly depends on their individual needs. All things considered, although there are many points against this approach, I believe there are certainly aspects in favour of it. Well-balanced training programme in conjunction with shorter sea-going time will be more valuable than longer sea-going experience without proper education.

To avoid delays in bringing Manila amendments into force tacit acceptance procedure was implemented. Mentioned procedure invert common acceptance practice and instead of requiring majority of countries to acknowledge proposed changes, leaves specific time for objections. Using tacit acceptance procedure Manila Amendments came into effect in July 2011 [1]

3 ECDIS EDUCATION

ECDIS introduction exerted significant influence on approach to officers training in e-navigation. Electronic charts became main source of navigation information and therefore require from users knowledge and understanding of system. Nowadays officers needs to catch-up with rapidly changing technical solutions. Integrated Bridge System should ease officers' work and improve navigational safety. It is designed as user-friendly work environment equipped in high-tech solutions. It will play its role only in hands of well-trained user, who is able to take full advantage of its capabilities. ECDIS became a core of whole Integrated Bridge System structure. It unites navigational sensors into one shared easily accessible by officer on the watch picture. Navigating officer has all key parameters in one place and a possibility to dig deeper if required. What navigator mostly needs is a simple reading displayed on the screen. If it's necessary there is always a possibility to adjust more advanced settings on the connected equipment itself. ECDIS abbreviation states for Electronic Chart Display and Information System. There is a tendency to perceive it as electronic chart nicely displayed on the monitor. ECDIS collects essential information from navigational sensors, calculates them and provides all data to the officer on the watch. Nevertheless, ECDIS is still a computer, a machine which needs to be managed and controlled by wise operator. Even the most sophisticated ECDIS, no matter how capable it is, must be operated by user who knows its potential and limitations. Illustrative differences between old-fashioned bridge where paper charts were in use and modern bridge equipped with ECDIS are shown in Table 1.

Table 1. Delegation of tasks on traditional and modern navigational bridge.

	Paper charts	ECDIS
Position plotting (GNSS)	OOW	ECDIS
Position cross-checking (doubled GNSS)	OOW	ECDIS
Position cross-checking (GNSS by observed)	OOW	OOW
Position cross-checking (GNSS by RIO)	X	ECDIS
Position logging (GNSS)	OOW	ECDIS
Position logging (observed)	OOW	OOW

Majority of tasks previously carried out by navigating officer are delegated to be done by ECDIS. Inputs will be calculated, logged and accurately plotted but only under one condition – input must be correct. Trash in - trash out. It cannot be forgotten that ECDIS is just a machine and won't forgive any mistaken values given. Officers successfully completed ECDIS training will know what parameters should be input into the system in order to remain within safety limits. Quoting 2016 Passage Planning Guideline "*a high level of equipment knowledge is required to understand the nuances of the ECDIS software in use, as only then can its capabilities be optimised and a safe passage plan produced*" [12]

3.1 Maritime universities & academies curricula

Maritime higher education curricula have been changed in order to cope with technological advance in marine industry. ECDIS implementation on board the ships resulted in ECDIS classes' introduction in teaching programmes. Correlation between teaching navigation on paper charts and on ECDIS was emphasized in 2016 Passage Planning Guideline "*the potential of ECDIS very much depends on the skill of the watch keeper. In this regard, very little has changed from navigating with paper charts as ECDIS, despite its capabilities, is still only a navigational aid. This meant that, although production of safe passage plan will inevitably take less time on ECDIS than on paper charts, it requires at least the same level of skill to compose*" [12] ECDIS classes originated in a form of extra-curricular

activities and became one of the leading topics in maritime universities and academies schedules. Students who get familiar with ECDIS structure at early stage of their sea carrier would have smooth path to develop their knowledge and skills in the field of electronic navigation. Well-established groundwork will result in easier adaptation of various ECDIS brands. After all, fundamentals remain the same and the differences are in system structure and various functions availability.

3.2 *ECDIS generic course*

ECDIS Generic Course is a basic training for officers who intend to work on the ships equipped with ECDIS. Revised STCW legislation sets extensively described standards for course programme. According to IMO Model Course 1.27 training should last for at least five days and forty hours providing participants with basic knowledge about ECDIS operation [8]. The generic training should include but not be limited to:

– Legal background and requirements of ECDIS
– Theoretical background information
– Limitations of ECDIS
– Types of electronic charts
– Functions and settings, familiarity of alarms and sensors
– Types of display and orientation
– Operating basic navigational functions
– Understanding route planning functions with particular emphasis on route checking and monitoring
– Updates and maintenance of ECDIS software and electronic charts
– Knowing back-up systems
– Knowing the risk – overreliance on ECDIS [16]

Some maritime universities and academies curriculum reaches far beyond IMO model course requirements and students treat ECDIS generic course as repetition of knowledge gained while studying. ECDIS generic course in the form as we know it today (five days, forty hours) will remain profitable for mariners who didn't pass full higher education program and aim to obtain officers' qualification.

3.3 *ECDIS type-specific course*

Officers holding certificate of competency issued in accordance with Manila Amendments are required to obtain familiarisation training in ship specific ECDIS and "*equipment training should relate to the make and model of the equipment fitted of the ship on which they are currently serving*" [4] Qualifications received during this course allow officers to be more competitive and valuable on the job market. Actually, *ECDIS type-specific course* is a common name given to the ECDIS training of a certain manufacturer. Completion of type-specific ECDIS course is required by Flag States based on ISM Code requirements [6] Unlike with generic course, as of now there are no guidelines for type-specific training issued by International Maritime Organisation. There is a big discussion about this issue and is getting more and more burning in maritime industry. In most cases ECDIS type-specific course is paid by the seaman's company and

when it comes to financial department it is always a question of balance between effectiveness and costs. ECDIS type-specific training is offered in various forms and Flag States specify either certain type of type-specific training is approved or not by the Administration. It could be carried out in a form of traditional classes with instructor, as an online training, on-board training or computer-based-system course. Whichever method is chosen the most important is that knowledge is successfully gained by trainees. Some smaller ECDIS manufacturers claimed that for them it is not possible to arrange required type-specific course due to high cost of training preparation. Polish maritime universities and academies response on IMO Model course implementation accurately identifies the possible solution: "*small brands have the possibility to join a training network or establish cooperation with independent training institutes to provide high quality training. So there should be no excuse on not being able to provide training*" [15]

4   CLASSROOM TRAINING

ECIDS course carried out in classroom equipped with simulators is recognised as the most efficient form of training. Classroom training offer unique opportunity of asking copious questions and getting comprehensive answers from experienced trainers. As the research shows classroom trainings are the most efficient when number of participants do not extend ten persons [3] Most people prefer it when is able to cooperate, it allows them to resolve problems and gives some opportunity for discussion. Training Simulators are an efficient way to train new operators in a risk-free environment. Experienced trainers teach proper operator technique, controls, and safe operation in a virtual jobsite. The most effective learning is based on practical use. Instead of showing where the particular function can be found, it is more beneficial for future ECDIS user to understand how certain function should be used. Classroom training with experienced instructor, preferably former navigating officer, who worked on specific ECDIS on daily basis as navigation officer is much more valuable for trainee than listening to description of the system. Officers who worked with ECDIS on navigational bridge are able to determine its advantages and disadvantages with greatest detail. Vetting, port state inspections, internal and external audits give them an excellent opportunity to recognise the system even more. After all, the best way to comprehend is searching for answers.

4.1 *On-line training*

This form of ECDIS type-specific training is becoming more popular nowadays. First of all course carried out online at home, in the training centre or on-board the vessel is cheaper than traditional course organised in training centre. Additionally cost of flight tickets, accommodation are reduced to minimum. Online courses are approved by most of the ECDIS manufacturers and therefore by appropriate flag states and port state control authorities.

"*Administrations may now allow the training of seafarers by distance learning and e-learning in accordance with the standards in section A-I/6 and the convention now contains substantial guidance. Seafarers should check with their administrations to ensure they provide for this and check with their company that facilities are available.*" [13] Many training companies have already created virtual campuses where officers use computers and the internet for studying. Trainees can run the on-line program whenever they have time. Such a system is useful in today's world where the seamen home cities are located far from training centres.

4.2 *Computer based system training*

This form of training is kind of supplement or repetition for officers who passed type-specific course. Unfortunately some of the lessons contain errors and imprecise questions what results in trainee's confusion and misguidance. Computer based training is acceptable form of supporting on-board practice rather than replacement of decent familiarization [2] The significant diversity of system structures on board the ships means that no single self-teaching program can be drawn up.

4.3 *On-board training*

It is a common practice that navigating officer is a person on board the ship who recognizes ECDIS in great detail and passes gained know-how to other officers. There is a noticeable analogy to the times when navigation was carried out with use of paper charts and hard-copy publications. Navigating officer was then the one who calculates distances and drew passage plans faster and more efficiently than his colleagues. While tools have changed, fundamentals remain the same. Navigating officer replaced pencil with flash drive. There was and will be a constant demand for on-board training and knowledge exchange between officers. Junior officers, raised on the computers, born with smartphone in hand will catch up faster how to operate ECDIS as every other electronic equipment. Electronic elements which are similar to those well-known from computer games are very easy to be adopted by new generation officers. Senior officers, on the other hand, experienced with chart work in its traditional form a great support for them – they teach how to use traditional navigation. Co-operation between bridge team members is crucial more than ever before. It is a great way of learning but not ideal due to individual limitations and lack of didactics background. Nevertheless, *trickle-down training* is deemed not acceptable by most of the Flag States therefore employment of external professional instructor is unavoidable in case of on-board training.

5 SMS – COMPANY PROCEDURES

Company Safety Management System navigation manuals describe in detail procedures to be followed by officers. But even the meticulous set of procedures will remain unexploited without proper training. All procedures, no matter how clear and simple they are,

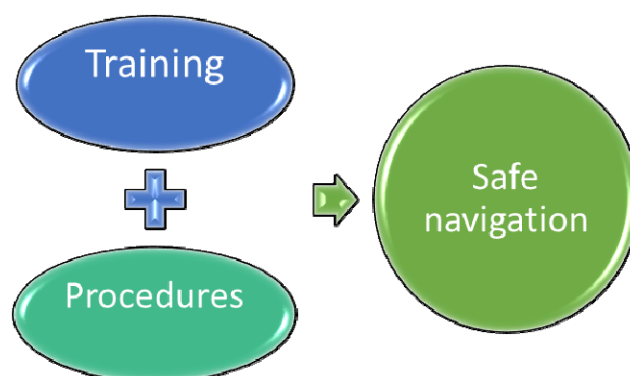without solid education fundaments is a straight way to jeopardize vessel's safety.

Figure 1. Corelation between training, SMS procedures and navigational safety.

6 CONCLUSION

Each training method has its own advantages and disadvantages. One of them is easier another requires more effort. The most important for officers is to obtain information and skills to be used on the next ship in the nearest future. Equally to form of training or even more important are the instructor qualifications. ECDIS user without navigational experience is able to operate it as electronic equipment not as navigational aid. And that is the clue of whole training – to pass know-how with regard to ECDIS usage for navigation instead of teaching how to click the button. One way of carrying training is to show existence of particular function, i.e. shift of position alarm value, while another method is to demonstrate its application. One trainer will present to his trainees that shift of position value can be inputted in alarm setting menu, while another trainer will show where it is located and explain how this function affects navigation process and how it can be used as an advantage in improving navigational safety. As emphasized in *Polish approach to the IMO Model Course 1.27: "training endeavours, the knowledge, skills and dedication of the instructor are the key components in the transfer of knowledge and skills to those being trained through IMO model course material*" [15] Modern ECDIS is equipped with copious functions and trainer role is to highlight those which will ease of officer's workload and improve vessel's safety, i.e. radar information overlay function usage. It can be shown where RIO function is located in the system structure, how to adjust radar picture and enable additional functions (range rings, bearing scale) but what is equally important is an explanation about unusual indications - red flags, strange behavior informing officer on the watch about faulty sensor or other related problems. ECDIS trainer should explain nuances, i.e. electronic logbook usage. As every officer notice, electronic logbook contains plenty information, what could be easily copied and used as voyage record. But, there is a trick: electronic logbook on some ECDIS systems could be edited and therefore cannot serve as a voyage record. International Maritime Organization in Resolution A.916(22) allows for various forms of voyage records: "*Methods of recording (…) may be handwritten, electronic or*

mechanical" but the keyword is that voyage records must be *permanent* and therefore editable logbook cannot be used as voyage record in this certain case.

To conclude, ECDIS qualifications nowadays are equally important to chart-work skills a decade ago. Training process in ECDIS fields has different forms. Whichever method is chosen it must be ensured that officer who leaves training class is equipped with solid knowledge package and forms a great support for bridge team.

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