Optimizing the Use of Electronic Chart Display and Information System (ECDIS) as a Support for Shipping Safety on MT. Gao Cheng II

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Abstract. The purpose of this study is to provide an overview of the increased use of ECDIS (Electronic Chart Display and Information System) and how it can contribute to enhancing safety on board by ensuring that officers are properly trained in its use. This research employs a qualitative approach and was conducted on the ship MT. Gao Cheng II. The study gathered both primary and secondary data, directly collected from the research location through observation and recording. The findings of this study reveal that officers in charge of ECDIS are not fully familiar with its use, which can be attributed to inadequate previous training and insufficient shipboard training. To address this issue, it is essential to provide proper education and training on the use of ECDIS both before boarding and after being on board the ship. This will ensure that officers can effectively utilize the system, thereby enhancing navigation safety.

Keywords: Analysis, Temperature, Turbocharger

1 Introduction

Ships are a means of transportation by sea that plays an important role in maintaining global economic stability. Maintaining the smooth operation of this means of transportation is very important to maintain global economic stability. One such issue is safety in navigation. The development of electronic chart and information display systems (ECDIS) is currently considered capable of improving navigation safety. As such, ECDIS enables navigators to conduct efficient, accurate, and careful navigation checks.

Older ships were traditionally required to rely on naval schedules and maritime publications to plan their routes and navigate during voyages. These publications provided essential information for plotting courses and monitoring the ship's location throughout the journey. However, with the advent of electronic charts in the 1990s, ships gained access to enhanced navigation tools. The integration of real-time data into Electronic Chart Display and Information Systems (ECDIS) allowed for more accurate and efficient route planning, enabling crew members to track the ship's position in real-time on ECDIS screens. This technological advancement improved navigation safety and provided more dynamic, up-to-date information to assist in decision-making during voyages.

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IMO adopted performance standards for electronic charts in the 1990s. In 2000, the IMO approved changes to SOLAS V/19, Navigation Requirements for Navigation Systems and Equipment, so that ECDIS could be accepted to meet Scheduled transportation requirements.

In recognition of the qualification of ECDIS for exploration, in 2009 IMO approved further amendments to regulation V/19 requiring the transportation of ECDIS. The amendments came into force on January 1, 2011, making ECDIS mandatory for new ships built after the specified date and phasing in the requirements for existing ships.

ECDIS systems are crucial for crews and officers responsible for navigation, as they replace traditional paper charts with electronic charts. These systems provide numerous advantages over conventional navigation methods, offering real-time updates, more precise positioning, and enhanced situational awareness. ECDIS allows for more efficient route planning, monitoring, and adjustment, improving overall safety during voyages. The ability to display detailed and up-to-date information on a screen significantly reduces the risk of human error and enhances decision-making, making ECDIS a vital tool for modern, safer navigation.

The minimum requirements for ECDIS are outlined in IMO Resolution A.817 (19), which specifies the "Performance Standards for Electronic Chart Display and Information Systems (ECDIS)." While ECDIS provides advanced electronic charting, it does not fully replace the need for accurate and up-to-date paper charts. According to the 2010 STCW Convention, there is no formal emphasis on ECDIS, but crew members are still required to meet the competency standards set out in Code B 11/1 of the STCW 2010, particularly regarding the assessment of skills and abilities for navigational watchkeeping. In the future, crew members may need to undergo testing to demonstrate their competence in using ECDIS, including interpreting and utilizing information related to the seabed. The standards for operating ECDIS devices are further defined in IMO Resolution A.817 (19), ensuring that the systems meet minimum operational criteria for safety and effectiveness.

The importance of understanding and correctly operating the Electronic Chart Display and Information System (ECDIS) cannot be overstated, especially in high-risk areas such as the Singapore Strait. The incident you described highlights the critical role of ECDIS in ensuring safe navigation. The mistake made by the Chief of Staff II in entering incorrect data, which resulted in discrepancies between the ship's data and what was visible to other vessels, could have had serious consequences if it hadn't been corrected in time. This situation underscores the need for thorough knowledge of ECDIS and its capabilities, as well as the importance of updating charts and data regularly to ensure the system is accurate. Moreover, the reliance on paper charts when the ECDIS data was not updated in the Batam Harbor area further emphasizes the need for crew members to be proficient with both electronic and traditional navigation methods. The issue of underwater pipes in the area required careful navigation, which could have been complicated without the proper chart updates in ECDIS. By discussing and addressing these challenges, it becomes clear that all officers, especially the Chief and their staff, must be well-versed in ECDIS operations and local navigation systems.

A comprehensive understanding of ECDIS not only maximizes its effectiveness in controlling navigation but also enhances team management on the bridge, reduces the likelihood of accidents, and eases the officers' workload. Training and continuous education on ECDIS are key factors in ensuring safer and more efficient maritime operations.

2 Overview

The STCW Code, specifically Table A-II/1, outlines the skills and knowledge that seafarers need for safe and effective navigation. Seafarers must be able to plan and prepare voyages, including using charts and navigational tools, to ensure the ship's route is safe. They must also know how to maintain a proper watch, monitoring the ship's position and surroundings to avoid risks. Communication with the crew, authorities, and other ships is also key for safe navigation. Seafarers should be skilled in using both electronic and paper charts, as well as other navigational equipment, to ensure the ship's safety. Additionally, they must be able to handle emergencies and respond appropriately to any navigational hazards. These competencies are designed to ensure that seafarers can manage their duties on board efficiently and safely.

According to the SOLAS Manual, 2010 Consolidated Edition, IMO: 368, the requirement for Electronic Chart Display and Information Systems (ECDIS) to be accepted as a competent navigation tool is outlined in Regulation 19.1.2.4. This regulation states that ECDIS must meet certain standards to be equivalent to traditional paper charts in terms of display and functionality. ECDIS must provide at least the same level of display and information as paper charts, and it should have the ability to issue warnings in case of equipment malfunctions. Additionally, when relevant chart data is unavailable, the ECDIS should be capable of switching to Raster Chart Display System (RCDS) mode to ensure continuous and safe navigation.

Regulation 27 focuses on the requirements for navigation charts and related publications. It stipulates that navigation charts and other publications, such as the ship's destination, light lists, notices to mariners, tide charts, and any other relevant waterway publications, must be accurate and kept up-to-date. These materials are essential for continuous and safe navigation, ensuring that seafarers have access to the most current information during their voyages.

According to ECDIS Integrated Navigation Control from the Bridge by Dadi Kuntjoro (2013: 9), all navigation officers (navigators) on board must be trained in the use of ECDIS. This training should adhere to the IMO Training Model Course 1.27, conducted by an accredited training provider, and meet the IMO’s minimum standards. Furthermore, navigational officers must undergo ship-specific equipment training, which can be provided by the company’s training body in line with ISM requirements, by the ECDIS manufacturer, or through computer-based training programs.

With the support of adequate data backup, settings, and updates, navigation charts must comply with the provisions of SOLAS Regulation V/20, ensuring that devices involved in distress and the global maritime system meet safety requirements. Electronic navigation devices, such as ECDIS, must comply with IMO A.694(17) and

the GMDSS safety standards, meeting regulatory competency requirements. Additionally, ECDIS must accurately display all relevant navigation information. Safe navigation developed, disseminated, and monitored by government hydrological agencies is crucial. The ECDIS should have tools for updating navigation information and charts with reliable and consistent updates while still balancing the use of paper charts. It should allow mariners to effectively plan and track their journeys, providing accurate and reliable data, particularly for charts developed by government-sponsored agencies. The system should also issue alarms if incorrect information is displayed. To ensure proper navigation, it should maximize the use of navigation tools according to COLREG 1972 Rule 5, focusing on safe and effective practices.

According to Capt. Anisa. M.Mtr., M.Mar. (2011:13), in the fifth law, P2TL refers to the view that every ship must always carry out proper inspections, visual and aural, and all available means following existing conditions and environments to operate. Thorough evaluation of circumstances and risks. The purpose of a vessel inspection is to thoroughly evaluate the condition of the vessel, the water, and the danger of collision.

In addition to these observations, Muslims should use all appropriate means, including electronic, auditory, and visual devices, such as radar. All of them should be used at once, no matter how little power they have. ECDIS can be used to display data and navigation to fulfill the fifth legal emphasis of COLREG of 1972.

The role of ECDIS for duty officers in improving navigation safety, according to L. Tetley & D. Calcutt Electronic Navigation System (3rd Edition: 236), explains that with the right knowledge and skills, duty officers can use it effectively. There are facilities available in ECDIS that can facilitate and assist the duty officer in navigation. There are several facilities, the first of which is route planning, which allows pilots to quickly and easily create a transportation plan including calculations of distance, course, all-terrain alarms, depth, and all other necessary information. The delivery plan will be fine. In order to reduce the workload and save the officer's time when planning the second transportation, road inspection with this tool can make it easier for officers to carry out checks while navigating. This is because the ECDIS will show the location of the vessel, its movements, and the area it is traveling through. In addition, the ECDIS will display information requested by the commander, such as location, route, speed, travel time, and other third-party information. If action is required, the ECDIS will provide an indication or warning to the commander. Caution. Therefore, the scale of the map used is not correct. And there are differences in the source.

The fourth travel note is intended for ECDIS to record transit routes or transit plans. This can assist officers if they later receive the same shipping plan. The fifth note is that the backup setting functions; if there is an error in the operation of ECDIS, it will automatically provide a graphical display. It provides the necessary information for safe navigation.

From the explanation above, it is clear that the multitude of facilities available in ECDIS is very easy to navigate. Therefore, without sufficient knowledge from the officer about ECDIS, it will be of no use.

The capabilities of ECDIS can be integrated with other navigation devices, providing navigators with all the necessary information for safe navigation. This integration

ensures that ECDIS can be easily updated, maintaining its accuracy with the most current data. This feature allows ECDIS to enhance the navigation process by streamlining information access. Additionally, ECDIS is beneficial for officers during inspections, as it supports effective monitoring and evaluation during voyages, as outlined in the Integrated Navigation Control of the bridge.

After the author outlines the learning from this book, the material includes an introduction to ECDIS and its integration with other navigation tools. This integration enables ECDIS to assist officers by providing essential information for safe navigation. The book also includes a list of equipment on the bridge that has been integrated with ECDIS, ensuring seamless coordination and enhancing the navigation process.

3 Research Methods

The type of data used in this research is qualitative data obtained in the form of variables representing information related to the discussion. The data sources used by the author consist of:

3.1 Primary Data

This data is obtained from direct observation of the MT in GAO CHENG II. Data and research are gathered using a survey method, observed and recorded directly at the research location.

3.2 Secondary Data

This data consists of supplementary information obtained from external sources that are still relevant to the research in this thesis, such as tutorial literature and from companies, as well as other matters related to this research.

3.3 Population

This refers to all units that need to be analyzed and are at least similar and documented in writing.

3.4 Sample

A subset of subjects within the population being studied, which can represent the community in a representative manner, with the model being the Muslim community.

The method of data collection is field research, conducted through direct control over the objects being studied. Data and information are collected from:

The observation method involves direct observation in the field during the author's sea practice.

The methodology involves direct interviews with the Team Leader and Watch Officers using the ECDIS Navigator.

The data analysis technique used in this research is descriptive-qualitative analysis. According to Moleong (2007:3), qualitative analysis is a research procedure that produces descriptive data in written and verbal language, as well as observed behavior. Descriptive analysis illustrates the usefulness, utilization, and application of ECDIS in the field of transportation.

4 Results And Discussion

The MT. GAO CHENG II is a vessel owned by CHH SHIPPING MANAGEMENT, classified as an Oil/Chemical Tanker used to transport oil or chemical cargo. However, this vessel was specifically repurposed to carry crude oil. The crew consists of personnel from various countries, but for this project, all crew members are Indonesian.

The MT. GAO CHENG II is equipped with advanced navigation aids, specifically ECDIS (Electronic Chart Display and Information System), which was installed by the company after the ship was built. The company hopes that ECDIS will enhance inspection control efficiency during voyages and facilitate sailors in planning their routes. However, the company did not consider the human resources on board the MT. GAO CHENG II before introducing ECDIS. The company assumed that the crew would be capable and ready to operate ECDIS. Only the first and second watch captains are certified ECDIS operators, which has resulted in the company's goals of enhancing safety and navigation efficiency not being realized. This was further emphasized by several incidents where the crew demonstrated a lack of knowledge regarding ECDIS operation and did not follow proper procedures.

One example of such an incident occurred on October 29, 2018, when the ship sailed from Sungai Pakning Port to Dumai Port through a narrow channel. The vessel was piloted for 4 hours, assisted by the third officer, and overseen by the captain as the responsible officer during the morning watch (08:00 – 12:00). During the journey, ECDIS continuously sounded alarms about the vessel's under-keel clearance, which disrupted the crew's concentration despite the depth in the area being safely around 4 meters below the keel, as indicated by the echo sounder. Upon inspecting the ECDIS, the captain found that the second officer had set the UKC to 5 meters, triggering the alarm. Moreover, many buoys in ECDIS did not align with the updated Mercator charts, and some buoys were missing altogether, which posed a danger while navigating.

The captain subsequently called the second officer to address these issues and clarify why the ECDIS settings were incorrect, as many buoy positions differed from the updated Mercator chart and some buoys were not present in ECDIS. It turned out that the second officer had never updated the charts in ECDIS, which had undergone many corrections. This incident raised concerns regarding navigational safety, as all navigation equipment must be verified and ready for safe operation before setting sail.

Another related incident occurred when my ship entered the Singapore Strait, a Traffic Separation Scheme (TSS) area where security must be heightened. On April 21, 2022, while sailing from Balikpapan Port to Dumai Port and passing through the Singapore Strait, the second officer mistakenly entered the ship's data into ECDIS, causing discrepancies with the actual data visible to other vessels. Fortunately, this

mistake was recognized by the watch officer, the first officer, before port authorities in the area requested the information, allowing the watch officer to update the data in ECDIS. That day, our ship anchored in the Batam Port area due to engine issues. There were numerous underwater pipes in the area, necessitating cautious anchoring, and the second officer had yet to update the data in ECDIS for that area. Therefore, we relied on an updated paper chart while the second officer updated the latest data into ECDIS.

Several incidents nearly led the vessel into restricted zones, including:

4.1 First incident

At the time of the incidents, the data in the ECDIS on the MT. GAO CHENG II did not match the actual data, which was due to inaccuracies in the system. This discrepancy led to errors in navigational decision-making by the officer, nearly causing the ship to enter prohibited areas.

4.2 Second Incident

The scheduling of data corrections in ECDIS was not executed optimally, as weekly corrections should have been implemented

4.3 Third Incident

The crew responsible for updating ECDIS data was not performing optimally.

4.4 Fourth Incident

There was a lack of awareness among the crew regarding the importance of making corrections for navigational safety. As a result, it is clear that the personnel aboard the MT. GAO CHENG II was not adequately equipped to operate the ECDIS system. Consequently, the tools available in the ECDIS that could enhance navigational safety were not utilized effectively, which was reflected in the findings of the Ship Inspection Report (SIRE).

During the inspection, the examiner discovered that ECDIS usage was suboptimal due to outdated details, and the crew tended not to respond to ECDIS warnings recorded by the echo sounder. Further consideration revealed that not all personnel on the MT. GAO CHENG II could operate ECDIS, meaning that tools within ECDIS that could support and enhance transport safety were not fully utilized. Therefore, ECDIS training needs to be developed.

After communicating this proposal to the company, it was agreed that training would be provided as an alternative solution to the issues concerning optimal ECDIS usage and the importance of data updates. The training is scheduled for November 15, 2018, on a cargo vessel at Balikpapan Port, with the company conducting ECDIS training for the crew aboard the MT. GAO CHENG II. The crew welcomed this training. The material used will be the Furuno Computer Basic Training on ECDIS, tailored to the

IMO curriculum. The ECDIS training material will also be adapted for the MT. GAO CHENG II, utilizing the Furuno FMD 3300 ECDIS.

After evaluating the alternative solutions implemented during the training, the goal is to identify the best, most effective, and most economical options to assist all stakeholders in addressing the various aspects of the decision-making process. This approach also involves comparing the benefits or positive outcomes that can be gained from each option against previously identified alternatives. The ultimate objective is to ensure that ECDIS functions more effectively, minimizing the risk of overusing its features while optimizing its potential for safer navigation.

5 Conclusion

5.1 Summary

Based on the research findings, the suboptimal use of ECDIS on the MT. GAO CHENG II is attributed to inaccuracies in the data displayed, which led to navigational decision-making errors by the ship's officers. This data inaccuracy arises from the failure to implement weekly corrections, meaning that data requiring regular updates remains unchanged.

5.2 Recommendations

Based on the conclusions drawn, the author offers the following suggestions to optimize the use of ECDIS on board: Continuous Knowledge Transfer: The captain should provide ongoing training to the officers to enhance their understanding of how ECDIS functions. It is also recommended that the captain monitor the handover process between officers at the end of their contracts to ensure that knowledge of ECDIS is consistently maintained. Collaborative Communication: The vessel should establish a reciprocal relationship with the company to ensure integration in line with the standards expected of ship officers. Effective Training and Evaluation: Supervisors should organize effective training and evaluation for the crew following the Manila STCW 2010 Convention. The company is encouraged to collaborate with officers to schedule ECDIS training, potentially involving ground trainers. Strict Oversight: The captain should adopt a firmer approach towards deck officers who are slow to master ECDIS operations on board.

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