

TRADITIONAL NAVIGATION IN E-NAVIGATION CONTEXT

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Abstract

This paper is based on research and analysis of 5 incident cases from the period 2013-2016 published by European Maritime Safety Agency (EMSA) that clearly marks the safety risks due to the improper use of sophisticated electronic navigational tools - AIS, ECDIS, Integrated Bridge Systems, Automatic Radar Plotting Aids on board commercial ships, as well as, discusses issues of potential risks involved with complacency and over reliance on Electronic Chart Display and Information System (ECDIS) and advises that seafarers should put more efforts to undergo the necessary traditional navigational training. There is a growing tendency for seafarer competence to be measured by administrative and electronic expertise, but this can mask poor performance when basic seamanship is required. Seafarers should continue to be trained in a variety of traditional and proven navigational techniques, hold a paper chart “back up” portfolio, and run table top exercises to maintain their familiarity with paper charts and proper position fixing routines. An over reliance on ECDIS can cause these traditional skills to fade and potentially lead to incidents. The industry should make sufficient navigational training widely available. Human errors are generally caused by technologies, environments, and organizations which are incompatible in some way with optimal human performance. The human has been expected to adapt to the system but this does not work. Instead, what needs to be done is to adapt the system to the human.

Keywords: e-Navigation, Traditional navigation, Maritime education and Training, Safety.

Introduction

We are moving into a new era with the arrival of true “e-Navigation”, the first manifestation of which is the electronic chart. And as with every other advance in navigation since the arrival of

radar, the benefits of the new bring with them cautions which must be considered if we wouldn't like to witness a number of "ECDIS assisted" incidents. Nowadays there is a growing tendency for measuring seafarer competence by administrative and electronic expertise, but this can mask poor performance when basic seamanship is required. Routine situations can turn into emergencies very rapidly.

Safe navigation in e-Navigation concept

According to IMO definition, scope and need of e-Navigation (IMO, MSC 85/26/Add.1, 2011) are:

- 1. E-navigation is the harmonized collection, integration, exchange, presentation and analysis of marine information on board and ashore by electronic means to enhance berth to berth navigation and related services for safety and security at sea and protection of the marine environment.*
- 2. E-navigation is intended to meet present and future user needs through harmonization of marine navigation systems and supporting shore services.*
- 3. There is a clear and compelling need to equip shipboard users and those ashore responsible for the safety of shipping with modern, proven tools that are optimized for good decision making in order to make maritime navigation and communications more reliable and user friendly. The overall goal is to improve safety of navigation and to reduce errors.*

The 2010 amendments to the STCW Convention (IMO, STCW/CONF.2/34, Resolution 2, 2010)

have introduced inter alia enhanced Bridge Resource Management training for all officers in charge of a navigational watch (OOW), and stricter minimum rest hour requirements. This was a direct response to the recognition by regulators and accident investigators of the importance of the human element in ship safety. New equipment and technology underlines the need for familiarization with ship specific arrangements. ECDIS is a particular example and caution against over reliance on the system should be paid off. In addition to contributing to maritime safety the efficient and well planned sea passages are necessary for the economic health of the shipping industry. Together with new environmental requirements, including rules to reduce air emissions, there are additional pressures to ensure effective passage planning and efficient execution.

Case analysis

Guided by the above principles and requirements for safe navigation, we selected and investigated 5 incident cases (European Maritime Casualty Information Platform, 2017) published by EMSA on EMCIP (European Maritime Casualty Information Platform) during the period 2013-2016 that in our opinion, reveals and clearly marks the safety risks due to the improper use of ECDIS equipment and potential risks involved with complacency and over reliance on sophisticated electronic aids to navigation.

The inception of e-Navigation concept took place way back in the year 2006, when the International Maritime Organization (IMO) decided to include a well-defined strategy (IMO, MSC 85/26/Add.1, 2011) to integrate new and existing navigational tools for enhancing handling and safety of ships at the sea. The main aim of the e-Navigation concept is to develop a system which can properly organize all the ship's data at one place in order to help improving navigational safety of the ships. Human error during ship navigation has been recognized as one of the prime reasons for maritime accidents. Though the number of accidents at sea has reduced lately, a lot needs to be done in order to reduce navigational errors as a result of human negligence. The matter of concern is that in spite of highly advanced equipment systems used in modern ships, accidents related to navigation continues to occur.

Incident No. 1 (MAIB, United Kingdom, REPORT No. 24/2014, 2014)

At 04:34 on 18 September 2013, the Malta registered chemical tanker, "Ovit", ran aground on the Varne Bank in the Dover Strait while on passage from Rotterdam, Netherlands, to Brindisi, Italy. The vessel, which was carrying a cargo of vegetable oil, remained aground for just under 3 hours; there were no injuries and damage to the vessel was superficial. There was no pollution. M/t "Ovit" refloated on the rising tide and subsequently berthed in Dover. "Ovit" primary means of navigation was ECDIS. The officer of the watch was following a route shown on the ECDIS display; the route passed directly over the Varne Bank.

Navigation safety issues directly contributing to the accident:

1. The passage plan, which was prepared by an inexperienced and unsupervised junior officer, passed directly over the Varne Bank and was unsafe.
2. The passage plan was not properly checked for navigational hazards using the ECDIS check-route function and it was not checked by the master.

3. When taking over the watch, the OOW did not check the ship's intended track relative to any dangers to navigation that would be encountered on his watch.
4. The OOW monitored the vessel's position solely against the intended track. Consequently, his situational awareness was poor.
5. Although the lights from the cardinal buoys marking the Varne Bank were seen by the lookout, they were not reported.
6. The passage through the Dover Strait was treated in exactly the same way as a passage in open water. Moreover, the master demonstrated an astounding level of complacency when his vessel was apparently drifting in the Dover Strait without propulsion.
7. The deck officers were unable to safely navigate using the vessel's ECDIS. The route was not properly checked, inappropriate depth and cross track error settings were used, and the scale of Electronic Nautical Chart (ENC) in use was unsuitable for the area.
8. The ECDIS audible alarm was inoperative. Although the crew was aware of this defect, it had not been reported.
9. ECDIS training undertaken by the ship's master and deck officers had not provide them with the level of knowledge necessary to operate the system effectively.
10. The safety management system (SMS) bridge procedures provided on board "Ovit" by Ayder Tankers Ltd. were comprehensive and included extensive guidance on the conduct of navigation using ECDIS. However, it is evident that the master and deck officers did not implement the ship manager's policies for safe navigation and bridge watchkeeping.
11. The on board management of "Ovit" was dysfunctional and the master provided insufficient leadership for a safety culture to be developed and instilled on his bridge.
12. The serious shortcomings with the navigation on board "Ovit" highlighted in this investigation had not been identified during the vessel's recent audits and inspections. There is a strong case to develop and provide tools for auditors and inspectors to check the use and performance of ECDIS.

Incident No.2 (HBMCI, Greece, REPORT No. 04/2014, 2016)

On 21 September 2014 Ro-Ro Passenger "Europalink" was enroute to Ancona, Italy having departed from the port of Igoumenitsa, Greece with 693 passengers, 70 crew members and loaded with 366 vehicles. At about 02:20 she was running at approximately 24 knots keeping a course of

360° while helm was in autopilot mode. Actual weather conditions were reported to be good with moderate sea and variable winds 2-3 (Beaufort scale) and good visibility. At 02:33, while under turn to port by continuously setting the autopilot, she hit on the rocky shoal reef South of Peristerai Islet, located 0.6 nm off the Northeast coast of the island of Corfu, Greece. No injuries to crew or passengers were reported and no pollution occurred. During the marine accident the 2nd Officer was on duty, however the Master being also on the bridge was in charge of the con.

“Europalink” primary means of navigation were standard paper Nautical Charts of British Admiralty while Electronic Navigational Charts were also provided through approved ECDIS system, installed as a component of her centralized Navigation Control System. Based on the above the navigating Officer could either monitor “Europalink” passage from the paper charts by entering fixes or continuously check and control her followed courses electronically through ECDIS and Radar, fitted in the main navigation console. Her passage plan was plotted on the voyage paper charts as well as in ECDIS, allowing the Officer on the watch to electronically monitor her track and execute course progress.

Navigation safety issues directly contributing to the accident:

1. “Europalink” navigational team performance was poor failing to effectively utilize state of the art navigational aids available.
2. “Europalink” SMS - “Voyage Planning form” was not incorporating in full the requirements foreseen in IMO Resolution A.893 (21) (IMO, *Resolution A.893 (21), Para. 2.1.7.6*, February 2000)^[6] that is volume of traffic in “appraisal planning phase”.
3. The execution phase of “Europalink” voyage plan was not effectively performed under the respective section of IMO Resolution A.893 (21) and as a result passage planning was ineffectively being monitored. .
4. The voyage plan speed limit for the Peristerai passage segment was disregarded by both Master and the OOW.
5. The Master was focused in “Europalink” trading operational demands (itinerary) at the cost of her navigational safety.
6. COLREGS safe speed rule was disregarded by the Master.
7. The Master’s situational awareness had been notably lessened under complacency and overconfident status. Bridge Resource Management provisions were not practiced by the Master and the OOW

8. The OOW situational awareness had been notably lessened failing to perform a safe turn based on the information sourced from the navigational aids and the external environment.

Incident No.3 (MAIB, United Kingdom, REPORT No. 27/2016, 2016)

At 16:58 on 29 August 2015, the Cyprus registered cargo ship “Daroja” and the St. Kitts and Nevis registered oil bunker barge “Erin Wood” collided 4 nautical miles south-east of Peterhead, Scotland. Minor damage was caused to “Daroja” but damage to “Erin Wood” included breaches of the hull, resulting in flooding of the vessel and pollution from leaking fuel cargo.

At the time of the accident, both vessels were manned by watchkeepers not keeping a lookout and therefore unaware of the risk of collision. On board “Daroja”, the Chief Officer, who was the OOW, missed opportunities to detect “Erin Wood” by visual, radar and automatic identification system means.

Navigation safety issues directly contributing to the accident:

1. “Daroja” and “Erin Wood” collided because a proper lookout was not being kept on either vessel.
2. On board “Daroja”, the Chief Officer, who was the OOW, missed multiple opportunities to detect “Erin Wood”; this happened because he had become complacent about his watchkeeping duties and allowed himself to become distracted.
3. Complacency and poor watchkeeping practices were systemic on board “Daroja”. This was largely due to the repetitive nature of its trading route and a lack of mentorship and direction from the vessel’s Master.
4. Although “Erin Wood” skipper was aware of the presence of another vessel, he did not effectively assess the situation and assumed a larger vessel would keep clear.
5. Lone watchkeeping was a normal practice in both vessels and the risks associated with this had not been properly assessed.

Incident No.4 (DMAIB, Denmark, 2015)

On 10 July 2014, the Danish fishing vessel “Inger Marie” and the Maltese general cargo ship “RIG” collided approximately 11 nautical miles north-east of the Island of Læsø, Denmark. “Inger Marie” foundered shortly after the collision and the skipper, who was the only crew member on board, perished. The collision happened in good weather conditions and with little traffic in the area. Circumstances suggest that neither the skipper on “Inger Marie” nor the OOW on “RIG” were

aware of the other ship's presence and the risk of collision until moments before the collision. The OOW on "RIG" tried to avoid the collision by turning to starboard, but the maneuver was too late. It is uncertain whether the skipper on "Inger Marie" realized the risk of collision before the impact. On "RIG", the OOW officer was not actively using the radar and did not plot the vessels in the area nor visually observe "Inger Marie" approaching, because he did not move around on the bridge and/or was preoccupied and therefore did not see "Inger Marie" approaching in a blind sector.

Navigation safety issues directly contributing to the accident:

1. A conjunction of circumstances led to the collision that was overall caused by a lack of effective look-out on both ships. On "Inger Marie", the look-out was not effective probably due to work practices while the vessel was underway. On "RIG", the lack of effective look-out was probably caused by the favorable weather conditions that gave a good overview of the situation and minimized the use of the radar. Once the presence of "Inger Marie" was acknowledged on "RIG", it was too late to avoid the collision.

Incident No.5 (MAIB, United Kingdom, REPORT No. 12/2016, 2016)

At 13:28 on 11 May 2015, the Bahamas registered passenger vessel "Hamburg" grounded on charted rocks near the New Rocks buoy in the Sound of Mull, Scotland. The accident caused considerable raking damage to the hull and rendered the port propeller, shaft and rudder unserviceable. There were no injuries and the vessel continued on its passage to Tobermory. The investigation found that, having been unable to enter Tobermory Bay on arrival, the passage plan was neither re-evaluated nor amended. Combined with poor bridge team management and navigational practices, this resulted in the vessel running into danger and grounding. Despite the loud noise and vibration resulting from the grounding, the bridge team did not initiate the post-grounding checklist, no musters were held and neither the vessel's managers nor any shore authorities were notified of the accident. Upon arrival at Tobermory Bay, the Master made an ill-considered and poorly executed attempt at anchoring just within the bay's entrance instead of the planned position in the south of the bay. This had to be aborted to avoid a second grounding when "Hamburg" dragged its anchor. The passenger vessel was then taken back out to the open sea with unknown damage to its structure, before diverting to Belfast where a dive survey revealed the extent of the damage. The vessel was withdrawn from service for 3 months for repairs.

Navigation safety issues directly contributing to the accident:

1. “Hamburg” grounded on the charted New Rocks shoal because the bridge team did not recognize that their vessel was approaching the New Rocks buoy from an unsafe direction.
2. The master did not demand a high standard of navigational practices from his officers which resulted in weak practices amongst the bridge team.
3. The OOW placed “Hamburg” in an untenable traffic situation where the passenger vessel was giving way to all other vessels regardless of the requirements of the COLREGS.
4. There is significant evidence that insufficient attention was being paid to the conduct of navigation on “Hamburg”.
5. It was foreseeable that the OOW would use the ECDIS instead of the paper chart for navigation, but no mechanisms were in place to ensure it was used effectively.
6. “Hamburg” bridge team failed to apply Bridge Team Management tools (BTM) effectively, either before or after the grounding, despite the requirements of the Safety Management System and the master and navigator having received BTM training.

A detailed analysis of the above cases, regardless of the different types of vessels and situations shows and highlights:

- 1. Serious accidents with casualties and significant property damage continues to happened despite the high level of automation and latest generation electronics on the bridge.*
- 2. Unsatisfactory and dangerous actions performed by the Officers on watch and/or Masters of ships in the cases examined are caused by complacency, inefficient Bridge Team Management and non-compliance with international safety regulations.*
- 3. Poor performance when basic seamanship and common sense is required, inadequate actions and misleading communications stands out in all cases.*
- 4. Human errors (regardless the reason - fatigue, poor passage planning, non-compliance, etc.) continue to create the foundation of marine accidents.*

Conclusion

50% of the casualties for the period 2011-2015 were of a navigational nature, such as contacts, groundings/stranding or collisions, according the 2016 EMSA data (EMSA, 2017, p.8) . Human

erroneous action represented 63% of accidental events and 67% of accidental events were linked to shipboard operations as a contributing factor, making the prevention of human error of paramount importance if we wish to reduce the number and severity of maritime accidents.

Crew size and training decisions directly affect crew workload and their capabilities to perform safely and effectively. A strict hierarchical command structure can inhibit effective teamwork, whereas free, interactive communications can enhance it. Company policies with respect to meeting schedules and working safely will directly influence the degree of risk-taking behavior and operational safety. While human errors are all too often blamed on “inattention” or “mistakes” on the part of the OOW or Masters, more often than not they are symptomatic of deeper and more complicated problems in the total maritime system. Human errors are generally caused by technologies, environments, and organizations which are incompatible in some way with optimal human performance. These incompatible factors “set up” the human operator to make mistakes.

So what to be done in order to solve this problem?

Traditionally international and local authorities, ship-owners and operators have tried either to persuade or threaten seafarers into not making errors, as though proper motivation could somehow overcome inborn human limitations. ***In other words, the human has been expected to adapt to the system but this does not work. Instead, what needs to be done is to adapt the system to the human*** (DR. ANITA M. ROTHBLUM, 2002, p.13).

In the light of the abovestated it is necessary, as per our humble opinion, to ask ourselves what is the role of the Maritime universities for the needed changes in the safe navigation process. The fundamental responsibility of the maritime education is to create and build well-trained and motivated maritime professionals. By focusing efforts on the transfer of knowledge, traditional skills and proven experience in the context of the safety navigation culture for the future officers, the Maritime universities can contribute greatly to the safety of navigation and therefore resulting outcome will be a significant reduction of marine accidents. High standard traditional seamanship training and new technologies should be blended in the 21st century marine education in order to form qualified and respected marine and naval officers.

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