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<http://dx.doi.org/10.21278/brod69306>

ISSN 0007-215X  
eISSN 1845-5859

## **PRACTICE OF AND ATTITUDES TOWARD FAMILIARISATION ON BOARD: SURVEY OF CROATIAN AND MONTENEGRIN MARITIME OFFICERS**

UDC 629.5.072.8

Original scientific paper

### **Summary**

Familiarisation is an important factor of safety on technologically advanced ships. International Safety Management Code (ISM Code) states that the Company should establish procedures to ensure the familiarisation process, but the exact way in which familiarisation should be carried out and the duration of the process are not determined. Familiarisation is often regarded as formality although it should not be the case at all. Non-compliance with the required familiarisation procedures and flaws in the safety system often result in human error. The latter is a major cause of numerous sea accidents. The research published has revealed that shipping companies and seafarers often fail to follow the prescribed procedures and perform familiarisation inadequately.

This research is based on a survey of Croatian and Montenegrin deck and engine officers. The survey results indicate weaknesses in the familiarisation and handover processes on board ships. Therefore, suggestions are made for enhancing the existing procedures, aiming at a more efficient familiarisation and handover, particularly aboard technologically advanced ships.

*Key words:* Familiarisation; Safety at sea; Handover; Seafarers; Technologically advanced ships

### **1. Introduction**

Familiarisation is a process of introduction to the ship, duties, and crew, which every seaman must go through upon joining the ship. It includes familiarisation with the ship systems and equipment, emergency procedures, and procedures described in the Ship Safety Management System – SMS manual. It is a demanding process, especially on technologically advanced vessels. One of the essential components of efficient familiarisation is the handover procedure between officers (deck or engine) when leaving / joining the ship. Handover is a procedure of exchange of responsibilities and work duties of two officers (deck or engine) in the same rank. It is usually obtained in ports while the ship is alongside or at anchor. The main distinction between familiarisation and handover is that familiarisation is a checklist

prescribed by the Conventions and the Company, and handover is a process including off-signing and on-signing officer describing completed and pending jobs, maintenance which needs to be done, etc. The common feature of both familiarisation and handover is that there is no written regulation on procedure duration. Investigations of sea accidents have revealed that insufficient familiarisation is one of the major causes of accidents [1].

In 1998, the International Maritime Organization (IMO) issued the International Safety Management Code (ISM Code) whose regulations became part of the International Convention for the Safety of Life at Sea - SOLAS Convention. The ISM Code served as a framework for creating the Safety Management System and Safety Management Manual, a handbook defining all safety procedures and checklists, including the procedures regarding familiarisation and handover on board ships [2].

Familiarisation is one of the first procedures that a crew member experiences when signing on. Upon joining the ship, the new crew member receives a familiarisation checklist from the officer in charge. The familiarisation checklist varies from one seafarer to another, depending on their rank, department, and ship type. According to the International Convention on Standards of Training, Certification and Watch-keeping for Seafarers (STCW), familiarisation is divided into Basic Safety familiarisation, Ship-specific and Security familiarisation. The checklist commonly consists of a part which must be completed on the date of joining and before taking the watch, and a part which must be completed as soon as possible, but not later than one week after joining [3].

The first part includes the procedures and duties such as:

- Be able to communicate with other persons on board on elementary safety matters, understand safety information symbols, signs and alarm signals, identify muster and embarkation stations and emergency escape, locate and don lifejackets, understand and execute security duties assigned to him etc.
- Know what to do if a person falls overboard, fire or smoke is detected, the emergency signal or boat signal is sounded.
- Watch-keeping procedures and arrangements (for all officers and watch-keeping ratings).

The other part includes the procedures and duties such as:

- Learn to operate the CO<sub>2</sub> / FOAM / DRY POWDER / HALON Fixed Fire-Fighting System, operate the Emergency Generator, and deploy the Emergency Towing Arrangement, etc.
- Get acquainted with procedure for handling garbage and use of associated equipment, Sewage Treatment Plant, etc.
- Understand the Company's Management System, Quality, Safety, Health and Environment Protection Policy and Drug & Alcohol Policy, etc.

The prescribed seven-day-period is a relatively short time frame for an efficient familiarisation, especially when a crew member is aboard ship for the first time or is appointed/promoted to a higher rank. The quality of familiarisation is questionable if a crew member joins a vessel that in terms of technology is more demanding than the vessel on which he/she served before. Technologically advanced vessels require specific/specialised knowledge and skills, thereby making familiarisation procedures more comprehensive [4]. The length and quality of familiarisation largely depends on the type of ship and its propulsion, cargo-handling gear and the facilities and arrangement of the bridge and engine room [5].

The bridge arrangement and the advanced features of navigation equipment, as prescribed by the Safety of Life at Sea Convention (SOLAS), are essential items on the

familiarisation agenda [6]. The SOLAS convention defines the minimum requirements regarding the quantity and features of the ship equipment and devices. The shipping company management selects the ship equipment and its manufacturer / provider, depending on the available budget and abilities [7]. The equipment may vary in quality, design and additional abilities/functions. The features that SOLAS does not deem mandatory may create difficulties in the process of familiarisation of an officer and may lead to human error.

An officer should be prepared and trained to use new technologies and equipment fitted to the ship prior to signing on [8]. Still, it is common practice to start familiarising an officer with the new systems at the moment he/she joins the ship. Responsible companies invest in their seafarers by providing them with adequate training before they start dealing with new on-board technologies and systems. In addition, upon joining the ship they are given longer familiarisation time before taking charge of operating the new systems. However, few companies are able to invest additional funds in acquiring expensive simulators for shore-based training of their seafarers, or to allow more days for handover procedure.

The reports of the United States Coast Guard (USCG) and port state control inspections often underline the issue of familiarising crew members with specific ship systems [9,10]. Ships and companies may be liable to relatively heavy fines due to non-compliance with the familiarisation procedure, especially when the crew have not been familiarised with the use of systems that can cause pollution. Poor familiarisation and lack of training was one of the major causes of sea accidents of the vessels “Orsula” [11], “Louis Jolliet” [12], “MS UND Adriyatik” [13], and “CSL Thames” [14].

After a research conducted in 2015 [6], the officers surveyed stated that the quality of familiarisation and handover does not depend on the education degree. In addition, the research revealed that the officers were content with the one-week familiarisation period. On the other hand, they considered the six-hour period of handover as insufficient. These results seemed contradictory, so that subsequent interviews with the respondents were performed in order to provide clarification. Actually, the officers provided such information because they sailed on the sister ships or the vessels featuring similar technologies [6].

## **2. Hypothesis**

Familiarisation is a factor that considerably affects the safety of navigation, especially on technologically advanced ships [7, 15]. The familiarisation process is often performed in an inadequate way, and the seafarers and their companies are not sufficiently aware of the risks that may arise due to poor familiarisation. SOLAS regulations referring to the process of familiarisation have been laid out in a very general way [16]. The mode of performing familiarisation is vaguely defined and leaves the implementation at the discretion of the seafarers and maritime shipping companies. The aim of the survey was to determine how well familiarisation is performed and to gain insight into how many maritime officers realise the importance of the problem of familiarity, and how many officers understand the importance of familiarisation.

## **3. Methodology**

The survey of seafarers was conducted at the Faculties of Maritime Studies in Split and Kotor. The target group consisted of Croatian and Montenegrin deck and engineer officers who were about to take their exams for acquiring the ranks of Chief Officer/ Chief Engineer on ships of more than 3,000 GT, i.e. powered by the main propulsion machinery of 3,000 kW or more. Some questionnaires were completed by the attendants of the Special Education Programme for the certification of seafarers at the Faculties of Maritime Studies in Split and

Kotor. The respondents were officers of different ages, with at least 3 years of sea service in the capacity of deck officers or engineer officers.

Croatian and Montenegrin officers go through similar high-school and higher education systems. Both countries provide Special Education Programme for the certification of seafarers who wish to acquire the rank of Chief Officer on ships of more than 3,000 GT, or the rank of Chief Engineer on vessels with propulsion of 3,000 kW or more.

One of the requirements for attending such a programme includes the maritime high-school degree (featuring programmes that comply with STCW A-II/2 Convention), and at least 36 months of sea service as watch-keeping officer.

The survey covered 400 officers (n), including:

- 238 deck officers (59.5%) and
- 162 engineer officers (40.5%).

The questionnaire was written in Croatian and Montenegrin languages, comprising 16 questions with a range of alternative responses. The questions referred to the familiarisation and handover procedures on board ships, and the information closely related to these procedures. The target information included previous sea service, ship type, education, ship department and rank, duration of familiarisation and handover, modes of reduced familiarisation periods, and familiarisation as navigation safety issue.

The survey was conducted throughout 2015 and 2016 by survey assistants whose role was to explain the purpose of the survey and deal with potential ambiguities. Some of the questionnaires were e-mailed to ships, along with a letter asking the master to ensure adequate environment for trustworthy responses. Deviations from the responses expected were checked in subsequent interviews. Part of the material obtained was examined, and additional explanations were required from the respondents.

#### **4. Results and discussion**

By analysing the questionnaire, data were obtained of the type of ships that officers were sailing. Some vessels are technically more complex than others, therefore the time of familiarisation is longer. In this regard, it is considered that familiarisation of seafarers, especially deck officers, is most complex on passenger ships, offshore ships, and liquid cargo ships. Marine engineer officers have a prolonged time of familiarisation on ships that have a specific propulsion (e.g. off-shore vessels with additional propulsion systems), and passenger ships due to the complexity and size of the ship's engine room.

Out of the total number of officers who took part in the survey (n=400):

- 16 officers (4%) served on passenger ships,
- 56 officers (14%) served on liquefied gas carriers,
- 78 officers (19.5%) served on tankers,
- 48 officers (12%) served on bulk carriers.
- 144 officers (36%) served on container ships and vehicle carriers,
- 44 officers (11%) served on off-shore vessels, and
- 14 officers (3.5%) served on other types of vessels.

With regard to the technological complexity of vessels, it can be noted that only 12% of the officers sail on bulk carriers, whereas the others (88%) sail on technologically advanced ships featuring special cargo-handling, navigation or propulsion systems.

In the survey conducted, it is stated that experience had positive influence on the familiarisation process duration time. Therefore, many companies embark officers on sister ships or similar vessels in order to reduce familiarisation duration.

1. The question “Your sea experience with the type of ship/engine? “ (n=400) was answered as follows:
  - 8 officers had up to 1 year of experience with the same type of ship/engine (2%),
  - 52 officers had 1 – 3 years of experience with the same type of ship/engine (13%),
  - 62 officers had 3 – 5 years of experience with the same type of ship/engine (15.5%),
  - 278 officers had 5 – 10 years of experience with the same type of ship/engine (69.5%).
2. The question “Your rank during the last contract? “ (n=400) provided the following results :
  - As the 1st Officer – 102 officers (25.5%)
  - As the 2nd officer – 170 officers (42.5%)
  - As the 3rd officer – 56 officers (14%), and
  - As the Chief Engineer / Master – 72 officers (18%).

The time of familiarisation depends on the rank aboard vessel. A higher rank (management level) means more complex duties aboard and, proportionally, more familiarisation time and more complex procedures.

Most of the officers (66.5%) were junior officers, i.e. 2nd or 3rd deck or engineer officers.

3. The question “How does your company reduce familiarisation time? “ (n=400) provided the following responses:
  - By serving on sister ships – 224 officers (56%)
  - By simulator-aided training – 12 officers (3%)
  - Joint service of the handover officers until the next port of call or further – 70 officers (17.5%)
  - The company does not consider familiarisation as an issue – 94 officers (23.5%).

Most of the respondents stated that their company reduced the period of familiarisation by employing officers on sister ships or ships featuring the same technologies (56%). A major concern is the response of 23.5% officers whose companies do not regard familiarisation as an issue. This percentage is rather high, as it indicates that there are still a number of maritime shipping companies which do not consider familiarisation process as a relevant factor of the safety of navigation.

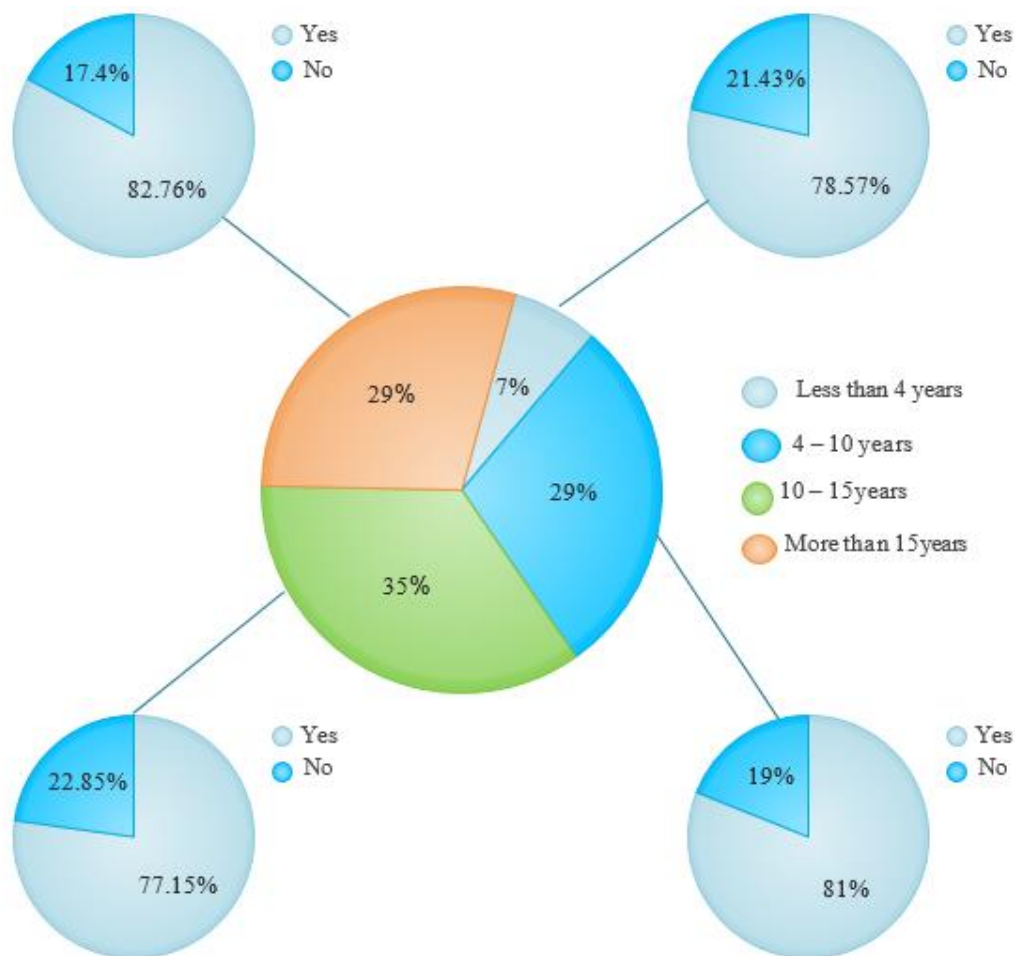
Likewise, the survey revealed a low percentage (3%) of familiarisation by means of simulator training. This low percentage can be an indication that the companies are not ready or able to invest in the expensive shore-based training for seafarers with the aid of simulators.

4. The responses to the question “Do you consider familiarisation time sufficient when joining the ship?” were analysed with regard to the respondents’ sailing experience (Question: “Years in seafaring service?“), and the following results were obtained (Figure 1):

- Out of 28 officers with less than 4 years of sea service (7%), 22 officers responded “yes” (78.57%), whereas 6 responded “no” (21.43%)
- Out of 116 officers with 4 – 10 years of sea service (29%), 94 officers responded “yes” (81%), and 22 “no” (19%)
- Out of 140 officers with 10 – 15 years of sea service (35%), 108 responded “yes” (77.15%), whereas 32 responded “no” (22.85%)
- Out of 116 officers with sea service longer than 15 years (29%), 96 officers responded “yes” (82.76%), and 20 responded “no” (17.24%).

Naturally, the experience gained on board sister ships considerably affects the quality and duration of familiarisation. Previous sea service on similar ships may reduce the time required for proper familiarisation. Exceptions refer to promotions to higher officer ranks, when the period of familiarisation may be longer.

The results show that the officers provided similar responses concerning familiarisation time (from 77.15% to 82.76%) regardless of the sea-service time. A recent research [6] revealed that familiarisation time does not depend on the education of officers, as similar responses are provided by high-school diploma-holders and higher-education degree-holders.

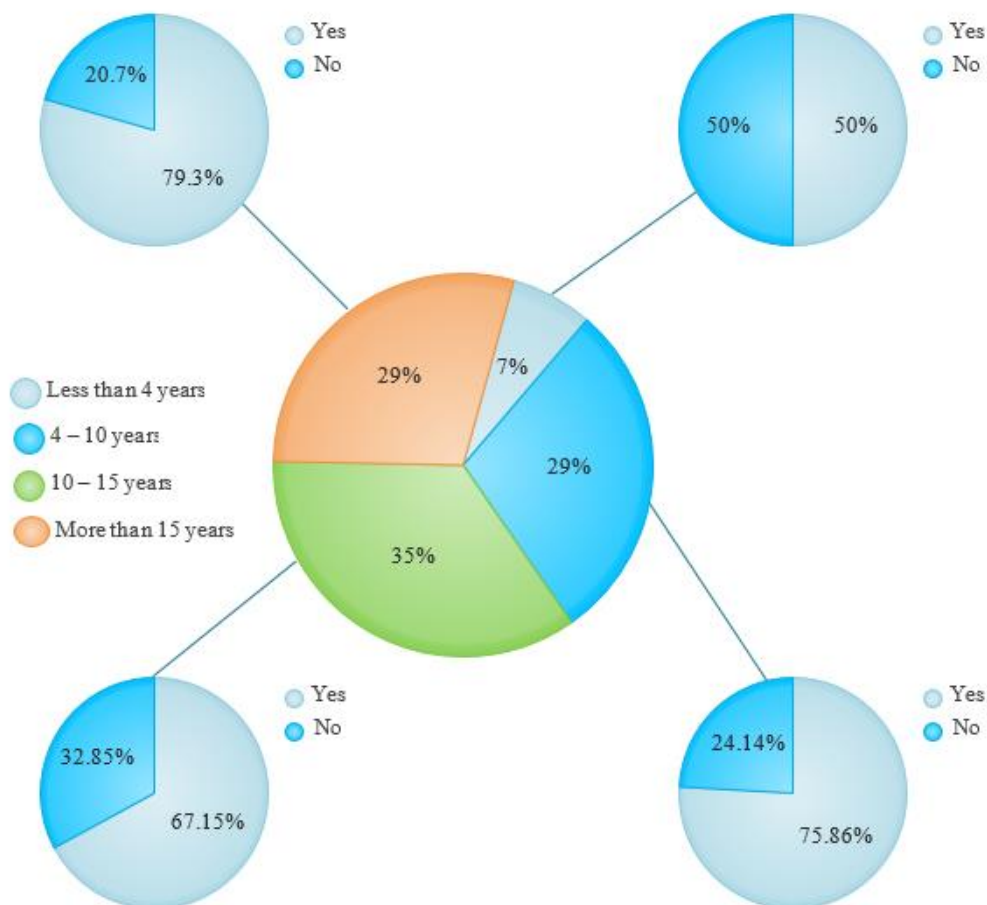


**Figure 1** – Relation between seafarers sea service time and their opinion about sufficiency of the familiarisation duration time (n=400)

5. As for the sea-service time (Question: “How many years of sea service do you have?”), the responses were statistically analysed with regard to the question: “Do you consider the handover time sufficient when signing on/off?” (Figure 2):

- Out of 28 officers with less than 4 years of sea service (7%), 14 officers responded “yes” (50%), and 14 officers responded “no” (50%)
- Out of 116 officers with 4 – 10 years of sea service (29%), 88 responded “yes” (75.86%), whereas 28 officers responded “no” (24.14%)
- Out of 140 officers with 10 – 15 years of sea service (35%), 94 responded “yes” (67.15%), and 46 responded “no” (32.85%)
- Out of 116 officers with sea service longer than 15 years (29%), 92 officers responded “yes” (73.3%), whereas 24 responded “no” (20.7%) .

Most of the experienced officers (>4 years of sea service) believed that the handover time was appropriate. Handing over is a more demanding process if officers are promoted to a higher rank. Unfortunately, companies usually change crews in smaller groups and do not make any difference between the cases in which an officer is promoted to a higher rank, or if he/she signs on in the same rank. This way of changing crew is used to reduce costs such as delay of departure of ships, travel costs, etc.



**Figure 2** – Relation between seafarers sea service time and their opinion about sufficiency of the hand-over duration time (n=400)

6. The responses to the question “How many years of sea service do you have?” were analyzed with regard to the question: “On the basis of your experience, do you believe that familiarisation is an important issue for safe navigation?” (Figure 3):
- Out of 28 officers (7%) with less than 4 years of sea service, 12 responded “yes” (42.85%) whereas 16 officers responded “no” (57.15 %)
  - Out of 116 officers with 4 – 10 years of sea service (29%), 58 responded “yes” (50%) and 58 officers responded “no” (50%)
  - Out of 140 officers with 10 – 15 years of sea service (35%), 72 responded “yes” (51.43%) whereas 68 officers responded “no” (48.57%)
  - Out of 116 officers with sea service longer than 15 years (29%), 64 responded “yes” (55.17%) and 52 officers responded “no” (44.83%).

When asked about the familiarisation as an issue for the safety of navigation, the officers had divided opinions. Regardless of their experience, approximately half of the seafaring officers (42-55%) did not consider familiarisation as an issue. In later interviews (during checking of answers), the officers stated that they had never heard of anything dangerous regarding the problem of familiarisation, or the vessels casualties due to insufficient familiarisation [10, 11, 12, 13].

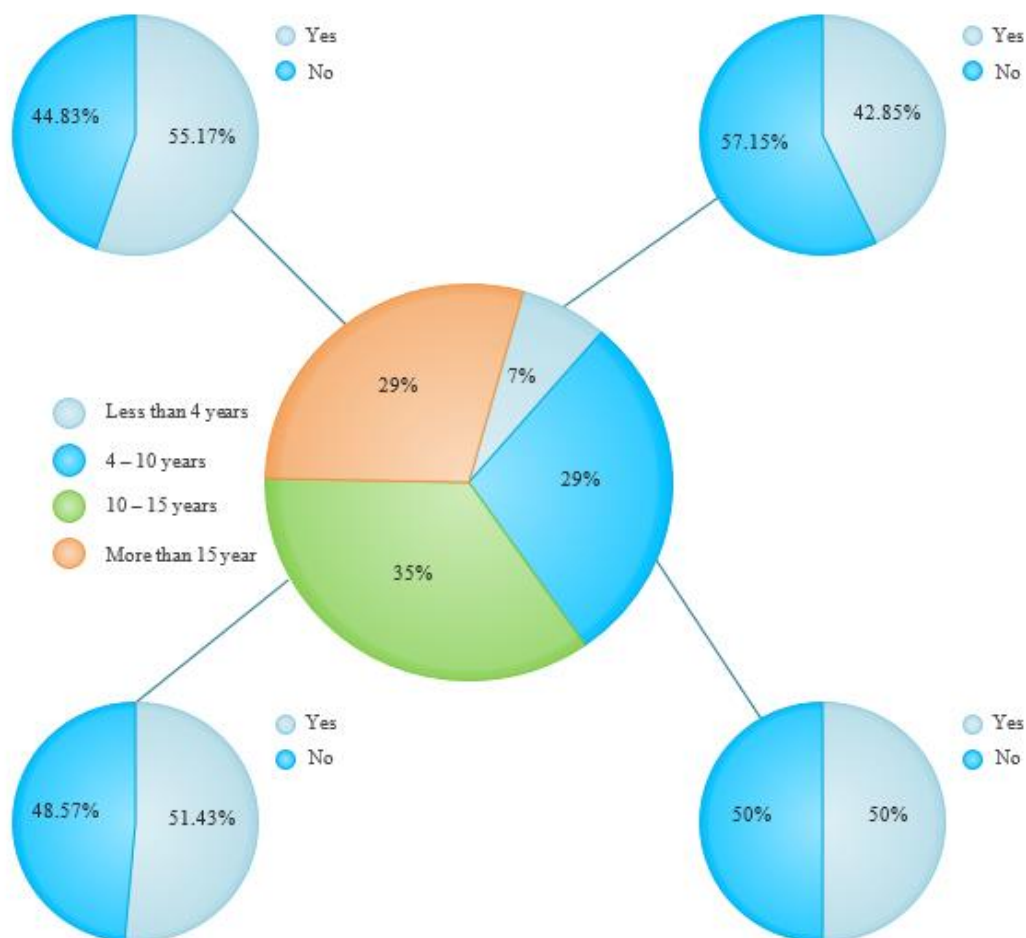


Figure 3 – Relation between seafarers sea service time and their consideration/opinion about familiarisation procedure as an safety issue (n=400)



7. With regard to their rank (Question: “What rank did you have on your latest contract?”), the officers were asked: “How long was the handover procedure when signing on/off your latest ship? “. The statistics provided the following results (Figure 4):

- 1st Officers (102 seafarers signed on in this rank – 25.5%):
  - 25 had the handover lasting up to 2 hours (24.5%),
  - 14 had the handover lasting for 2 – 4 hours (13.7%),
  - 11 had the handover lasting for 4 – 6 hours (10.8%),
  - 52 had the handover lasting for more than 6 hours (51%).
- 2nd officers (170 seafarers signed on in this rank – 42.5%):
  - 56 had the handover lasting up to 2 hours (33%),
  - 53 had the handover lasting for 2 – 4 hours (31.2%),
  - 14 had the handover lasting for 4 – 6 hours (8.2%),
  - 47 had the handover lasting for more than 6 hours (27.6%).
- 3rd officers (56 seafarers signed on in this rank – 14%):
  - 20 had the handover lasting up to 2 hours (35.7%),
  - 6 had the handover lasting for 2 – 4 hours (10.7%),
  - 8 had the handover lasting for 4 – 6 hours (14.3%),
  - 22 had the handover lasting for more than 6 hours (39.3%).
- Chief engineers / masters (72 seafarers signed on in this rank – 18%):
  - 17 had the handover lasting up to 2 hours (23.6%),
  - 8 had the handover lasting for 2 – 4 hours (11.2%),
  - 14 had the handover lasting for 4 – 6 hours (19.4%),
  - 33 had the handover lasting for more than 6 hours (45.8%).

The analysis of the results indicates that senior officers (Chief Officers, Masters, 1st Engineers and Chief Engineers) had longer periods of handover, i.e. more than 6 hours. Junior officers (second and third officers) had shorter periods of handover, i.e. up to 2 hours. The extended handovers present deviations from the results expected, due to promotion to a higher rank or taking up new duties.

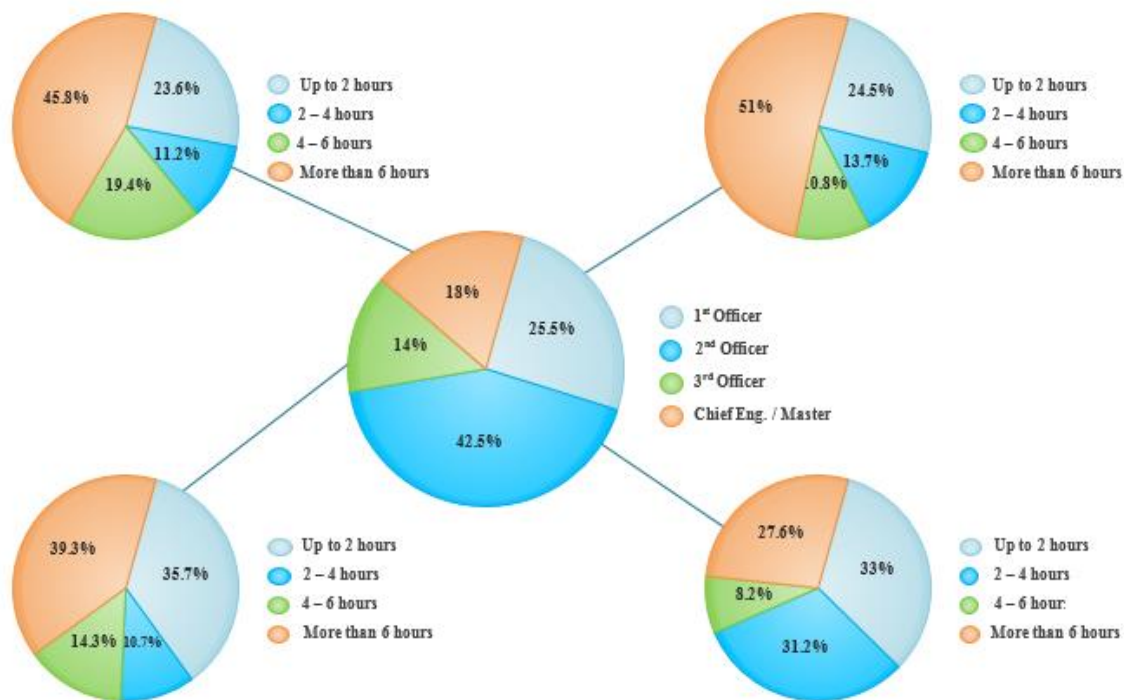


Figure 4 – Relation between seafarers rank during last contract and duration of hand-over (n=400)

8. With regard to the duties / ranks on their latest contracts (Question: “What rank did you have on your latest contract?”), responses to the question “How long was familiarisation when signing on/off your latest ship?” were analyzed (Figure 5):

- 1st Officers (102 seafarers signed on in this rank – 25.5%):
  - 85 had the familiarisation lasting up to 7 days (83.33%),
  - 14 had the familiarisation lasting for 7 - 15 days (13.73%),
  - 3 had the familiarisation lasting for 15 – 30 days (2.94%),
  - No one had the familiarisation longer than 30.
- 2nd officers (170 seafarers signed on in this rank – 42.5%):
  - 142 had the familiarisation lasting up to 7 days (83.5%),
  - 22 had the familiarisation lasting for 7 - 15 days (12.9%),
  - 3 had the familiarisation lasting for 15 – 30 days (1.8%),
  - 3 had the familiarisation lasting for more than 30 days (1.8%).
- 3rd officers (56 seafarers signed on in this rank – 14%):
  - 39 had the familiarisation lasting up to 7 days (69.6%),
  - 17 had the familiarisation lasting for 7 - 15 days (30.4%),
  - No one had the familiarisation longer than 15 days.
- Chief engineers / masters (72 seafarers signed on in this rank – 18%):
  - 66 had the familiarisation lasting up to 7 days (91.6%),
  - 3 had the familiarisation lasting for 7 - 15 days (4.2%),
  - 3 had the familiarisation lasting for 15 – 30 days (4.2%),
  - No one had the familiarisation longer than 30 days.

Regardless of the rank they had when joining the latest ship, most of the officers experienced familiarisation lasting for up to 7 days (from 69.6% to 91.6%). The fact that some officers had familiarisation lasting from 7 to 15 days (13.73% and 12.9% for the 1st and 2nd Officers respectively) is the result worth noting. Deviations arise from the promotion to the new rank/duties. Few officers who joined their ship as 2nd officers had the period of familiarisation from 30 to 45 days. Deviations from the expected results arise from the promotion to a new rank/duties or from changing the company (new familiarisation procedures). Deviations can also be noted among 3rd officers, as 30.4% of them had familiarisation lasting for 7-15 days. The reason for this is their joining the ship as officers for the very first time (promotion from cadets to officers), so that longer periods of familiarisation were required.

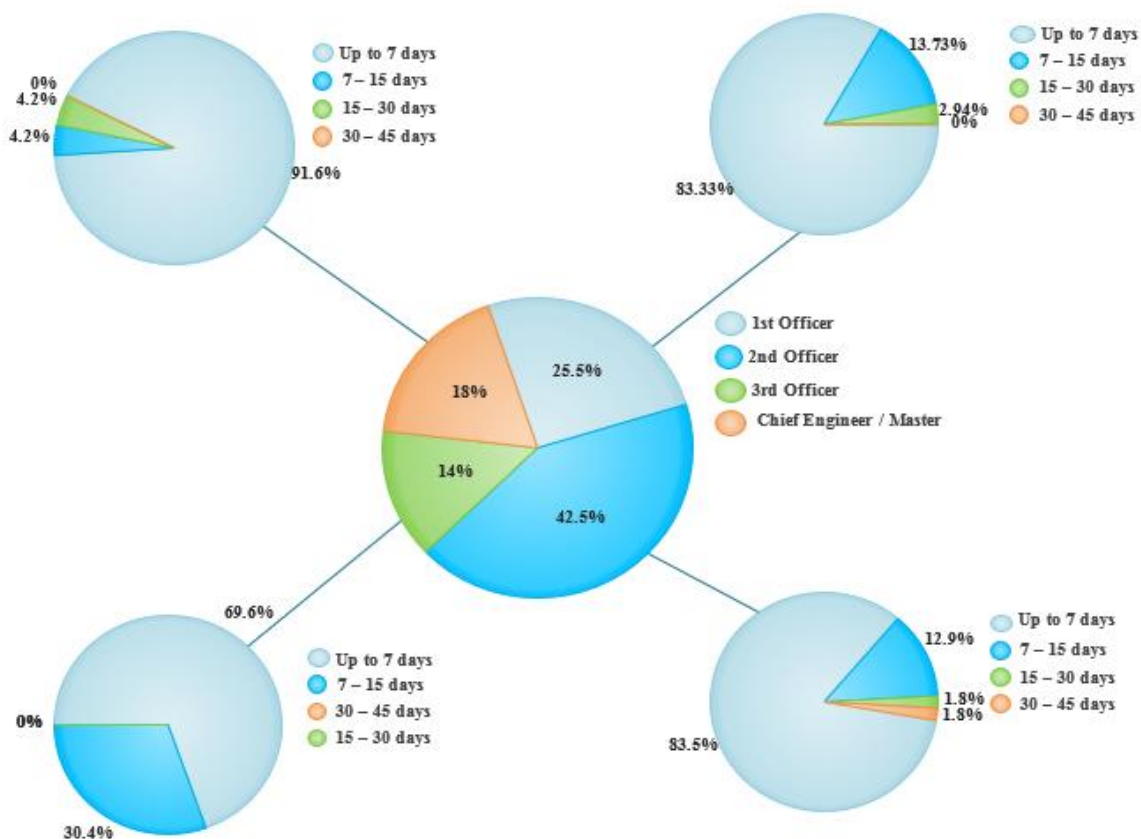


Figure 5 Relation between seafarers ranks during the latest contracts and duration of familiarisation

According to the survey, it results that the officers examined do not consider familiarisation as an important issue on board. They also think that duration of familiarisation is satisfactory. Familiarisation depends on their rank in the shipboard hierarchy. Higher ranks accept familiarisation more seriously and need more time for it. Junior Officers find that duration of familiarisation is satisfactory.

Most examined officers accept the procedures of companies in the matter of familiarisation (e.g. signing on the same or sister ships, etc.) as a good way of its improvement.

## 5. Recommendations

Familiarisation process can and should be improved by:

- training ashore – STCW basic training, Ship specific training (ECDIS, Cargo handling, etc.),
- training on board (CBTs, Feedback across company etc.),
- joining the vessels with similar technologies, e.g. when a seafarer is familiarised with container ships, the company tends to keep him/her on this type of ship,
- back-to-back contracts – type of arrangement where the seafarer always returns to the same ship, at least for 4 highest ranks (Master, Chief Engineer, C/O and 1 A/E),
- defining the exact time of familiarisation and handover,
- extended handover,
- introduction of junior officer training – the period of time given to the officer prior to his/her promotion to a higher rank,
- Officer Matrix requirements – an officer must have sufficient experience, i.e. sea-service time in the rank on a particular type of vessel, and be with the same company for some time,
- strict definition of the procedures of familiarisation and handover by Safety Management System (SMS),
- regular performance of emergency drills in compliance with the international conventions, etc.

Familiarisation problem could be solved by embarking the same crew on the same or sister vessels.

Vessel ergonomics should be improved, especially in the parts which are used for command, control, and supervision. This solution has already been known in the airline industry, where the pilot is certified for flying a specific type of airplane with which he/she has enough experience collected during training on simulators and as co-pilot on the airplane. The same solution can be applied on board vessels.

One of the most discussed ways of dealing with familiarisation refers to the navigation equipment and development of the S-Mode, i.e. Standardized Mode of operation of navigational equipment. The Nautical Institute is developing the concept of the standard “S-Mode switch”. When activating the switch, navigation device would turn to the pre-set mode with the same settings across the equipment, regardless of the manufacturers [17]. However, it is important that the S-Mode does not limit the producer innovation and enhancement of the navigation equipment. There is an IMO document (MSC/95/19/12) with a three-year plan whereby the drafting of an S-Mode guideline for the design of shipboard navigational equipment along with notes for training implications would be completed by the end of 2019 [18,19].

## 6. Conclusion

The familiarisation as a process of on-board adaptation still remains insufficiently defined, in particular from the viewpoint of the duration and quality of the process. The latter is usually described within Safety Management System (SMS) rulebooks of individual companies and ships so that it presents the matter related with the quality management. In real

life, it is common practice to cut the time of familiarisation and handover in order to reduce the costs of manning.

Although the SMS can be adjusted to the type of vessel, it is necessary to make the procedures clearer.

Embarking on sister ships or similar ships is a good way of reducing familiarisation time.

Administration should consider the possible solution of ergonomic vessels, especially in the parts where the probability of human error is highest. This practice has already been in use in air transport.

Training should be obtained on simulators which are not generic but specific, and more similar to shipboard design.

Future research should thoroughly examine familiarisation and handover processes when officers are promoted to the higher rank for the first time, and when officers change the employer or the type of vessel.

It is recommended that the time of familiarisation is reduced through shore-based, simulator-aided training, uniform design of controls, and innovations such as S-Mode switch in order to enhance the safety of navigation and cut the costs.

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