

Maritime education and its role in improving safety on the sea

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Abstract

Within the past few years there has been an increasing number of ship accidents. This fact must be seen as a dangerous disappointment for safety regulators on the sea, with great impact on maritime industry and, at the same time, on the environment. Safety on the sea is difficult to be clearly defined. To realize what “safety” means, it is necessary to create a “culture of safety”. This term is easily understood if it is explained and applied starting from the first year of maritime school. For this reason is important to increase the role of maritime schools in this issue. It is generally accepted that the actual regulation regarding safety on the sea is not very accessible for younger seamen. For the moment, there are many rules, regulations and codes, international and national requirements regarding safety on the sea, but all of this are stated in difficult terms hardly comprehended by a person who doesn't have knowledge in the field.

In this paper we will try to develop a method to introduce the future deck officers in the so called “culture of safety.” We will present alternative ways of understanding the actual regulations, instead of classical style of read and learn. These procedures will include discussions about code themes, case studies and interactive analyses about the cases and safety measures and will use simulation techniques to create a virtual situation of safety alteration. Studying student's reactions in these simulated cases will bring data about the ability of acquiring the concepts of safety culture during their learning period and their future applicability expressed in the reduction of ship accidents or number of events.

1 Introduction

Essential things are often learned from examples. It's written in human nature: we keep in mind other people's mistakes in order not to make the same. Agreeing with this general opinion and reflecting it in the maritime field, a way to learn from other's mistakes is to study maritime accidents. Studying and discussing these accidents with students creates concrete explanations of what “safety” means and shows the results of unsafe actions.

The starting point of many accidents has been represented by a wrong decision or action. These mistakes were made through breaking the existing rules regarding safety and resulted, in many cases, in a disaster. To avoid these situations it is necessary to know and respect all international, national or local rules and regulations, such as company rules or onboard rules.

Today's students are the future seagoing officers. During their study cycles, especially at the university level, they learn about present regulations applied in the maritime domain regarding safety and security onboard the ships. As an example related to the safety sector, they take knowledge about COLREG Regulation, the ISM Code, Bridge Team Management and other regulations and codes created for crew members, ships and environment's protection.

It is difficult to evaluate their knowledge in this field using only classical examination forms, simple questions based on the regulation text. It is important to know if students understand the rules and are ready to apply them properly. This can be made in fact only through evaluating of one real situation onboard the ship or simulating this situation in an exercise. Discussing and analyzing their reaction will allow a correct evaluation of their knowledge in the field.

In this context, the evaluation using simulation techniques helps students to gain practical skills by using electronic devices, which they will work with in reality onboard the ships. Generally, safety elements used in navigation activities are bounded with data received from electronic devices. Understanding the data and making decisions based on them can be critical for a safety environment.

2 The “Safety Culture”

The term “safety culture” has been used to describe an organizational environment that promotes self-regulation by ensuring that each individual within the organization takes responsibility for actions to improve safety and performance. (Moore & Roberts, 1995)

According to this concept, the main element involved is the person. Onboard the ship this person can be any crew member, responsibilities being divided with respect of his position.

As a future officer, a student has to know the responsibilities for the safety of life, of ship and environment. These responsibilities should come from actual regulations and also as a natural behavior. First they are learned during training, and secondly, they are characteristic for each person.

The most important thing is to be able to understand and define the term “safety” by its personal meaning. If one can realize the correct meaning of the concept, than it's able to create a safety environment for the others. This depends also on the level of knowledge and the performance on duty.

Maritime education can be seen as an organization, and has a role in building its “safety culture.” Maritime universities and academies are very important as a first step in the training of future officers and have to take the

position of initial creator of behaviors related safety conscience and safety acts performed onboard ships.

At this moment, the revised STCW Convention added new requirements, but still kept these at a minimum level of knowledge for future officers. When we talk about safety it is impossible to maintain only the minimum standards; is necessary to try to reach a higher level of understanding in the training process and in the end to have a normal level of application.

Once developed and instilled in future officers, the safety culture has to be maintained.

Therefore, to be able to offer a safety environment as a duty officer on a ship, present students must understand the concept and the way to apply it. After that, they have to prove that they are able to implement and develop their own culture of safety. It is a duty for maritime education to inspire them to make this effort in order to have safe seas in the future.

3 Actual requirements for training

At this moment the training process in the maritime field is made under the recommendations of International Maritime Organization, in accordance with the STCW Convention and IMO Model Courses for operational and managerial levels.

The STCW Convention provides the requirements necessary for a trained person involved in operations on sea and the IMO Model Courses explain how these requirements can be satisfied and what has to be covered during the training process at the higher educational level for an operational or managerial officer. The duty of maritime universities is to acknowledge in their curricula the indications given by these documents and to do the training accordingly.

Regarding the requirements of IMO Model Course accepted as a standard level of training, we have some remarks near complete training, especially with the use of electronic navigational devices. We do not consider this absence as an intended one, due to the fact that the Course Model is edited in 1999 and the techniques continued to grow up after. Our idea is a revision of courses with the adding of these elements as mandatory in academic curricula.

Bearing in mind that the revision of STCW Convention and Code was made long after its birth, a moment when basic concepts were considered outdated by the actual requests onboard the ships, we appreciate that the reappraisal of IMO Model Course in order to cover the present especially about the use of modern technologies in maritime activities.

There is an option to study electronic navigation separately, but it would be much more useful to combine with other navigational procedures, such as coastal and celestial navigation in complex applications.

Also, requirements about the use of computerized techniques and specialized software for applications in the coastal and celestial navigation are necessary to be introduced in the mentioned courses model.

This conclusion comes from the actual situation on board ships, where the higher techniques are already present. The role of the maritime university is to provide education to the world fleet officers that are more trained and capable to work with latest equipment. It is irrational, in a century of technical innovation, to teach about procedures in a field as navigation, but not to mention about the latest technology found onboard, made just to be used for a more safely navigation activity.

In order to the improve competences and skills of the future officers, it is important to make changes on the present training requirements and bring them to the actual development of the maritime field so as to ensure all are covered.

Some steps are made by the local authorities through their own requirements related to the use of electronic devices in navigation, especially for electronic charts and automatic identification system. These come to complete the general requirements expressed by IMO.

Another concept of training not clearly implemented concerns the use of case studies in the training process. This concept can be very useful in the theoretical modules as collision regulation and watch-keeping duties.

4 Training techniques for understanding of safety concept

As we stated before, it is necessary to develop techniques to help and provide to the students the possibilities to understand and work with the actual international regulation. One way will be to explain the regulation text through real life cases and in this way maintain the essence of these rules. For this method the materials can be found on the internet in the web page of the maritime accidents investigation commitiies and organizations, such as The United States Coast Guard, the Maritime Accidents Investigation Branch of the UK and from other national or international authorities with competence in this field.

The cases to discuss must be chosen in order to have the desired impact on the student's memory. Many times the presented cases are those in which in the end were produced only material damage and no person was affected.

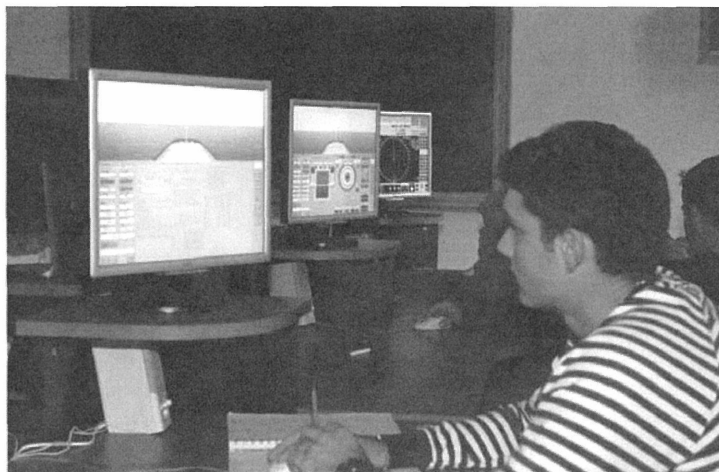
Currently, these types of cases are used in the process of Collision Regulation learning, where accidents are produced because of breaking rules for lights and signals, mainly in restricted visibility conditions or when navigation is made during night inside of a separation scheme, in heavy traffic conditions.

We agree with the idea that COLREG should be learned as it is and that there are no omissions allowed, but is a fact that the student is more perceptive when together with a rule is presented a real situation.

At the first contact with the COLREG, many students have never seen a ship before, and do not know what is a navigation light, a beacon or a fog signal. Using ships machetes and draws for imaging, together with learning movies are a good solution for a starting point in the knowledge achieving process.

After that, during simulated exercises they can use lights and signals according to situation and become able to realize the importance of these elements in the safety of navigation.

Case discussion is also a good method with good results when presenting the ISM Code and The Bridge Team Management and Procedures.



Students during training on navigation simulator

Many accidents produced are the result of a lack in the safety management system or in the arrangements on the bridge level. Problems like misunderstanding based on difficult communication inside the team or in relation with the outside authorities are very well explained using the students during different applications, which suggest the use of Standard Maritime Vocabulary -- in this way, they can find by themselves the problems in communication.

Poor communication between members of the bridge team can be an opportunity for a dangerous situation to arise. Using the complex navigation simulator helps create a situation on the bridge which requires good communication, such a port entrance maneuver; passing of a strait or navigation in a heavy traffic area. During these applications, students are grouped as a team of two – a maximum of three persons -- each of them having their own tasks and covering a duty on bridge. In these conditions they must to communicate to one another and take the best decision in order to provide safe navigation with the respect of regulations. At the end of the exercise, students participate in a debriefing session where they can see what went wrong and how they have passed a difficult situation.

Also in these applications, students must take very seriously their duties and this means that they are forced to give orders to their colleagues; this is a

moment when the friendly relationship is replaced with a subordinate one. For doing this student is necessary to be convinced about his decision and be able to apply it. This action requires knowledge on how to acquire information, how to analyze it and implement it according to a good seaman practice and as per regulations.

If the student is in a position to execute an order, he must know what it means and how it can be done. It is necessary to understand the orders and to have skills regarding ship characteristics and maneuvering details.

Another unsafe situation that can arise on board the ship is represented by possible bad relations between members of a team with duties related to safety. This situation can show a misunderstanding of the Bridge Team procedures and could appear if students do not realize the importance of these regulations.

If it is difficult to have a good team relationship in a simulated situation during classes, when the members know each other, the situation could be worse when the team is formed by people meeting for the first time, from different nations and cultures.

As an officer on the watch it is necessary to know to conduct the ship and to complete the ship's mission. These duties require complete knowledge about navigation and voyage planning. The ship route planning must be done according with the good practice and in respect of safety procedures, connoting use of all equipment present on the bridge and necessary for these tasks.

A good navigation officer has to be a good user of all navigation equipments and should be able to apply the navigation principles through classical procedures as well as modern ones.

In this spirit, in simulating application, student's have to plan the voyage as on a real navigation bridge, starting from the paper chart and continue with the GPS devices, and route planning, the electronic charts display for route planning and in this way to cover all requirements for a watch officer with navigation duties.

Also, in these voyage planning activities, they have attributions regarding the consultation of nautical publication, chart correction and the acquirement of all needed data for the actual voyage.

Working as a team, students should check themselves about completing the planning task and correct what they think is unsafe and risky for their mission so they can observe mistakes from the beginning, without lecturer's intervention during application in order to correct it. This stimulates them to pay more attention to such important activity.

Another regulation with importance in the safety maritime process is the ISM Code. The ISM Code represents at this moment the actual regulation regarding the management of safety on board the ships and at the companies. Mandatory regulations are made in juridical terms, which are difficult to be understood by the younger students who may read such a document for the first time.. This Code is made not only for reading, it is made to establish a safety environment on board and for the companies offices.

As we said before, to be able to generate a safety environment means to understand the principles of safety. The ISM Code contains many elements with direct impact on the level of safety for crew, ship and environment. Do not forget that the ISM Code was created after a concrete situation of breaking the safety rules with the cost of many lives. Understanding it can reduce the chance to have other similar cases.

This Code is mainly necessary for the managerial level, but could also be usefully to be known at the operational level, due to the fact that many actions with risk are made by the persons under the managerial stage.

For this, it is recommended to discuss with the students each chapter, to try to make them understand the idea, to give them examples from daily life, which can be correlated with the activities onboard; also the use of case studies are very efficient.

When students reach the necessary level of knowledge about all Regulations and Codes learned during the classes, the applications, including computerized and simulated exercises can be made containing elements from all of them. In this way is created a complex system of evaluation with a minimum level of understanding requested for passing of 70%.

Application forms contain data about the ship characteristics, ship mission, route imposed to be executed and requests.

Evaluation forms are based on different criteria according with exercise tasks. The principal elements of all evaluation forms are presented as a table with columns as:

- team number;
- team members name and surname;
- team members level of training or year of study;
- skills level in using of technology present in application;
- using of Maritime Standard Vocabulary (beginners in native language, advanced in English);
- using of electronic navigational devices;
- organization at the bridge team level;
- respect of principles of safety navigation;
- applying the COLREG Rules;
- different requests according with the application tasks.

For each evaluated task students receive points from 1 to 10. To pass the exam it is necessary to have a minimum 5 points for each task, but in the end not less than 70%, with an average of minimum 7 points.

We consider that a student able to cover 70% of a complex application has sufficient knowledge about safety regulation and procedures and is capable of offering safety environment for the other crew members.

In the evaluations based only on COLREG Rules, the minimum level for passing is 90% correct answer, for this uses a computerized program which at the application end offers student the possibility to find out his score and also to see at what point he has given a wrong answer.

As concrete results, during one application made with the 3rd year students, based on ISM Code watch safety requirements and Bridge Team Management procedures, we collected the following data.

Exercises description and condition:

- students present for evaluation: 200;
- competences evaluated: safety requirements for navigation on bridge level included COLREG Rules;
- exercise time: 4 hours (according with a watch period);
- area for navigation: Southern part of England;
- type of the ship used: crude carrier of 55,000 dwt;
- number of bridge team members: 3 (one in role of the Master, one as watch officer and one helmsman);
- day time application: 18.00 to 22.00 hours;
- language use for communication: English;
- technology used for application: complex navigation simulator.

Evaluation results in percents:

- 70 % of the students ended application with tasks completed; entire category respected the rules and regulations in a percent of 60% to 80%;
- 20% of the students ended application with tasks completed; a percent of 40% to 60% respect of requirements (they bring vessel few times in dangerous situations or near miss conditions, some COLREG Rules were broken, especially related navigation light and navigation inside a vessel traffic scheme);
- 10% of the students could not end application; they grounded or collided with other vessel.

These results lead us to believe that we reached our objective of creating a safety conscience to our students, to help them to understand and apply correctly the regulations regarding practice of a safe navigation.

All of these techniques based on mandatory regulations used for training students can be used to acquire a level of safety efficiency; the results can be measured afterwards, in the reduction of accidents, or even in decreasing of their impact in economical and social life.

5 Use of high technology in the training process

According with the revised STCW Convention, the simulators must be used more effectively in the training process of the future seamen and officers. The high technology has to be used in order to increase the level of training and to reach higher standards of knowledge and skills. The use of simulators and technology, especially electronic devices in the training process offer the

possibility to create models close to reality. Moreover, students are more involved in the events and also more receptive to the training objectives.

In the first stage we have to familiarize students with all of these equipments and make them understand their function and role in the navigation, with implications in the safety of maritime activities.

Today, many ships are armed with the latest technologies for navigation, as GPS devices, Anti-Collision Radar and Electronic Charts Display, Automatic Identification System devices. Their role onboard the ship is to reduce the human work level and, at the same time, to increase the quality of navigational processes at a safe and secure level. These are very useful if the operators know how to work with them, to get the necessary information, to analyze it and to take the right action accordingly.

The training process for the use of these devices is a long one, starting in school and continuing onboard. During school training, future operators receive data about technical details, configuration, operational procedures, models of data analyze and correct decisions. During the applications made with simulators, students have the possibility to develop their skills by using these devices, they can work with them interconnected, analyze all data or compare data received from two different devices or from other sources. They will learn to use information in the navigation activities and in the end to realize a safe and correct travel for their virtual ship.

Onboard, they will apply knowledge according with to a particular situation and will complete their skills by using real electronic navigational devices.

6 Conclusion

For achieving a satisfactory level of safety at sea it is necessary to start creating a safety conscience from the first level of specialized training during the academic stage. For this reason is probably needed to change or to bring out the present international context regarding maritime training.

It is the duty of maritime universities to request to the International Maritime Organization to review the policy regarding training, especially to Officer On the Watch and Master and Chief Officer level, to introduce as mandatory the use of latest techniques in the training process, and to increase the role of the modern navigation technology.

These requirements are not meant to increase the difficulty of the training level; they are coming from maritime companies, the beneficiary of the future officers. If these officers will be better trained, they will be able to provide a more safe and secure navigation and ship operations, thus resulting in a reduction of accidents.

We tried to show a way, or an idea about few alternative possibilities to explain to a beginner in this domain what it means to do a safe activity, what is the sense of the word “safety” and how they can create their own safety environment and conscience.

Starting with the regulations lecture, continuing with the case studies and discussions, bringing the reality through simulated applications, it can be an efficient method of understanding and correct applying the present regulation and thus, a real improvement of safety at sea.

References

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