

## **A NEW TOOL FOR MENTORING, TRANSFER OF EXPERIENTIAL KNOWLEDGE AND EVALUATION TO UNDERSTAND THE COLREGS AND THEIR APPLICATION AT SEA**

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### **ABSTRACT**

In spite of passing more than 42 years on the implementation of the international rules for preventing collision at sea “ known as ColRegs”, introducing several amendments since then till now, the improvements in navigational aids such as Automatic Radar Plotting Aids (ARPA), Electronic Chart Display Information System (ECDIS) and Automatic Identification System (AIS) and attempts to raise the standards of training through Standards of Training, Certification & Watch keeping (STCW-78) convention and its amendments, collisions still occur. Many studies and accident reports indicate that the accidents are caused by either human error or are associated with human error as a result of inappropriate human responses due to wrong understanding of ColRegs.

This paper reviews a comparison between the traditional style of evaluation and modern evaluation style using media and simulations to identify the deficiencies in the application of Collision rules at sea. This paper will also touch on the deficiencies in the maritime education and training.

Finally, will suggest a set of standards and study units for testing the understanding of seafarers in applying the ColRegs rules. The standards will be developed from real accident cases while testing the potential navigators’ understanding with real time situations. This would improve the application of the ColRegs rules at sea environment.

**KEYWORDS:** Colregs, Maritime Education and Training, Collision Avoidance, Seafarer Evaluation

### **INTRODUCTION**

It is essential to ensure that all navigational officers responsible for navigation watches have a full understanding and good interpretation of the rules to apply them at sea to avoid collisions. The International Maritime Organisation (IMO) developed the first standards for Vocational Education and Training (VET) programmes for merchant officer’s in 1972, and it has been amended in 1991, 1995, 2003 and 2010 respectively.

However, no mechanisms to monitor how these standards are being applied on high seas or inland water; nowadays by using modern technology in maritime education and training we can reduce the substantial diversity on the knowledge, understanding, interpretation and application of these rules in the high seas and inland waters that has always threatened the safety of life at sea.

More than 90% of collisions are attributed to the human factors [1]. It is interesting to note that earlier studies reported human error, contributing to 85% of all accidents, either directly initiated by human error or associated with human error as a result of inappropriate human response [2]. Human error is reported to be the main cause of accidents, which has now apparently increased by some 5 percent in recent years.

## THE MARITIME INDUSTRY AND MARITIME ACADEMIC

### The Maritime Industry

From the beginning of times, people have been attracted by the sea, by the possibilities to interact with other people, especially for trade and also for social and cultural development. The main way of transport used in trading relations is represented by the maritime transport, first because of the quantity transported, second due to the price. Once economical relations got wider, the maritime industry had to adjust the capacity to satisfy these requests. The growth of the ships capacities becomes obvious starting from the 70's and continues during present time. This development requests increasing quality of operability, bringing onboard the ship the newest technology and people able to work in these new conditions. The improvement of technology and this presence of high technology onboard ships are changing the concept of classical sea transport and in consequence require people trained for this.

Not only one part of maritime industry has changed, the ships, also they have changed the connecting activities during last decades. So, the port operations, shipping company activities and others have suffered changes and requested personnel trained for the new conditions.

Even if technology evolved, the basic activities and the operation of equipments are still human duties. The maritime industry is based on human element and, in this way; the necessity to invest in human factor must be a high priority. To have qualified personnel according to technological standards is away difficult goal to achieve without having adequate background training. A solution can be represented by the training onboard ships, directly on the working elements, but can have the inconvenience of missing knowledge's in case of changes.

Also, the technological changes impose continuous updating of older employees, people familiarized with the previous equipments, which have also gaps into theoretical field related, not only into practical experience. Here, the difficulty consists in the age of the employees, their position facing new technology and, not in the end, the ability of achieving sufficient knowledge to assure a good and safety operability. With the younger personnel, problems related to accessibility to the new are less; they are living in the technological era and have more resources to comply these onboard ships. Also, if they are correctly trained and are open to latest techniques, they will be able to help their older colleagues in achieving knowledge and skills in operating computerized equipments.

Now, after the ships have been modernized, armed with computerized equipments and high technology in order to provide a safe operation, to increase protection of the human life and of the environment, is the time to improve people capabilities.

These goals can be achieved through a better learning and training period before taking over any responsibility onboard. During this period, they must be taught about new ships types, their operational characteristics, differences between these types, technology already exists, configuration and operation. Situations which can be met during a voyage organizing and managing of onboard activities and duties, and everything that is necessary to provide a safe activity.

This is the responsibility of the academic staff, to satisfy the present requests and necessities of the maritime industry, to provide people, both deck and engine officers able to work and react in different conditions and situations encountered during activity.

## Maritime Academic

In the middle east region the Arab Academy for Science, Technology and Maritime Transport (AASTMT) plays a great role not only the training but also being a formative institutions for maritime officers, including personality modeling and developing a responsible behavior of their actions. It is in human nature to borrow from other people's personalities, from lecturers or trainers in this case. Being examples, the lecturers have to show only the better part of their personality, oriented on their professional knowledge and skills and to correct the intention of the trainees to become a copy, to help them develop their own personality, based on a model.

For this, it is important for lecturers to use in the training process their experience in working with people, to complete theoretical knowledge with practical examples and advices, based, if is possible, on own experience at sea, if not, on studied cases. To do these it is necessary that lecturers possess an adequate level of training and to have knowledge from domains complementary to their teaching area.

Doing this, trainers training from the beginning of their academic career, is a more acceptable situation, because of fresh theoretical knowledge acquired during studies period. It will be necessary just to introduce them in the teaching techniques, to use different teaching materials and to teach them to target the maximal goal, in order to have at the end good prepared people for their future professional life. For teachers involved in training process from many years, the scope is to keep them in line with technological development, to convince them to pass from classical teaching methods to the new ones, to include in their activity the use of computerized and simulated application, also distant open learning and e-learning concepts.

Starting from these ideas, AASTMT covered knowledge and skills related by using the training technologies, as simulators, the development of an e-learning course, management of knowledge, class courses curricula developments, and other objectives used for becoming a better trainer or for updating with technical advance.

## COLREGS IN MARITIME EDUCATION

Maritime education and training programmes include ColRegs training under a Navigational Watch, includes a number of hours teaching in a classroom environment at a theoretical and practical level. The IMO model courses allocate 100 hours for this Navigational Watch for deck officer programmes [3]. Similarly, at senior and higher levels, the programmes include 30 hours of training that is considered as a refresher course. These model courses are designed to provide additional guidance to Maritime Education and Training (MET) providers as required in STCW 2010.

Different countries have varying methods of teaching ColRegs rules as well as having different methods to test and certify the knowledge and competency of deck officers in Collision rules. For instance, in AASTMT, at basic study choose to test the knowledge of students with multiple choice type questions. It is the best way for evaluating knowledge, comprehension and application. But the Maritime Examination Center (MEC) has two different methods oral and computer based exam to test the officers with different difficulty question according to their level. Figure 1 showing the MEC laboratory.



**Figure 1: Maritime Examination Center Laboratory**

ColRegs are intended to operate in an environment where the Navigation Officer on each vessel has a complete understanding of the situation, knowing which rules are in effect, how those rules are interpreted and what needs to be done [4].

Marine Accident Investigation Branch (MAIB) in 2004 has conducted a safety study that reviewed 66 collisions and near collisions in their accident database. As a result of the study, the most common contributory factors in all these collisions were poor lookouts (Rule 5) and poor use of radar (rule 7(b), (c)). This means that the standards of lookouts are poor and ineffective and radar is not used properly to identify the risk of collision. In fact, Colregs clearly state the necessity of maintaining lookout in Rule 5 and the use of radar in Rule 7(b) and 7(c) [5].

The level of navigators understanding and interpretation of ColRegs rules are inconsistent. Besides, there is always a question mark how student's knowledge is taught and being tested. Furthermore, the level of competency varies significantly. The officers are in fact expected to reach certain levels of proficiency and competency either by their companies or potential employers. The collision avoidance actions require to be applied in all waterways, unless additional national rules are set by national authorities in their inland and coastal waters.

In this paper is a comprehensive evaluation of all ColRegs rules for two different levels carried out using different criteria.

## **SEAFARER EVALUATION**

This section reviews the evaluation of two different seafarer groups, these group are senior officer (master and chief mate) and junior officer group (second and third mate). The evaluation criteria grouped in three main clusters which are Professional Knowledge & Skill and Adaptation to Safety Rules, Professional Behavior and Leadership and Social Behavior.

**Senior Officer Evaluation**

**Table 1: The Result of ColRegs Oral Exam for Senior Officers**

| Exam Session              | Number of Seafarers | Pass       |               | Fail      |               |
|---------------------------|---------------------|------------|---------------|-----------|---------------|
|                           |                     | Number     | Percentage    | Number    | Percentage    |
| Jan 2013                  | 148                 | 131        | 88.51%        | 17        | 11.49%        |
| July 2013                 | 137                 | 122        | 89.03%        | 15        | 10.95%        |
| Jan 2014                  | 126                 | 117        | 92.86%        | 9         | 7.14%         |
| July 2014                 | 140                 | 118        | 84.29%        | 22        | 15.71%        |
| <b>Total / Percentage</b> | <b>551</b>          | <b>488</b> | <b>88.57%</b> | <b>63</b> | <b>11.43%</b> |

Source (MEC 2013-2014)

**Table 2: The Result of ColRegs Computer Based Exam for Senior Officers**

| Exam Session              | Number of Seafarers | Pass       |               | Fail      |              |
|---------------------------|---------------------|------------|---------------|-----------|--------------|
|                           |                     | Number     | Percentage    | Number    | Percentage   |
| Jan 2013                  | 148                 | 140        | 94.59%        | 8         | 5.41%        |
| July 2013                 | 137                 | 132        | 96.35%        | 5         | 3.65%        |
| Jan 2014                  | 126                 | 107        | 84.92%        | 19        | 15.08%       |
| July 2014                 | 140                 | 128        | 91.43%        | 12        | 8.57%        |
| <b>Total / Percentage</b> | <b>551</b>          | <b>507</b> | <b>92.01%</b> | <b>44</b> | <b>7.99%</b> |

Source (MEC 2013-2014)

Table 1 shows the result of four groups of senior officers attended oral exam on January / July 2013 sessions and January / July 2014 sessions. Exams were carried out by panel of examiners in the MEC. Results show that more than 88% of the participants succeeded and about 11.45% failed.

Table 2 shows the result of the same group of senior officers attending computer based exam and modern technology which showed an increase in the percentage passed by more than 3%.

**Junior Officers Evaluation**

**Table 3: The Result of ColRegs Oral Exam for Junior Officers**

| Exam Session              | Number of Seafarers | Pass        |               | Fail       |               |
|---------------------------|---------------------|-------------|---------------|------------|---------------|
|                           |                     | Number      | Percentage    | Number     | Percentage    |
| Jan 2013                  | 276                 | 207         | 75%           | 69         | 25%           |
| July 2013                 | 360                 | 268         | 74.44%        | 92         | 25.56%        |
| Jan 2014                  | 467                 | 345         | 73.88%        | 122        | 26.12%        |
| July 2014                 | 562                 | 394         | 70.11%        | 168        | 29.89%        |
| <b>Total / Percentage</b> | <b>1660</b>         | <b>1214</b> | <b>73.13%</b> | <b>446</b> | <b>26.87%</b> |

Source (MEC 2013-2014)

**Table 4: The Result of ColRegs Computer Based Exam for Junior Officers**

| Exam Session              | Number of Seafarers | Pass        |               | Fail       |              |
|---------------------------|---------------------|-------------|---------------|------------|--------------|
|                           |                     | Number      | Percentage    | Number     | Percentage   |
| Jan 2013                  | 276                 | 256         | 92.75%        | 20         | 7.25%        |
| July 2013                 | 360                 | 327         | 90.83%        | 33         | 9.17%        |
| Jan 2014                  | 467                 | 425         | 91%           | 42         | 9%           |
| July 2014                 | 562                 | 495         | 88.08%        | 67         | 11.92%       |
| <b>Total / Percentage</b> | <b>1660</b>         | <b>1503</b> | <b>90.54%</b> | <b>157</b> | <b>9.46%</b> |

Source (MEC 2013-2014)

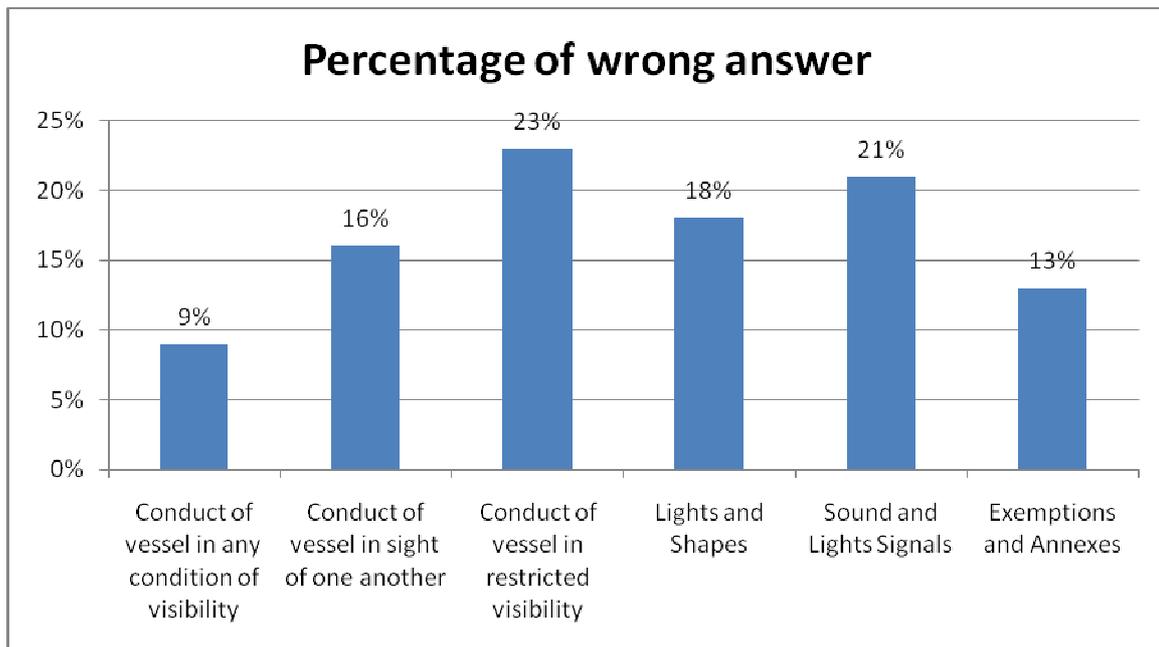
Table 3 shows the result of four groups of junior officers attended oral exam on January / July 2013 sessions and January / July 2014 sessions. Exams were carried out by panel of examiners in the MEC. Results show that more than 73% of the participants succeeded and about 27% failed.

Table 4 shows the result of the same group of junior officers attending computer based exam and modern technology which showed an increase in the percentage passed by more than 17%.

**The Result Analysis**

Both groups during their exams, whether oral or computer based exam, the results shows common causes in the wrong application of ColRegs rules and can be summarized in the following points:

- Poor knowledge of ColRegs
- lack of training
- lack of experience
- poor appreciation
- poor lookout
- excessive delay in action



**Figure 2: The Percentage of Wrong Answer of Computer Based Exams**

Figure 2 shows the analysis of examination score reports for both group, it is shown that there are some areas of weakness in the understanding and application of ColRegs by the participants. Those areas are the highest in restricted visibility and sounds and light signals which require more attention from the academy part to rectify this deficiency.

## THE MAIN CHARACTERISTICS OF USING SIMULATOR IN COLREGS EVALUATION

Without creating a common understanding and interpretation for navigational officers to take action against the risk of collision, ColRegs rules are not effective to prevent the collisions. Every country has diverse systems in training and testing seafarers understanding in collision avoidance. The knowledge of seafarers in collision avoidance is usually tested in the maritime colleges in which the students are enrolled. Later on, students are externally tested again by the national authorities of the countries that they will be certified as competent.

There is a main generic problem with ColRegs, which is difficult to apply ColRegs rules in different locations and situations at sea. A solution to this problem is a set of scenarios, including critical parts of the world, being developed based on real accidents. This would be a novel approach of showing where the ColRegs rules are being breached. This will remedy the difficulties in applying the ColRegs rules at sea in real time situations. The common interpretation and testing may well be translated to different country languages so that it would aid the creation of a mutual understanding of Colregs.



**Figure 3: The College of Maritime Transport Class B Simulator**

As shown in figure 3 The College of maritime transport provides a class B simulator, for the basic nautical programmes and for active sea personnel participating on different courses. The simulators are however not standardized and may vary from simple table computer based training to training in simulators. The rationale for a simulator is to give as real environment as possible, in a high-fidelity manner, giving the sensation that is similar to an actual bridge. The full mission simulators are equipped with visual channels, providing a perspective of the scenery around the simulated ship. The steering and sailing directions of the “International Regulations for Preventing Collision at Sea” are determined by the visibility. When using full mission simulators with visual channels, the simulator trainees must also determine the visibility and decide which regulations are applicable.

It's clear that many schools can't afford the latest and best technology regarding simulators, so the amount of hours in simulator training varies depending on where the student gets his training. Large shipping companies are however investing in more sophisticated equipment and different joint-venture projects with schools around the world, which is also in the benefit of students. Companies have seen the value of training up their junior officers in simulators, with their own specific training programs, company or even ship specific standard operating procedures as a complementary education to the basic training their junior officers received in school. The students on maritime (deck officer) programs have various sessions in the simulator, from basic navigation courses to more advanced courses, for example ship handling and ship maneuvering. The code “Standards of Training, Certification & Watch keeping” (STCW-78) is regulating the minimum

requirements of the education / training of deck officers. Some of the courses described in the code are to be held as simulator training.

## CONCLUSION AND RECOMMENDATIONS

Establishing standards for examination unit to evaluate the understanding of ColRegs rules from real accident should consider the use of full mission simulations and through the work of innovative programs for simulations of real accidents. So can develop their own standards deck officers, targeting skills and competencies required to assess the unit based on understanding and mutual understanding and coordination.

The content of the tests will rely on existing ColRegs rules with a number of real time situations developed from real accidents to test the knowledge of seafarers. Maritime education and training courses are not complete if ColRegs are not effectively interpreted and officers are tested to see whether they can apply it in real time situation or not.

It is highly recommended that the AASTMT should take the ColRegs rules more seriously and set programs from real accident to improve the standards of training and testing the understanding of seafarers in applying the ColRegs rules.

Some points of weakness occurred in the past two years exams, those points should be addressed in the scenarios students carry out in the simulator.

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