Article

Reduction of collisions risks at sea. A study of recent casualties through collisions and endeavour to predict the changes required in the use and application of existing IMO collision regulations for the development of an e-learning model course.

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Abstract
The article reports from extensive studies and analysis of the use and application of IMO (International Maritime Organisation) Collision Regulations (COLREGs) to reveal the practices and problems of collision avoidance as seen from the perspective of seafarers, maritime education and training providers, VTS (vessel traffic services) operators, employees of the port authorities, pilots as well as with masters of the fishing boats and yachts. The focus has been to identify and establish a common understanding of an individual rule through some kind of guidelines that are needed to standardize the education, training and assessment of COLREGs through the proposed COLREGs Model Course. It also expresses and justifies the view that the COLREGs model course should be an integral part of the STCW (Standards of Training, Certification and Watch-keeping) for Seafarers.
KEYWORDS: International regulation for preventing collision at sea

Introduction
The shipping industry has changed dramatically. In recent years, the shipping has undergone a revolution. The world fleet has grown enormously. There are now many more specialized ships that are transported across the oceans. Ships themselves have grown bigger and more sophisticated in terms of technology, automation and design, yet, accidents at sea seems to be a common occurrence. Accidents and disasters at sea involve the human life, environmental pollution, and economical and also ecological damages. The consequences of collisions at sea are grave. Yet the means available for maintaining the desired degree of safety are relatively limited. Therefore, how to support navigators in avoiding collisions is central to maritime safety. It has always been recognized that the best way to improve safety at sea, is by developing international regulations that are followed by all shipping nations.

Ever since the development of IMO, its primary task was to improve maritime safety. IMO's first task was to adopt a new version of the International Convention for the Safety of Life at Sea (SOLAS), dealing with maritime safety. In addition to developing several international conventions, codes and treaties, IMO also developed and adopted global standards of International Collision Regulations for seafarers.

"In 1981, the International Association of Institutes of Navigation (IAIN) submitted to IMO the
result of a study analysing the causes of collisions around the world. It particularly studied the impact of traffic separation schemes, which had first been recommended by IMO in the late 1960s. These measures were strengthened through the adoption of mandatory rules concerning their use in the 1972 Convention on the International Regulations for Preventing Collisions at Sea, which entered into force in 1977. The main purpose of traffic separation schemes added in COLREGs is to separate shipping moving in opposite directions, thus minimizing the risk of a head-on collision". ('Collision avoidance at sea -practice and problems'- by: Morten Nielsen & Johannes Petersen)

Statistical evidence shows human error causes most accidents. These errors and mistakes can in turn be caused by many factors - such as- inadequate training, fatigue, poor morale, linguistic difficulties, bad equipment design, lack of interpretation and application of collision regulation and combination other factors.   IMO therefore, concentrated on preventing such error by improving the standard of training of crew so that it would automatically lead to an improvement in maritime safety and adopted the first Convention on Standards of Training, Certification and Watch-keeping for Seafarers, which entered into force in 1984.

Some experts reveal that 85% of all accidents are either directly initiated by human error or are associated with human error by means of inappropriate human response (Ziarati, 2006). This is in line with the findings of a recent paper (IMO, 2005) that 80% of accidents at sea are caused by human error. The paper by Ziarati (2006) notes that

mistakes are usually made not because of deficient or inadequate regulations, but because the regulations and standards that do exist are often ignored. The IMO MSC (Ziarati, 2006) clearly indicates that the causes of many of the accidents at sea are due to deficiencies in maritime education and training of seafarers or disregard for current standards and regulations. Ziarati (2007), reports that most common accidents and incidents at sea are due to collisions. Several of Ziarati's recommendations have been led to the identification of skill gaps (www.maider.pro) and (www.maredu.co.uk).

IMLA (International Maritime Lecturers Association) is of the view that IMO has provided a clear COLREGs text and relevant organisations have developed interpretations of these regulations and have used them in their teaching and training activities. It is a common view that many COLREGs-based accidents have pointed out to the poor maritime training of these regulations.

These rules have been amended several times in order to address new issues and solutions related to sea navigation. IMO adopted 55 new amendments to COLREGS in November 1981, which came into force in June 1983. IMO adopted 9 more amendments that entered into force in November 1989. More amendments were made in 1993 that were related to positioning of lights on vessels. In 2007, Annex IV (Distress signals) was re-written.

IMO has responded positively to the need to improve training of COLREGs by developing a model course. IMO's development of a new model course, however, does not address any dedicated model training course that specifically addresses the COLREG and the navigational watch-keeping standards that are required to ensure a proper appreciation of the different rules and competency as to when and how to apply them in the interests of effective collision avoidance. Yet, adequate and appropriate application of the COLREG across the board is a core element of safe navigation.

The result of these research evidences, a new project supported by the European Commission, Project ACTS (http://ecolregs.com/), having carried out a comprehensive survey is working to develop an online training course to improve the training of these regulations and to identify whether changes to the rules or new ones are necessary.

This project has two main aims: one concerns recently identified skill gaps (Szozda, 2012) relating also to recent accidents (e.g. Costa Concordia), and the other refers to identified problems in the application of current collision regulations (COLREGs, 1972). Project ACTs also includes collisions with fixed objects (Grounding).

A review of accidents has identified the need for the development of new skills and an urgent review of COLREGs. For instance, a case law by MARS and MAIB (UK accident agencies) indicates that many of the basic principles of collision avoidance are improperly applied. It is also a common practice to use VHF Radio in collision avoidance procedures, although such radio communications are not part of the COLREGs (MAIB, 2004).

The work summarised above has led to several proposed improvements to the existing Maritime Education and Training (MET) programmes. The review of accidents in the projects identified above has also led to a list of potential new skills and jobs. The proposed project intends to test and transfer several new skills into existing MET programmes and common methods and systems
for their deliveries.

For the research and analysis purposes, the questions were carefully designed to determine which rules are difficult to understand and which rules are most often breached in practice. Questionnaire was prepared using phrases from IMO COLREGs by academics and support from the people with, expertise in research methods, teaching and assessment.

The aim was to examine first, the understanding of certain Rules where only two vessels are involved in collision avoidance, in practice however, very often we have multi-vessels scenarios.
A separate Questionnaire was also prepared for non-professional seafarers (amateur sailors).
The questionnaire was composed of 4 groups of specific questions:

1. General questions for identifying the target group of respondents (12 questions).
2. Questions that have answers in COLREGs (34 questions).
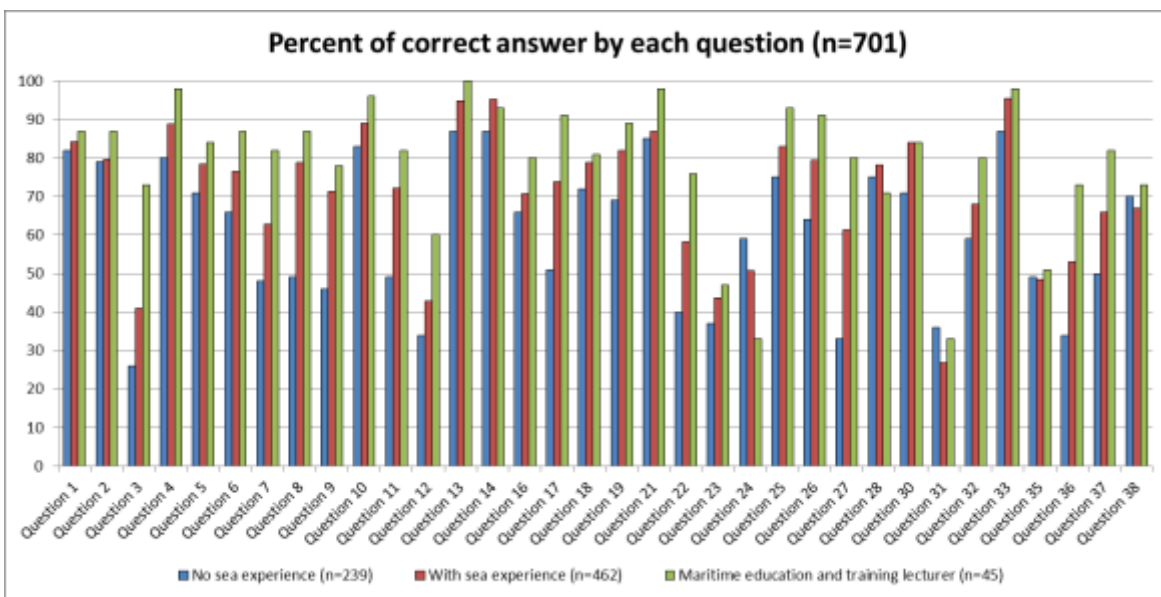3. Questions for testing the opinion and actions of seafarers (12 questions).

(These questions were given to students intentionally to ascertain whether their instructors explained to them specific situations and what they should do when they became junior officers).

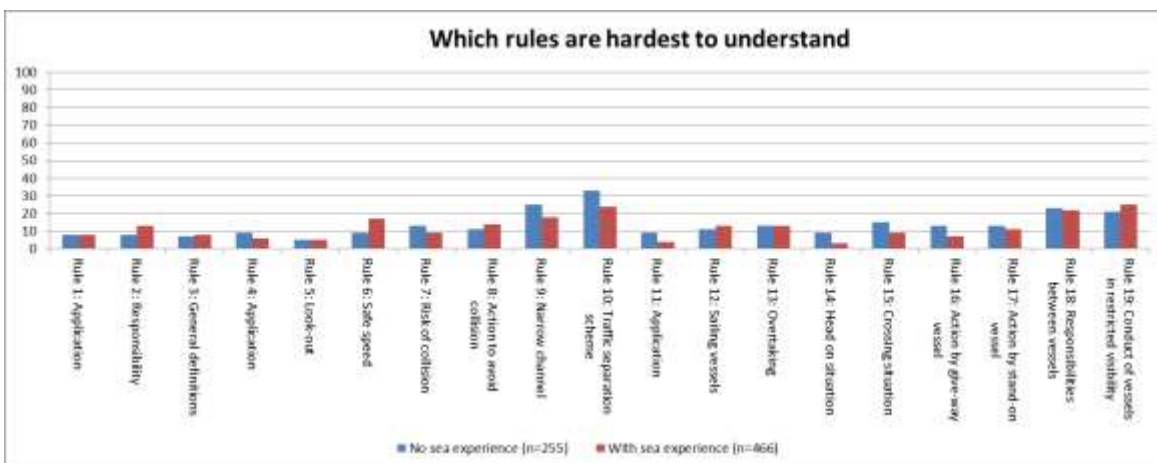4. Optional questions for instructors at the maritime colleges (4 questions).

The questionnaire was distributed to maritime schools and colleges, seafarers on merchant ships, teachers and lecturers at maritime institutions, VTS operators, employees of the port authorities, pilots as well as to masters of the fishing boats and yachts.

The questionnaire was fulfilled by 1280 participants (professional seafarers, maritime high school and faculty students) and 285 persons holding licenses for various types of ships/boats (including pleasure craft and small fishing vessels).
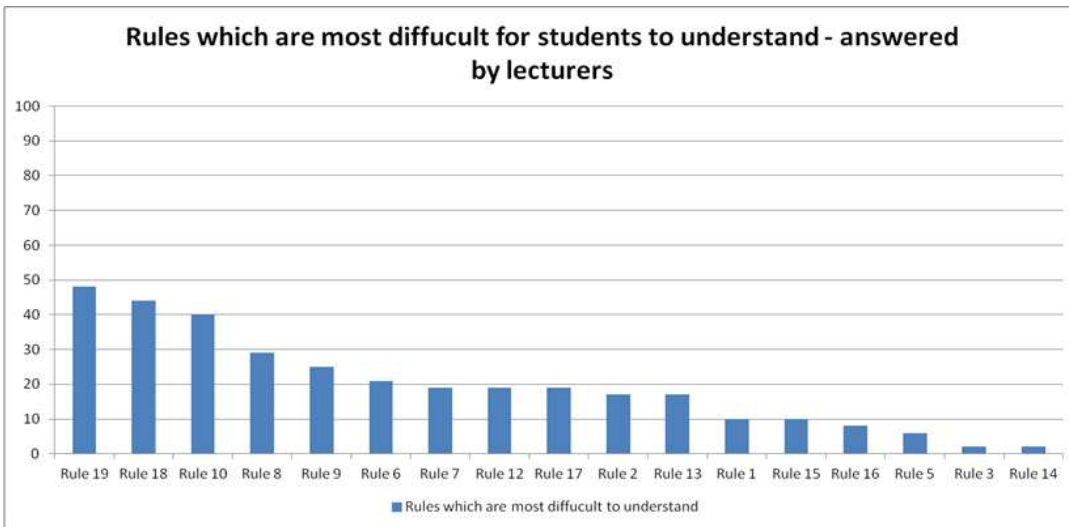
Analysis of the questionnaire results show that maritime education and training lecturers have the best results followed by seafarers with sea experience which have on average 15% better results than participants with no sea experience.
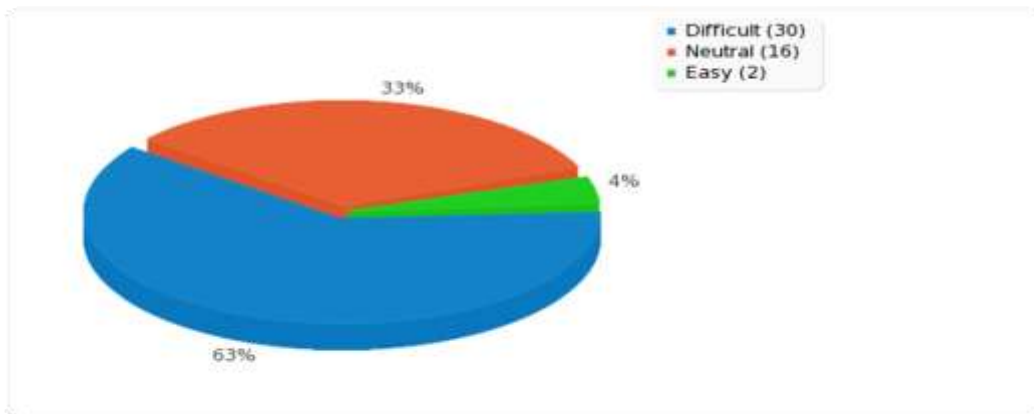

Rules which are hard to understand according to all participants are Rules 6 (Safe speed), Rule 8 (Action to avoid collision), Rule 9 (Narrow channel); Rule 10 (Traffic separation scheme), Rule 13 (Overtaking), Rule 18 (Responsibilities between vessels) and Rule 19 (Conduct of the vessels in restricted visibility).

According to maritime education and training lecturers, Rules which are most difficult for students to understand are Rule 19 (Conduct of the vessels in restricted visibility), Rule 18 (Responsibilities between vessels), Rule 10 (Traffic separation scheme), Rule 6 (Safe speed) and Rule 7 (Risk of collision). Similar difficulties to answer the questionnaire are also depicted by other participants.

Questions for maritime education and training lecturers show that over 63 % percent of students have problem in interpretation of the Rules.

This research clearly confirms that there are significant differences in the understanding and application of the Rules. For instance, some questions have answers accuracy of 50 % (Rule 10 – TSS) and some 70-80 % as the upper limit. Results of the questionnaire were used to run workshops for seafarers on merchant ships, teachers and lecturers at maritime institutions, VTS operators, employees of the Port authorities and pilots in order to validate the results of questionnaires and findings from questionnaire and gap analysis.

Based on the outcome of the workshops, it was concluded that there is a strong need for some minor changes or updates are necessary in accordance with evolving technology, methods of learning and explanations of COLREGs for a better understanding of the Rules. In some cases, the existing rules have to be interpreted precisely so that they are understood in the same way by everyone. The rules that give priority to others have to be clearly determined and navigation officers should be able to apply them without having a difficulty.

Conclusion
1. Based on the research evidence and a review of case studied of real accident scenarios have identified the need for the development of new skills and an urgent review of COLREGs.

2. The Rules need to have some minor changes or updates in accordance with evolving technology. There is no need for drastic changes in the rules. However, the existing rules have to be interpreted precisely so that they are understood in the same way by everyone.
3. More guidelines are needed to standardize the education, training and assessment of COLREGs through the proposed COLREGs Model Course.
4. The rules that give priority to others have to be clearly determined and navigation officers should be able to apply them without having a difficulty.
5. A Global COLREGs online test would be strongly supported and recommended. The test should be taken in English and in mother tongue.
6. The research evidence and expert opinions also justify the view that the COLREGs model course should be an integral part of the STCW (Standards of Training, Certification and Watch-keeping) for Seafarers.

A new paper is being prepared for the 11th TRANSNAV Conference that will be conducted in Gdynia/Poland, 17-19 June 2015. The event is organized by the Faculty of Navigation of the Gdynia Maritime University and The Nautical Institute; the Conference is to address the scientists and professionals in order to share their expert knowledge, experience and research results concerning all aspects of navigation, safety of navigation and sea transportation. (http://transnav2013.am.gdynia.pl/)