

# **AN INVESTIGATION INTO COLREGS AND THEIR APPLICATIONS AT SEA**

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## **ABSTRACT**

It has been almost 40 years since the 1972 International Regulations for Preventing Collisions at Sea known as Colregs were introduced and there have been several amendments to Colregs rules since then until now.

Collision avoidance is believed, in a sense, to prevent groundings, the striking of fixed obstacles and ships colliding. Over the last half-century despite improvements in navigational aids such as ARPA and attempts to raise the standards of training through various STCW conventions, 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. Collisions commonly represent the majority of these accidents.

This paper does not attempt to examine all Colregs rules, but is concerned with the basic rules that are usually ignored or disregarded, in order 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 (MET) navigational officers' programme that is related to Colregs teaching.

This paper will suggest the development of a course with 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

## **1. INTRODUCTION**

Colregs is one of the internationally agreed conventions of the sea. It is essential to ensure that all officers responsible for the navigational 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 navy officers (STCW) in 1978, and it has been amended in 1991, 1995, 2003 and 2010 respectively. However, there are currently no mechanisms to monitor how these standards are being applied as many VET providers have been found not to follow many of the requirements. Therefore, there has always been substantial diversity on the knowledge, understanding, interpretation and application of these rules in the high seas and coastal waters that has always threatened the safety of life at sea. Colregs rules are reported to be difficult to understand and apply at sea by navigational officers (Stitt, 2002). Ziarati (2007) reports that majority of these accidents and incidents are related to collisions and near misses. Therefore, there is a need to reduce the accidents and near misses at sea.

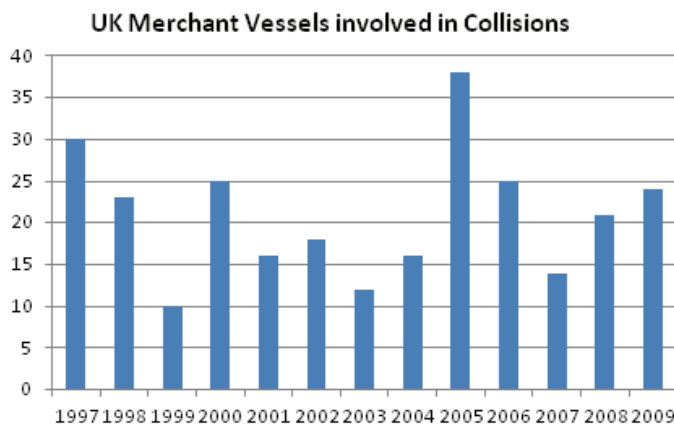
The Colregs rules are basically a set of rules that are required to be followed by all navigation officers. The rules provide various guidelines regarding passing, crossing, overtaking manoeuvres to be made; detailing which ships have the right of way depending on the circumstances and the types of ships involved, and what actions these ships should take. It also describes the rules on signals (lights, shapes and sounds signals). It is one of the most important International Conventions in a seafarer's education and training, where full understanding and knowledge must be performed by interpreting the Colregs rules.

The rules in fact serve two main purposes:

- a) To provide guidance to mariners on how to prevent collisions at sea
- b) To serve as a basis for apportioning blame when collisions occur (Stitt, 2002)

The recent IMO bulletin “maritime knowledge centre” reports that more than 90% of collisions are attributed to the human factors (IMO, 2010), and this had earlier been reported by Parker (2010). 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 (Ziarati, 2006). Human error is reported to be the main cause of accidents, which has now apparently increased by some 5 percent in recent years.

The following figure shows the number of accidents that UK merchant vessels involved in recent 12 years.



**Fig. 1. UK merchant Vessels involved in Collisions [Source: maritime Accident Investigation Branch 1997-2009]**

The Maritime Accident Investigation Branch (MAIB) and Mariners’ Alerting and Reporting Scheme (MARS) reports conclude that many of the basic principles of collision avoidance are improperly understood/applied at sea (MAIB, MARS). There is a clear signal from the reports that Collision regulations are either not understood or ignored, even though Colregs provides a primary set of rules for taking actions to avoid collisions.

## 2. COLREGS IN MET

Maritime education and training programmes include Colregs training under a Navigational Watch unit, which is usually supported by full mission simulator training. This includes a number of hours teaching in a classroom environment at a theoretical/practical level, whilst also being supported by full mission simulator training. The IMO model courses allocate 100 hours for this Navigational Watch Unit for deck officer programmes (IMO, 1999). 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 MET providers as per required in the Standard Training Certification and Watchkeeping (STCW) II/1 level.

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 Turkey, the national authorities choose to test the knowledge of seafarers with multiple choice type questions. Whereas, in the UK, candidates are tested through a one-to-one oral examination with an experienced captain directing questions using model ships as a demo to identify whether the candidate is able to explain their Colregs knowledge and apply it to different situations where the risk of collisions exists.

The research conducted by Syms (2002) highlights the seafarers’ view. The seafarers agree that the improvement of maritime training and education (MET) systems are necessary, when they think it will help to improve the application of Colregs at sea.

The same research (Syms, 2002) also reports that in northern countries such as the United Kingdom, Germany and France, the application and understanding of Colregs is of a higher standard than when compared to other countries.

Ziarati (2006) extends the problems associated with Colregs emphasising that mistakes are usually made not because of deficient or inadequate regulations, but because the regulations and standards, that do exist, are often ignored.

### 3. RESEARCH INTO COLREGS RULES

Colregs currently have thirty eight rules and four annexes. It applies to all vessels on the high seas and in all waters navigable by seagoing vessels, except where the local rules are not in effect. However, the local rules in any case should be in line with the international rules where possible as stated in Rule 1 (Application) of Colregs (Ford, 2003). For instance, in the United States of America, additional rules for vessels navigating inland waterways are published alongside the international rules (US, 1989).

Belcher (2002) states that Colregs are intended to operate in a 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. In case the action does not occur, Belcher (2002) perceives that Colregs operate in an environment of mutual comprehension, understanding and coordination, with clear logical steps ensuring clarity and predictability.

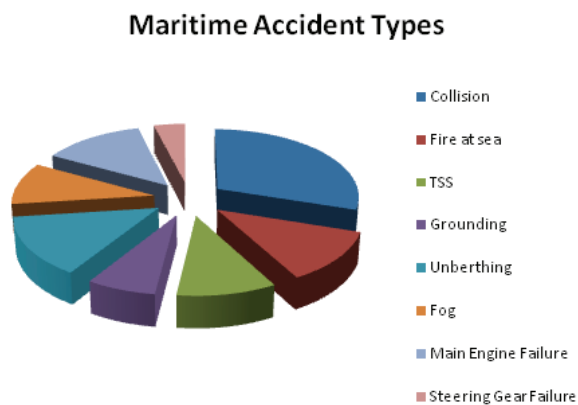


Fig. 2. Variation and Causes of Accidents [Source: UK Protection and Indemnity Club, 2007]

MAIB (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):

“Rule 5 - Every vessel shall all the times maintain a proper lookout by sight and by hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make full appraisal of the situation and the risk of collision”

“Rule 7(b) – Proper use shall be made on radar equipment if fitted and operational, including long-range scanning to obtain early warning of risk of collision and radar plotting or equivalent systematic observations of detected objects.

Rule 7(c) – Assumptions shall not be made on the basis of scanty information, especially scanty radar information.

Examples of Colregs Rule 5, Rule 7(b) and Rule 7(c) are basic and easy to understand, interpret and comply with compared to the other rules of Colregs. However, it is interesting to note that the application of these Rules is the first concern of the report, expressed in the MAIB full study (MAIB, 2004). The same report (ibid) also points out that substantial numbers of accidents occurred at night and in restricted visibility. This proves the lack of understanding of seafarers Part C – Lights and Shapes and Rule 19 – Conducts of Vessels in restricted Visibility.

The accident case below shows the collision attributed by poor lookout.

### Case 1 - Poor lookout

A dredger collided with a fishing vessel in Dover Traffic Separation Zone, in daylight, calm conditions and clear visibility. The dredger had been on passage and following the flow of traffic, and the fishing vessel was not engaged in fishing when in the separation zone. The vessels approached each other on a collision course for 10 to 12 minutes with the fishing vessel on the dredger's port bow. The watchkeeper on the dredger had seen the other vessel and, having identified it as a fishing vessel not engaged in fishing, was expecting her to alter course at the last minute.

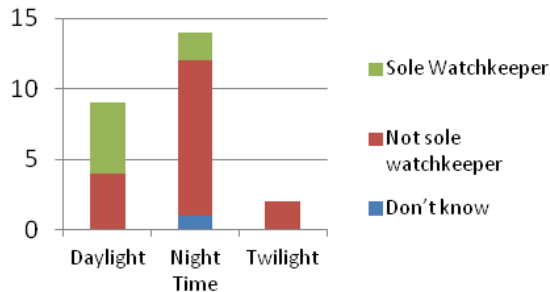


Fig. 3. Vessels failing to keep a proper lookout [Source: Maritime Accident Investigation Branch, 2004]

With regard to the provision of a lookout, STCW 95 states that the officer in charge of the navigation watch may be the sole lookout “in daylight” provided it can satisfy the provisions in STCW for lookout requirements (STCW, 95). Despite this international requirement to maintain lookout at night, the MAIB research also points that at least three of fifteen vessels involved in accidents had failed to do so.

### Lookout perspective to Collisions

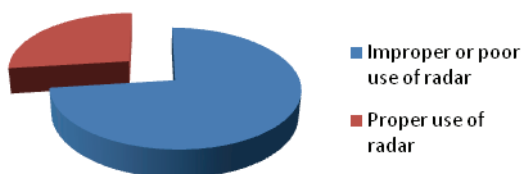


Fig. 4. Lookout perspective to Collisions [Source: Maritime Accident Investigation Branch, 2004]

In the same report, the reason for not maintaining a lookout was attributed to a “lack of competency”. However, MAIB believes that poor visual lookout is also linked to the poor employment of ratings on the bridge (MAIB, 2004).

The same report also points that many collisions has two common factor: One is that many seafarers are found to be fatigue and second is that there is an issue with the competency of seafarers in complying with rules.

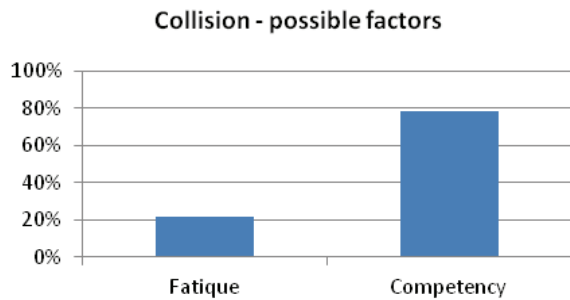


Fig. 5. Possible factors of Collisions [Source: Maritime Accident Investigation Branch,2004]

Bridge watchkeeping practices have inevitably changed in recent years under the influence of automated systems which are being implemented in order to enhance efficiency and safety as well as overcoming the shortage of seafarers (Hwang, 2001). As advanced automation systems are developed and deployed on board, it influences the international rules and regulations which are under consideration for being updated in parallel to revolved systems on board the vessels.

An earlier survey conducted among seafarers highlighted the concerns regarding the application of Colregs rules at sea. The survey results showed that 50% of the responses by these seafarers either ignored or disregarded Colregs rules (Syms, R.J, 2002). In the same survey, 90% of the responders identified the reason as “ignorance”, “Poor knowledge of Colregs” and “lack of training”.

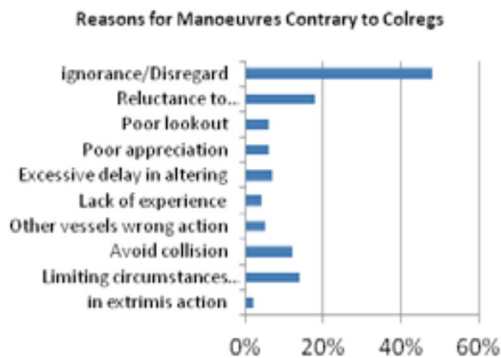


Fig. 6. Reasons for manoeuvres contrary to Colregs (Syms, R.J, 2002).

#### 4. THE USE OF VHF AT SEA

Collisions should theoretically be avoided if all navigation officers comply with International Rules for the prevention of collisions at Sea 1972. It is however dreadful that these regulations are contravened to varying degrees in different locations across the world, as evident in many of the MAIB and MARS reports.

It is reported that the use of VHF radio is more attractive and it has become common practice in collision avoidance, although it is not part of Colregs. The MCA (Maritime and Coastguard Agency) in the UK and several other countries took this issue seriously and issued guidance for their seafarer network to highlight the dangers associated with the use of VHF radio (MCA, 2002). The summary of that same report states that

“Although the use of VHF radio may be justified on occasion in collision avoidance, the provisions of the Collision Regulations should remain uppermost, as misunderstandings can arise even where the language of communication is not a problem”

Similarly, MARS reporting has been collating the collision and near miss reports received from seafarers to emphasize the dangers associated with the use of VHF. (MARS, 2005). MARS recommended the following:

“The use of VHF should be kept to minimum and only be used, for instance, an obstruction exists on starboard side for stand on vessel, and however, reduction of speed should be preferred on communicating the intention on VHF”

It should not normally be the case for a navigation officer to use VHF to take action to avoid collisions, however, it does usually happen, and the only reason might be that using VHF is easier than understanding and interpreting the 38 rules and annexes in different collision situations.

The MAIB (2004) study shows that after examining the use of VHF in collisions and near misses that it was only used in 14 of the 47 collisions, and was only effective in 3 of those.

The accident cases below shown below is a collision attributed with the use of VHF radio.

#### **Case 2 - VHF assisted collision**

A cargo vessel was outbound from the River Humber in poor visibility. The master of the cargo vessel had the control, a helmsman was steering and the bosun was stationed on the forecandle as a lookout. The master saw the target of an inbound vessel on his radar, and he called the unknown fishing vessel using VHF with the intention of requesting to pass “green-to-green” in the channel. He received instant response but, by then it was too late. His ship was committed to the manoeuvre, and the fishing vessel was trying to pass red-to-red. They collided, causing extensive damage to the fishing vessel.

#### **Case 3 – VHF assisted collision**

Two container ships were navigating in the China Sea. A risk of collision appeared however both did not realise until 3 minutes before the accident. The stand on vessel tried to make contact via VHF on 3 minutes before the collision instead of complying with the Colregs rules. However, he received a response after several calls, and disagreement took place and the ships collided.

## **5. E-COLREGS TESTING STANDARDS**

Colregs in a way is not dissimilar to the necessity of seafarers to be able to make use of Maritime English at sea. It is very obvious that it is one of the most critical safety regulations, and that if it is known and applied in an environment that has mutual understanding. It would stop many collisions and groundings from happening if it is applied correctly. 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, as stated in many MAIB accident reports.

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/universities 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. These exams are usually carried out in the way of multiple choice and open ended questions or one-to-one exams to make sure that the candidate is able to act and take action against any risk of collision under their certification processes.

There is currently no international or European common interpretation of these rules that is efficiently applied by all countries. 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 across institutions in a given country and this is even more inconsistent across EU. 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.

There are currently two generic problems with Colregs. Firstly, there is no common interpretation of Colregs rules that are widely used, where navigators could have the same understanding. Secondly, it is difficult to apply Colregs rules in different locations and situations at sea. To remedy the first problem, there needs to be a common interpretation which is used by countries taking into account where and how those rules should be applied. A solution to the second 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. To this end, a set of standards to test the competency of navigators in applying the Colregs rules at sea could be the main focus. The standards will be designed so that the industry could use them to assess the competency of their potential employees.

In some countries, many seafarers have serious problems in understanding and interpreting the rules, and that complicates the application of the rules at sea as the individual ships do not operate in a vacuum.

The focus should be to remedy the problems relating to the competency of seafarers in Collision regulations when they are applied to real time situations. A project could be developed concerning the establishment of standards of collision regulations for all classes of navigators. The standards are expected to be recognised by international professional bodies and licensing authorities. To ensure these developments are implemented effectively, the project could:

- develop supporting training programmes for the intended standards by formation of pilot groups in many countries and then re-run them and/or validate them in other countries
- establish a network of transnational partners to support the development of the project to set the standards for application of Colregs rules set in Colregs 1972 by IMO
- design a programme for trainers and assessors development and their certification for the application of the intended standards and subsequent tests as well as for the internal assessment and verification process, in line with European Vocational qualifications for Assessors and Verifiers
- facilitate the secondment of trainers and assessors to partners' establishments on short assignments in order to familiarise the trainers and assessors with the necessary skills and good practice

## **6. CONCLUSIONS**

Establishing standards for collision rules from real accident cases should be considered innovative. Developing standards for potential navigational officers and targeting skill/competencies needed in a unit of study could be used as a guideline and a benchmark for improving existing Colregs testing standards so that Colregs can operate in an environment of mutual comprehension, 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.

It is evident that in the northern part of Europe, Colregs are being taken more seriously and the probable effect is that more confident navigation duties that are performed by officers the less they need to depend on VHF.

MET programmes are not complete if Colregs are not effectively interpreted and navigators are tested to see whether they can apply it in real time situation. MET institutions should revise their navigation programmes and make sure that the seafarers know Colregs as required.

National authorities should take the Colregs rules more seriously and issue guidance similar to MCA (2002) to their seafarers with an intention to spread the word Colregs and discourage the use of VHF at sea.

## **ACKNOWLEDGEMENT**

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