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The Importance of Reporting All the Occurred Near Misses on Board: The Seafarers' Perception

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ABSTRACT: Improvement of maritime safety has previously been based on a reactive regulatory approach, where regulatory improvements have been imposed to prevent recurrence of a specific type of accidental event or accidental scenario, after such an accidental event has happened. The ISM Code requires that hazardous situations are to be reported to the company, investigated and analyzed in order to prevent future happenings. Near-miss reporting is positively evaluated in this respect, because, near-misses are represented experiences and mistakes that should be shared to learn from in order to prevent the occurrence of accidents.
The expression "**that was too close**" on ships' bridges between the master and the officers is rarely transferred to a near miss report form, preserving the probability of reoccurrence. Near misses occurred and near misses reported might present a big difference in number. Officers easily forget the near miss situation when the safety of the ship is restored.
Hazards identification will be based on documented management system (SMS- TMSA- ISO). The analysis of the documented safety and quality management will address the gap in order to improve the implemented systems.
The objective of this research is to find out the best practices about near-miss reporting from the companies considered to have high level of commitment to safety within their organization. The study is based on interviews with a total of 35 seafarers who are joining on Greek ocean going vessels, and 4 representatives from safety departments of Greek maritime companies.
The research also aims to address the seafarers' perspective of reporting all near misses which have been experienced while they were in charge of specific duties (bridge watch, engine room watch) or any other operation (mooring, maintenance, drill) carried out on board.
The majority of both the seafarers and the companies' representatives believe that prior to the near miss reporting issue a safety culture environment on board is the real gain pursuit. In their perspective this is first priority to improve the general safety on board. It seems that near miss reporting is carried out on board as a compulsory compliance to the regulatory framework (ISM implementation). Further, it seems that the companies are not yet utilizing the reported data to improve feedback and the follow-up within the organization.
The authors would like to thank companies' representatives and seafarers who have participated in this study.

1 INTRODUCTION

Maritime safety has been developed by fatal or environment disaster accidents as the accidents have revealed deficiencies in legislation, management and

construction of ships. Major accidents have trigged huge amendments in regulatory framework, sometimes with major changes in the way safety was evaluated on board ships. This means that safety has developed step by step in a reactive way. Sacrifices have been made, sacrifices counting human lives. Eventually, this has led to improved safety at sea. It has been agreed by all industry's stakeholders that is not acceptable to wait for another accident to happen before safety work can develop further. Instead, the idea has come up to use not only accidents but also occurrences that might have resulted in accidents but for some reason did not (i.e. near misses).

But what is really the difference between an accident and a near-miss? The outcome, of course, but the circumstances ending up in either an accident or a near-miss are most likely similar in many ways. According to ISM Code, near misses should be considered as incidents regarding reporting procedure. If so, this would mean that also near-misses could deliver experiences valuable to the future safety strategy. This would also mean that it might be possible to reach a proactive way to handle future maritime safety.

Near-miss is defined as the sequential happenings that haven't resulted in loss and/or injury but has the risk to do so. Loss can be a personal injury, environmental damage and/or negative financial effect on the trade. Mentioned loss has been prevented by a fortunate break in the chain of events (IMO MSC-MEPC.7/Circ.7, 2008). In view of its definition, reporting near-misses plays an important role in learning from mistakes, preventing accidents and suffering from their serious consequences. Section 9 of the ISM Code requires companies to establish procedures for the reporting and investigation of hazardous situations together with the implementation of corrective actions. IMO has a guidance to encourage near-miss reporting, not a mandatory regulation. Therefore, companies and the national authorities are the ones who take initiatives. Every company forms its own reporting system, either a paper reporting procedure or a computer system. After all, crew's understanding of it and involvement in the reporting are the core values to achieve the intended level of reporting, both within the company and at the national level.

The research was carried out among Greek seafarers and Greek managed shipping companies. The scope of the study was to answer the following questions:

- What are the existing reporting routines on board ships?
- Are there any better practices that can be proposed to maritime industry to reach a better reporting level?
- How really seafarers evaluate the near miss occurrence towards near miss reporting on board vessels?
- Are there motivations provided by the managing company to increase reporting of near misses?
- Are there any proposals by the seafarers to increase the number of near miss reported?
- What is the perception of companies' representatives related with external reporting databases?

Overall aim is to collect the best practices inside the industry and make the others that are aiming at a better level of safety culture, be aware of them and make use of them. To be able to reach the main purpose, existing situation of safety culture, in connection to near-miss reporting, will be investigated.

2 LITERATURE REVIEW

In this part of the study, the topics which are highly related to near-miss reporting and safety culture and which are mentioned in the previous studies are given with a scientific background. It is important to focus on them, because they have a considerable effect on both people's resistance to report and for the future development to achieve a successful reporting level and process. Besides, these points have formed the frame of the interviews carried out.

2.1 *Background of related studies*

Prior to ISM adaption and enforcement, the near miss reporting issue was implemented in other industries such as aviation, nuclear etc. Studies where the issue of near miss reporting was triggered is the iceberg pyramid theory (Heinrich 1959, Bird 1969). According Heinrich's study for every major accident, there are 29 minor incidents and 300 near misses. Frank E. Bird Jr. drilled even deeper in his study of industrial accidents, during which he analyzed more than 1.7 million accidents reported by 297 companies. The essential finding was that for every reported major accident there were 9.8 reported minor accidents. For each minor accident with lost time, there were around 30.2 minor incidents. Diving deeper during this extensive study, Bird found out that below those real accidents, there was a bottom layer of around 600 near misses or incidents that might have caused major accident. Overall these findings are usually depicted in a pyramid with a 1-10-30-600 ratio.

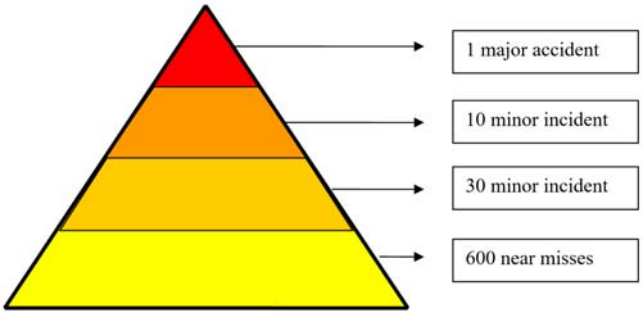

Figure 1. Accident Pyramid Sourse: Bird (1969)

Studies on enhancing safety have been multiplied since the ISM Code came into force. The focus has been the implementation of the ISM Code at first but while searching on that many issues came to surface, such as it has been perceived as a huge paper work and time lost by the seafarers.

Later, the studies focused on more detailed issues which might be the reasons for the ISM Code to gain some resistance from seafarers. Near-miss reporting has been concluded as being the failing part of the

ISM Code's implementation (Lappalainen, 2011). In many ships it is reported on a paper format according SMS (Safety Management System- provided by the company) requirements which is again perceived as another extra paper work. Criticisms started on the side of the company as is the direct responsible for the "excessive useless workload" in the eyes of seafarers. Company has represented the 'written procedures' while the seafarers has represented 'the way that the work actually done on board' which are believed not to match each other (Dekker, 2003). Recommendations and/or practical applications from other industries, such as nuclear, chemical, have been proposed in the same studies. Finally, the issue of 'blame culture' has appeared to be considerable effect on near miss reporting. All these mentioned are mostly investigated separately, however, they all led us at the end to think about creating safety as a 'culture' both in the company, including all management levels, and on board the ships, in the minds of seafarers. Although 'culture' itself is a complex issue, the aim with the ISM Code is identifying hazardous occurrences including the risks to individuals, ships and marine environment, then reporting them regularly to the company and continue with proposing corrective and preventive actions with an end to apply them to reduce those identified risks (IMO MSC-MEPC.7/Circ.7, 2008). One of the challenges in the maritime industry is increasing of the work load for seafarers due to paperwork added. It has always been criticized by seafarers and gained resistance since the ISM Code was introduced. When a high amount of paperwork is introduced, the number of crew working on board, the schedule of ships should also be considered. If the number of people onboard stays the same or even decreases together with tight schedule, that causes high workload for people and a compromise for safety. As a result of conducted studies, it is agreed that paperwork should be reduced. It is a matter of adaptation which was also mentioned in Dekker's (2003) study.

The study carried out in 2006 in Norway controlled 83 liquid and dry bulk cargo vessels showed that feedback from the company is a positively influencing factor for reporting more frequently (Oltedal & McArthur, 2011).

The interview results from previous studies clearly show that, especially, experienced seafarers perceive some of the events are not worth reporting. They think that those events are somehow inevitable and do not compromise safety. When they are required to report even those minor ones, their perception is that this reporting scheme is being made more bureaucratic which is considered as a negative factor.

2.2 *The human element-no blame culture*

Mistakes are included in human element. Contributing factors to human error can be both individual and organizational factors. Individual can be stress, fatigue, insufficient training and experience, poor level of communication while the organizational influences can be lack of time, poor design of equipment, and poor level of safety culture. *MCA Guide on Human Behavior (2010)* explains the effect of a good safety culture as the serious approach of the senior management towards all these mentioned factors which contribute on mistake-making. Senior management is waited to invest on these factors. When it is clear that it is normal for people to make mistakes, it is also clear at the same extent that organizational factors have a considerable effect on helping create the human behavior which includes mistakes as well. This leads us to shift from the 'blame culture' to a 'just culture' (MCA, 2010). Same issue is emphasized by *IMO Guidance on Near-miss reporting* that company should adopt a 'just culture' to encourage reporting (IMO MSC-MEPC.7/Circ.7, 2008).

The first principle to create a 'just culture' is to accept that the human error is inevitable. Therefore, policies, processes and interfaces in an organization must be monitored and improved all the time. In the same guidance open communication, discussion and team management issues are also addressed which are believed to have an effect on a 'just culture'.

Creating a safety culture, in the most effective way, has always been an issue for the maritime industry. Not only the duty of the ship is to create safety culture on board and maintain it but also so many other organizations such as port states, owners, operators, national and international organizations among many others are included in the creation, review and feedback process. The ISM Code was the attempt to form the safety culture in the maritime industry. After ISM Code was introduced, studies have been carried out to see how much successfully it has been implemented and what criticisms it has gained. Near miss reporting has seen as the failing part of ISM code's implementation and received resistance from the users (Lappalainen, 2011).

Safety culture definition of IMO Maritime Safety Committee is that "it is a culture in which there is considerable informed endeavor to reduce risks to the individual, ships and the marine environment to a level that is as low as is reasonably practicable" (IMO MSC-MEPC.7/Circ.7, 2008).

Under this approach near miss reporting considered as the most important tool in link-back the error chains before drifting into failure. The main points of reporting near misses are learning from others' experiences and avoid accidents. It can be said, in other words, that it is big resource for the companies especially for the small ones to have a bigger pool of occurrences on board and their preventive actions. Then, it becomes easier to manage safety related issues on board, such as technical failures among many others. Near-miss and accident reporting systems are the ways of sharing experiences. Reporting near-misses is the factor that can lead to better safety level as a result of learning from small mistakes and avoiding them to turn into major accidents.

3 METHODOLOGY

In this section data collection together with the interview content (The profile of the companies and people participated in the interviews questions and analysis of the answers was given) are presented.

The method used for data collection was personal interviews in a semi structured way. Question was presented in a close form (was answered by a YES or NO) but depending on the answer there was a second open requirement granted by the interviewer. This method was used both for companies' representatives and seafarers.

3.1 *Interviewers' profile*

Totally 39 people were interviewed which includes one (1) DPA, one (1) crew manager and two (2) safety department employees, from shore side, 7 masters, 4 chief engineers, 6 chief officers, 5 second engineers, 7 second officers and 6 third engineers. All the participants were Greek. Ages were approximately between 24 and 55. The companies chosen to participate are considered (according their quality systems) to be in a high level of safety both on board and at the office. Interviews were confidential. Therefore, they appear as letters.

Company A is a Greek company running 17 ships (5 bulk carriers panamax and supramax size, and 12 tankers of various sizes). The DPA of the company participated in the interview.

Company B is a Greek company running 32 ships (all bulk carriers of capsize, post panamax, panamax sizes). The safety department sub-director of the company participated in the interview.

Company C is a Greek company operating 28 ships (all tankers of various sizes). A member of the safety department participated in the interview

Company D is a Greek company running 52 ships (bulk carriers and tankers of various sizes). The crew manager of the company was interviewed.

36 Seafarers were participated in the interview while they were attended courses of special schools according STCW requirements. The interview was conducted during the intervals of the classes. Seafarers were served on various types of ships of various companies.

4 FINDINGS OF THE INTERVIEWS

In this part findings from the interviews are to be listed, separately from the shore-based and onboard organizations' perspectives, respectively.

4.1 *Companies' representatives' answers*

In these interviews were participated one DPA, one crew manager and two companies' safety department members. They were all Greeks and the Greek language was used. Ages of the company's representatives were between 45-55 years old. All of them were serving their companies for 15 years and more. Participants answered the interview questions as following:

1 Do you think that reporting of near misses is a matter of compliance to regulatory framework or a factor to increase overall safety within the company?
All of them answered that "it is a factor of increasing safety, but it still on the evaluation process regarding the number and nature of reports.
2 How many near miss reports are received approximately per ship/per year?

Table 1. Near miss reported

	Number of vessels	Number of near misses
Company A	17	12 per ship per year
Company B	32	7 per ship per year
Company C	28	10 per ship per year
Company D	52	9 per ship per year

The 52 ships owning company was received 9 per ship per year, the 32 ships owning company was received 7 per ship per year The 28 ships owning company was received 10 per ship per year and finally 17 ships owning company was received 12 per ship per year
3 What kind of near misses are reported?
All the tanker owning ships companies' representatives claimed that they are receiving mostly equipment failure near misses reports than the human error near misses in a percentage of 70% against 30% respectively. The bulk carrier company's representative claimed that near misses' reports are more or less the same in number either regarding equipment failure or human error.
4 Is your reporting system revised since ISM implementation?
The answer was the same for all companies. The system is used for near miss reporting is the SMS format and is the same from 1/7/1998 when ISM was implemented.
5 Is increasing of near misses reported really a key factor for improving overall safety on board ships?
All of the representatives believe that if they are advised to report every small detail, reporting loses its importance and reality. They all think that number of near misses is not an indication of safety level on board. They say that the number of accidents can be an indication because they cannot be hidden, and they must be reported. Since not all the near misses are reported, there are hidden ones, they cannot be an indication of anything.
6 Is your company motivating its employees on board for increasing reporting?
Only two of the interviewed representatives answered positively in the above question and motives are not related to money, but as contributing factor to promotion of the crew members. All four of them say that awarding systems do not increase the number of near miss reporting but contribute to enhance safety culture environment on board.
7 Is your company implementing the "no blame culture?"
All the representatives say that no blame culture shall not be considered as incompetency tolerance by the company and when a near miss occurs due to human error only at the very first time the no blame culture will apply
8 In your opinion the safety culture on board ships in an acceptable level?
All the tanker owning ships companies'

representatives believe that safety is in a higher than an acceptable level but when it comes to safety culture environment, they think that there is a lot of work to be done starting with the newcomers in the job (mostly seafarers). Instead, the bulk carrier company representative says that the safety culture level in his company is a slowly increasing procedure.

9 Is there a system within your company of analyzing reported near misses to support feedback and follow up procedures?
Feedback process works quite similar in all the companies with small differences. The reports come to the responsible person for the reporting system, DPA or safety department manager, then distributed to technical or marine superintendents depending on the nature of the near miss. After all, DPA gets the report, adds his ideas and forwards it to the ship. Regarding follow up system the only procedure to check if the proactive measures are implemented on board is internal audits on board by company's representative.

10 What kind of barriers are there for reporting and for the development of safety culture?
All the participants agreed that barriers to near miss reporting are considered the excessive workload and the paperwork, the seafarers' perception on reporting especially the masters'

11 Are you in favor or against to report companies near misses directly to an external database? They all agree that a common database for all Greek companies is a very power tool by sharing other companies' experiences and improving feedback to the ships. But the first step is to use computer systems for reporting in a user-friendly and simple way.

4.2 *Seafarers' answers*

In seafarers' interviews 7 masters, 4 chief engineers, 6 chief officers, 5 second engineers, 8 second officers and 6 third engineers participated. All the participants were Greek. Ages were approximately between 24 and 50. They answered the questions as following:

1 Do you think that reporting of near misses is a matter of compliance to regulatory framework or a factor to increase overall safety on board?
Answers here are quite surprising. In a percentage of 60% they think that reports are a regulatory compliance and only 40% of them think that is a safety improving factor. The surprising part is that junior officers and engineers believe the second, while masters, chief engineers and senior officers believe that near miss reporting separately is only adding paperwork, but they have to comply with the company's written procedures

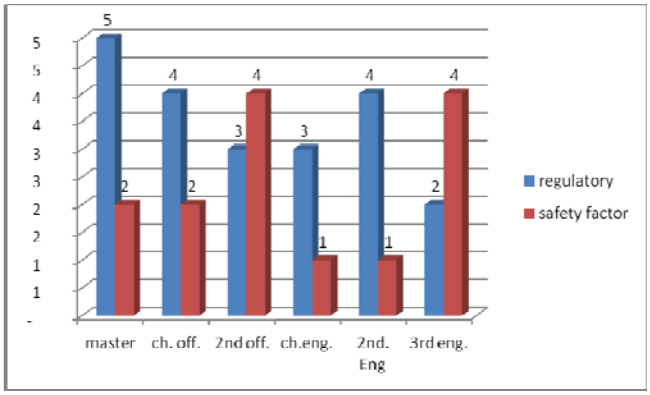

Figure 2. Near miss: Regulatory obligation or safety level factor

2 How many near miss reports are reported approximately per ship/per year?
Masters in their vast majority (5 out of 7) claimed that they report 1-2 monthly in the formal way but they discuss more than6-7 internally with their crew.

3 What kind of near misses are reported? Are shipping companies providing ships with guidelines on what kind of near miss will be reported?
Masters (4out of 7) and chief engineers (3 out of 5) say that they report near misses which are not expanded to the lack of safety culture. "These are not the significant ones" they say. A chief officer gave an example of a close encounter in open sea, but he did not report the fact as a near miss because such a report might cost his job.

4 Is increasing of near misses reported really a key factor for improving overall safety on board ships?
Many of the participants (28 to 35) agree on that number of reports is not a key factor of safety level on board. Most of them say that they often discuss the happenings and take the actions immediately however, they don't make any report. They believe that safety meetings on board are a stronger tool to improve the ship's safety level than near miss reporting and by including near misses in the agenda of safety meetings the job is done in a simpler and more effective manner.

5 Are in your experience shipping companies motivating seafarers on board for increasing reporting? Many (20out of 35) of the interviewed say that they have heard about promotion motives from some companies (mostly tanker operating)

6 Are in your experience shipping companies implementing the "no blame culture?"
They all are familiar with the expression but in their mind no blame culture sometimes especially to junior officer and engineers is perceived as tolerance from their superiors. Masters (all of them) claimed that "no blame culture" is a dangerous policy when it comes to safety.

7 In your opinion is safety culture on board ships in an acceptable level?
Seafarers say that safety culture has to be fitted in the minds of the seafarers prior to joining a ship for the very first time. One of the masters say that when he conducted training on board on a specific issue, he had to revert on the training issue a week later and participants are not still aware of the training issue. "If for a simple matter alertness is

very poor who is talking about increasing near miss reporting?"

8 Is there a system within shipping companies of analyzing reported near misses to support feedback and follow up procedures?
According to the seafarers' statements nowadays all shipping companies are implementing feedback procedures either from other company's ships reports or accidents occurred on other companies' ships. But for the follow up procedure there is not a proof of decided proactive measures implementation on board

9 What kind of barriers are there for reporting and for the development of safety culture?
Masters and chief engineers say that the most important barrier is the resistance of seafarers to comply, the excessive workload in an already heavy schedule and the "we know how things is done" philosophy

10 Are you in favor or against to report companies near misses directly to an external database?
Seafarers in their vast majority (30 out of 35) say that the first step is the use of a computer reporting system in a simple manner between shore and ship. Shipping companies have to cooperate on the subject and conclude in a creation of such a database in a national or international level.

5 CONCLUSIONS

The objective of this research was to find out best practices about near-miss reporting from the companies considered to have high level of commitment to safety within their organization. Inside the safety departments of these companies' efforts are made to create on board a safety culture environment and although increasing of near miss reporting gain a strong resistance by seafarers the number of reporting is quite impressive.

- Companies' representatives believe that near miss reporting is an indicator to safety but is still under evaluation. On the contrary, seafarers believe that near miss reporting is more an obligation to regulatory framework than a commitment to safety.
- Both the participants seafarers and companies' representatives agree on using a simple manner of reporting through a computer-based system instead the ISM hardcopy format.
- Increasing the numbers of reporting is not necessarily an increasing in safety culture level on board a ship. According to the majority of the participants from both onboard and shore organization, providing more significant and rarely happening near misses to the company is more important with regard to the actual purpose of the near-miss reporting.
- Financial motivation is not preferred by the companies. Promotional is most likely but the results are still under evaluation.
- No blame culture although is recommended by the companies, seafarers especially the superior officers have reasons to believe that results will be worse.
- All participants agree to the use of an external common database for reporting near misses as they consider that pool of experiences is dramatically increasing giving the chance to companies' representatives and seafarers to "learn from others"

For companies and seafarers there is a lot of work to be done in the aspect of training courses aiming first to change the culture on board in the direction of safety. Programs of studies in the Maritime academies and in-house training courses for the companies should be adjusted to "plant" the safety in the minds of the officers.

Finally, regarding near miss there is no clear evidence which shows that safety culture on board and within the companies will increase by increasing the number of reporting or companies.

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