Perceptions of Risk in the Maritime Industry: Ship Casualty

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Lloyd's Register Educational Trust

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Executive Summary

The aim of this report is to consider perceptions of risk with regard to ship casualty amongst the various occupational groups across the maritime industry. Specifically the data is interrogated with regard to the identification of possible sub-cultures within the industry based upon such factors as: rank, department, nationality, age, and length and nature of experience of ship type.

The report is based upon the data from a questionnaire (see Appendix 1) survey of 2372 seafarers from 50 countries conducted during 2006. The response rate achieved in undertaking the survey was approximately 36%. The data were analysed using SPSS and the report focuses on the statistically significant findings from the survey[1].

The analysis presented here is in two parts. The first considers perceptions of risk relating to ship level event (fire, collision with another vessel, explosion, sinking, grounding and contact with a fixed structure) in relation to the likelihood of an incident occurring within respondents' present, or most recent, company. The second considers perceptions of risk in relation to ship level incidents as they were perceived to exist more generally across the industry. The data were then investigated to determine whether there are similarities and differences in the perceptions of seafarers across rank, department, nationality, experience, etc. The data presented here can only demonstrate the relative perceptions between different groupings, what it cannot do is indicate which group has the more accurate perception; this will form a later part of the study.

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[1] At the 95% confidence level.

Findings 1

This section represents the outcome of the analysis of responses to the question:

Just thinking in general terms, how likely do you think it is that someone working for your company at sea will experience the following during their sea-going career?

Respondents were given a variety of scenarios to consider and were asked to tick a box indicating how likely they thought these events were to occur in the course of their colleagues' careers.

The statistically significant findings from this analysis indicate that:

- The majority of respondents perceived the risk of a ship casualty as generally low.

- A significant minority (15% - 38% dependent upon type of incident) however saw the risk of an incident as medium/high.

- When given the opportunity to cite the most dangerous thing about working at sea, approximately 11% mentioned a ship level casualty.

- There were significant differences in perception of risk between groups of respondents along the lines of occupational hierarchy (i.e. managers, ships' officers and ratings), department, time with the company, most recent ship type, and nationality.

- Nationality was the most powerful explanatory factor, followed by rank, and most recent ship type served on.

- Shore side managers tended to perceive the risk of a ship level incident as being higher than other groups. However there were differences between those managers with, and those without, sea-going experience; those with sea-going experience perceived the risk as higher than those without.

- In general, ratings perceived the risk of experiencing an incident to be lower than managers and officers.

- Chinese seafarers tended to rank the risks more highly than the other nationalities listed and Filipinos saw the risks as lower.

- Seafarers and managers who had been with their company longer tended to perceive risk as greater than those who had worked for their company for a short time.

Findings 2

This section relates to the responses to the question:

*In your opinion, which of the following incidents is **the most likely** to occur in each of the following ship types (see Table 1).*

- The following factors were identified as the major risk for each ship type listed (Table 1).

Table 1*: Perceived major risk factor by ship type*

Vessel Type	Major Risk Factor
Tankers	Explosion
Bulk Carrier	Sinking*
General Cargo ship	Grounding*
Ro/Ro ship	Collision *
Passenger ship	Fire
Container ship	Collision
Supply Vessel	Contact with fixed structure
High Speed Craft	Collision

* Although this factor was rated the highest, other factors were rated almost as highly.

- Statistically significant differences in perceptions were found to exist between respondents on the basis of rank, work department, nationality, and the type of vessel seafarers worked upon. However no general *patterns* in response were found.

Conclusion

A significant minority of seafarers perceived their workplace to be a dangerous environment in its own right. However perceptions of risk varied across different groups. Such differences were primarily found between seafarers of different nationality and rank. They also appeared to be related to the type of ship that respondents worked on. Thus workers' background, experience, and place within an organisation, appears to have an impact upon how they perceive the risk of a ship level incident, which consequently may impact upon safety-related behaviour and responses to management led safety initiatives.

Introduction

In 2002 the International Safety Management (ISM) Code came into effect requiring that all ship operators implement an occupational health and safety (OHS) management system. The central plank of the system is the effective assessment, elimination, and control of risk. The onus is placed on company management to develop and operate in-house systems. The code simply specifies a set of functional requirements necessary to develop an effective safety culture which is deemed essential to the successful operation of any such system (Gallagher *et al*., 2003).

The concept of safety culture is highly contested, but in general terms can be understood as the shared attitudes, perceptions, and behaviour, constitutive of a common commitment to the values of worker health and safety (ACSNI, 1993). That is, a concern for 'safety' must be incorporated as a central feature of ship management and operation at all levels. The achievement of an effective safety culture is, however, dependent upon the everyday operationalisation of formal safety systems by both management and shipboard workgroups.

It has been shown, in other high risk industries, that different work groups within an organisation may develop their own unique concerns, objectives, and behaviours, (Harvey *et al.*, 2002; Clarke, 1999). Effective OHS management requires an understanding of any such differences, as a lack of awareness can produce poor co-operation, antipathy and miscommunication (Clarke, 1999; Harvey, Bolam, and Gregory, 2000). There has been little research of this type within the maritime industry and yet the structural arrangements that characterise the sector seem especially interesting in the context of such concerns, as those onboard ships are physically removed from their shore-based managers, are often from different parts of the world, and may be employed on differing terms and conditions. This study addresses this deficiency.

The research is organised in two parts. The first identifies concerns and perceptions of risk as they exist generally across the industry and differences in perception across work groups. This has been achieved through the analysis of a globally distributed questionnaire. The second part of the study involves an investigation of the practices

and characteristics found within companies and aboard ship which serve to facilitate effective safety management in the maritime sector. Thus the impact of corporate strategy and management practice on the promotion of safety culture aboard ships and within the sector is considered. These findings emerge from analysis of interviews and observation in shipping company offices and aboard ship.

The report focuses upon the findings from a part of a large-scale project considering perceptions of occupational risk and OHS management. It aims to provide an in–depth understanding of the concerns and perceptions of those responsible for the safe and efficient management of ships and those who work aboard them. Given the global nature of the maritime industry, this research provides the ideal opportunity to gain new and original insights into the management of health and safety in an extensively globalised setting, but also an in-depth understanding of working life aboard ship.

Method

In order to develop a research instrument appropriate for the maritime industry focus groups and interviews with key industry stakeholders were conducted prior to the production of a questionnaire. The aim was to identify participants' major safety concerns in order to ensure that they were reflected in the questionnaire. To this end interview guides and focusing activities were used to facilitate respondents' reflections on shipboard risk. Two versions of the interview guide were used, one for those working onboard vessels, and one for managers.

Participants were recruited from a number of organisations including ship operators and maritime colleges in the United Kingdom, Philippines and Singapore. In total, ten focus groups were conducted. These consisted of: a group of engineering officers; two groups of deck officers; a group of cadets; a group of ratings; and a mixed group of officers. Face to face interviews were conducted with managers from four shipping/management companies and with a captain and chief engineer.

The responses from the focus groups and interviews were subjected to thematic analysis. The results were then used to inform the development of the questionnaire.

The questionnaire was initially subjected to peer review before undergoing extensive piloting in early 2005. After some modification and refinement, a final version of the questionnaire was drafted in English and then translated into Chinese. Distribution of both versions began in March 2005. A range of organisations were identified to assist with distribution, these included maritime training establishments, shipping companies, management companies, crewing agencies and ship owners' associations. These were spread across the main labour supply countries. In the event, 47 organisations participated, based in nine different countries dispersed widely around the globe.

There was concern that some groups of seafarers might feel that their position within the company was vulnerable and as such might be wary of completing a form that could be viewed by fellow employees/seniors. To address this issue, a self-addressed pre-paid envelope was provided with each questionnaire as were instructions on how to return the completed form so that individuals could return them directly to SIRC. In addition, in order to protect confidentiality, details such as: name, ship name or company were not required. Instructions stressing the importance of confidentiality and anonymity were also provided for both contacts in company offices and those onboard ships. In so doing the aim was to protect individual respondents and increase response rates.

As completed questionnaires were returned, responses were entered into the computer based statistical package SPSS 12.0.2. In February 2006 data entry ceased and provisional analysis began. In the first instance, Chi Square analysis was used to test the null hypothesis that there were no significant differences between the perceptions of the various groupings, i.e. in terms of rank, department, nationality, etc,. The null hypothesis was rejected if significance level was less than 0.05. Although the Chi Square test indicates whether significant differences in perceptions occur within these categories, it does not give an immediate understanding of where these differences are meaningful. For that it is necessary to produce graphs and Tables and to visually examine trends and patterns.

Further analysis was then conducted using Binary Logistic Regression. Initially pairings of variables (i.e. hierarchy and nationality) were entered into the model to

determine which factors were the most influential in relation to perceptions of risk[2]. Additionally, this modelling allowed us to identify within each variable (i.e. hierarchy), how likely one group were to see an incident as occurring as compared with another group listed.

Finally multiple variables were entered into a single Binary Logistic Regression model to determine the most influential variables on perceptions of risk.

Sample and Sample Distribution

Although our sample size was large with 2372 'cases', some grouping of respondents was required in order to maintain sufficient numbers of cases within individual categories of respondents. Variables were therefore recoded along potentially explanatory lines such as rank and department (see Appendix 3 for full variable list).

As Figure 1 illustrates, the largest group of respondents was ships' officers and these divided almost evenly into two groups of senior (n=709) and junior officers (n=704), where senior officers were defined as Chief Officer and Master on the deck side and Second Engineer and Chief Engineer in the engine department[3]. Once officers were split in this way ratings remained the largest group for analysis (n=763), and managers constituted the smallest group (n=104). A further 94 respondents did not specify their rank or provided an answer that could not be interpreted.

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[2] Reference groups for each variable were chosen from the Chi[2] analysis, and were the ones which were seen to be the greatest outliers.
[3] This is the usual division between senior and junior ship management as applied within the industry.

Figure 1: Sample distribution: number of respondents by rank
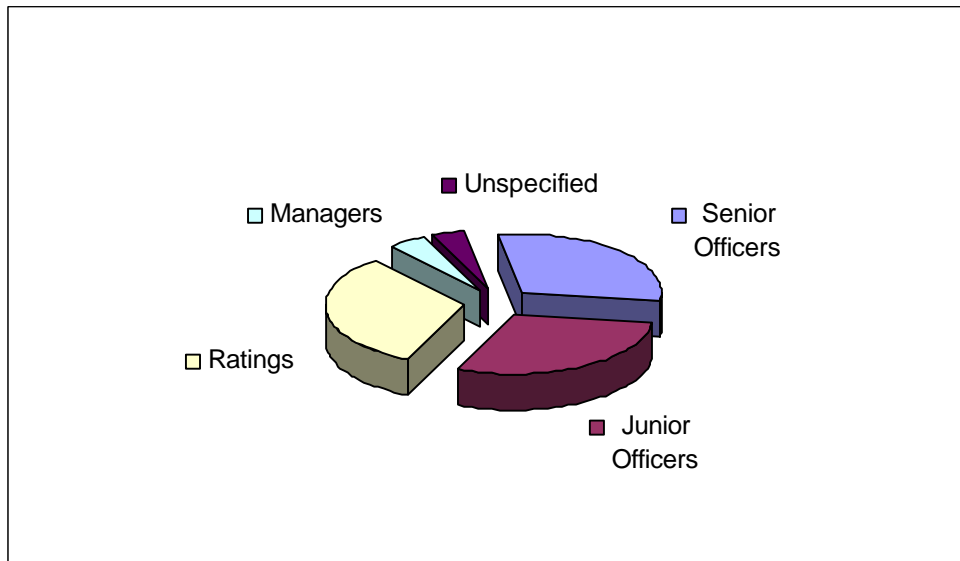
 In order to examine whether our sample was distributed similarly to the distributuion of the general seafaring population a comparison was made with the SIRC Global Labour Market (GLM) Database (2003). Table 2 shows the percentage of respondents in the present study by department, and compares these to the GLM Database (2003).

Table 2: The frequency and percentage of respondents by department for the current study compared to the GLM (2003) database

	GLM		LRRU	
	Percent	*Frequency*	*Percent*	*Frequency*
Deck	50.9%	40083	56.1%	1220
Engine	37.4%	29483	35.8%	779
Deck & Engine	1.3%	1059	2.8%	62
Catering	10.4%	8197	5.3%	115

This comparison demonstrates that the distribution of respondents by department in the present study is similar to that within seafaring in general. However, since the sample is not, in a strict sense, random, a note of caution should be exercised when generalising about the seafaring population as a whole using these data.

Within our sample senior officers tended to be the oldest group of seafarers, and were the most experienced in terms of years spent at sea and length of time in their present

company (See Table 3). Junior officers were the youngest group and were the least experienced in both contexts.

Table 3: *Mean age, years at sea, and years in the present company*

Hierarchy	Age of Respondents (Mean value)	Number of Years spent at Sea (Mean value)	Number of Years in present company (Mean value)
Managers	41	14.2	8.9
Senior Officers	44	20.4	11.8
Junior Officers	32	9.3	5.5
Ratings	37	11.9	7.8

The vast majority of respondents worked in the deck (51.4%, n=1220) and engineering departments (32.8%, n=779) (See Figure 2). However there were a number of ratings and officers who identified themselves as working in both (2.6%, n=62). The other major shipboard department was catering (4.8%, n=115). The remaining work group was those based 'shore-side' (4.4%, n=104), (i.e. managers/ superintendents, etc). For a further 92 (4.4%) respondents it was not possible to allocate a department.

Figure 2: *Sample distribution: the percentage of respondents by department*
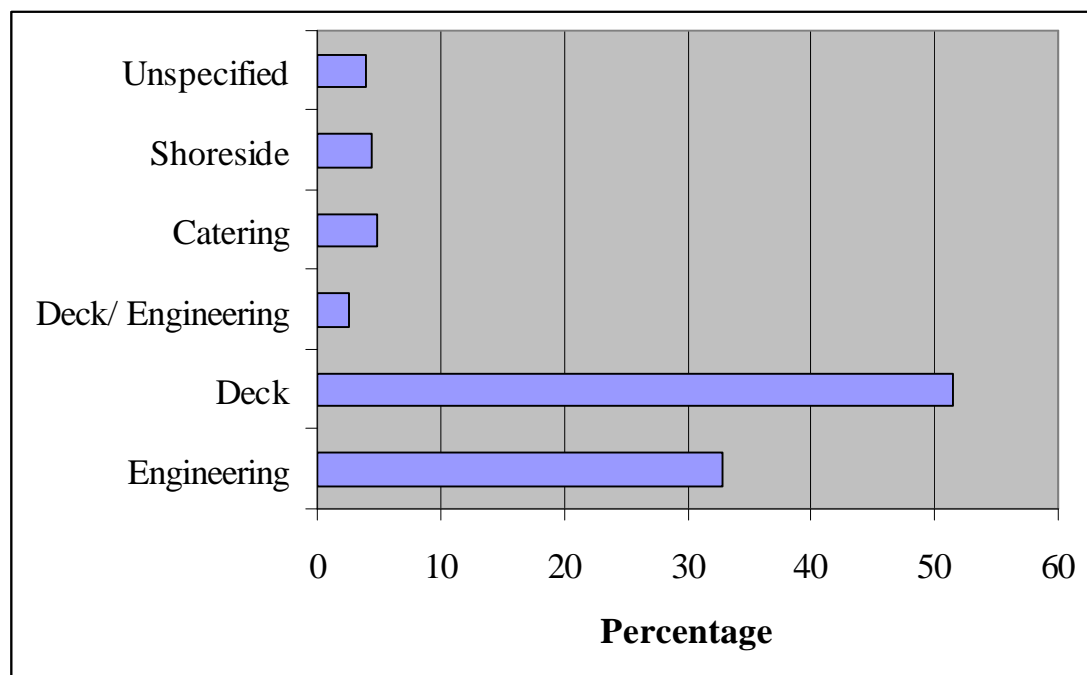
The majority (84.5%) of respondents came from just five countries: Philippines (39.0%, n=909), United Kingdom (17.2%, n=402), China (16.8%, n=391), India (7.7%, n=180) and Netherlands (3.8%, n=89). The single largest group was from the Philippines (See Table 4).

Table 4: *Sample distribution: number and frequency of respondents by nationality (top 20)[4]*

	Frequency	Percent	Cumulative Percent
1. Philippines	909	39.0	39.0
2. United Kingdom	402	17.2	56.2
3. China	391	16.8	73.0
4. India	180	7.7	80.7
5. Netherlands	89	3.8	84.5
6. Indonesia	40	1.7	86.2
7. Singapore	38	1.6	87.8
8. Ukraine	31	1.3	89.2
9. Poland	25	1.1	90.2
10. Bangladesh	22	0.9	91.2
11. Norway	19	0.8	92.0
12. Spain	19	0.8	92.8
13. Pakistan	15	0.6	93.4
14. Canada	14	0.6	94.0
15. Burma/Myanmar	14	0.6	94.6
16. Italy	12	0.5	95.2
17. Australia	11	0.5	95.6
18. Croatia	10	0.4	96.1
19. Ireland	10	0.4	96.5
20. Malaysia	8	0.3	96.8
Other	74	3.2	100.0
Total	2333	100.0	----

Taking the five most strongly represented national groups within the sample, it can be seen that each of the national groupings was represented at each of the hierarchical levels. Chinese respondents in particular were fairly evenly distributed across the different ranks, while Indians tended be more strongly represented at the junior officer level and Filipinos amongst the ratings (Figure 3).

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[4] For the full Table see Appendix 2

Figure 3: *Sample distribution: frequency of respondents by nationality and rank*
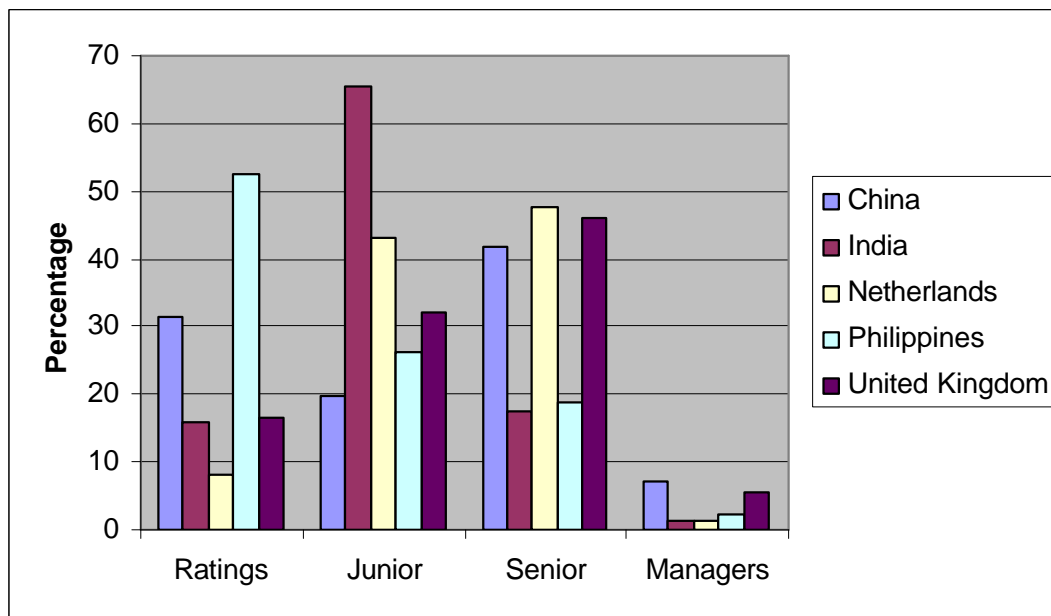
The following sections discuss the findings from our analyses. Seafarers' and managers' responses are examined in relation to a range of factors including rank, department, and nationality, to identify relevant differences in perceptions of risk.

Findings 1

Respondents were asked the following question:

> *Just thinking in general terms, how likely do you think it is that someone working for your company will experience the following (Fire, Explosion, Collision with another ship, Sinking, Grounding, Contact with a fixed structure) during their sea-going career?*

Respondents were asked to indicate their answer on a scale of 1-5, where (1 = not at all likely) and (5 = extremely likely). For the purposes of this report, '1' and '2' on the scale are understood as indicating that respondents saw the particular risk as unlikely to occur or, put another way, saw the risk as **'low'.** By contrast where they answered '3', this is understood as indicating that the particular incident was perceived as likely to occur, or there was a '**medium**' risk. Finally, '4' and '5' on the scale were treated as indicating that the incident was perceived as highly likely to occur, or the risk of it occurring was perceived as '**high**'.

1.1: Overall perceptions of the likelihood of a ship level incident in present, most recent, company

Analysis of seafarers' and managers' responses when taken as a whole revealed that the majority of respondents perceived the risk of a ship level casualty within their company as low. Responses varied, however, according to the type of incident considered.

Seafarers and managers saw the risks of 'fire' and 'contact with a fixed structure'as the most significant medium and high risk events of those listed. Represented graphically, these responses can be seen in Figure 4. The greater numbers of respondents seeing the risk as low (represented by the tall blocks), are contrasted with the much smaller numbers seeing the risk as high.

Figure 4*: 3D representation of overall perceptions of ships casualties*
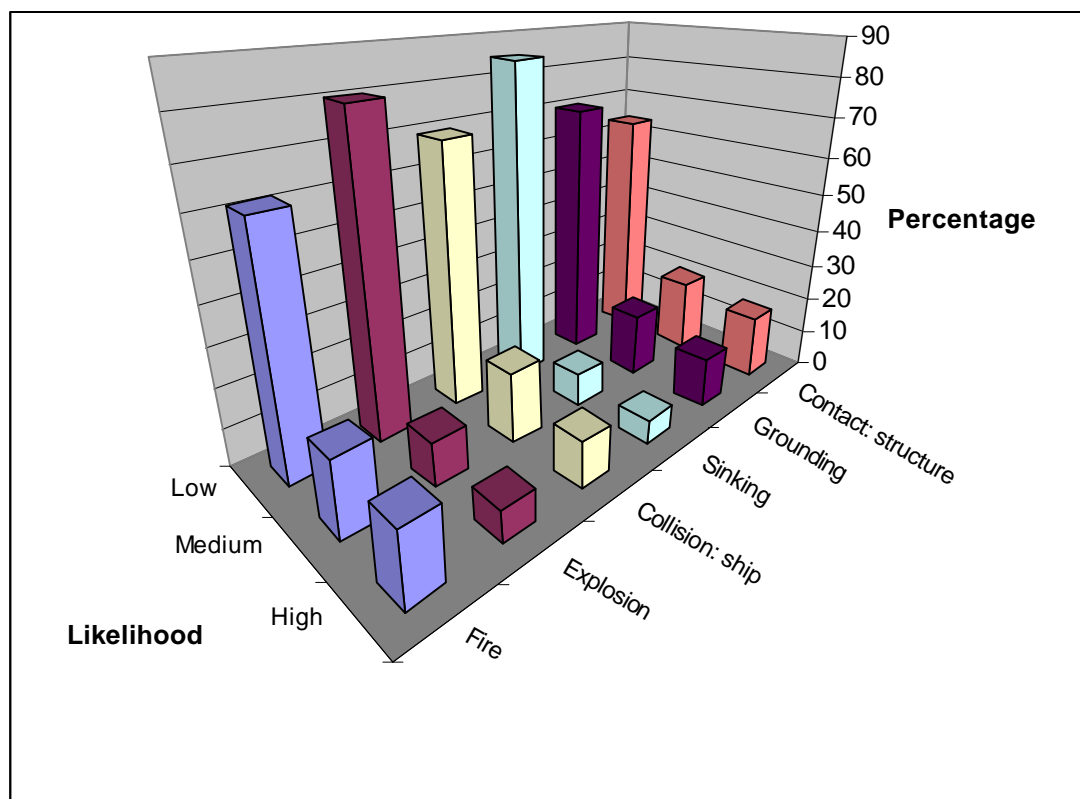
There is a clear downwards trend from low to high risk, for all types of ship casualty. What is perhaps most striking, however, is that although the majority of seafarers and managers saw the risks as low, a significant minority still perceived the likelihood of an incident occurring as medium and high. For example, the listed events were seen as medium risk by between 8.8% (sinking) and 19.6% (fire) of seafarers, and as high risk by a further 6.4% (sinking) and 18.5% (fire) of respondents. Put another way, 15.2% of respondents thought that it was likely that someone in their company would be on a ship that sank during their seagoing career, and 38.1% that someone in their company would be on a ship that had a fire. This suggests that significant numbers of the workforce perceive their work place to be a dangerous environment. Indeed, in a separate question[5], seafarers and managers were provided with the opportunity to state, in their own words, what they perceived as the most dangerous thing about going to sea. Approximately 11% of those who answered the question (n=236), mentioned a ship level casualty (Figure 5). Others mentioned such things as specific

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[5] The responses to this question will be discussed fully at a later point in the report

work activities, fatigue, weather, and management, these will be discussed later in a forthcoming report on 'safety culture'.

Figure 5: *The percentage of open responses referring to ship casualty by type*
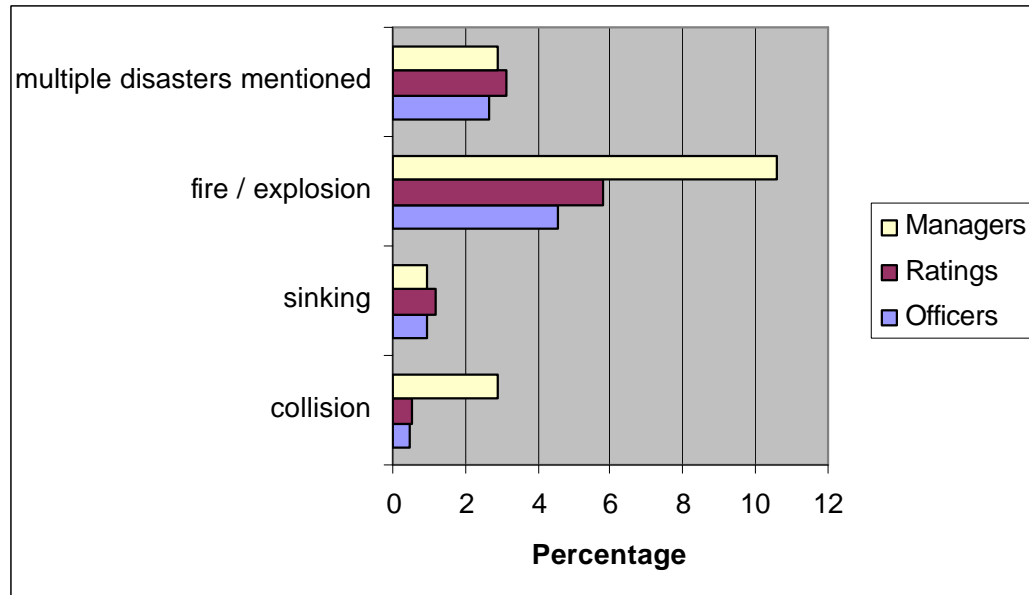
That seafarers and managers chose to mention ship level incidents when given the chance to specify anything at all of concern, further demonstrates the significance to them of ship level incidents. By addressing the same issue with different questions and allowing for different types of response (i.e. pre-specified and open options) the questionnaire was designed to allow for the demonstration of stronger and weaker support for given attitudes or opinions. In this case the analysis demonstrates that a significant percentage of managers and seafarers do indeed see the likelihood of a ship level incident as a high risk.

Amongst those who answered the open question about the most dangerous aspect of going to sea, fire and explosion were cited most frequently. Indicative comments were:

The most dangerous thing about working at sea is fire and explosion. #877[6]

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[6] The number refers to the respondent's data entry in the database.

Fire and small fires can lead to a greater one and can cause severe fears for human life as well as the ship. #731

Fire is the most dangerous thing if you are working at sea; no way out you're burned and drowned. Is no chance if there is fire onboard. #1816

Many respondents however mentioned a range of incident types.

Fire, explosion, sinking, and collision with another ship. #1427

Collision and grounding, fire and explosion. #1710

I would say explosion is the most dangerous thing at sea. Depends what type of ship you are working on. It can be grounding or collision can be dangerous also. #1797

In cases of any damage to the ship chance of survival are negligible. There is no such safety item that can guarantee survival on the ship if it sinks mid ocean. They can only give some time. #2133

We have identified that there is a level of concern about the safety of the marine workplace for seafarers and managers. In the following sections, we identify the extent to which these perceptions of risk were influenced by hierarchical level (rank), department, nationality and experience.

1.2:   The effect of rank (hierarchy)

Further analyses of perceptions of risk by position in the occupational hierarchy (i.e. shipboard/shore-based rank/occupation) show that seafarers and managers see the likelihood of a ship level incident occurring in their company differently. There were significant differences in perception between ranks relative to all types of incident listed, except explosion.

Managers and senior officers were more likely to rank the risk as higher than other groups (Figure 6).

Figure 6: *Perceptions of risk as medium/high for each type of incident by rank*
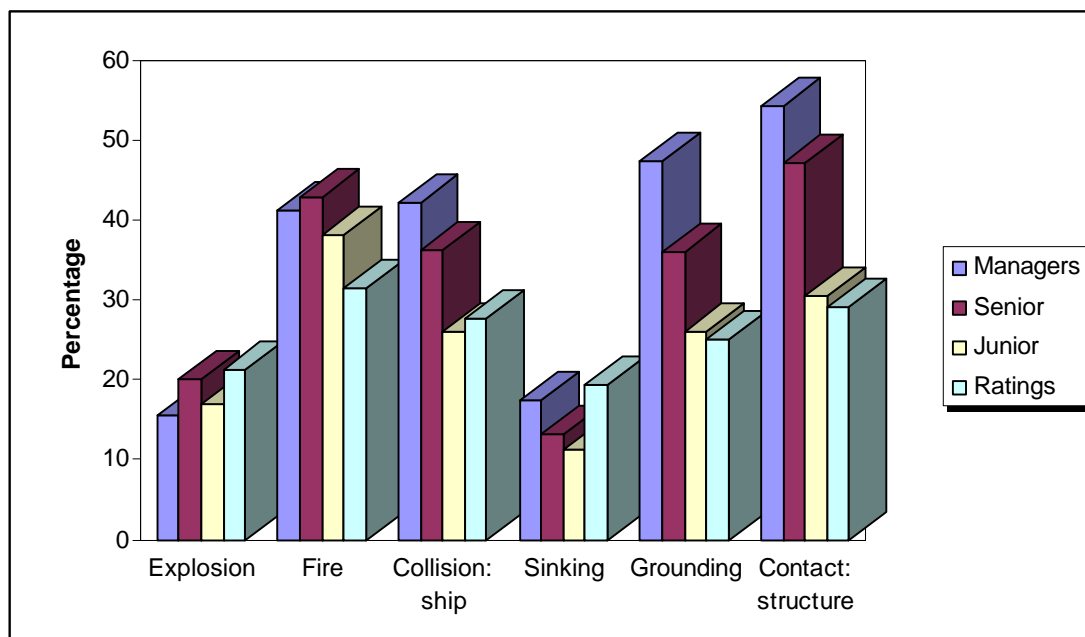
Notably, however, managers perceived the risk of explosion as lower than all the other ranks [Figure 7]).

Figure 7: *Perceptions of risk of explosion by rank*
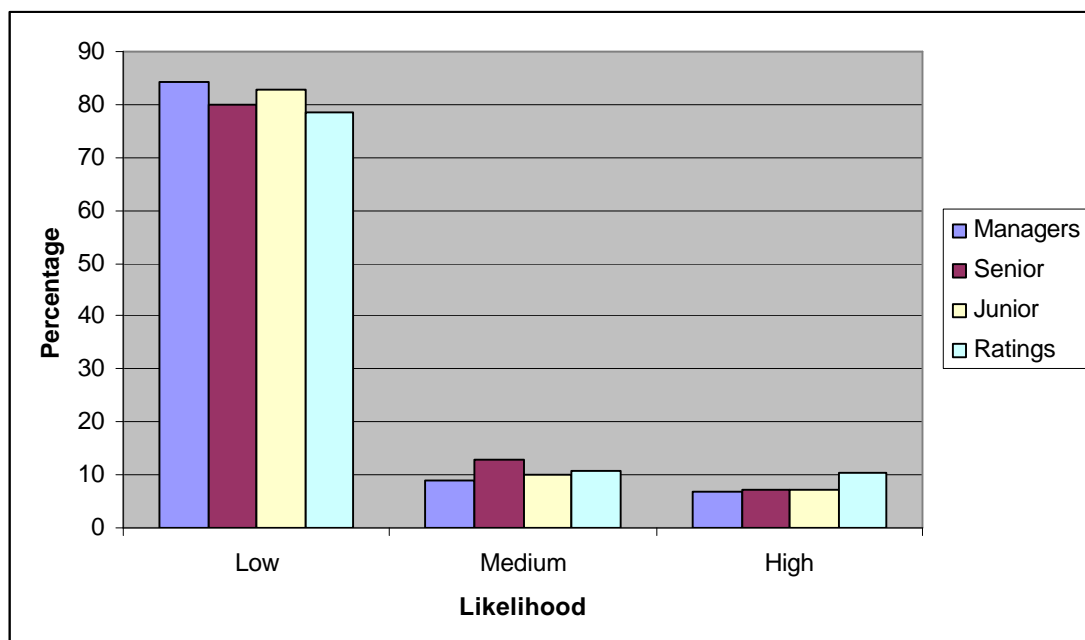
All ranks saw the risk of sinking as the least likely eventuality. Indeed, not a single manager perceived the risk of sinking as extremely likely (Figure 8).

Figure 8: *Perceptions of risk of sinking by rank*
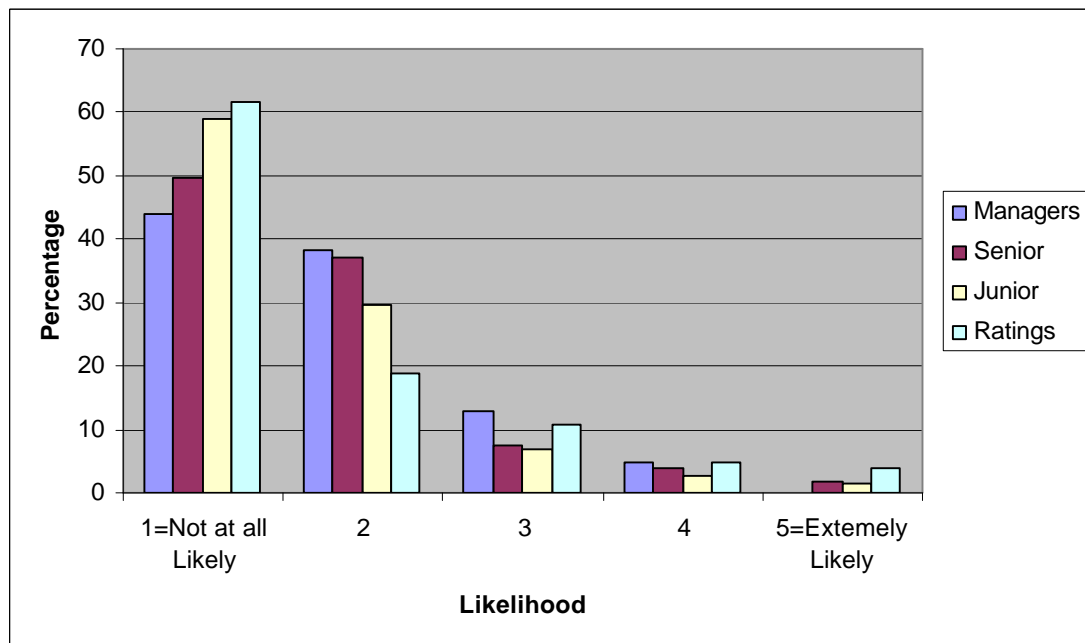
Ratings tended to perceive the likelihood of the listed events occurring as lower than officers and managers. Moreover ratings did not appear to significantly differentiate between types of incident, but saw the risk associated with each incident type as more or less the same (Figure 9). The risk of fire was perceived as marginally higher than the other types of incident listed.

Figure 9: *Rating's perceptions of ship casualties*
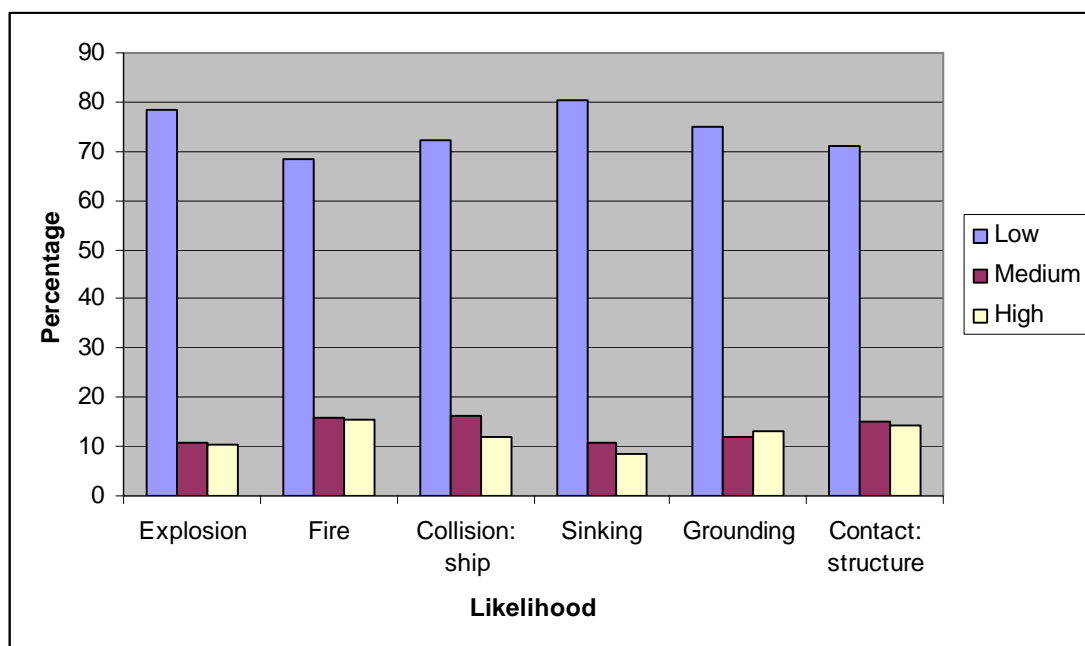
By considering modal values, it is possible to identify the most common responses for each group in the occupational hierarchy in relation to each type of incident. Here we find a trend in perceptions of risk relating to occupational hierarchy. Ratings most commonly identified the lowest levels of risk across all incidents and the modal values gradually increased across the ranks with managers most commonly identifying the highest levels of risk of all ranks (Table 5).

Table 5: *Modal values for perceptions of likelihood of a ship casualty by rank*

	Sinking	Fire	Collision	Explosion	Grounding	Contact
Managers	1	2	2	2	2	3
Senior Officers	1	2	2	2	2	2
Junior Officers	1	1	2	2	2	1
Ratings	1	1	1	1	1	1

This difference in perception may result from a higher degree of awareness on the part of managers of the fleet of all the incidents that occur year in and year out across the company. The knowledge of ships' staff may be more limited to those company vessels of which they have personal experience. Furthermore, as senior officers have the greatest contact with management, and possibly the most extensive training and the greatest involvement in onboard risk management of all those on board, this could explain why their perceptions were most closely aligned with those of shore side management. However at this stage we are not in a position to judge which perception is the more 'accurate'. What the data does indicate however is that the further the group is from direct management influence the greater the difference in perception between groups and managers. This could related to organisational communication strategies, which will be explored in greater depth in forthcoming reports drawing upon case-study data.

Although the majority of respondents from each group: managers, officers and ratings, saw the risk of an incident as low, it is interesting to look at those individuals who saw the risk of an incident as high. Managers and senior officers were most in agreement that there was a high risk of contact with a fixed structure. By contrast junior officers were most in agreement that the likelihood of explosion constituted a high risk, while ratings considered that sinking was high risk (Table 6).

Table 6: *Percentages of the different hierarchical groups ranking risk as 'high' by incident type*

	Ratings	**Junior**	**Senior**	**Managers**
Fire	15.6	7.1	7	21.2
Collision: ship	11.8	9.1	14	15.4
Grounding	13.3	8.9	15.9	20.4
Contact: structure	14.1	13.3	21.6	22.3
Explosion	10.5	19.2	19.5	6.9
Sinking	8.6	4.3	5.7	4.9

In general, junior officers were the least inclined to see the level of risk as 'high' as compared with managers, senior officers, and ratings. The exceptions are explosion, and fire where, interestingly, junior officers' perceptions strongly agreed with those of senior officers. It could be hypothesised that these differences in perception might be due to relative youth and lack of experience (Table 3). Perhaps surprisingly however few officers (junior and senior) saw the likelihood of fire as high.

The observed differences in perceptions amongst the different ranks were further supported by logistic regression. This showed that the greatest differences in perception as to whether a type of incident was likely (i.e. posed a 'low/medium/ high' risk) were between ratings and all other ranks. In general, ratings and junior officers had similar perceptions of the likelihood of incidents occurring, holding different views in relation to only two of the five types of incident. By contrast ratings and managers saw the risk of an incident differently in four out of the five cases, and ratings saw the risk differently to senior officers in relation to all five types of incident. For example, managers and senior officers saw the risk of an incident occurring as between one and a half (fire) and three times (contact with a fixed structure) more likely than ratings. However in relation to sinking, ratings thought this was more likely to occur than ships' officers: senior officers saw the likelihood of sinking as 37% less likely than ratings, while junior officers thought it was 47% less likely to occur (Figure 10).[7]

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[7] The Table is based on ships' ratings as the reference group.

Figure 10: *Differences between ratings and other ranks in terms of perceptions of likeliness of an incident occurring.*[8]
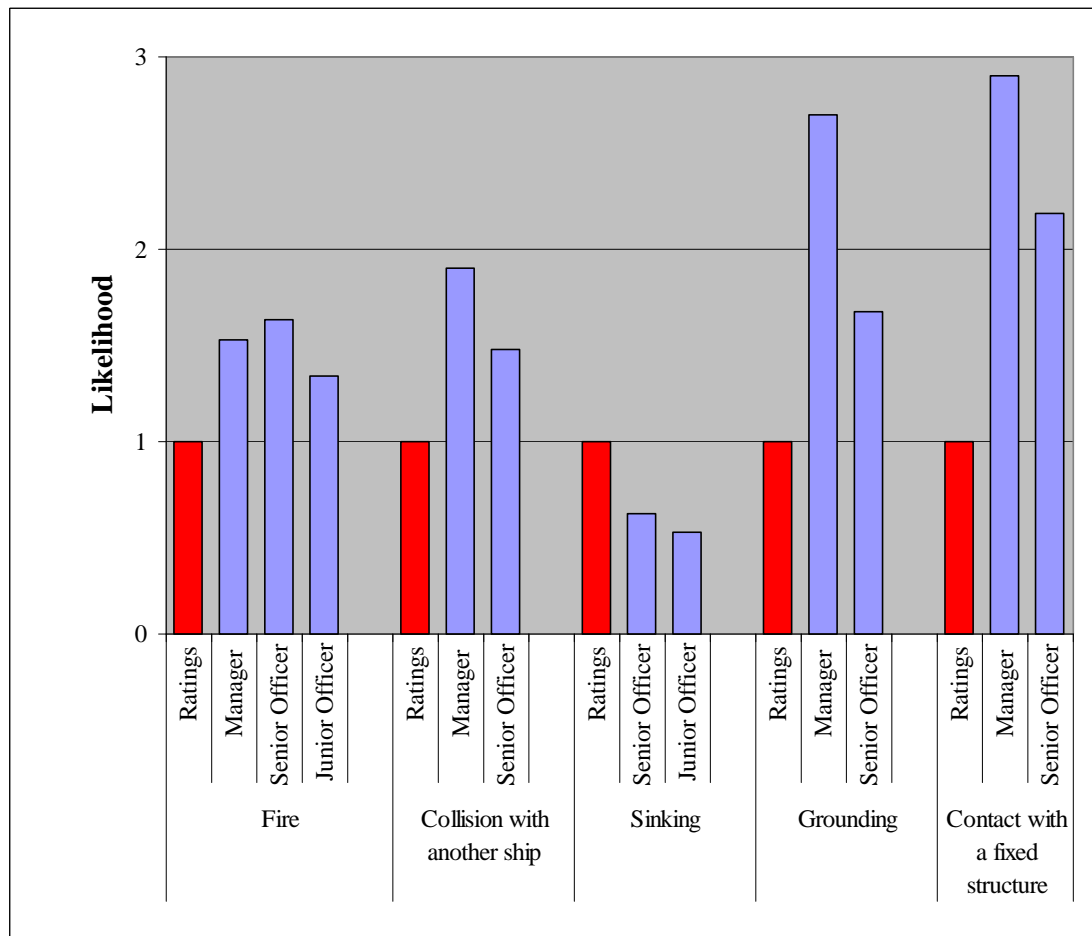
NB. The red bars represent the reference group (i.e the ratings). The blue bars indicate how likely the different ranks are to see the risk associated with each type of incident as medium/high compared to the reference group.

1.3: The effect of department

In this section we look at perceptions of risk of a ship level incident through the lens of 'department'.[9] We found statistically significant differences in the ways in which those from different occupational departments ranked the likelihood of the occurrence of the following incidents: explosion, collision with another ship, sinking, grounding, and contact with a fixed structure. No significant differences were found between departments in relation to perceptions of the likelihood of fire.

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[8] For each type of incident only those ranks appear where there is a significant difference between their perceptions and those of the reference group, i.e. ratings.
[9] To ensure adequate numbers, interrogation of perceptions by 'department' required the recoding of department to exclude those respondents who identified themselves as combined deck / engine department.

There was a marked difference in the pattern of response at the medium and high level between those on shore and those onboard ships (Figure 11).

Figure 11*: Perceptions of risk by department*
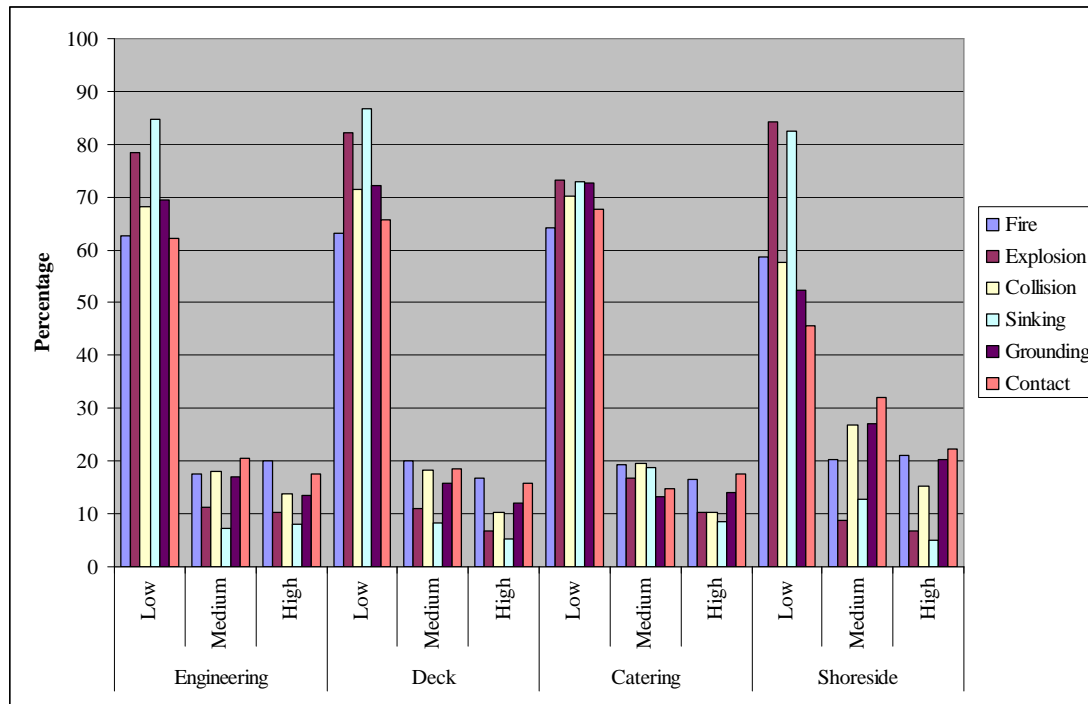
Managers perceived the risk of experiencing an incident as higher than seafarers working onboard, in relation to four of the six incidents listed. The two exceptions were explosion and sinking. Interestingly it was in the catering department where a greater percentage of respondents perceived the risks of sinking (27.1%) and explosion (26.9%) as medium and high (Figure 12). Given that sinking is potentially the ultimate outcome of any ship level incident, concerns about sinking on the part of the catering personnel could perhaps be due to the lack of involvement in the actual operation of the vessel and consequent lack of awareness of operational status and an associated greater sense of vulnerability. However it is unclear why explosion rather than any of the other types of incident should also be perceived as more likely by seafarers than shore-side managers.

Figure 12: *Perceptions of risk of an incident as medium or high by department*
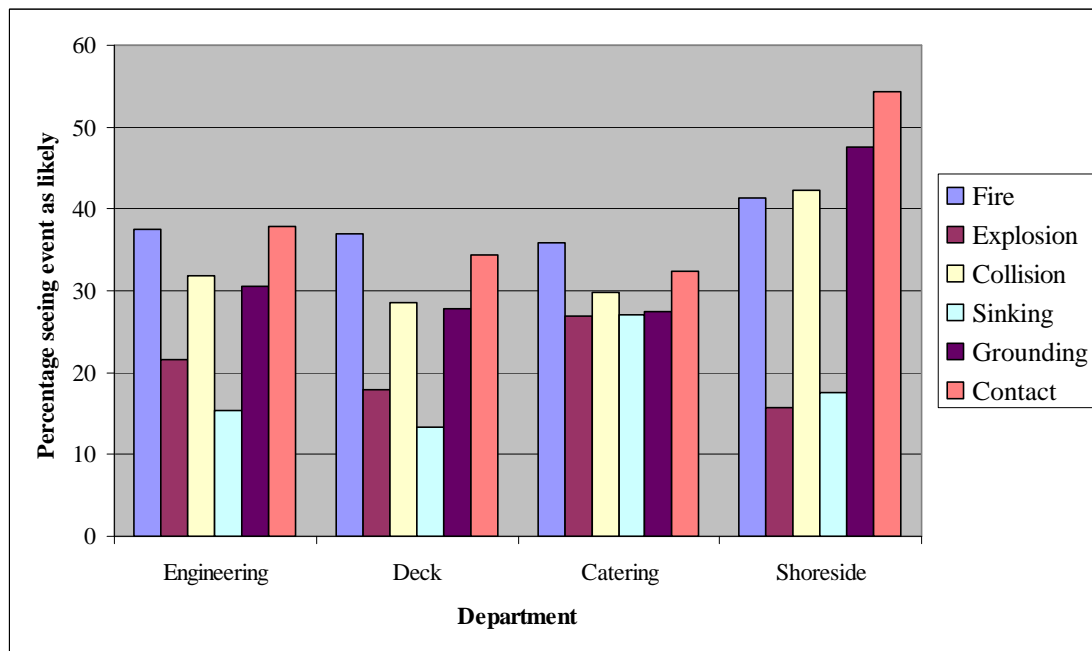
The identification of differences between ranks was further supported by the use of binary logistic regression. Significant differences were identified in perceptions of risk between shore side workers and those onboard ships, and also between catering personnel and those in other departments. The greatest difference was between shore side workers who saw the likelihood of an incident as twice as likely as those onboard in relation to three out of five types of incident. By contrast, those in catering perceived the likelihood of the occurrence of an incident as higher than those in other shipboard departments in relation to two types of occurrence (i.e. explosion and sinking - Figure 13).

Figure 13: *Differences between shore side workers/catering staff and other ranks in terms of perceptions of likelihood of an incident occurring*[10]
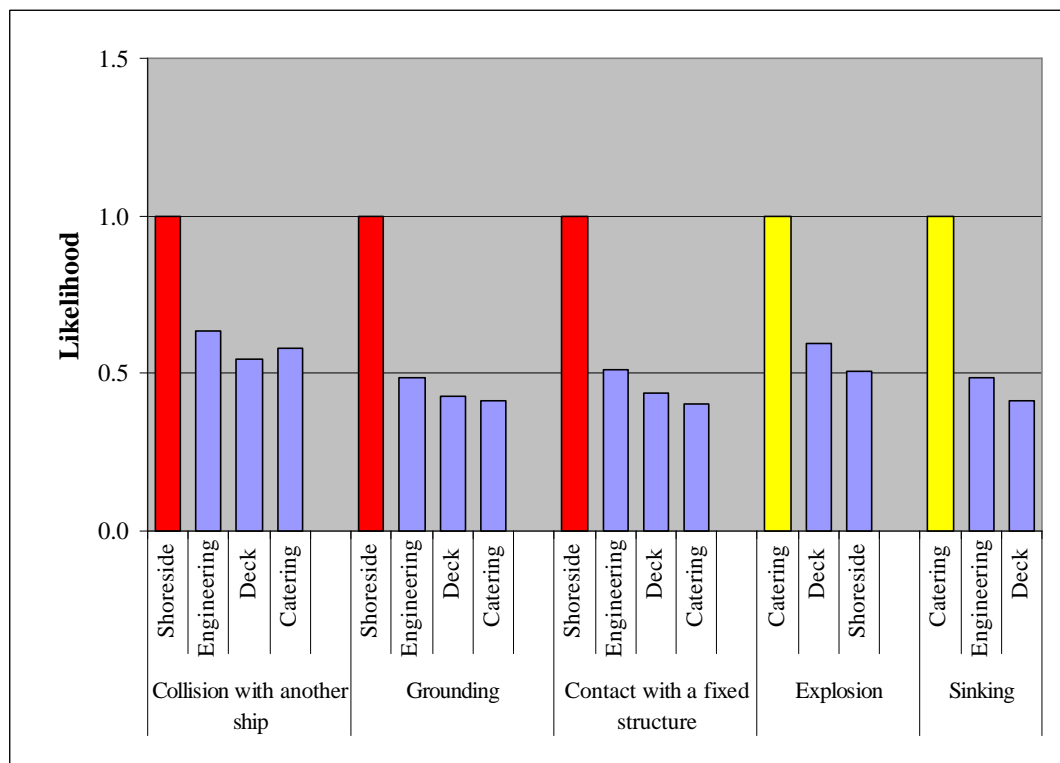
NB. The red and yellow bars represent the reference groups. The blue bars indicate how likely the different ranks are to see the risk associated with each type of incident as medium/high compared to the reference group.

1.4: The effect of experience of most recent ship type worked on

In this section we investigate whether the type of ship that respondents most recently worked on influenced their perception of the likelihood of ship incidents. Statistically significant differences were found for each incident type listed, except explosion. This tells us that respondents see the risks differently depending upon the type of ship they are working on. This is perhaps unsurprising as different ships, and types of operation, have different characteristics liable to influence perceptions of susceptibility to different types of incident.

Contact with a fixed structure was ranked, most frequently, as the greatest risk by seafarers on tankers, bulk carriers and 'working'[11] vessels (Table 7). For example,

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[10] For each type of incident only departments appear where there is a significant difference between their perceptions and those of the reference group, i.e. catering.

[11] Within the category working vessel are included those vessels whose primary purpose is other than the transportation of goods around the globe, e.g. dredgers, tugs, standby boats, supply vessels, etc. See Appendix 3 for full details.

14.9% of respondents whose present or most recent ship was a 'Tanker' indicated that they felt that someone in their company would be most likely to experience 'a ship contact with a fixed structure' during their sea-going career. For those working on tankers and bulk carriers this may be due to the massive size and relatively poor manoeuvrability of these types of vessel, whereas for those on 'Working' vessels it may be due to the nature of their work, i.e. working close alongside offshore platforms, etc.

Table 7: *Percentage of Respondents on each ship type indicating that they saw the risk as medium and high for each incident*

	Percentage indicating medium/high risk[12]				
	Tankers	*Bulk Carriers*	*Dry Cargo (Non-Bulk)*	*Passenger Ships*	*Working Vessels*
Fire	14.0	19.5	18.7	24.0	20.5
Explosion	8.0	10.6	6.4	6.6	8.7
Collision	9.2	16.5	10.6	3.9	12.3
Sinking	4.1	8.2	5.7	1.3	9.6
Grounding	10.8	18.1	9.8	9.3	13.8
Contact	14.9	24.3	11.3	15.6	20.9

Fire was clearly perceived as one of the two most likely incidents to occur on all the vessel types listed. However, those whose most recent ship type was a Dry cargo vessel or Passenger ship were most strongly in agreement that fire was a medium/high risk.

1.5: The effect of experience in the industry

Commonsense might suggest that a respondent's experience of the industry should influence their perception of risk. In the following section we consider the effect of both sea service and management experience upon perceptions of risk.

1.5.1: *Seafaring Experience*

Surprisingly, the number of years spent at sea had no significant impact upon perceptions of risk (Figure 14)[13].

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[12] Figures in bold, relate to the columns they are in, and indicate the type of incident rated most frequently as likely to be experienced by respondents working on that ship type.

Figure 14: *Perceptions of likelihood of sinking by number of years worked at sea*
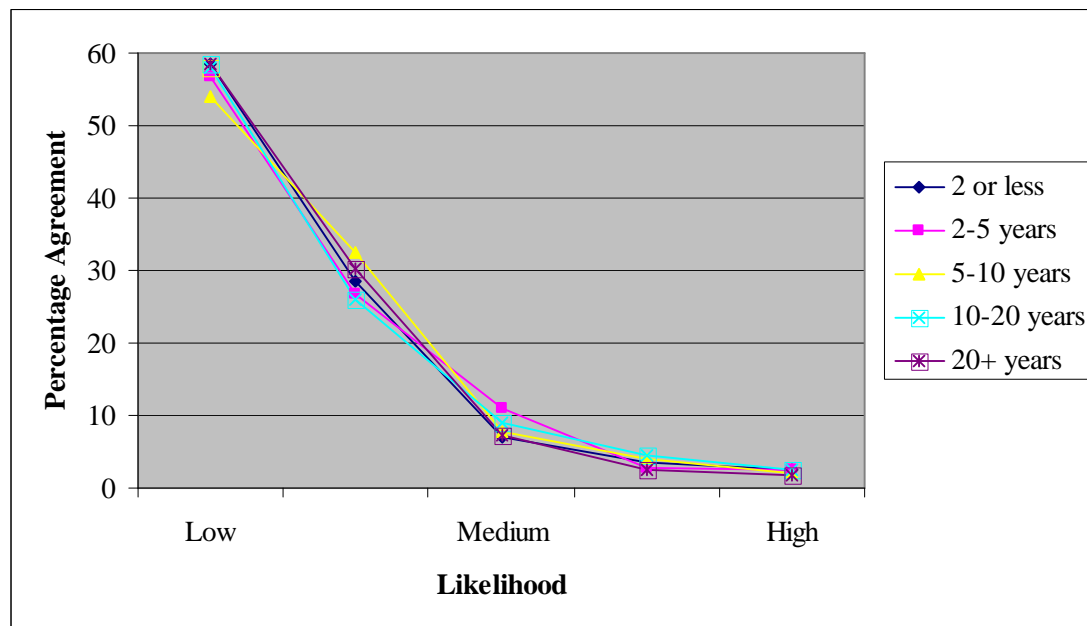
Our daily life informs us that experience affects our perceptions and thus carrying out a job over a number of years could be expected to impact upon perception of the hazards faced in the course of a sea-going career. However, we were surprised to find that amongst our respondents no such differences were apparent. We were unable to identify any effect, of experience, on perceptions. The reason for this may be understood in the following way. We have (reasonably) attempted to measure the effect of experience simply in terms of numbers of years at sea, but it could be argued that it is the specific nature of that experience (e.g. position in the hierarchy or the number and extent of vessel types served on) that shapes perceptions of event likelihood. In particular, within an organisation perceptions may be determined by the company culture and the extent to which knowledge is communicated from experienced workers to those more recently employed. Equally particular company history may lead to a focus on particular types of events, i.e. based on stories, say, of a particular ship or incident

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[13] With the exception of 'contact with a fixed structure' (p=.011)

1.5.2: *Management Experience*

Significant differences *were* found relating to the length of time respondents had worked in shore-side management and their perceptions of the likelihood of collision with another ship and grounding. However, no significant differences were found for the other types of ship level incident listed. Consideration of the two types of incident where there were differences reveals that those managers with less than two years experience were more inclined to see the risk as medium or high than their colleagues with longer experience (Table 8).

Table 8*: Percentage of managers by years of experience who see risk of an incident as medium or high*

	Years in Management			
	2 or less	**2-5 years**	**5-10 years**	**10+ years**
Collision	59.6%	30.8%	42.0%	39.4%
Grounding	54.4%	24.6%	44.9%	50.8%

By contrast, those with two to five years experience were the least inclined to see the risk of an incident as high or medium (Figure 15). Thus there was a marked contrast in perception between managers with less than two years experience and those with two to five years experience, in relation to grounding and collision. This pattern of response was repeated across the other types of incident but the differences in perception were smaller (Figure 15).

Figure 15: Percentage of managers by years experience who perceive each incident type as medium/high risk
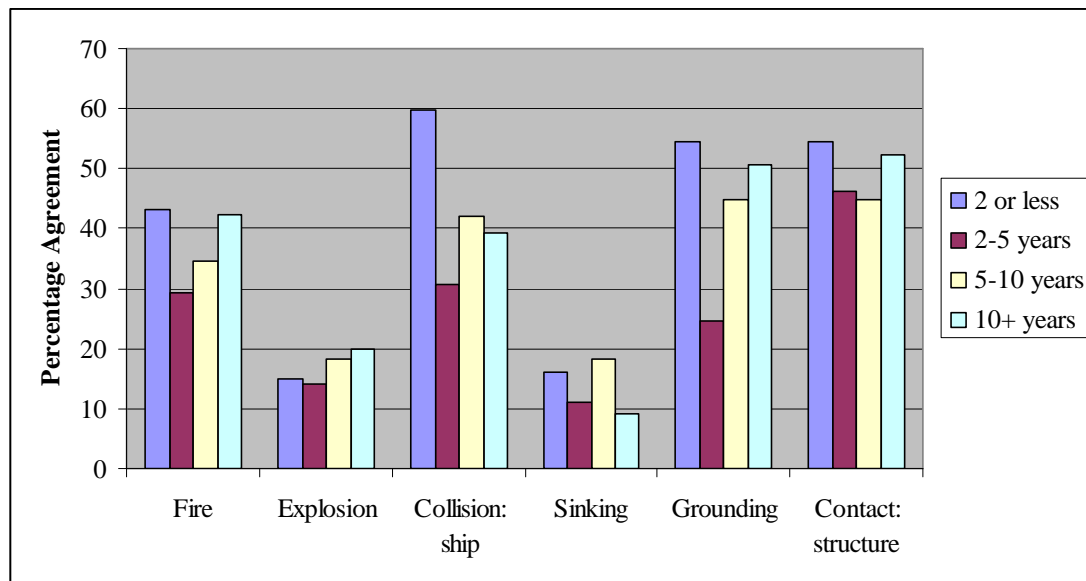
Such a marked contrast in perception would seem to suggest that experience gained in the company during the first two years significantly alters new managers' perceptions of risk.

Given that many managers were formerly seafarers (74% of our sample) their perceptions could be expected to be influenced by that history. Therefore managers were analysed separately to determine whether having been to sea influenced their perception of risk. Between those managers who had or had not been to sea, there were significant differences in their perception of all ship level incidents (Table 9).

Table 9: Percentage of managers with, and without, seafaring experience that perceived risk of ship level incident as medium/high

Seafaring Experience	Grounding	Collision	Fire	Explosion	Contact	Sinking
No	42.1%	36.4%	35.1%	9.3%	44.7%	10.7%
Yes	63.0%	59.3%	59.3%	33.3%	81.5%	37.0%

Those who had not been to sea generally rated the likelihood of all types of incident as low, although for grounding and contact with a fixed structure increased percentages of managers without seafaring backgrounds rated these as posing medium

risk (Figure 16). By contrast, those managers who had been to sea tended to perceive the likelihood of an incident occurring as being higher. For example, managers with seafaring backgrounds tended to see the likelihood of fire (Figure 17) as medium risk, and the likelihood of grounding as high risk (Figure 16), compared to those who did not have a seafaring background who tended to see both as low risk.

Figure 16: *Rating of likelihood of **grounding** comparing managers who had or had not been to sea*
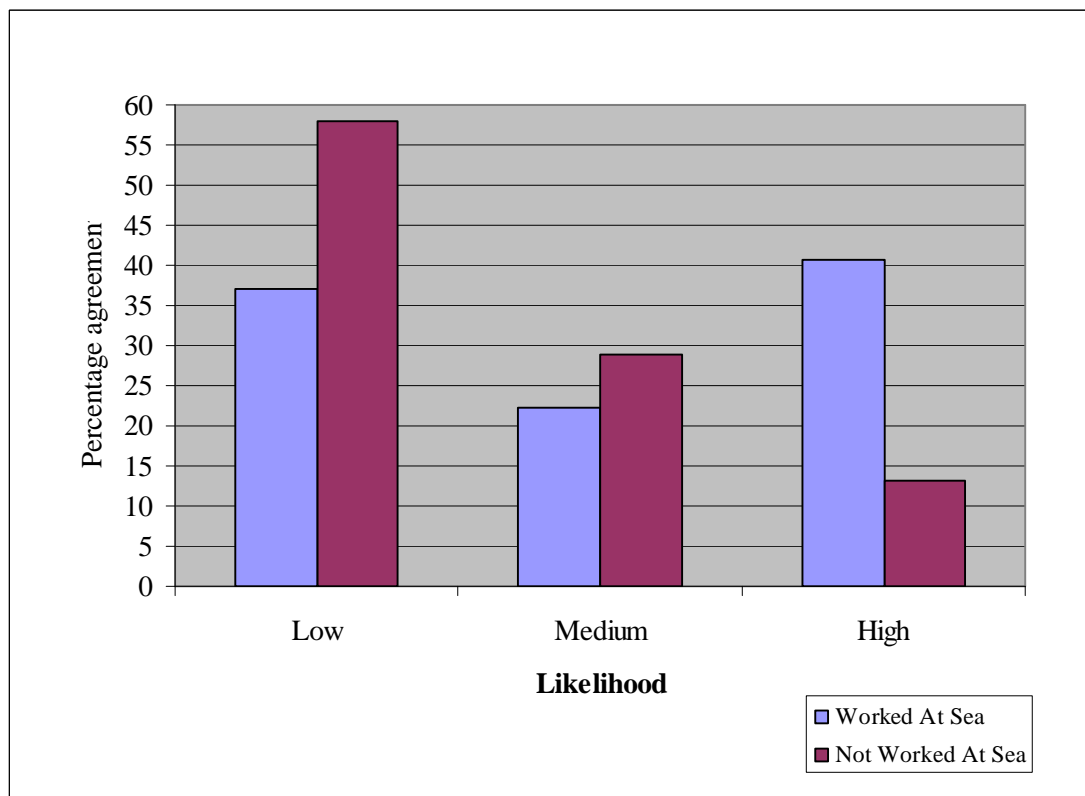
Figure 17: *Rating of likelihood of **fire** comparing managers who had or had not worked at sea*
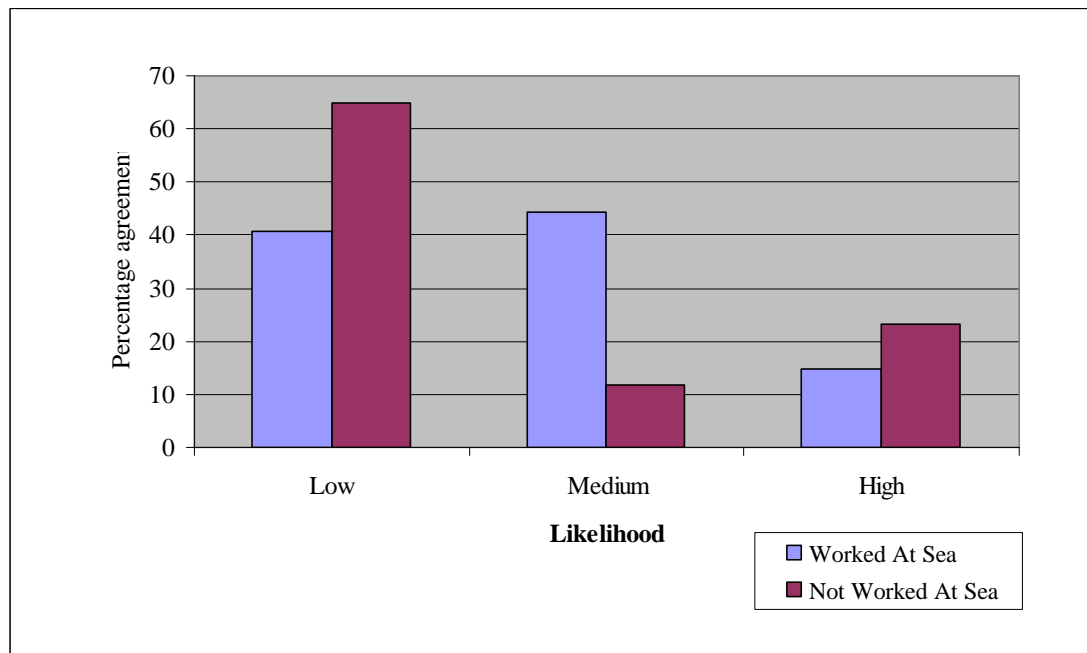
While we do not have a breakdown of managers' actual positions within their organisations it could be hypothesised that those with sea-going experience tend to occupy positions more concerned with the operational side of the vessel and so are more risk aware with respect to ship level incidents. However, those working in health and safety positions (with or without sea-going experience) would presumably also be aware of actual risk to ships in their company.

If we look at the groups of managers relative to their experience in management and whether they have sea-going experience an interesting pattern emerges (Table 10).

Table 10: *Number of years worked in management cross-tabulated with percentage of managers with sea-going experience*

	Worked at Sea	
Years in Management	Percentage 'No'	Percentage 'Yes'
2 or less	44.4	55.6
2-5 years	43.8	56.3
5-10 years	17.4	82.6
10+ years	16.1	83.9

What we see is that there appears to have been a marked change over the last 5 years in terms of the recruitment of managers, with significantly fewer of them being ex-seafarers than previously (Table 10).

Given that we have identified a difference in perception between managers with and without seafaring backgrounds, such changes in demographics could potentially have an impact upon future shore-side perceptions of shipboard risk. However, we have also seen that length of time in management appears to impact upon perceptions. Further research is required to determine how these two factors might interact to shape perceptions of risk.

1.6: The effect of experience in the company

Although total length of experience at sea did not impact upon perceptions, we did find significant differences in perception according to length of experience with current, most recent, employer. Significant differences were found in relation to the perceptions people had of the likelihood of an individual within this company experiencing: fire, explosion, grounding, and contact with fixed structures.[14] There were no significant differences in relation to collision and sinking.

Those who had been in their companies longest (10 years plus) tended to perceive the risk as generally about 1.5 times higher than those with very little experience in their company, i.e. 2 years or less (Figure 18).

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[14] Interestingly there was again no discernible difference between all groups for perceptions of sinking.

Figure 18: *Differences between those who had worked for their present company for less than 2 years and those who had worked for their company for longer in terms of perceptions of likelihood of an incident occurring[15]*
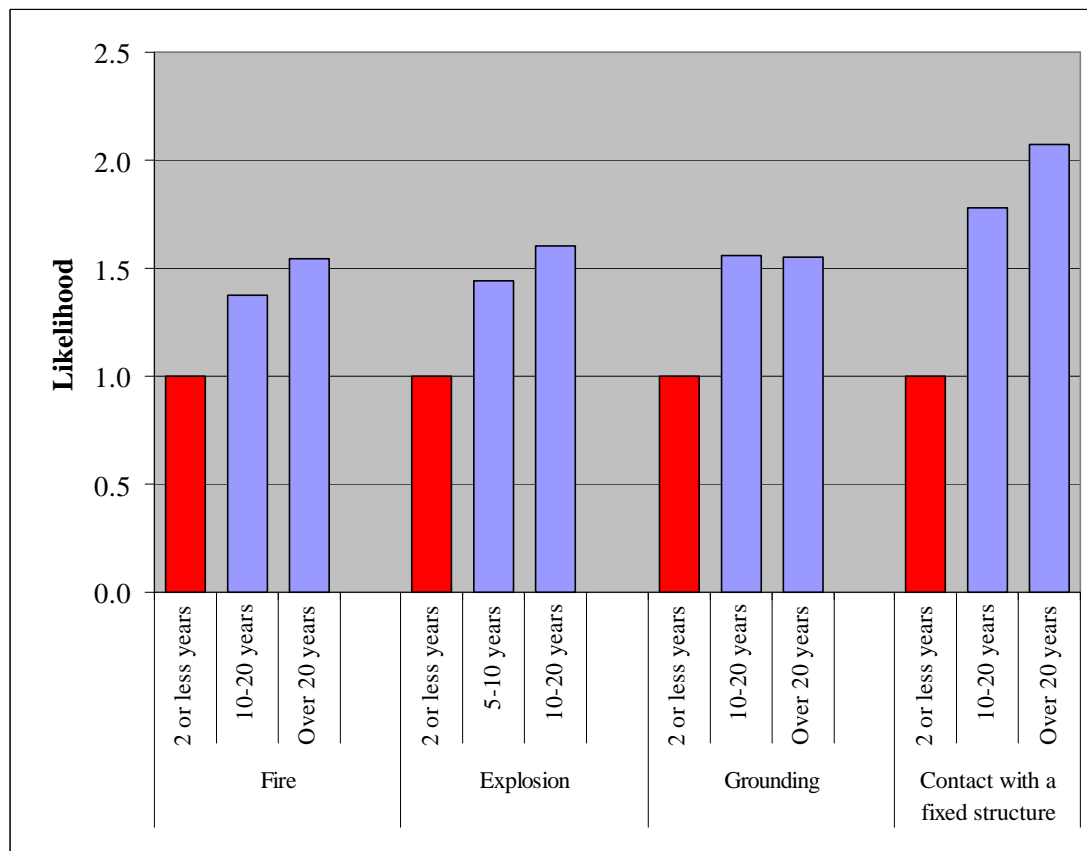
NB. The red bars represent the reference group. The blue bars indicate how likely the different groups (based on years experience in the company) are to see the risk associated with each type of incident as medium/high compared to the reference group.

The fact that the number of years spent at sea is not significant while number of years spent working for a company is, may suggest that an individual's experience within a company, exposed to a particular organisational culture, is the important factor in determining perceptions. Interestingly greater experience of a company seemed to produce a higher estimation of risk.

1.7: The effect of nationality

Just five national groups make up 85% of respondents (China, India, Netherlands, Philippines, UK see Table 4, p11). Given the prominence of these five nationalities,

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[15] For each type of incident only the years experience in the company groups appear where there is a significant difference between their perceptions and those of the reference group.

we analysed the data specifically focussing upon the differences/similarities between them. We found significant differences between the responses of the five different national groups in relation to all the types of incident listed. All groups saw sinking as the lowest risk of the incidents listed, although Chinese respondents saw it as significantly more likely to occur than the other national groups (Figure 19). In fact Chinese respondents saw the risk of occurrence of four of the six types of incident as being higher than all of the other national groups.

Figure 19: *Percentages of groups by nationality that saw each type of incident as medium or high risk*
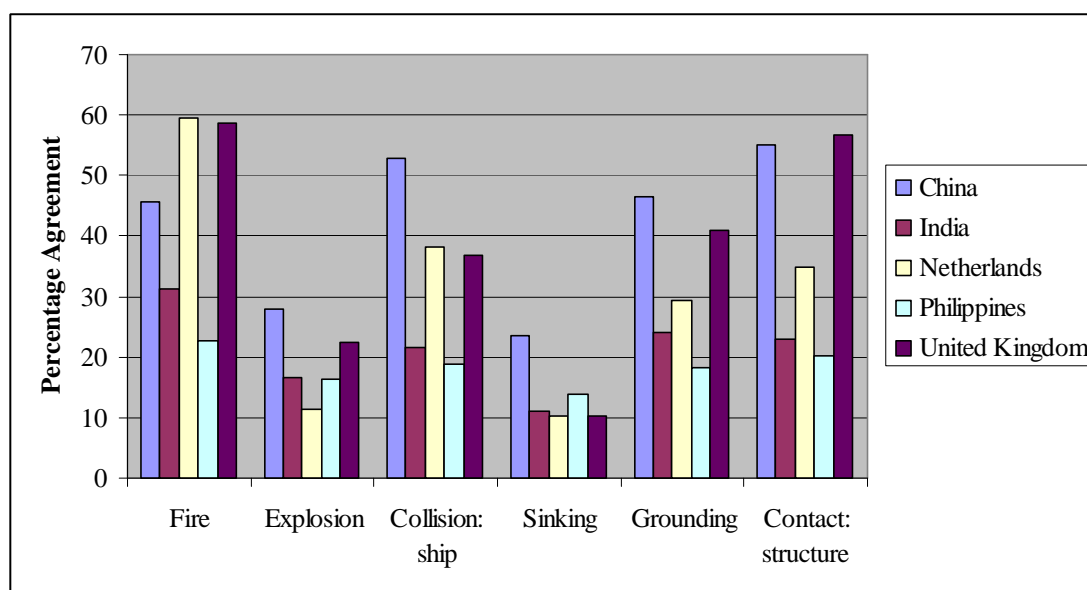
Using binary logistic regression it was possible to establish that respondents from China were more than twice as likely to see an incident as likely to occur within their company as other nationalities listed (see Figure 20). Perceptions of the occurrence of fire were the notable exception.

Figure 20: *Differences between Chinese respondents and other nationalities in terms of perceptions of likelihood of an incident occurring[16]*
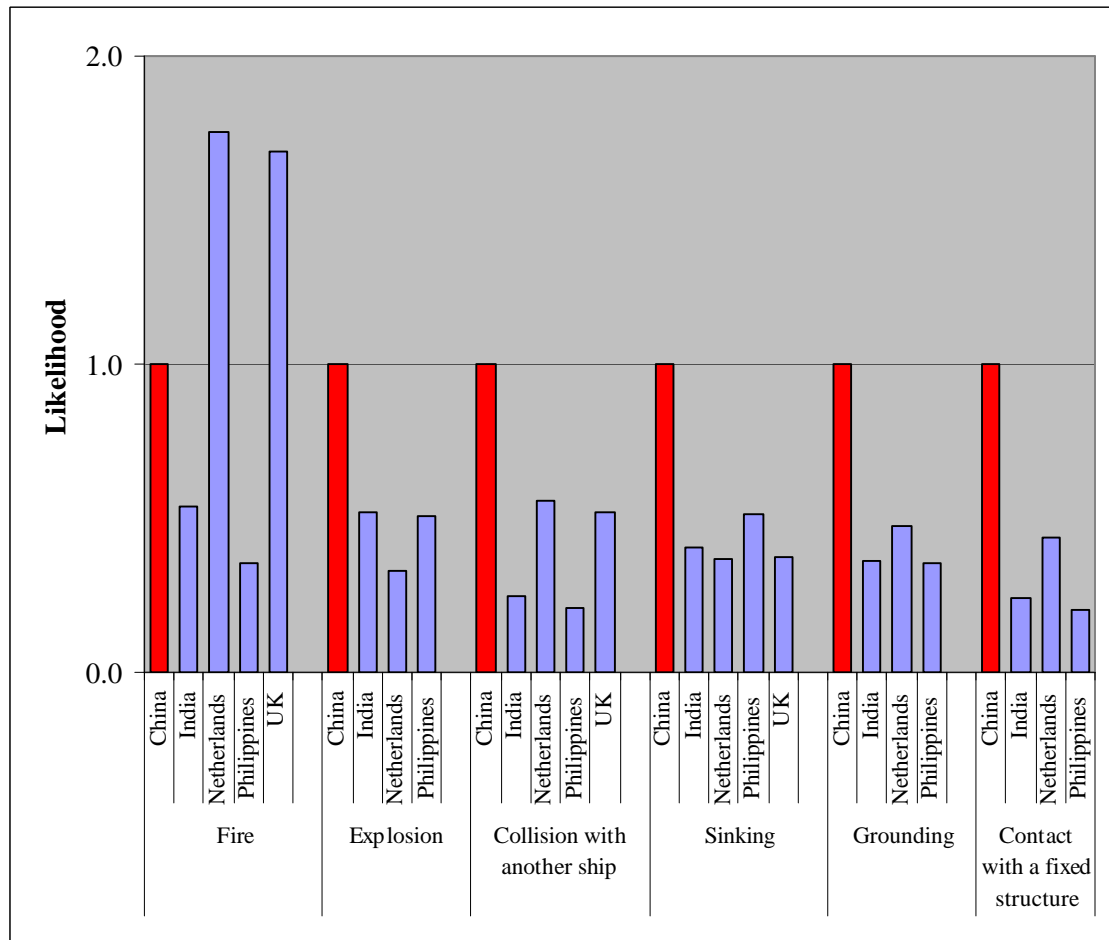
NB. The red bars represent the reference group. The blue bars indicate how likely the different national groups are to see the risk associated with each type of incident as medium/high compared to the reference group.

Respondents from the United Kingdom and Netherlands saw fire as more of a risk than other national groups; they were approximately one point seven times more likely to identify fire as a risk than those from China and almost five times more likely than those from the Philippines.

Filipinos tended to perceive the risk associated with the different types of incident to be lower than the other identified national groups (Figure 21).

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[16] For each type of incident only nationalities appear where there is a significant difference between their perceptions and those of the reference group, i.e. China.

Figure 21: *Significant differences between Filipino respondents and other nationalities in terms of perceptions of likelihood of an incident occurring[17]*
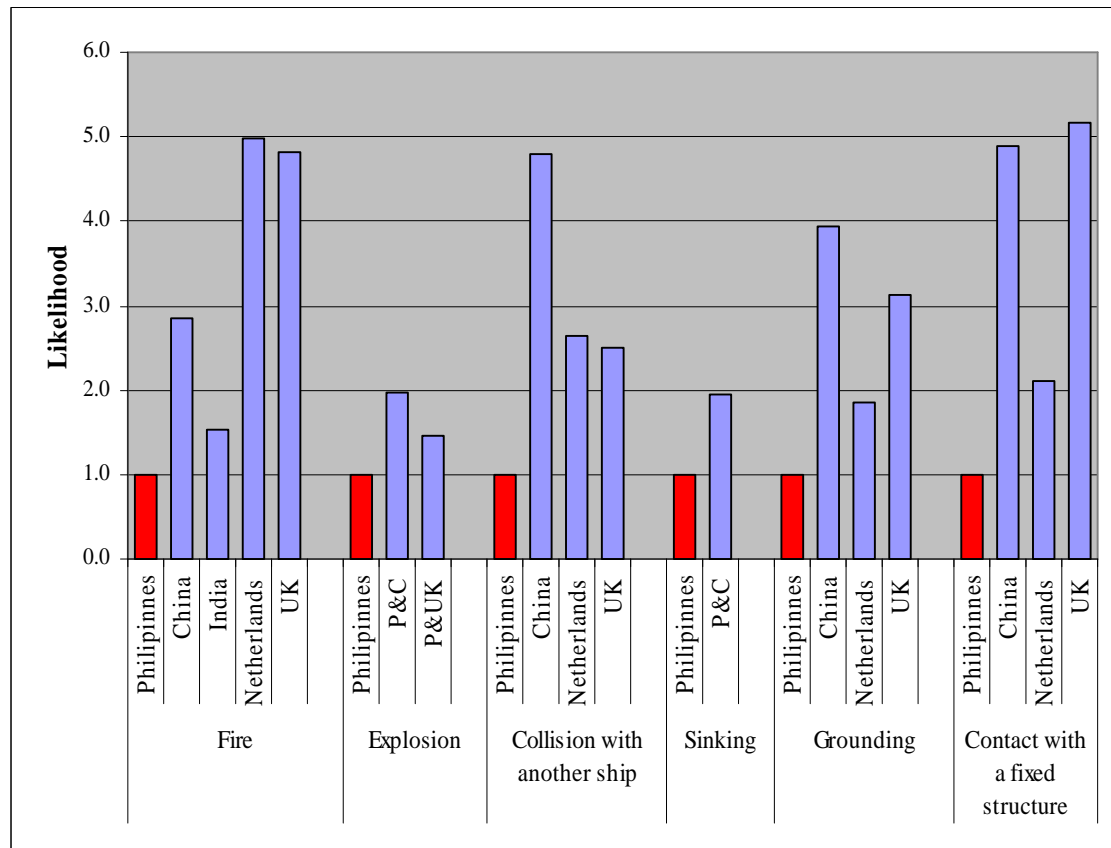
NB. The red bars represent the reference group. The blue bars indicate how likely the different groups (based on years experience in the company) are to see the risk associated with each type of incident as medium/high compared to the reference group.

Differences between the perceptions of risk of different national groups could be due to a range of possible factors, including: training, local labour markets, national employment structures, national cultural differences, and types of ship employed upon.

1.8: Multivariate Analysis

In this section we report on the findings from our implementation of binary logistic regression modelling to compare the effect of variables in relation to differences in

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[17] For each type of incident only nationalities appear where there is a significant difference between their perceptions and those of the reference group, i.e. Philippines.

perceptions of risk. The following factors were put into logistic regressions for each of the incident types:

Rank
Department
Nationality
Years in company
Most recent ship type worked on

The binary logistic regression model indicates that nationality was the most influential factor in determining perceptions of risk, but that rank and last ship type served on also had an independent though lesser effect upon perceptions (Table 11).

Table 11: *Factors influencing perceptions of likely occurrence of each incident type*

Incident Type	Factor
Fire	Nationality
	Most recent ship type worked on
Explosion	Nationality
	Rank
Collision with another ship	Nationality
	Most recent ship type worked on
Sinking	Nationality
	Most recent ship type worked on
	Rank
Grounding	Nationality
	Rank
Contact with a fixed structure	Nationality
	Most recent ship type worked on
	Rank

Nationality was seen to be predictive for responses in relation to all incident types. Last ship and rank were predictive in relation to responses to two thirds of the incidents. Years worked within present company and work department were not found to be predictive of responses to any of the incidents.

Summary of Findings 1

In this section we have presented the findings that relate to the question:

How likely do you think it is that someone working for your company will experience the following (Fire, Explosion, Collision with another ship,

Sinking, Grounding, Contact with a fixed structure) during their sea-going career?

The aim has been to determine whether perception of risk is affected by rank, work department, experience in the industry, experience in the company, type of ship most recently employed on and nationality. Seafarers and managers most frequently suggested that the likelihood of a ship level incident occurring within their company was low. However a significant minority saw the risks as medium/high.

Statistically significant differences in perceptions were identified amongst the different hierarchical levels. Senior officers and shore-side managers tended to suggest that there was a higher risk of ship level incidents occurring more frequently than junior officers and ratings.

When the sample was considered on the basis of work department, little difference was found between those in the deck and engineering departments. There were however differences between catering personnel and other shipboard departments. The greatest differences in perception however tended to be between those working on ships and those in shore side offices.

Experience, in terms of number of years worked at sea was not found to be significant in affecting respondents' perceptions; except that those managers with sea-going experience tended to suggest a higher likelihood of a ship level incident occurring than their peers without sea-going experience. However, length of time served in the company was significant for four out of the six incident categories. Those seafarers and managers with less than two years experience served in their present, most recent, company tended to perceive risk as lowest while those with more than 10 years experience tended to see it as highest. Respondents' perceptions further varied depending upon the type of ship they had most recently worked on. This was significant across all categories of incident.

When we look at the effects of nationality, Chinese respondents tended to see risk of a ship level incident as higher than the other national groups, while Filipinos saw it as lower. Sinking was perceived to be a low risk by all nationalities.

Findings 2

Respondents were asked the following question:

Which incidents are most likely to occur for each ship type?

In this section we analyse responses to question four of the questionnaire, which required respondents to indicate which type of incident (fire, explosion, collision, contact with fixed structure, grounding, and sinking) they considered to be most likely to occur for each of the listed vessel types (Tankers, Bulk carriers, General cargo ship, Ro/Ro ships, Passenger ships, Container ships, Supply vessels, and High Speed Crafts).

2.1: Overall perceptions of the likelihood of a ship level incident relative to different ship types

Table 12 illustrates the percentage of respondents that identified each type of incident as most likely to occur by ship type. The type of incident perceived as most likely to happen for each ship type is highlighted.[18]

Table 12: The percentage of respondents that identified each type of incident as most likely to occur by ship type

	Tankers	Bulk carriers	General cargo ship	Ro/Ro ships	Passenger ships	Container ships	Supply vessels	High speed crafts
Fire	17.3	8.1	20.5	14.6	38.2	9.1	8.5	3.1
Explosion	65.7	4.3	5.0	4.1	7.3	5.2	4.6	2.5
Collision	4.5	11.7	18.8	23.7	22.5	38.4	15.2	67.7
Contact with structure	2.6	10.0	17.1	20.7	8.3	11.7	51.4	14.0
Grounding	8.9	30.9	23.5	15.9	13.4	30.8	9.5	8.5
Sinking	0.8	35.0	15.1	21.0	10.4	4.8	10.7	4.1

Overall percentage of sample who indicated 'don't know' response

Don't know	7.1	10.1	15.8	17.9	18.8	14.0	26.1	20.0

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[18] The 'don't know' response is not included in the percentages in the top part of the Table.

The incidents that were seen as most likely to occur for each ship type were:

> Tanker =explosion;
> Bulk Carriers=grounding;
> General Cargo=grounding;
> Ro/Ro's=collision;
> Passenger ship=fire;
> Container ship=collision;
> Supply vessels=contact with fixed structures;
> High Speed Craft=collision.

For four of the eight vessel types listed there was one single occurrence that strikingly stood out as the incident considered to be the most likely to take place: tankers=explosion, high speed craft=collision, passenger vessels=fire and supply vessels=contact with fixed structure. This may be explained by the very specific function of each of these types of vessels and the nature of their work which may occasion, or may draw attention to, specific risks. For example, when thinking of tankers, the most prominent association might reasonably be the large quantities of flammable products carried and thus the consequent risk of explosion. Interestingly despite our use of this example, fire is not listed as relatively high risk aboard tankers. One possible explanation of this might be that seafarers consider that there is a high awareness of the risk of fire aboard tankers and that control measures to reduce the incidence of fire are therefore likely to be in place.

Although 'don't know' responses were generally low for each ship type, for supply vessels and high speed craft 1/5th of the sample, or more, indicated that they did not know what the most likely incident onboard that vessel would be. This suggests a low level of awareness of these vessels which perhaps derives from a lack of experience of working aboard them.

While there is a level of consensus in seafarers' responses with regard to half of the vessel types included in the survey, there is nevertheless a wide range of opinion represented as to which type of incident is the most likely to occur on each of the different types of vessel. We explore these differences more fully in the following sections to see whether they are determined by factors such as rank, work department, nationality or experience.

2.2: The effect of rank (hierarchy)

Analysis of each ship type by rank revealed that there were statistically significant differences in the way different ranks perceived the associated risks for all vessel types except for Ro/Ro's. We discuss each vessel type in turn.

2.2.1 Tankers

For tankers, over 50% of all ranks rated explosion as the incident most likely to occur. Higher percentages of shipboard personnel than managers ranked fire and explosion as more likely to occur. By contrast, managers were slightly more likely than sea staff to suggest that grounding was the most likely incident to occur on tankers.

Figure 22: Percentage by rank seeing each incident as 'likely to occur' on tankers
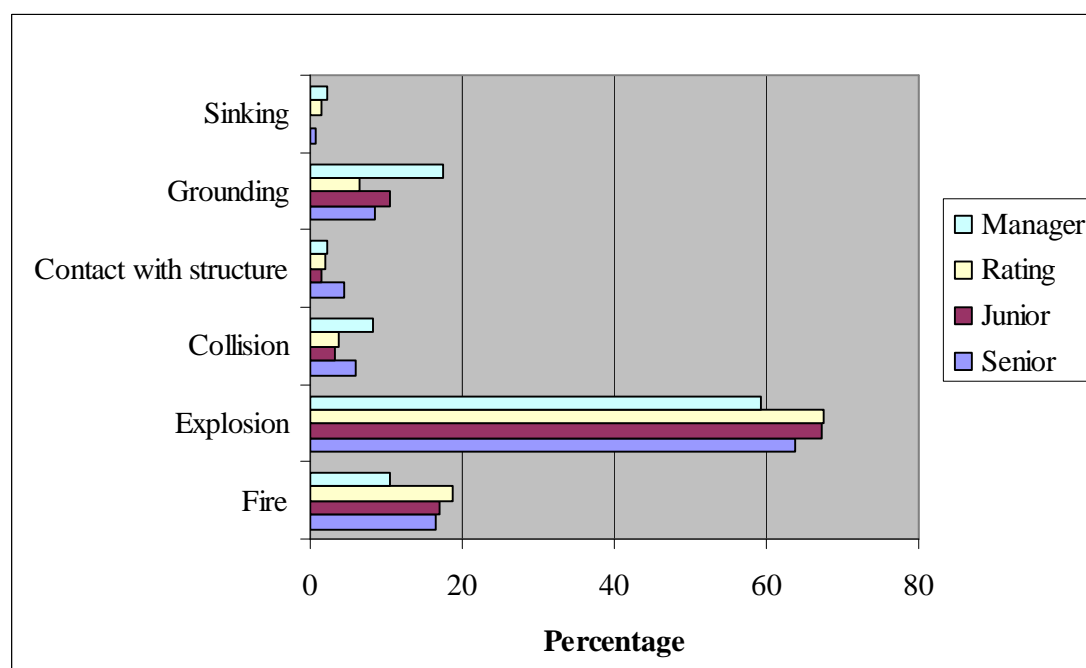
2.2.2 Bulk Carriers

Sinking, and grounding were perceived to be the main risks for bulk carriers (sinking was followed closely by grounding). There was no single event type that all ranks rated highest. Junior officers and senior officers rated sinking as most likely to occur, whereas ratings and managers ranked grounding as most likely.   Though seen as the two most likely types of incident on bulk carriers, the way the different ranks perceived these two types of incident was slightly different. There was broad

agreement between the various ranks as to the likely occurrence of grounding. By contrast, there was a greater variation in perception between ranks as to the risk of sinking.

Markedly more managers considered there to be a likelihood of collision than shipboard ranks.

Figure 23: *Percentage by rank seeing each incident as 'likely to occur' on bulk carriers*
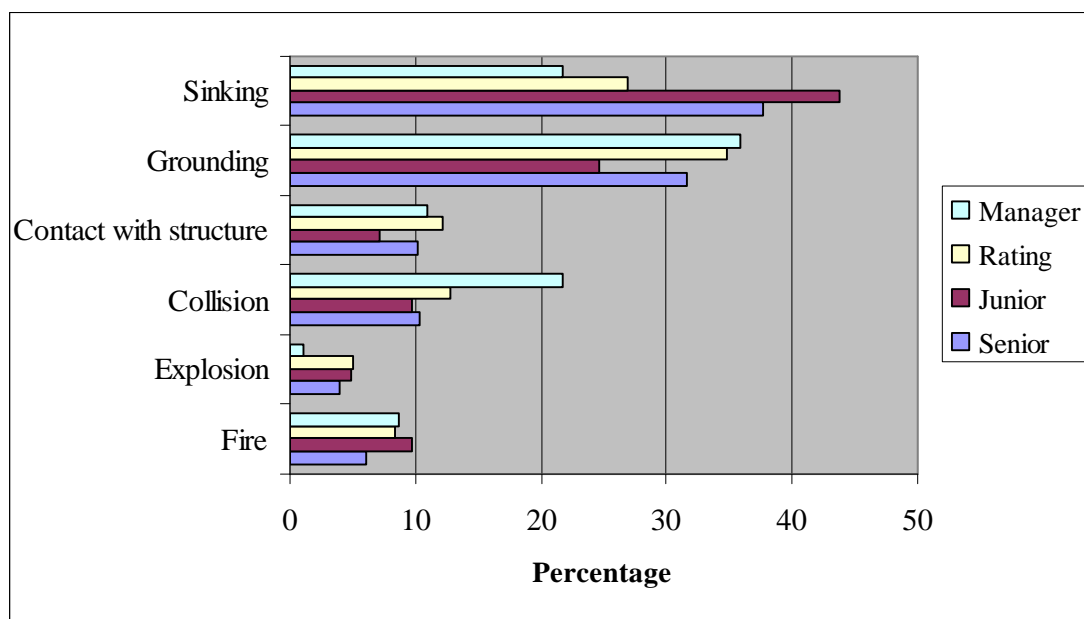
2.2.3 General Cargo

For general cargo ships no single incident was clearly identified as being the most likely to occur, although explosion was perceived as less likely to occur than other listed incidents. Different ranks identified different types of incident as the most likely to occur: managers=collision, senior officers=collision, junior officers=fire, ratings=grounding. Thus both senior officers and managers saw collision as the incident that was most likely to occur. Ratings ranked fire as less likely to happen than other groups.

Figure 24: *Percentage by rank seeing each incident as 'likely to occur' on general cargo ships*
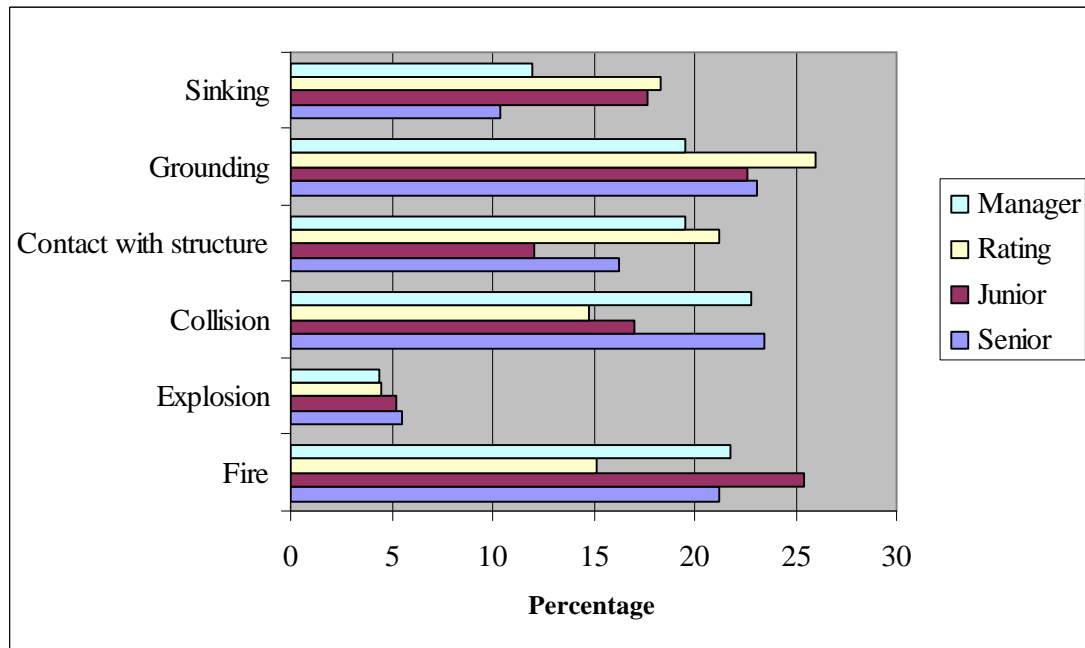
2.2.4 Ro/Ro Ships

No significant difference was found in the perceptions of different groups across the occupational hierarchy in terms of the incident most likely to occur onboard Ro/Ro's (p=.531).

For Ro/Ro ships, as with general cargo ships, no one single incident was seen by all ranks (hierarchical levels) as being most likely to occur, although 'explosion' was seen as markedly less likely to happen than other listed incidents.

Figure 25: *Percentage by rank seeing each incident as 'likely to occur' on Ro-Ro cargo ships*
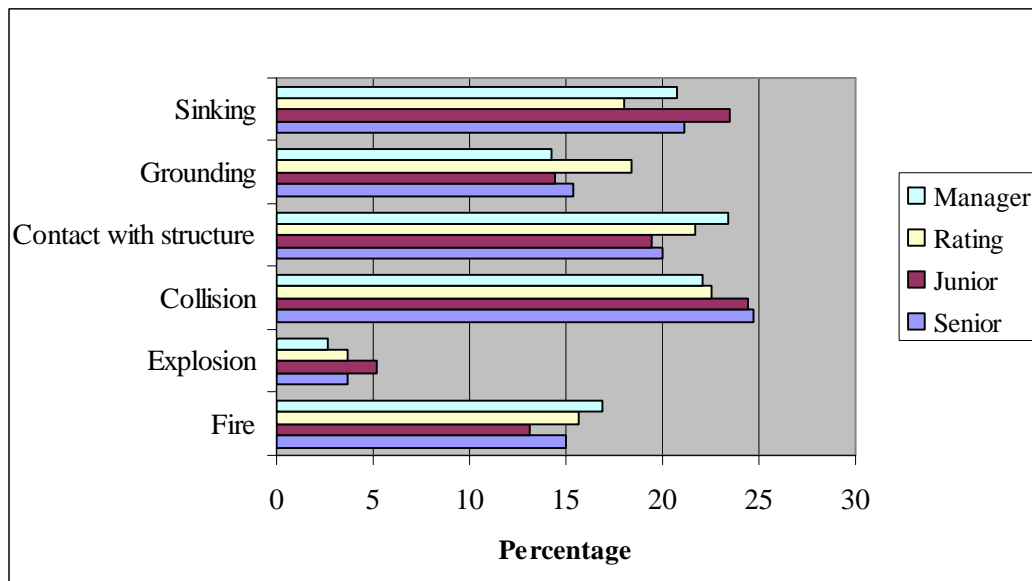
2.2.5 Passenger Ships

All ranks perceived 'fire' to be the most likely type of incident to occur on passenger ships. However, ratings (30.7%) viewed fire as less likely to occur on passenger ships than other ranks (>40%). Junior officers and ratings perceived collision to be more likely to occur than senior officers and managers.

Figure 26: *Percentage by rank seeing each incident as 'likely to occur' on passenger ships*
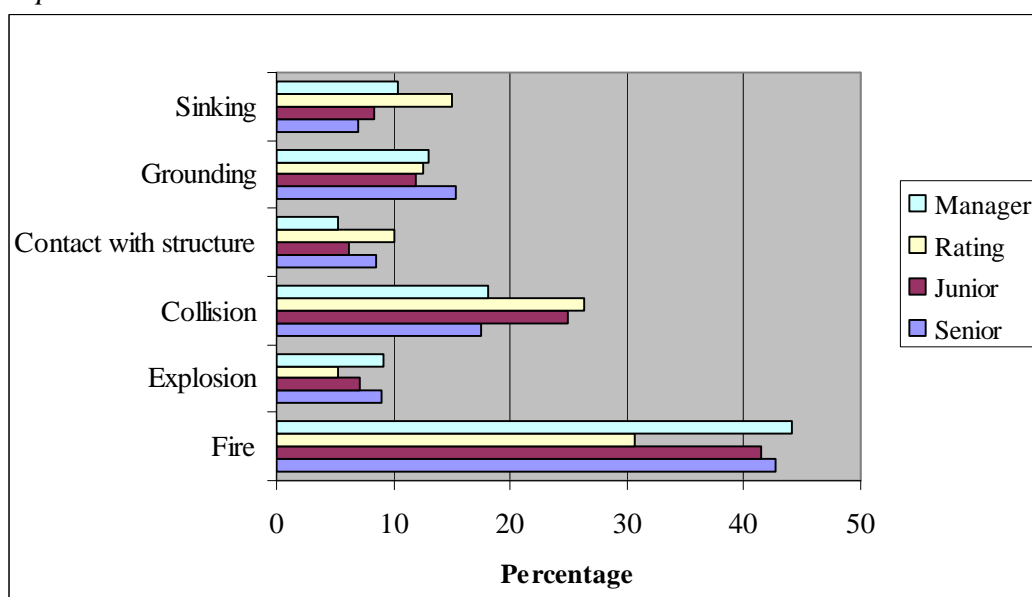
2.2.6 Container Ships

Collision and grounding were perceived to be the most likely types of listed incident to take place on containerships. Collision was seen as high risk by both officers and managers (45.0-48.8%), although not by ratings (23.6%). The reverse pattern was seen for grounding, where ratings saw this as a higher risk (43.4%) than officers and managers (23.0-33.3%).

Figure 27: *Percentage by rank seeing each incident as 'likely to occur' on container ships*
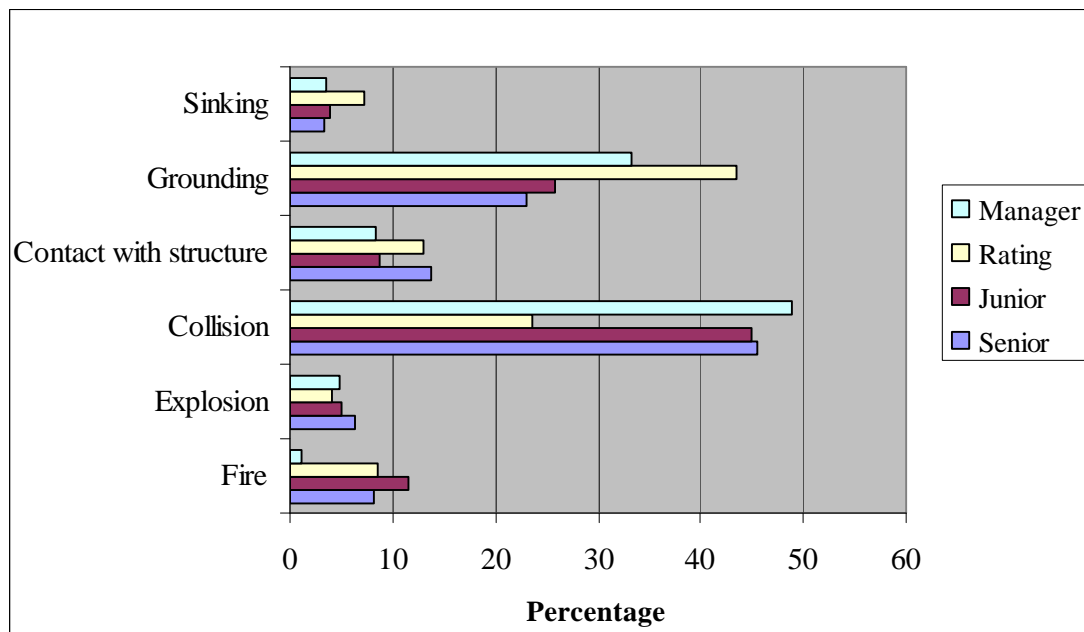
2.2.7 Supply Vessels

For supply vessels the incident that was seen as most likely to occur was 'contact with a fixed structure'. While 55.9-62.8% of officers and managers rated this as most likely, only 34.9% of ratings perceived it to be so.

Figure 28: *Percentage by rank seeing each incident as 'likely to occur' on supply vessels*
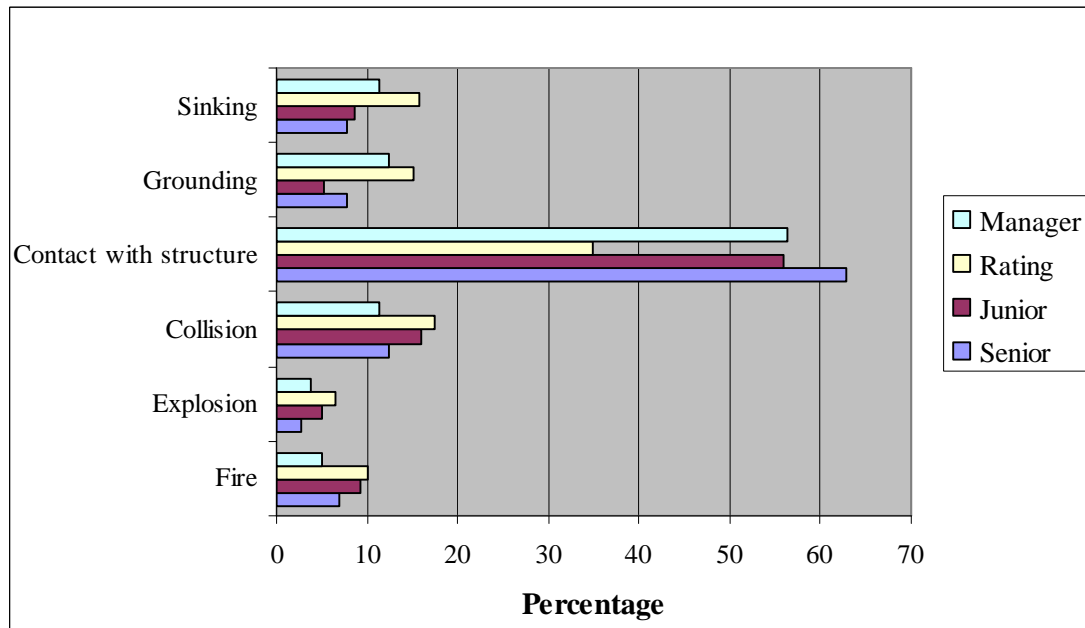
2.2.8 High Speed Craft

There was strong consensus in relation to high speed craft with 'collision' overwhelmingly (over 60%) identified, by all ranks, as the most likely type of listed incident to occur on these vessels. However there were, nevertheless, significant differences in the way different ranks saw the likelihood of the other types of incident listed. For instance, managers and ratings saw sinking as more likely than officers, while senior officers saw contact with a fixed structure as more of a risk.

Figure 29: *Perception of the most likely incident for high speed craft by rank*
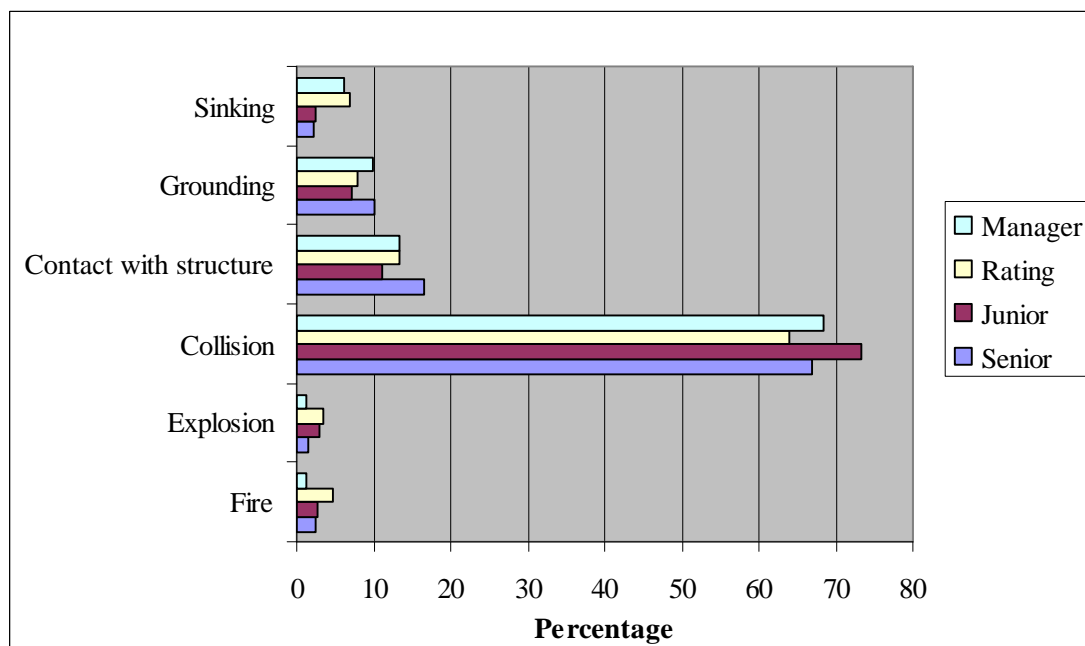
Overall, there were significant differences between the perceptions of the different hierarchical groups in relation to the listed types of incident for each type of ship. Nonetheless there tended to be broad agreement across ranks as to the most likely event to occur for each ship type. For example, in relation to passenger ships, all ranks saw fire as the most likely type of incident, but only 30.7% of ratings thought this compared with 44.2% of managers.

2.3: The effect of department

The department that respondents worked in appeared to impact upon their perceptions of risk. On all ship types, except Ro/Ro's and high speed craft, significant differences in perception across department were identified. Whilst there were no general trends that can be identified, along the lines of departmental perceptions of risk, there were specific features of note. For example, the risk of grounding tended to divide groups of workers. More shore side workers saw grounding as the most likely type of incident to take place on tankers and bulk carriers (Figure 30) than seafarers who worked onboard ships. However, shipboard personnel were more inclined to see sinking as the main risk for bulk carriers than shore side personnel (Figure 30). In relation to general cargo ships and Ro/Ro's catering and engine room personnel saw

grounding as more of a risk than shore side or deck staff. Moreover those who worked in the catering department were also slightly more inclined to see grounding as the main risk for high speed craft and supply vessels (Figure 31) than those in other departments.

Figure 30: *Perception of the most likely incident for bulk carriers by department*
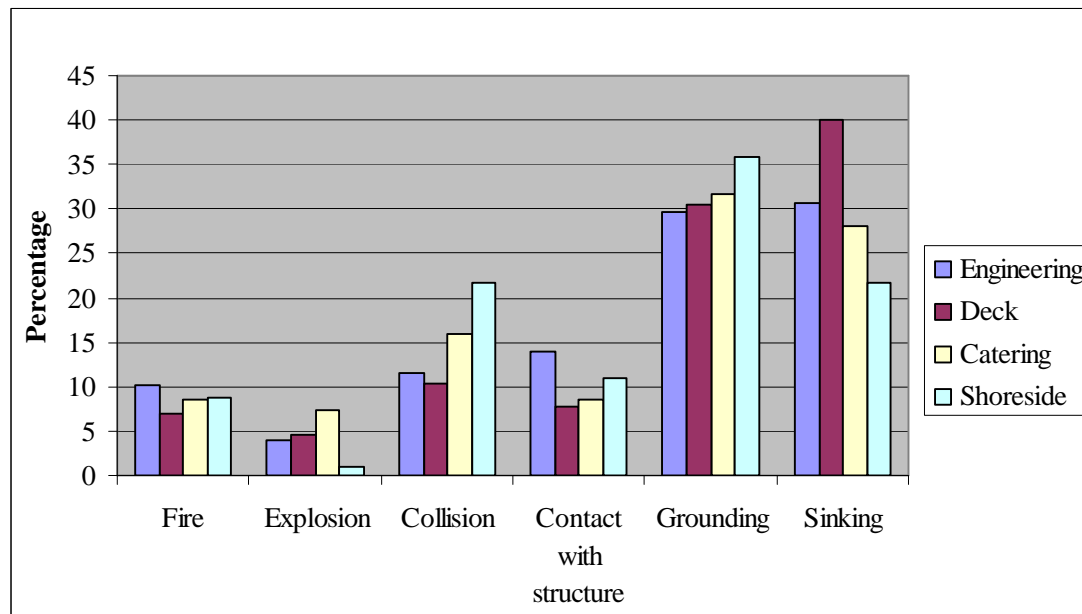
While all groups saw contact with a fixed structure as the main risk to supply vessels, those in the deck department and shore side staff most frequently held this view (Figure 31).

Figure 31: *Perception of the most likely incident for supply vessels by department*
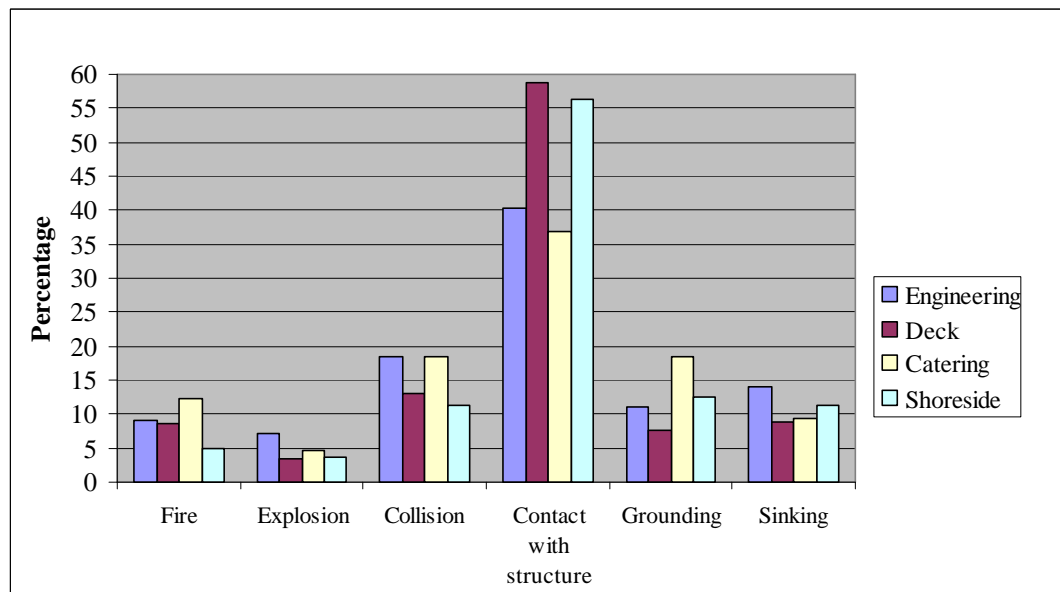
2.4: The effect of nationality

There were significant differences between the ways different nationalities perceived the various risks for each ship type (see Figure 32 for an example), but as with department there were no general trends that could be identified.

Figure 32: *Percentage of respondents that see grounding as the most likely incident for each ship type split by nationality*
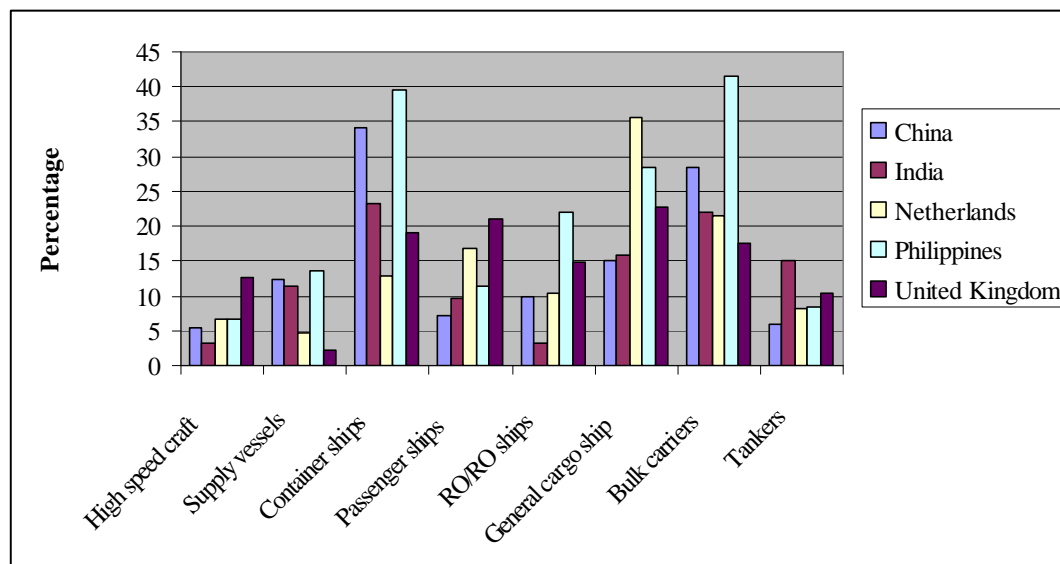
The strongest agreement amongst the different national groups was found in relation to the likelihood of explosion across different ship types (Figure 33).

Figure 33: Different national perceptions of the likelihood of explosion by ship type
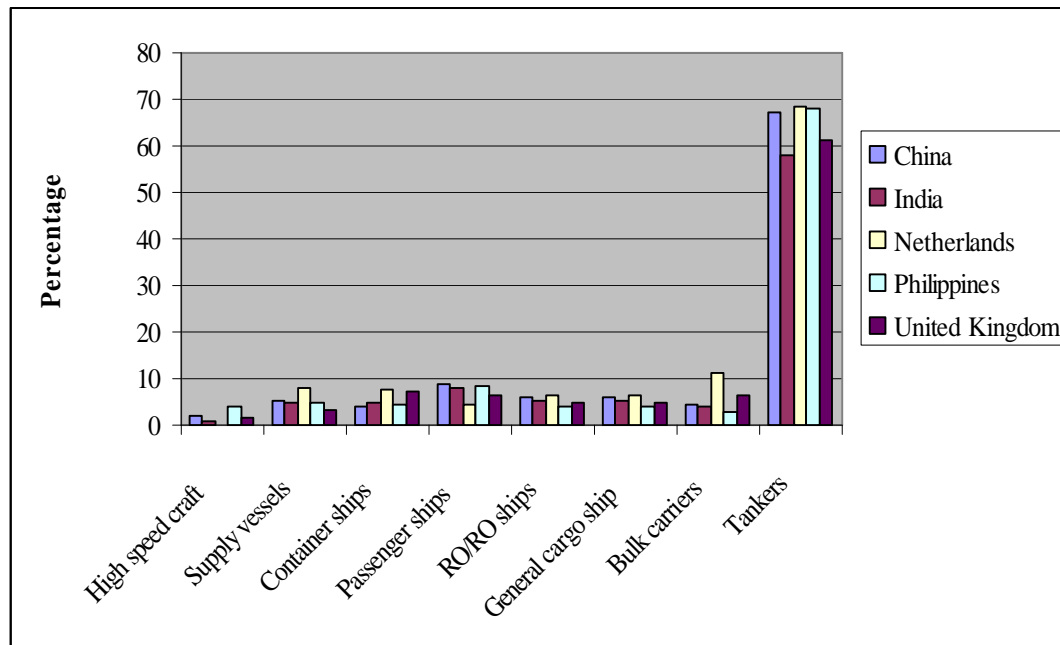
2.5: The effect of experience of types of vessel worked on

In Findings 1, we analysed the impact of respondents' most recent vessel on perceptions. However our interest was in the likelihood of an incident within their present company. In this section we are concerned with perceptions of the industry as a whole with reference to particular ship types. We thus consider responses in relation to whether respondents have experience of the specific type of vessel, or not, rather than simply their most recent vessel.

Respondents were either coded as having had experience of, or not (i.e. 'served on' or 'not served on') the type of vessel concerned[19]. These variables were then used to examine whether working experience of each of the vessel types influenced perceptions. Significant differences in response emerged between the two groups, but no discernible patterns within the responses were identified. Specific notable differences according to ship type were as Table 13.

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[19] Excluding high speed craft as these were not included in section 1.4.

Table 13*: Notable differences in terms of type of incident ranked highly by those who had served on a particular vessel type and those who had not*

Ship Type	Served on[20]	Not served on
Bulk Carriers	Sinking	Grounding
General Cargo Vessels	Contact with Structure	Fire
Ro/Ro's	Fire	Sinking
Passenger Ships	Collision	Grounding
Containerships	Collision	Fire
Supply Vessels	Sinking	Contact

If we look at the responses for bulk carriers it is perhaps surprising, given the media attention to bulk carrier losses, that those who had not worked on bulk carriers experience perceived grounding to be a greater risk than sinking. A graphical illustration of these differences for bulk carriers can be seen in Figure 34.

Figure 34*: Percentage of respondents indicating most likely type of incident to happen on bulk carriers comparing those 'who had' and 'had not' served on this type of ship*
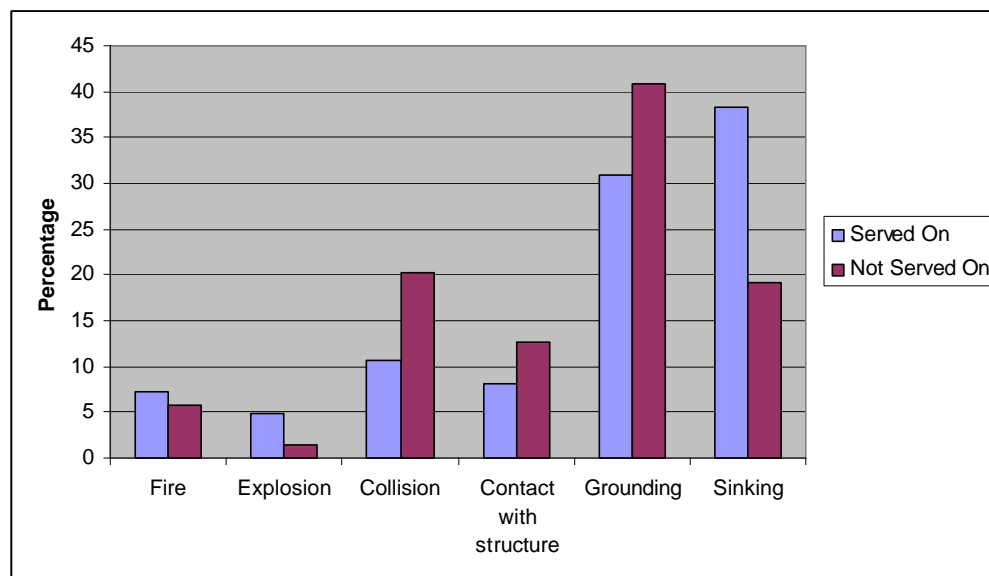
Similarly, if we look at the responses in relation to supply vessels it is interesting to note that those who had not served on this type of ship perceived the risk of *contact with a fixed structure* as higher than those who had served on them. Those with experience of this type of vessel saw the risk of *sinking* as much higher than those without experience of working on supply vessels (Figure 35).

---

[20] The incident types listed were ranked notably higher by those who had experience of this type of ship.

Figure 35: Percentage of respondents indicating most likely type of incident to happen on supply vessels comparing those 'who had' and 'had not' served on this type of ship
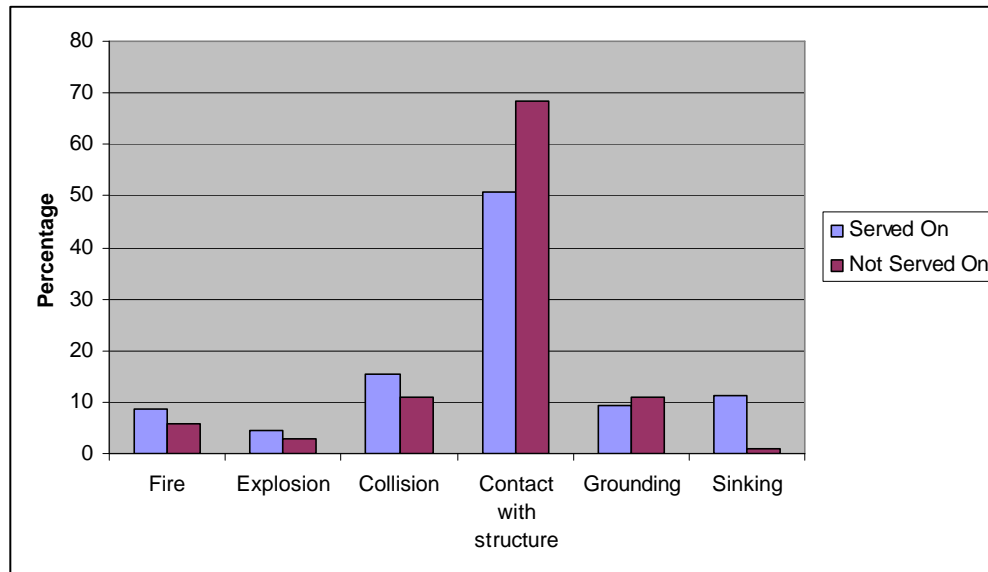
2.6: The effect of time served

In the previous section (Findings 1) we found that time spent working for a company had an effect upon perceptions of risk, but overall length of time spent working at sea was not significant. We were concerned to identify perceptions of the likelihood of ship-level incidents occurring within respondents' current or most recent companies. By contrast, this section is concerned with seafarers' and managers' perceptions of the likelihood of a ship-level incident more generally in relation to different ship types.

Interestingly, this time there were significant differences in perception of the likely occurrence of different ship level incidents, based upon the length of time respondents had worked at sea. This was the case for all of the types of vessel listed, except for tankers and high speed craft. While perceptions varied, in general there tended to be greatest differences between the perceptions of those with the least seagoing experience and those with the most experience. This is most apparent in relation to perceptions of the likelihood of an occurrence of a ship level incident aboard supply vessels (Figure 36).

Figure 36: Percentage of respondents indicating most likely type of incident to happen on 'Supply Vessels' based on years seagoing experience
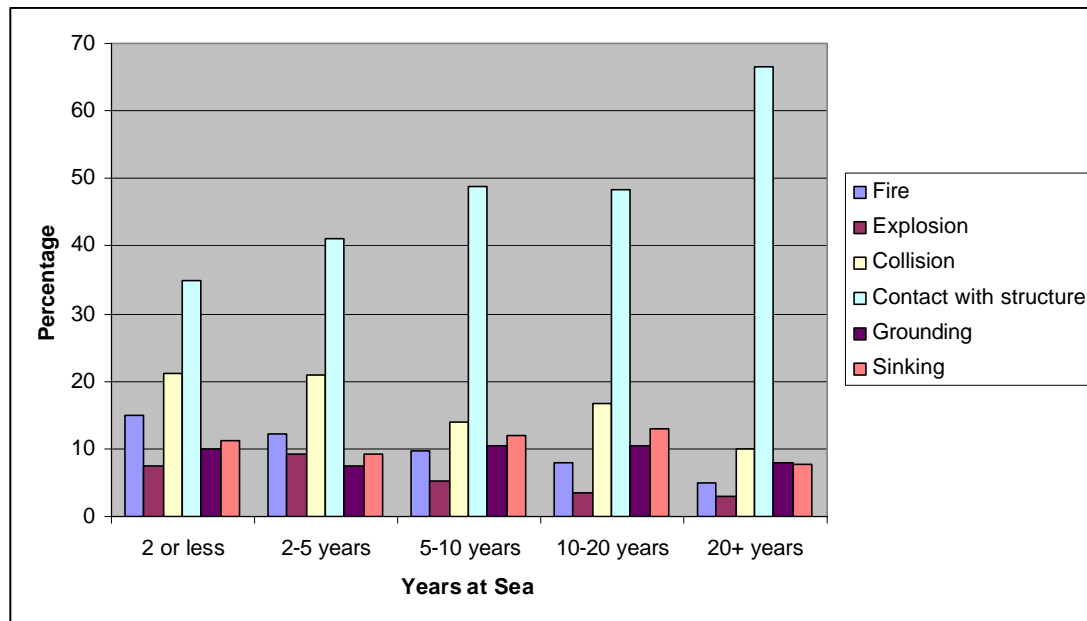
Length of time served in present/most recent company was far less significant with differences in perception only appearing in relation to three of the eight ship types, namely: general cargo ships, supply vessels and high speed craft. The only pattern in perceptions regarding these three ship types was a tendency for a change to occur around the 5-10 years experience groups. For instance, in relation to 'high speed craft' the perceived risk of collision rose with years served, peaked at 5-10 years and then declined. Similarly the perceived likelihood of *contact with a fixed structure*, initially fell then levelled out, and then began to rise again (Figure 37).

Figure 37: *Percentage of respondents indicating most likely type of incident to happen on 'High Speed Craft' based on years served in present company*
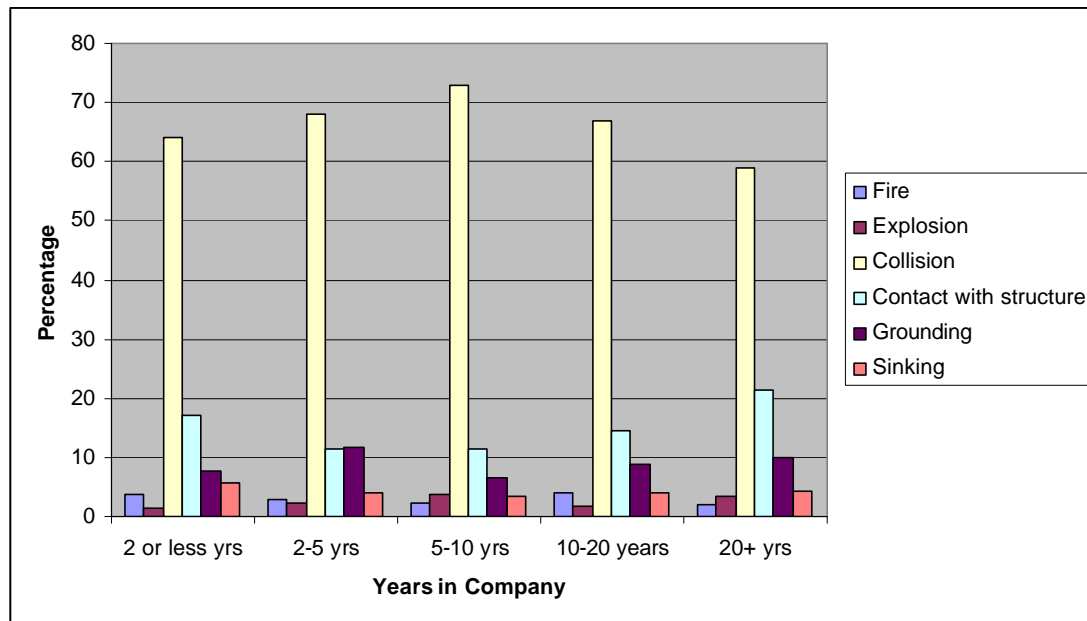
Summary of Findings 2

Respondents' perceptions of risk differed according to ship type. There was very strong agreement amongst respondents, when taken as single group, as to the specific risk for three of the listed ship types; these were: tankers=explosion, supply vessels=contact with fixed structure and high speed craft=collision.

When the data were analysed in relation to rank, work department nationality, and type of vessel worked on, significant differences were found in perceptions of risk for the different types of ship. However no general patterns of response were found.

Conclusion

In this report we have analysed the perceptions of seafarers and ship managers in relation to the likely occurrence of ship level incidents, such as fire and collision.

The findings demonstrate that the majority of seafarers and managers see the likelihood of a ship level incident occurring in their company as low. However a significant minority saw the likely occurrence of such an incident as medium or high.

This highlights the perception that the maritime work place is a dangerous environment in its own right. Moreover, certain ship types were perceived as subject to readily identifiable risks, e.g. high speed craft and collision. Whether these perceptions are correct will be discussed in a future report.

The data also suggest that there is a significant effect upon perceptions of risk of nationality, rank and most recent ship type worked on. Thus what we can see from the analysis is that a worker's background and place within an organisation do have an impact upon perception of risk. This in turn may impact upon safety-related behaviour and responses to management-led safety initiatives.

Acknowledgements

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APPENDIX 1

Study of Safety and Perceptions of Risk

Questionnaire

'Study of Safety and Perceptions of Risk'

The attached questionnaire is part of a research project being undertaken by Cardiff University. The aim is to find out what people in the maritime industry think about risk and safety. The questionnaire is designed to be answered by shipping company managers and all sea-going staff.

We would be very grateful if you could take the time to complete the questionnaire. Your answers are very important to us and may help to improve safety for people working in the maritime industry.

There are no right or wrong answers. We are interested in what **you** think.

The information you provide will be kept strictly confidential. Your answers will only be used for the research and will only be seen by the research team. You will not be identified in any way; we **do not** require your name, your company name or the name of your ship.

Your participation in the study is extremely important to us.
All responses will be strictly confidential.

Thank you for your cooperation!

Dr Nick Bailey and Mr Neil Ellis

SIRC, Cardiff University, 52 Park Place, Cardiff, CF10 3AT,

Wales, United Kingdom

Email: BaileyN3@cf.ac.uk or EllisN@cf.ac.uk

I

About You

1.1. What is your current (most recent) position onboard ship / on shore? …………………………..

1.2. How many years have you worked for your current company?   ………………….

1.3. How many years have you worked:
- At sea ? ………………………….

and / or   • In shore-side ship management? ………..

1.4. What ship types have you served on / managed?
(*Please circle the appropriate numbers*)

Gas Tanker	Chemical Tanker	Oil Tanker	Other Tanker	OBO Oil/Bulk Dry	Bulk Carrier	Self Discharge Bulk	General Cargo	Container Vessel	Reefer
1	2	3	4	5	6	7	8	9	10

Ro-Ro Cargo / Car Carrier	Passenger Ro-Ro	Passenger Cruise Ship	Other Dry Cargo	Offshore Supply	Other Offshore support	Research	Tug	Dredger	Other (Please write which type)
11	12	13	14	15	16	17	18	19	20

1.5. What ship types does your present (most recent) company operate?
(*Please circle the appropriate numbers*)

Gas Tanker	Chemical Tanker	Oil Tanker	Other Tanker	OBO Oil/Bulk Dry	Bulk Carrier	Self Discharge Bulk	General Cargo	Container Vessel	Reefer
1	2	3	4	5	6	7	8	9	10

Ro-Ro Cargo / Car Carrier	Passenger Ro-Ro	Passenger Cruise Ship	Other Dry Cargo	Offshore Supply	Other Offshore support	Research	Tug	Dredger	Other (Please write which type)
11	12	13	14	15	16	17	18	19	20

1.6. What ship type were you most recently on? (*Pick from above list of 1-20*) …………

1.7. In which country did you do most of your work related training? ……………………………..

1.8. How old are you? …………….

1.9. What is your Nationality?   …………………………..

1.10. Are you? Male (man) ☐   Female (woman) ☐

II

Think about the company you work for now / the most recent company you worked for.

In the questions below, indicate your opinion by circling one number for each item.
The numbers represent a scale of 1 to 5, where "1= Not likely at all" and "5 = extremely likely"

2. Just thinking in general terms, how likely do you think it is that someone working for your company at sea will experience the following during their sea-going career?

	Not likely at all				Extremely likely
2.1. Fire	1	2	3	4	5
2.2. Explosion	1	2	3	4	5
2.3. Collision with another ship	1	2	3	4	5
2.4. Sinking	1	2	3	4	5
2.5. Grounding	1	2	3	4	5
2.6 Contact with a fixed structure	1	2	3	4	5

3. Just thinking in general terms, how likely do you think it is that someone working for your company at sea will actually experience a personal injury caused by the following during their sea-going career?

Personal Injury caused by:	Not likely at all				Extremely likely
3.1. Contact with moving machinery	1	2	3	4	5
3.2. Being hit by moving (includes flying / falling) object	1	2	3	4	5
3.3. Being hit by moving vehicle	1	2	3	4	5
3.4. Being struck against something fixed or stationary	1	2	3	4	5
3.5. Handling, lifting or carrying	1	2	3	4	5
3.6. Slips, trips or falls on same level	1	2	3	4	5
3.7. Falls from a height	1	2	3	4	5
3.8. Trapped by something collapsing / overturning	1	2	3	4	5
3.9. Drowning / lack of oxygen / overcome by fumes	1	2	3	4	5
3.10. Exposure to, or contact with, a harmful substance	1	2	3	4	5
3.11. Exposure to fire	1	2	3	4	5
3.12. Exposure to an explosion	1	2	3	4	5
3.13. Contact with hot surfaces	1	2	3	4	5
3.14. Contact with cold surfaces	1	2	3	4	5
3.15. Contact with electricity or electrical discharge	1	2	3	4	5
3.16. Working in hot environment	1	2	3	4	5
3.17 Working in cold environment	1	2	3	4	5
3.18 Acts of violence	1	2	3	4	5

4. **Think about shipping in general**. In your opinion, which of the following incidents is *the most likely* to occur in each of the following ship types.   (*Please indicate by ticking the appropriate box.*)

Example: If you think that for Containerships the incident *most likely* to occur is 'Grounding' tick the box 'Grounding'.   You should only tick **one** box per ship type.

	Major Fire	Major Explosion / Fire	Serious Collision	Major Contact with fixed structure	Grounding	Sinking	Don't Know
	1	2	3	4	5	6	7
Containership					✓		

	Major Fire	Major Explosion / Fire	Serious Collision	Major Contact with fixed structure	Grounding	Sinking	Don't Know
	1	2	3	4	5	6	7
4.1 Tankers							
4.2 Bulk Carriers							
4.3 General Cargo ships							
4.4 RO/RO ships							
4.5 Passenger ships							
4.6 Container ships							
4.7 Supply vessels							
4.8 High speed craft							

III

5.1. In your opinion how great is the risk to a seafarer's health and safety when doing these tasks onboard any ship?

(*Please circle a number for each item on the scale of 1 to 5; where 1 = No Risk and 5 = Very Great Risk*)

	No Risk				Very Great Risk
5.1.1 Use of ladders /gangways	1	2	3	4	5
5.1.2 Rigging of gangway	1	2	3	4	5
5.1.3 Entry into enclosed space	1	2	3	4	5
5.1.4 Opening and closing hatches	1	2	3	4	5
5.1.5 Use of power tools	1	2	3	4	5
5.1.6 Welding / gas cutting	1	2	3	4	5
5.1.7 Manual-handling of heavy or awkward items	1	2	3	4	5
5.1.8 Engine maintenance at sea	1	2	3	4	5
5.1.9 Work in a confined space	1	2	3	4	5

5.2. In your opinion how great is the risk to a seafarer's health and safety during these times onboard any ship?

	No Risk				Very Great Risk
5.2.1 Rough weather	1	2	3	4	5
5.2.2 Mechanical breakdown	1	2	3	4	5
5.2.3 Crane operations	1	2	3	4	5
5.2.4 Helicopter operations	1	2	3	4	5
5.2.6 Mooring operations	1	2	3	4	5
5.2.7 Operating in piracy areas	1	2	3	4	5
5.2.8 Working over-side	1	2	3	4	5
5.2.9 Working on exposed deck	1	2	3	4	5
5.2.10 Working in vicinity of moving vehicles	1	2	3	4	5
5.2.11 Working at height	1	2	3	4	5
5.2.12 Working near open hatches / tanks	1	2	3	4	5
5.2.13 Doing unfamiliar work	1	2	3	4	5
5.2.14 Working having consumed alcohol / drugs	1	2	3	4	5

5.3.In your opinion, how great is the risk to a seafarer's health and safety due to these factors?

	No Risk				Very Great Risk
5.3.1 Navigation at night without a dedicated lookout	1	2	3	4	5
5.3.2 High numbers of alarms, for example, on the bridge / in the engine room.	1	2	3	4	5
5.3.3 New equipment	1	2	3	4	5
5.3.4 Working in the galley	1	2	3	4	5
5.3.5 Working in the engine room	1	2	3	4	5
5.3.6 Working on deck	1	2	3	4	5
5.3.7 Working in the accommodation	1	2	3	4	5
5.3.8 Working on the bridge	1	2	3	4	5
5.3.9 Working in shore-side office	1	2	3	4	5
5.3.10 Having just joined the ship	1	2	3	4	5
5.3.11 Approaching the end of the time onboard	1	2	3	4	5
5.3.12 Entering and leaving port	1	2	3	4	5
5.3.13 Navigation in restricted / congested water	1	2	3	4	5
5.3.14 Navigation in open water	1	2	3	4	5
5.3.15 Navigation near fishing vessels	1	2	3	4	5

5.4 In your opinion, what is the most dangerous thing about working at sea?

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

5.5 In your opinion, if one thing could be changed to improve safety, what would it be?

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

……………………………………………………………………

IV

6. Thinking about the company you work for now (the most recent company you worked for)

Please indicate the extent to which you agree with the following statements.
(*Tick one box per item*)

6.1 **Work Situation**	Strongly Disagree	Disagree	Nether Agree nor Disagree	Agree	Strongly Agree
Crew sizes (numbers) are too small to ensure safe work					
There is too much paper work to do onboard ship					
ISM (International Safety Management) has improved safety					
ISPS (International Ship and Port Security) Code has made ships safer					

6.2 **Rules, Procedures and Shortcuts**	Strongly Disagree	Disagree	Nether Agree nor Disagree	Agree	Strongly Agree
It is more important to get the job done than follow company procedure					
It is sometimes safer not to follow company procedure					
Company procedures exist just to protect management if something goes wrong					
It is often necessary to work more hours than can be legally recorded to get the job done					

6.3 **Leadership**	Strongly Disagree	Disagree	Nether Agree nor Disagree	Agree	Strongly Agree
Shore-side management actively promote safety					
It is the responsibility of each individual to lookout for their own safety					
The shore-side management style is the most important influence on safety					
The Captain / Chief Engineer's management style is the most important influence on safety					
The attitude of the Bosun and other Petty Officers (supervisors) is the most important influence on safety					

6.4 **Management Commitment**	Strongly Disagree	Disagree	Nether Agree nor Disagree	Agree	Strongly Agree
Shore-side management put safety before profit					
Company policies and practices prevent the ship's officers from managing onboard safety effectively					
Shore-side management are aware that it is sometimes necessary to take shortcuts and break rules					

6.5 **Information and Communication**	Strongly Disagree	Disagree	Nether Agree nor Disagree	Agree	Strongly Agree
Ship's staff are well informed about the risks relating to their job					
Shore-side managers respond positively to suggestions from ship's staff					
Senior officers listen to what the rest of the crew have to say about safety					
Near-miss reporting is encouraged and used constructively to promote safety					

6.6 **Training**	Strongly Disagree	Disagree	Nether Agree nor Disagree	Agree	Strongly Agree
My company provides the training necessary for seafarers to work safely					
Different nationalities have different standards of training					
When a new piece of equipment is put onboard ship the staff receive the proper training to operate it					

6.7 **Perceptions and Attitude**	Strongly Disagree	Disagree	Nether Agree nor Disagree	Agree	Strongly Agree
I do not fully understand the purpose of ISM (International Safety Management)					
There are too many external rules and regulations on ships					
I do not always understand instructions					
Other ships do not follow the regulations					

6.8 **Equipment and Maintenance**	Strongly Disagree	Disagree	Nether Agree nor Disagree	Agree	Strongly Agree
The maintenance of safety equipment gets neglected					
Safety equipment gets locked-up and is difficult to get to in an emergency					
The safety equipment and PPE (Personal Protective Equipment) onboard ship is often unsuiTable or inadequate					
Wearing PPE (Personal Protective Equipment) sometimes interferes with doing the job					

6.9 **Well-being**	Strongly Disagree	Disagree	Nether Agree nor Disagree	Agree	Strongly Agree
In my opinion, the food quality, quantity and variety onboard are adequate for a seafarers health and well-being					
In my opinion the recreation facilities onboard are adequate for a seafarers' health and well-being					
The amount of shore leave is currently inadequate to maintain seafarer wellbeing					
Seafarers have adequate opportunities to discuss emotional problems aboard ship					
Seafarers have adequate access to means of communication with home (e.g. phone, internet, etc.)					
Seafarers are often unable to get adequate sleep when onboard ship					

6.10 **Satisfaction**	Strongly Disagree	Disagree	Nether Agree nor Disagree	Agree	Strongly Agree
I do not worry about safety on a day to day basis					
I am satisfied with safety in my company					
If I raise problems I fear I will lose my job					

V

*[**A major injury** is a broken bone, loss of limb or part of limb, dislocations, loss of sight (whether temporary or permanent); or any injury leading to hypothermia, unconsciousness, or requiring resuscitation or a stay in hospital for more than 24 hours, or if at sea confinement to bed for more than 24 hours.]*

7.1 How many **major injuries** have you had in the last 2 years?   ……………

7.2 How many major injuries (to you) have you reported to the company in the last 2 years? …..........

*[**A serious injury** is any injury that is not a major injury but results in incapacity for more than 3 consecutive days or results in the person being put ashore and left behind when the ship sails, e.g. a sprained wrist or ankle, a deep cut, a burn, a crushed finger or toe, etc.]*

7.3 How many **serious injuries** have you had in the last 2 years? ………………

7.4 How many serious injuries (to you) have you reported to the company in the last 2 years? ...………

*[A **minor injury** is any injury that is not a major or serious injury, e.g. a bruise, a scratch or a cut, a pulled muscle, a particle in the eye, a small burn, etc.]*

7.5 How many **minor injuries** have you had in the last 2 years? ……………………….……

7.6 How many minor injuries (to you) have you reported in the last 2 years? …………………..

*[A **dangerous occurrence** is any event that nearly resulted in injury, e.g. a wire or rope breaking a falling object landing nearby, nearly slipping or falling, nearly getting burned, nearly running aground, etc.]*

7.7 How many **near-misses** (dangerous occurrences) have you had in the last 2 years? ……....

7.8 How many near-misses (dangerous occurrences), involving you, have you reported in the last 2 years? ......

We very much appreciate that you took the time to complete this questionnaire. Your answers will be very helpful to us.

If you are in training centre, please return your completed questionnaire to the course lecturer or instructor.

If you are onboard ship, please place the completed questionnaire in the envelope provided and seal it. You can either post it directly back to us or give it to your captain to post.   (You do not need to add a stamp, postage is free)

Thank You!

APPENDIX 2

Sample Distribution: Number and Frequency

of Respondents by Nationality

Sample Distribution: Number and Frequency of Respondents by Nationality.

	Frequency	Percent	Cumulative Percent
Philippines	909	39.0	39.0
United Kingdom	402	17.2	56.2
China	391	16.8	73.0
India	180	7.7	80.7
Netherlands	89	3.8	84.5
Indonesia	40	1.7	86.2
Singapore	38	1.6	87.8
Ukraine	31	1.3	89.2
Poland	25	1.1	90.2
Bangladesh	22	0.9	91.2
Norway	19	0.8	92.0
Spain	19	0.8	92.8
Pakistan	15	0.6	93.4
Canada	14	0.6	94.0
Burma/ Myanmar	14	0.6	94.6
Italy	12	0.5	95.2
Australia	11	0.5	95.6
Croatia	10	0.4	96.1
Ireland	10	0.4	96.5
Malaysia	8	0.3	96.8
New Zealand	8	0.3	97.2
Greece	7	0.3	97.5
Thailand	7	0.3	97.8
Egypt	5	0.2	98.0
Russian	5	0.2	98.2
Bulgaria	4	0.2	98.4
Nigeria	4	0.2	98.5
South Africa	4	0.2	98.7
Denmark	3	0.1	98.8
France	2	0.1	98.9
Ghana	2	0.1	99.0
Kenya	2	0.1	99.1
Kuwait	2	0.1	99.2
Sri Lanka	2	0.1	99.3
Turkey	2	0.1	99.4
Afghanistan	1	0.0	99.4
Cuba	1	0.0	99.4
Fiji	1	0.0	99.5
Germany	1	0.0	99.5

Iran	1	0.0	99.6
Lithuania	1	0.0	99.6
Mexico	1	0.0	99.7
Peru	1	0.0	99.7
Portugal	1	0.0	99.7
Romania	1	0.0	99.8
Saudi Arabia	1	0.0	99.8
Trinidad and Tobago	1	0.0	99.9
United Arab Emirates	1	0.0	99.9
Tanzania	1	0.0	100.0
Yugoslavia	1	0.0	100.0
Total	2333	100.0	----

APPENDIX 3

Database Variable List

Ship casualty
    1   Collision
    2   Sinking/flooding
    3   Fire
    4   Fire/explosion
    5   Grounding
    6   Multiple

Current (most recent) position - Recoded
    1.00   Senior
    2.00   Junior
    3.00   Ratings
    4.00   Managers

Department
    Missing Values: -999.00, 6.00, 3.00

    3.00   M Deck / Engineering
    6.00   M Other
    9.00   M missing
    1.00   Engineering
    2.00   Deck
    4.00   Catering
    5.00   Shore side

How many years have you worked for your current company?
    Missing Values: -999.00, 1.00

    -999.00   M missing data
    1.00   M None
    2.00   2 or less   less than 2
    3.00   2-5 years   2 - 4.999999
    4.00   5-10 years   5 - 9.999999
    5.00   10-20 years   10 - 19.9999
    6.00   20+ years   20+

How many years have you worked at sea?
    Missing Values: -999.00, 1.00

    -999.00   M missing data
    1.00   M None
    2.00   2 or less   less than 2
    3.00   2-5 years   2 - 4.999999
    4.00   5-10 years   5 - 9.999999
    5.00   10-20 years   10 - 19.9999
    6.00   20+ years   20+

How many years have you worked in shore-side shipping management?
Missing Values: -999.00, 1.00

-999.00	M missing data	
1.00	M None	
2.00	2 or less	less than 2
3.00	2-5 years	2 - 4.999999
4.00	5-10 years	5 - 9.999999
5.00	10-20 years	10+

What ship type were you most recently on
Missing Values: -999

Value	Label
-999	M missing data
1	Gas Tanker
2	Chemical Tanker
3	Oil Tanker
4	Other Tanker
5	OBO Oil/ Bulk Dry
6	Bulk Carrier
7	Self Discharge Cargo
8	General Cargo
9	Container Vessel
10	Reefer
11	Ro-Ro Cargo
12	Passenger Ro-Ro
13	Passenger Cruise Ship
14	Other Dry Cargo
15	Offshore Supply
16	Other Offshore Support
17	Research
18	Tug
19	Dredger
20	Other

Recoded Variable: What ship type were you most recently on (GROUPED)
Missing Values: -999.00, 6.00

Value	Label	Includes
-999	M Missing data	missing data
1	Tankers	Gas Tanker
		Chemical Tanker
		Oil Tanker
		Other Tanker
2	Bulk Carriers	OBO Oil/ Bulk Dry
		Bulk Carrier
		Self Discharge Cargo
		Dredger
3	Dry Cargo (Non Bulk)	General Cargo
		Container Vessel
		Reefer
		Ro-Ro Cargo

		Other Dry Cargo
4	Passenger	Passenger Ro-Ro
		Passenger Cruise Ship
5	Working Vessels	Offshore Supply
		Other Offshore Support
		Research
		Tug
6	M Other	Other

Age (Re-coded)
Missing Values: -999.00

Value	Label
-999.00	M Missing data
1.00	less than 25 years	25 or less
2.00	25-35 years	26-35
3.00	35-45 years	36-45
4.00	45-55 years	46-55
5.00	Over 55 years	56+

Likely to Experience: Q1-Q6
Missing Values: -999

-999	M Missing data
1	Not Likely
2	Likely

Likely to Experience: Q1-Q6
Missing Values: -999

Value	Label
-999	M Missing data
1	Low
2	Med
3	High

Greatest Risk: ALL SHIP TYPES
Missing Values: -999, 7

Value	Label
-999	M missing data
1	Fire
2	Explosion
3	Collision
4	Contact with structure
5	Grounding
6	Sinking
7	M Don't know