SAFETY AND PERCEPTIONS OF RISK

Mr Neil Ellis[1]
Lloyd's Register Research Unit[2]

INTRODUCTION

Improving health and safety is a key concern for many industries. Historically, attempts to improve safety and reduce accidents have focused on technical solutions, such as automation (Weick*., et al*, 1999; Flin *et al.*, 2000; Cox and Cheyne, 2000). For example, in the aviation industry, the introduction of air traffic control systems have helped to reduced collisions between aircraft. However, although these technical solutions have met with significant success, what such attempts frequently ignore is the effect that individuals and organisations may have upon safety (Cox and Cheyne, 2000). As a result, it is suggested that, 'future improvements may best be realised through enhanced efforts in the area of human factors, and through the associated development of health and safety culture' (Cross Industry Safety Leadership Forum, 1997). There is much discussion over what constitutes a safety culture. A broadly accepted definition developed by the Advisory Committee on the Safety of Nuclear Installations (ACSNI, 1993) is:

> "The safety culture of an organisation is the product of individual and group values, attitudes, perceptions, competencies and patterns of behaviour that determine the commitment to, and the style and proficiency of, an organisation's health and safety management"

Other organisations have chosen to extended and clarify this definition (see for example, National Patient Safety Agency, 2004)

Although the concept of safety culture is universally understood, different researchers have utilised a range of measures to assess the strength of safety culture across a

[1] Please note, the opinions presented within this paper represent those of the author, and not of Lloyd's Register.
[2] The Lloyd's Register Research Unit is comprised of Dr Helen Sampson, Professor David Walters, and Dr. Nick Bailey, who as co-researcher participated fully in the collection of data for this study.

variety of industries. Most commonly these have been found to focus upon an organisation's management style, safety systems, awareness of risk, competence, and work pressure (Flin *et al.*, 2000). Whilst it may be argued that there are a range of common practices that assist in the establishment of safety cultures across economic sectors, as indicated in Flin *et al.'s* (2000) study, there are also industry specific issues that need to be taken into account. Like other sectors, the context of the shipping industry is a very specific one which is likely to have significant implications for the establishment of organisational safety cultures. There is therefore a need for specific research in the maritime sector.

What are the benefits of a 'positive' safety culture? Research has indicated a number of links between safety culture and accidents (Mearns *et al.,* 2001; Rundomo, 1994; Lawton and Parker, 1998). For example, Rundomo (1994) found that there was a correlation between frequency of accidents and 'cultural factors' such as safety attitudes, satisfaction with safety measures, and employees' commitments to safety (Rundomo, 1994). However it is not simply 'poor' safety culture which increases the probability of accidents. Commitment to a safety culture may vary across a company (Harvey *et al.*, 2002; Clarke, 1999), and such fluctuations may have important implications for safety and accident rates. It is suggested that such variations in 'culture' can produce poor co-operation, antipathy and miscommunication' (Clarke, 1999; Harvey, Bolam, and Gregory, 2000). This may be especially pertinent within the maritime industry, as those onboard vessels are physically removed from their managers, and it has been shown in other industries that managers play a critical role in the formation of attitudes and behaviour towards safety (Clarke, 1999). However, the existence of sub-cultures, or differing safety cultures within an organisation, do not always have negative implications for safety; especially if these differences are both recognised and accurately perceived (Clarke, 1999).

This paper describes the first phase of a large-scale study of safety culture in the maritime industry. It outlines the main findings from a number of focus groups and interviews which assessed what those working both onshore and onboard vessels are most concerned about in terms of safety. Differences in their concerns will also be tentatively discussed.

METHOD

In order to examine the main safety concerns of those working in the maritime industry a combination of focus groups and interviews were conducted. These were conducted using interview guides, covering key safety-related topics. Two versions of this guide were used, one for those working onboard vessels, and one for managers (see table 1 for an overview of the topics covered).

Table 1: Topics covered in the focus groups/ interviews with onboard personnel and managers.

Onboard personnel	**Managers**
1. Why did you go to sea? 2. Was your experience of being at sea different to your expectations? 3. Did you have any concerns before you went to sea? 4. What are your daily activities at sea? 5. What are the risks relating to your job? 6. What are the risks of being at sea? 7. Are there any ship type specific risks? 8. Do you have control over these risk? 9. Are there any major risks at sea, in general, which are not being addressed?	1. Background in the maritime industry? 2. Questions abut the organis ation and its structure? 3. Who is responsible for safety? 4. How the company operates? 5. What is management's role in safety? 6. Questions about the general issues facing the industry 7. Questions about the introduction of legislation such as ISM and ISPS 8. How safety is managed in the company? 9. Operating priorities? 10. What are the main risks to the companies vessels? 11. What are the risks to the seafarer? 12. What steps are the company taking to reduce risk?

Participants were recruited with help from a number of organisations including shipping companies, management companies, UK maritime colleges, maritime colleges in the Philippines and in Singapore. Using these sources ten focus groups were conducted with: managers from four shipping companies; a group of engineers; two groups of deck officers; a group of cadets; a group of ratings; and a mixed group of officers. Two individual interviews were also conducted, with a captain, and a chief engineer.

FINDINGS

The focus groups and interviews identified a number of key safety concerns for those working within the industry. Throughout this paper verbatim quotes are used to illustrate these.

One of the most frequently raised concerns in relation to safety was that of high workloads. This related to a number of issues, such as high levels of paper-work, the number of roles seafarers were having to take on and the long hours they were working.

Paperwork is becoming an increasingly central part of a seafarer's job. It may take various forms such as the completion of checklists, communications with shore based managers, and activities associated with risk assessment. This situation has been exacerbated by the introduction of new legislation and the introduction of new electronic forms of communication such as email. When discussing paperwork participants referred to several different types of activity, and included such things as: risk assessments, completing checklists and answering queries from the office. Moreover such activity was often viewed as superfluous, as one Chief Engineer reported:

> "You used to be able to work and do the same job a few years ago without having to fill all the paper-work out, and you had a good idea of the hazards that were involved. When the paper-work wasn't there you would still do the job and take the safety precautions, but you didn't have to go through a checklist" (Chief Engineer)

A similar sentiment was expressed by this Deck Officer:

> "In the past you could probably just get on with your job, but now you have got all this extra paperwork to tell you how to do your job, and then you have to sort of sign to say you have done these things. So it is a lot more paperwork a lot more extra burden" (Deck Officer)

Increased levels of paper-work were said to not only add to the amount of work of those onboard, but many suggested it actually prevented them from doing what they saw as their 'real' job. This view is illustrated by the following comment from a captain, who talked about having to finish routine paper-work instead of being on the bridge as his vessel approached a port:

> "The guy will come in and say, 'excuse me sir we are 3 minutes from [the pilot station]' and you say, 'Yeah, OK, thanks'. Then he will pop in and say, 'We're at A1', and you will go, 'OK, just a second, I'm on my way', but you aren't, you are finishing the wretched paperwork" (Captain)

In this example the captain felt that he should have been on the bridge but he found that instead, he was bogged down with paperwork. The safety implications of this are self-evident, and the captain himself was uncomfortable with the situation.

Other seafarers reported dealing differently with extra paper-work. For example, one cadet talked about having to spend extra time every week on top of his working hours in order to complete all his required paperwork. He told us that:

> "You could sit there for hours crossing stupid little boxes. There is no need for it. They are asking that you only do certain hours a week, but then your spend another 2 hours a week filling in the forms" (Cadet)

This example illustrates the danger that additional paper-work may lead to longer working hours with implications for fatigue, and increased risk of fatigue-related incidents.

Our evidence suggests that the issue of increased workloads is recognised by onshore managers. As with those working onboard, managers frequently associate increased

workloads with increased amounts of paperwork. Managers were concerned with the work required of captains as the following quote illustrates:

> "Yeah, because they [the master] must be completely bogged down with paper-work sometimes. I mean they can't get on with their proper job" (Managers)

However they were also concerned with the workloads of seafarers across all ranks. One told us that:

> "[Due to ISPS] men are being taken away from what seamen are supposed to be doing on the ships, so the ships going to suffer" (Managers)

What these examples appear to illustrate is that there is a shared perception among a number of the participants that seafarers undertake certain tasks which are seen to constitute their 'proper job' and which are essential and relevant to seafaring. By contrast, doing paperwork is perceived to conflict with the performance of these tasks. Such perceptions may lead to frustration and a sense of disaffection which in turn could feasibly undermine attempts to develop a positive safety culture.

Research shows that in other industries the role of management in promoting a positive safety culture is central. However, ship managers often reported that, while they appreciated the challenges posed to sea staff, they felt unable to effectively address the problem. Reasons cited included the fact that putting extra crew on board was financially prohibitive. This finding will be discussed in more detail later.

Many of the comments about workload also related to the number of tasks and roles those onboard were expected to carry out, which were, in turn, frequently attributed to the implementation of legislation, such as the International Ship and Port Security (ISPS) Code. The ISPS code requires that vessels must carry out drills and have documented plans with regard to security. As part of these plans, onboard personnel are designated certain roles (e.g. security officer). The ship's security officer is expected to oversee the implementation of the security plan, for example making sure, whilst in port, that access to the vessel is controlled. It was reported that this generally entailed having someone stationed at the gangway at all times. Such requirements were perceived as placing additional, and unreasonable, demands on those onboard:

> "It impossible, there is no time to do it all, there are two many drill, legislation, the burdens there, you could lay the ship up….You could spend a week in three doing it all couldn't you" (Managers)

A number of seafarers reported that because of the demands upon their time they felt that the only way they could cope was to complete paperwork without having undertaken associated tasks. This was reported to be particularly the case where activities were supposed to be done on a regular basis. Instead seafarers told us that checklists were simply being completed to say that the task had been undertaken. The following example is illustrative:

> "14 drills it's impossible. OK we are doing it, but by paper. If any comes they say OK everybody's signature - there and there, put one stack of paper, sign, sign, this paper, seven people sign. Signing, people have no choice. We have to follow the regulation, but practically it's not possible" (Deck officer)

Reports of such behaviour were not just restricted to drills, but also referred to the completion of checklists to say maintenance had been done when it had not.

A positive safety culture requires a commitment to safety from all members of an organisation, where they accept safety as part of their daily job, and adhere to safety protocols. The reports of behaviour presented here, however, seem to suggest that the perceptions of those onboard, as to the contribution of certain tasks to organisational safety, are at odds with those who designed the procedures. As such this would seem to be indicative of a weak safety culture aboard some vessels.

A side effect of heavy workloads is that those onboard have to work long hours, which often leads to a lack of sleep and rest, ultimately culminating in fatigue. The following comments illustrate the number of hours crews are regularly required to work, and how this may lead to tiredness and fatigue, and potentially dangerous situations:

> "I work about 14-15 hours a day, so by about a week into the start of your second week I know I start to make mistakes because I am practically falling asleep" (Deck Officer)

> "I've seen situations onboard where as well as watching out for your own personal safety I'm watching everybody else's as well. It's not their fault its just they've been so overworked and they get to a stage when they're just so tired they're a danger" (Cadet)

The outcome of such long working hours is frequently fatigue, and there are many cases, such as the collision between the *Hoo Robin* and the *Arklow Marsh*, in which fatigue, due to high workload was seen to be the key factor in the incident.

In an attempt to reduce long working hours, seafarers may take shortcuts which compromise safety in order to complete certain tasks more quickly. This is illustrated by the following example in which a deck officer admits taking short cuts so that he can get off duty quicker:

> "I think that the majority of accidents happening due lack of rest. I mean I know that if I have been doing some jobs I take shortcuts because I know when the jobs finished I will get to my bed." (Deck officer)

High workloads often mean that crews work hours in excess of what can be legally worked or recorded. This may lead to falsification of documentation in order to comply with working hours legislation. This is graphically illustrated by the following examples:

> "The captain gets the worse of everything because he has to be up taking the ship in, then he has all the shore side authorities to deal with, and for him to do 8 hours on, 16 hours off, or at least to have a 8 hour break in a 24 hour period is pretty impossible, but you're not allowed to put that down" (Chief Engineer)

> "Because of the ISM system and everything sadly the documentation that we do on ships is very well, but everyone knows that documentation is also fudged – hours of rest he has to be so many hours a day, but if you work 20 hours a day …. no one is going to allow you to do that" (Deck officer)

Fatigue not only has an impact on the safe operation of the vessel but may also affect the well being of seafarers in other less dramatic ways, producing, for example,

reduced sociability and poor self esteem. So why do seafarers fail to report excessive working hours? A simple explanation may be fears about contract renewal. This may lead seafarers to work long hours, undertake large amounts of paper-work, and undertake tasks which are not part of their job. Such concerns were indicated by many of those in the focus groups, for example a deck officer reported that:

> "If you say no I cannot do it and tell them its not my job and you show them in the black and white again you are scared … about what will happen" (Deck Officer)

> "Even the duty officer if he says I cannot do it, the company will within 24 hrs say Ok I will find somebody who can do it. So whatever the crisis you have to just bend and take what's going on, there's nothing you can do about it" (Deck Officer)

Not only may fears about contract renewal lead to seafarers working long hours, which may ultimately culminate in fatigue, but they may also mean that companies do not actually get made aware of these long hours, and thus management may not recognise the need to address them. Of particular significance in terms of safety culture, is the impact of routinely falsifying safety related documentation. Such practices inevitably erode commitment to safety practices and to safety culture.

Another safety concern frequently reported by both managers and seafarers was associated with a reduction in crew size. Regulation requires that a ship has a minimum number of crew aboard. These minimum levels are outlined in a vessel's safe manning document, which all vessels are required to have. Specific crewing levels are agreed between ships operators and maritime administrations (i.e. for the UK this is the Maritime and Coastguard Agency). As a result there are often significant variations between the safe manning levels of similar vessels under different flags.

Despite the introduction of 'safe manning certificates' it was frequently reported that there were not enough crew onboard to cope with high work loads. This perception is illustrated by the following quotes from both a rating and a captain:

> "Unfortunately we don't have enough people to cover on the deck to allow breaks, so, when you are working everybody is working. And it is no different in my company as it is in other companies" (Captain)

> "Its no good the guy saying well if the master knew he was tired he should get someone else to do it, you are getting to the stage where there isn't anyone else" (Captain)

Although some mangers put additional crew onboard their vessels (over and above that specified by the 'safe manning certificate'), many do not. Some managers reported that they were not able to allocate more crew to a vessel, due to financial constraints imposed by owners who were unwilling to pay extra wages. However, many vessel managers indicated that they would prefer to have more crew onboard their vessels.

In the context of short-staffing new regulation was often unwelcome aboard and onshore. As a result the safety benefits of regulation were often over looked and new regulation was thus at risk of being paid lip service rather than being wholeheartedly incorporated into work practices. One manager told us:

> "I've got a pet peeve, which is a lack of bodies onboard, specially now with ISPS coming, and all the additional demands on the crew, which are being forced upon them by people from shore side. It's just putting extra strain" (Manager)

Whilst a deck officer took an alternative view emphasising the need for companies to crew vessels properly so that beneficial regulation could be effectively implemented:

> "It is really good the ISM the STCW 95, the ISPS everything good, but there is no doubt about it, but then at the same time the companies like they should realise how much workload or the work pressure there is on the people working onboard, you know with such short manning and day by day it is getting bad." (Deck Officer)

There was evidence to suggest that the practical aspects of new legislation were not yet being taken into account by many ship owners and operators. For example, as discussed earlier, a practical outcome of ISPS legislation is the need, when a vessel is in port, for there to be someone on the gangway at all times. However in many cases seafarers told us that there were simply not enough crew members on their vessels for

this to happen. This lack of crew for tasks relating to legislation was recognised by both managers and those onboard. The recognition was not limited to seafarers alone as the following quote illustrates:

> "this thing ISPS came in a few months back …… now one person is fully blocked whenever the ship is alongside because of the gangway watches. Companies knew this, ships staff knew it, but the company is not providing any extra hands for that" (Deck officer)

However a few larger companies were reported to have taken the additional demands made upon seafarers' time, by regulation such as ISPS, into account when crewing their vessels.

In companies that did not take these steps, some seafarers felt that the crewing levels were so low that they compromised effective on-board safety responses. This view is illustrated in the following example in which a Chief Engineer talks about the number of staff needed for the tasks that must be undertaken during fire drills onboard:

> "If you are doing a manifold foray you need at least two fire hoses, so you need two teams, two men on each hose, 1 man backing up, and you might have to have BA [Breathing Apparatus] sets to go in and shut the valves, say under a water curtain, and you need a backup team for that, and then you need people that are monitoring the BA board, and then of course you have the captain, who will be on the bridge overseeing everything, directing operations. So eventually if you think of all the things you have to do for a manifold fire you can eventually run out of people ….. it has got to the point, where there are some [emergency] scenarios that we work on while were at sea, where we basically don't have enough people to cover" (Chief Engineer)

This lack of staff may not only mean an increased risk for those working onboard as they may not be able to deal with emergency situations safely, but in the worst case scenario could lead to the loss of the entire vessel.

On a daily basis, insufficient crewing may also result in 'unsafe' practices in order to get work done. We were told, for example, of single crew members doing jobs which ideally required two people for safe conduct. Isolated working was often seen as poor safety practice by those onboard but it was nevertheless, reluctantly implemented as a result of crew shortages. One deck officer explained:

> "The manning levels have gone down, earlier we had crew when I was a cadet, the chief officer always made sure everybody worked in twos….but over the years now because of this thing is going down the manning level and the mate has got too much work to get done so he just lets people work everywhere" (Deck officer)

A manager echoed this view observing that:

> "On top of that you've only got 10-12 people as well, so often there isn't somebody around to stand at the bottom of the ladder" (Manager)

Such isolated working produces a risk of accidents remaining undetected for significant periods of time, resulting in increased numbers of, and more serious injuries.

There was a concern among some seafarers that a 'macho attitude' sometimes prevailed aboard resulting in a acceptance of danger, and a failure to take steps to reduce this danger. The following quote from a rating illustrates the acceptance of seafaring as a dangerous occupation:

> "At the end of the day it's a dangerous job" (Rating)

This kind of attitude is likely to impact negatively on safety behaviour and safety culture, for example people may, as a result, routinely fail to follow procedures, or use appropriate safety equipment. Sometimes senior officers were felt to impose their 'careless' attitudes on their subordinates as the following comment from a rating illustrates:

> "They say like you shouldn't stand in front of the helicopter on the heli-pad. But no our mate tells us to, he seems to think that invincibility suits are fire suits on, and wants us to stand in front of it" (Rating)

This attitude was felt to be most commonly held by those who had spent longer at sea, and it is these people who were considered to be less open to new safety measures laid out in safety-regulations. They were also reported by managers to have the attitude

that, 'I have never done this before, why should I now'? The following quote is illustrative:

> "I'm still finding is a slight reluctance on the part of some of the older people. The younger people have been educated differently as far as health and safety are concerned. The older personnel at sea, are still of the fact, why do we have to do this, why do I have to wear that, I've never worn a safety harness climbing a mast before, why do I need to wear one now" (Manager)

This may suggest that many, especially older seafarers are not taking ownership of safety systems, with International Ship Management (ISM) being seen as not really relevant, and something which managers have imposed on them. For example:

> "It's amazing how many of them are still saying, 'oh well the company's procedures', and not its theirs" (Managers)

Therefore it would seem that there is variable commitment to safety culture within shipping companies, and that a 'macho' attitude to safety in this predominantly male occupation may inhibit the future development of strong safety culture.

In addition to problems of safety culture the research also highlighted some practical barriers to safe operations aboard ship. The most significant of these seemed to concern communication and language. Nowadays many ships are crewed by mixed nationalities, reflecting the global market in seafarer labour. Although 'English' is generally accepted as the language of the sea, concerns about safety were frequently reported in relation to communication difficulties. Communication difficulties were said to hamper day to day tasks, making routine procedures difficult; for example a deck officer suggested that:

> "Language barrier are a problem…. you may be have some one on the bridge radioing down to someone down aft or forward who is a different nationality, and who then has to tell the crew who is again another nationality. Sometimes that can be a problem" (Deck officer)

These language difficulties were also pointed out by managers, for example:

> "The junior Dutch officers couldn't speak that language either, so even in routine operations when the masters giving orders in Bahasa, the junior officer on the bridge didn't understand what was happening" (Management)

The safety implications of such difficulties are self-evident in the day to day operation of the vessel, however seafarers also expressed concerns in relation to emergency procedures. They suggested that in emergency situations crew would revert back to their 'own' language, and communication would be ineffective and difficult. As one cadet suggested:

> "Again I think the language barrier is a problem, it provides some sort of barrier when it comes to safety as well. If there was an emergency onboard, a lot of peoples first instinct is to panic. Ok maybe when your at sea you don't, but if these guys start communicating in Bulgarian, were going to be standing there as if to say what is going on….that leaves you in the dark, you just don't have a clue " (Cadet)

Discussion

The aim of this paper was to identify the key safety concerns of those working in the maritime industry, following the conduct of focus groups and interviews with a wide range of personnel across the sector. A common view amongst seafarers and managers was that workloads in combination with current crewing practices and new regulatory requirements militate against safe working practices and the development of effective safety culture. Often seafarers blamed safety regulations for their excessive workloads producing an antagonistic attitude that can be seen as counterproductive in terms of efforts to establish safety culture. Other issues such as 'macho' attitudes to work and a failure to ensure adequate levels of English among multinational crews were also considered to hamper the development of routine safe working practices.

However, although there was general agreement concerning many of the safety concerns amongst managers and those working onboard vessels, there were also a number of important areas of difference. For example, although both managers and those working onboard recognised that crews were subject to high workloads,

managers did not talk about the practice of document falsification in order to comply with working hours legislation.

This may be interpreted in two ways: either managers genuinely do not realise that those onboard their vessels are falsifying records (which seems unlikely in many cases), or they feel unable to do anything about this, perhaps, due to pressures of commercial competition, and thus turn a 'blind eye'. This leads to dangerous situations, where crews are seen to be complying with working hours regulation, and managers are not obliged to change working practice policies, producing excessive workloads, long working hours, and the potential for extreme fatigue.

Such differences are indicative of variations in perceptions of safety amongst key groups in the sector. These may negatively affect safety, hampering the ability of management to make informed safety policy decisions, which could cumulate in the development of dangerous onboard situations.

The safety concerns identified in this study were often similar to those highlighted by research in other sectors. For example the 'shortcuts' factor described here can be seen to parallel the 'risk taking' behaviour identified by those working in nuclear processing plants (see Harvey *et al.,* 2000 for more details). However, there were a number of factors identified which can be seen to be specific to the maritime industry, and this may relate to the 'unique' nature of the job. For example, communication was found to be an important factor which has not been identified in other industries.

The preliminary findings presented here would seem to support Flin *et al.'s* (2000) suggestion that the concepts which make up a safety culture are specific to an industry, and are likely to vary according to work environment and practices. Such differences have implications for the development of measures designed to foster safety culture, as they imply that measures adopted elsewhere may not simply be grafted on to the maritime industry.

The development of specific measures designed for the maritime environment is required to maximise the successes of attempts to build a safety culture across the sector. The next stage of this project is a wide scale survey of the safety concerns of

those working in the maritime industry, which is designed to properly inform the future development of strategies to strengthen safety culture across the industry.

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