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E-Mail Bindery@Cardiff.ac.uk

Rule Following Behaviour in Collision Avoidance.

A study of navigational practices in the Dover Strait.

By Phillip Belcher.

Cardiff University

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789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106-1346

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Dedication.

This work is dedicated to Dave Cox and all the other seafarers who never made it home.

Abstract:

This research is concerned with the manner in which the risk of a collision is managed by people in control of ships as they navigate the Dover Strait. Fundamental to the management of collision risks are the International Regulations for the Prevention of Collisions at Sea 1972 (Merchant Shipping Notice M. 1642/COLREG 1 1996) which are known as the COLREGs. These regulations are designed to give guidance to the people in charge of the ships in order to manage the collision risk.

A two-phase mixed method approach was utilised to investigate the reasons lying behind the decisions taken to manage the collision risk through the application of the COLREGs. The first phase consisted of an analysis of a 24 hour period of the radar record of all ship movements in the Dover Strait. The findings from this dataset informed the ethnographic second phase in which the actions of those in charge of the ships were observed onboard ship.

Strict compliance with the COLREGs required trust in the other ship to resolve the risk of collision. For the respondents, strict compliance with the COLREGs would have raised the risk of collision to an unacceptable level due to a lack of trust in the other. The people in charge of the ships then undertook unilateral action, in contravention of the COLREGs, to resolve the collision situation. This non-compliance occurred whilst under the observation of the regulatory authority. However, the authority failed to visibly enforce the COLREGs and so the surveillance lacked any deterrent value.

The issue of an ex-practitioner undertaking the research was investigated from both ethical and methodological aspects. It was found that being an ex-practitioner assisted greatly in gaining access but placed an added responsibility on the ex-practitioner to handle the data with great care.

Table of Contents

List of Tables

List of Figures

Chapter 1. Introduction

1.0 Collision Avoidance

This research is concerned with the manner in which the risk of a maritime collision is managed by people in control of ships, as they navigate the Dover Strait. The potential aftermath of a collision is the loss of the ship, deaths of members of the crew and passengers, considerable environmental damage and financial loss. For example, the collision between the *Atlantic Empress* and the *Aegean Captain* in 1979 resulted in the spillage of 2.2 million barrels of crude oil (nine times more oil than was spilled by the *Exxon Valdez*); and the collision in 1987 between the passenger ferry the *Dona Paz* and the oil tanker the *Vector* resulted in the death of, approximately, 4,375 people. The avoidance of collision is, therefore, essential to the safe operation and management of ships.

The person in overall control of the ship is the Captain. The Captain usually controls the ship as it leaves port. Unlike the situation found on armed Naval ships, as explored by Hutchins (1990), navigation of a merchant ship is not undertaken by a team of individuals. Upon clearing the port, command of the ship is delegated to the officer of the watch. This means that the minute by minute control of a ship is at all times in the hands of a single individual. This person will have completed an internationally recognised training course of several years duration. This individual has near complete autonomy over the navigation of the ship. It is this single person who assess and manages the risk of collision. They are often assisted by a lookout whose job it is to visually spot other ships and a helmsman who manually steers the ship. However, this is not always the case and these people have no role in the decision making process.

Fundamental to the management of collision risks are the International Regulations for the Prevention of Collisions at Sea 1972 (Merchant Shipping Notice M. 1642/COLREG 1 1996) which are known as the COLREGs. These regulations are designed to give

guidance to the people in charge of the ships in order to manage the collision risk. Lying at the heart of these regulations is the concept that one ship has the right of way over another. This means that the other ship has to give-way and so must take action to resolve the collision situation. Conversely, the ship which has right of way, the stand-on vessel, is required to maintain its course and speed. This is to ensure that the stand-on vessel does not take action which would conflict with that of the give-way vessel. The result of this is that the stand-on vessel must wait for the other ship to take action, during which time the stand-on vessel is reliant for its safety on the actions of the other. Therefore, the issue of trust in the other is paramount in the operation of the COLREGs and the resolution of the collision risk. To this end the purpose of this thesis is to investigate the manner in which people in charge of ships use the COLREGs to manage the collision risk. Therefore, the two research questions are:

- How are the COLREGs being applied?
- Why are they applied in the way that they are?

These questions were used to explore this area as this was an approach which had not been explored in this way before. As detailed in Chapter 2, previous research in this area either concentrated on the actions of people involved in collisions, looked at collision situations involving students on simulators or looked at the movements of ships as seen on radar. However, this previous research did not adequately explore the human factors involved in collision avoidance. With the aid of these research questions, this research aims to address that. Firstly by gaining a broad baseline understanding of the current practices relating to collision avoidance and secondly to explore the underlying human element involved in the resolution of the risk of collision.

1.1 Maritime Traffic Research

An area as fundamental as collision avoidance, has been the subject of past research. Such research has involved the monitoring of ship movements through the use of radar, the observation of students in simulators and the use of questionnaires. From this research, which is reviewed in Chapter 2, it was found that the COLREGs were not being

applied by the people in charge of the ships in a consistent manner. Deviations from the COLREGs were observed on many occasions both in real and simulated situations. However, even though the actions taken to avoid collisions were entirely in the command of the participants, in all bar two studies (Goodwin 1975a and Curtis 1977) there had been no attempts to directly relate the movements of those ships to the decisions taken to avoid collision by those in charge of the ships. The researchers in the studies simply calculated collision risks and isolated other issues, relating to the application of the COLREGs by concentrating on, either the routes and tracks of the ships, in order to formalise methods of reducing the traffic density in certain areas, or to highlight deviations from the COLREGs. But all without asking the people in charge of the ships why the deviations were occurring. In this thesis, I will argue that, although traffic density is an important factor in collision risk, it is however, inadequate to only look at the traffic density, for it is the decisions taken by those in charge of the ships which are most relevant to the resolution of the risk of collision. To this end I have utilised theoretical positions relating to the management of risk and used them to critically analyse the decisions of the people in charge of the ships.

1.2 Risk Management

The main method used to manage risk can be characterised as the setting of an acceptable threshold for a certain risk, before an attempt is made to quantify that risk, followed by putting into place control measures in order to minimise the risk (Fleury 1998). This has become the accepted paradigm by which risk is managed and this is the approach that people in charge of ships apply to the collision risks that they are faced with. The people in charge of the ships undertake a quantification of the risk through the use of onboard radar systems. After the assessment of the collision risk, the person in charge of the ship then takes steps to manage and regulate that risk through the application of the COLREGs.

There exists a large body of literature relating to the application of rules. A review of this literature was undertaken (see Chapter 2) and a variety of reasons were found lying behind rule non-compliance. These may be listed as:

- Lack of knowledge of the regulations
- Lack of surveillance and enforcement
- Taking a short-cut or just getting the job done
- Lack of acceptability of the legitimacy of the rule
- Lack of trust where co-operation was required
- As a demonstration of a workers professional skills
- Regulations could not cover all the circumstances.

The wide range of interrelated factors and issues, which lie behind rule non-compliance, illustrate the complicated nature of the decision making involved in the application of rules. It was interesting to note that one aspect of non-compliance was found to be that of where highly trained workers demonstrated their superior knowledge and skills to co-workers by deviating from the regulations. The belief being that, through their superior knowledge, they knew the rules which could be deviated from, as they knew which rules really mattered. This is of particular importance as the seafarers, in charge of the ships within this study, regarded themselves as being highly skilled professionals who possessed abilities above the norm. Three other issues should also be highlighted at this stage as they have such relevance to this study and they are: the imposition of company rules, the concept of trust in the other and surveillance by shore authorities. The first because of the company rules put in place to manage the passing distance between ferries and traffic passing through the Dover Strait. The second, because of the way in which the application of the COLREGs is predicated on the issue of trust, where one ship is reliant upon the other to resolve a collision situation. And the third because of the radar surveillance regime backed up with the threat of sanctions in the event of non-compliance with the COLREGs, that ships navigating in this area are under.

1.3 Methodology and Area of Study

To undertake this research, a two phase approach involving a mixture of methods was adopted. A mixed method approach was adopted in order to gain a broad and more complete understanding of the substance of the research area. The first phase of the research took advantage of the radar surveillance in the Dover Strait of the English Channel, which is operated by the Channel Navigation Information Service (CNIS), an agent of the Maritime and Coastguard Agency (MCA). The area under surveillance is shown in figure 1.1.

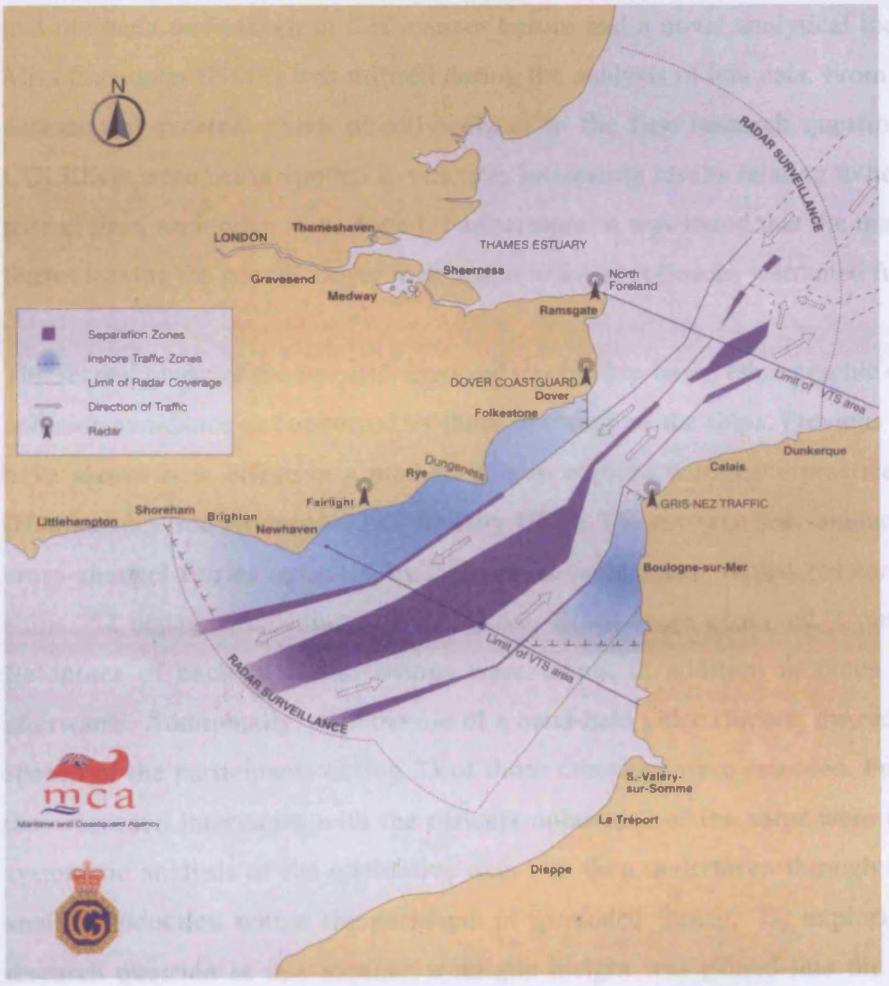

Figure 1.1, Dover Strait radar surveillance.

Within this area a traffic separation scheme (TSS) has been set up as a means by which opposing streams of traffic can be separated from each other such that they do not meet head-on. TSSs are located at various other choke points around the world. Such places include the Gibraltar Strait, the Malacca Strait and the Turkish Straits. Ships are directed by the COLREGs to follow the main traffic routes and cross the scheme at right angles to the general direction of flow.

In the first phase, an in-depth analysis of the radar record of all ship movements for one 24 hour period was conducted. An investigation looking at all ship to ship interactions had not been undertaken in this manner before and a novel analytical tool of the Near Miss Encounter (NME) was utilised during the analysis of this data. From this, a unique dataset was created which directly related to the first research question of how the COLREGs were being applied in practice. Interesting results relating to how close ships passed from each other were found. Furthermore, it was found that the manner in which ferries leaving the port of Dover took action to avoid collisions warranted further study.

The second phase of the research involved *in situ* ship-based ethnographic observation of collision avoidance as conducted by those in charge of the ships. Previous ethnographies have shown how effective a method it is to explore workplace practices and culture (Hammersley and Atkinson 1995, Bellaby 1999). The research was conducted onboard 7 cross-channel ferries operated by 2 different companies. Whilst onboard these seven ships, 52 separate crossings of the Dover Strait were observed. Contemporaneous fieldnotes of each of the crossings were taken, in addition to notes made shortly afterwards. Additionally, with the use of a hand-held video camera, the radar picture and speech of the participants during 33 of those crossings were recorded. Furthermore, 12 tape-recorded interviews with the officers onboard 2 of the ships were undertaken. A systematic analysis of the qualitative data was then undertaken through the process of analytic induction within the paradigm of grounded theory. By exploring the second research question in this manner, a unique insight was gained into the reasons lying

behind the decisions taken to resolve collision situations through the routine application of the COLREGs.

Through the exploration of the research questions by utilising this mixture of methods the identified gap in the literature relating to the decisions taken by the people in charge of the ships in the management of the collision risk has been addressed.

1.4 Structure of Thesis

This thesis is arranged into eight chapters with three (chapters 5-7) being empirical. These chapters are outlined below:

Chapter 1. Introduction.
In this chapter the research area is introduced and the themes of the thesis are outlined.
Chapter 2. Literature Review.
An analysis is made of the literature relating to maritime traffic studies and the management of risk as it relates to rule following, trust and surveillance.
Chapter 3. Methodology.
A review is made of the methods used to investigate this subject area. The ethical issues raised by this project with particular reference to ex-practitioner research are dealt with.
Chapter 4. The International Regulations for the Prevention of Collisions at Sea.
This chapter is concerned with an analysis of the problems inherent within the International Regulations for the Prevention of Collisions at Sea.
Chapter 5. Radar Data.
The aim of this chapter is to present the analysis of the empirical radar data relating to ship movements in the Dover Strait.
Chapters 6. Crossing the Dover Strait.
In this chapter an analysis of the process by which people in charge of ferries go through to successfully navigate the Dover Strait is presented with the use of the empirical ethnographic data.
Chapter 7. Risk, Trust and Surveillance in Collision Avoidance.

An analysis of the ethnographic research data relating to the themes of risk management, trust and surveillance is resented in this last empirical chapter.

Chapter 8. Conclusions and Recommendations.

The arguments put forward in this thesis are brought together in this final chapter. A number of practical recommendations relating to these findings are then presented.

From this review, I will show that there exists a gap within the literature on this subject of how and why a professional group, who are highly trained, apply a set of regulations, in the manner that they do.

2.1 Marine Traffic Movement Studies

The study of the movements of traffic at sea first came to the fore in the 1970s. This was due to improvements in radar technology and photographic techniques. Radar sets became less expensive and their use expanded with the fitting onto merchant ships. This allowed research institutes the ability to gain access to data relating to the movements of ships which prior to this time had been modelled mathematically (Draper and Bennett 1973).

2.1.1. Radar Observation of Traffic Movement

The first direct observation of marine traffic flows was undertaken by the National Physics Laboratory in 1971 (Johnson 1973). In this research ships were observed using land based radars at Dungeness and St Margaret's, near Dover. These radars observed the traffic flows for a 72 hour period and were supplemented later that year by the use of the radar set onboard a fishery support vessel the *Miranda*. From this survey the first detailed knowledge of ship's routeing in the Dover Strait were ascertained. However, the survey group could not positively identify the ships using the area nor analyse the data with respect to manoeuvres undertaken to avoid collisions. This method of direct observation of radar records was then used in several more studies, (Kemp and Holmes 1977, Iijima 1977) however neither of these studies looked at the collision avoidance practices, only the traffic routeing and density. Goodwin (1977) used radar observations to study traffic densities in the Southern North Sea. In this study Goodwin looked at the actual distribution of ships and compared it with a theoretical traffic distribution model. In this she found that the ships were not randomly distributed but showed a degree of separateness between each other. Goodwin concluded that the people in charge of the

ships were actively seeking to keep a space around their ship free from other vessels. Goodwin then mathematically modelled this data to produce a ship domain and tested the validity of it in a radar simulator (Goodwin 1975a, Goodwin 1975b).

This concept of a ship domain was derived from earlier work by Fuji and Tanaka (1971) in which they took the concept of proxemics, where a person requires a space to be kept free around them (Hall 1963) and applied it to the maritime field. However, Fuji and Tanaka's domain was based on theoretical modelling of ship interactions, whereas, Goodwin's was based upon the observed traffic movements. Goodwin then tested the validity of this domain model in a radar simulator using 70 maritime students (Goodwin 1975a, Goodwin 1975b). However, she later recounted how using this study did not give all the answers by stating:

> Unfortunately, when the original study was done, time and other practical considerations prevented a full study of ship domains in restricted visibility in real life. Certainly the differences in navigators behaviour in real-life and simulated conditions needs to be investigated'.
>
> (Goodwin, response to Jingson *et al.*, in Jingson *et al.*, 1993: 436).

By 1973 the first radar station used for the routine surveillance of traffic was introduced into the Dover Strait area following the recommendations of an inter-governmental working group (Richey 1966). This new technology allowed researchers access to the direct observation of the traffic within this area without the need of additional equipment. Barratt (1977) made use of the newly installed radar surveillance at Dover coastguard and used time lapse photographs of the radar screens in order to ascertain the number and location of near misses between ships. In this research Barratt compared the tracks of all the ships using the south west bound traffic lane, both following and crossing, with each other for a 12 hour period. The criteria that Barratt used in the determination of whether an encounter was classed as a near miss or not was that of encounters with time clearances of less than two minutes. For Barratt a collision would occur between two ships if they attempted to pass through the same spot at the same time. Therefore, a near miss would occur if the ships passed through that same point but were separated by two

minutes. Using this criteria Barratt recorded just one near miss for the entire 12 hour period. Upon further analysis Barratt found that this near miss was due to a ferry leaving Dover and altering course to port for ships following the south west bound traffic lane. The ferry passed behind the ship with a separation of one minute. This study should be compared with Curtis (1977) who used the violation of a ship domain of 8 cables as the determining criteria for a near miss. This domain of 8 cables was based on the earlier work of Goodwin (1975a, 1975b, 1977). In this study, Curtis observed the overtaking manoeuvres between ships following the south west bound traffic lane of the Dover Strait using Dover Coastguard's radar station. Curtis found that each ship would be overtaken at ranges of 8 cables or less once in every 5 hours, a much higher figure than Barratt (1977).

Studies of traffic density and movements using radar observation continued throughout the1980s and 1990s (Barratt 1980, Chalk and Coupard 1980, Lewison 1980, Dare and Lewison 1980, Cockcroft 1981, Goodwin, *et al.* 1983, Hagart 1983, McGeoch 1985, Wennink 1992, Judson 1992, Jingson, *et al.* 1993, Hara and Nakamura 1995). Chalk and Coupard (1980) for example, undertook a radar survey of vessel traffic movements within the English Channel over a seven day period using a considerable quantity of resources. These included: UK and French coastguard and military shore based radar stations; the radar observations from a UK fisheries protection vessel and a French warship; various small patrol boats, provided by the port authorities in the area; a number of flights by French military aircraft; and 14 flights by RAF Vulcan bombers. During this survey, photographs were taken of the radar screens in order to ascertain traffic densities and collision risks. From this they concluded that the traffic separation scheme was eliminating head-on collision situations and reducing traffic densities in certain areas.

Judson (1992) used shore based radar in conjunction with geographical information systems (GIS) to map the traffic movements in the approaches to the Strait of Juan de Fuca in Canada. Using this method, Judson found that traffic density and reduced

visibility were the most significant factors in increasing the risk of collision. A similar finding had been found by Lewison (1980) where he stated that:

> The number of collisions to be expected per million potential encounters depends primarily on the visibility, and is approximately 6 in clear weather, 60 in mist and fog and 900 in thick or dense fog.
> (Lewison 1980: 322).

Studies of traffic movements continued with the turn of the Century and these have utilised improvements in computer technology in the analysis of traffic movements (Bichler-Robertson, 2002, British Maritime Technology 2003, Barber *et al.* 2003). Barber *et al.* (2003) used a shore based radar unit to monitor traffic movements in the vicinity of the Isles of Scilly traffic separation scheme. Once again the traffic densities within the survey area were used as a criteria for collision risk.

However, throughout this long history of using radar to monitor the movements of ships, only Goodwin (1975a) and Curtis (1977) made any attempts to directly relate the movements of ships to actual collision avoidance manoeuvres. Goodwin looked at the movements of ships to ascertain the size and shape of an area that the people in charge of the ships would wish to keep clear and Curtis analysed the movements of ships using a time clearance criteria. In both studies the collision avoidance manoeuvres of the ships were looked at in relation to passing factors. Whereas in the other studies, a simple measure of traffic density was used to ascertain the risk of collision. The collision avoidance manoeuvres of the ships were not taken into account when determining this collision risk. I would argue that, although traffic density is an important factor in collision risk, it is however, inadequate to only look at the traffic density. This is because a major factor in collision avoidance is how people in charge of ships take actions to avoid the collision risk through their use of the COLREGs.

2.1.2 Questionnaire Surveys

One method that has been used recently, to explore the area of collisions and the application of the COLREGs, has been that of questionnaire surveys. These surveys have been sent to members of professional organisations (Syms 2003a), to people working on particular ship types (Cockcroft 1998), administered at various training institutions (Singh 2003, Hagart 1983) or as part of a wider study of collision avoidance (Smeaton and Aldridge 1996). Smeaton and Aldridge (1996) for example used a questionnaire as part of a study of navigation within pilotage waters. Pilotage waters for the purposes of this study were waters close to a port or up a river (the Mersey in this case) where a local pilot was required to be carried. This study also utilised semi-structured interviews and direct observation of the work of pilots. Smeaton and Aldridge do not state how much reliance was placed upon data gained through each method, however, they did find that the COLREGs were deviated from on many occasions.

> In general terms the study has revealed that the COLREGs do provide a framework of operation. However, in practice so many deviations occur related to terrain, geography and local practice, that collision avoidance in pilotage waters can be considered a separate and distinct skill from that practised in coastal and deep sea navigation.
>
> (Smeaton and Aldridge 1996: 134).

By this statement they talk about the tacit skills that the local pilots have for the area, the understandings that exist between the pilots such that they can co-ordinate their movements, and the local custom and practice that exists within this area which explains the many deviations from the COLREGs. This, they contrast, with their perception of deep sea collision avoidance where there are not the same constraints on action such as tidal restrictions, geography and commercial imperatives.

However, even though questionnaire surveys are of course an accepted method of enquiry (see for example: de Vaus 1991, Fowler 1993, de Vaus 2001) this form of quantitative investigation has limited value as a method to explore the application of the

COLREGs. Syms (2003a, b, c, d) for example, used a questionnaire to present a series of hypothetical collision situations, with possible solutions, to the participants. From Syms's report and articles it would appear that he was interested in whether seafarers took correct or incorrect actions to avoid the hypothetical collision. The criteria for whether actions were correct or incorrect was his own interpretation of the COLREGs that govern the particular scenario. Syms interpreted the situations in a very particular manner which has prompted some heated debate within the wider maritime community (see: Cockcroft 2003, Woinin 2003, Huinink 2003, Crosbie 2004, den Hartog 2004, Toner 2004). However, Syms did conclude that although he had decided that certain actions were incorrect and illegal in some cases, the survey could not ascertain which rules had been applied to each of the situations. This means that the respondent could have answered the question in the manner that Syms determined to be correct, but through the application of the wrong rule.

The main problem in using questionnaires as the main research instrument in a survey of the application of the COLREGs is that the actions of seafarers cannot be placed within the context of the reality of collision avoidance. Furthermore, the researcher cannot explore the background behind how the decision was actually reached. Goodwin (1975a) attempted to explore the relationship between how collision avoidance decisions were made through the use of a ship simulator and this has become a popular method of exploring collision avoidance.

2.1.3 Simulator Studies

Harrald *et al.*, (1998) used a simulator in order to test a model of human error within a maritime environment. They stated that there were three main advantages in using simulators:

1. The occurrence of human error in simulated hazardous situations can be observed
2. Trained observers can provide uniformity in data collections
3. Participants can be questioned to confirm the types of errors made.

(Harrald *et al.*, 1998: 247)

Perdok and Wewerinke (1995) stated that marine simulators were able to successfully simulate the realities of navigation and collision avoidance and so the findings produced by studies based upon them can be relied upon. Simulators provide the opportunity to test various collision avoidance scenarios upon research participants in a manner which could not be undertaken in any other environment. It would be unsafe to place a ship in a situation involving risk of collision purely for research purposes and so the advantages in using simulated situations are evident. Furthermore, under the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1995 (STCW 95) (IMO 1995), there is a requirement for seafarers to undergo routine training on simulators. This means that simulators are located at every maritime college and so these simulators provide a ready opportunity for research into collision avoidance (Cannel 1981, Uchino and Kobayashi 2002, Manrai *et al.* 2002, Ince and Topuz 2004).

However, a number of authors have stated that there are problems in relying upon data generated with the use of a simulator. Lamb and Hunt (1995) have claimed that simulator based research is not the best way to study collision avoidance because the reality of collision avoidance at sea can never be truly simulated and so there is a great danger in the reliance based upon the results. They state the main reason for this is that the seafarers training on them do not have to contend with the psychological pressure of a serious penalty in case of an error, as they would in real life, and so behave in a considerably different manner than they would at sea. Now Lamb and Hunt might be being too critical, as simulators have been successfully used in the study of flight deck operations (Smith 1979, Hutchins and Klausen 1996) and nuclear power stations (Dien 1998). However, there are further drawbacks in the use of simulators as it is nearly impossible to fully simulate the reality of life at sea with its: broken sleep patterns; fatigue; separation from family; operational distractions; ship movement, all being missing from the simulated collision encounter and the absence of these factors must have some effect upon the performance of the participants in any simulator study. In fact Hutchins and Klausen (1996) state that it would be preferable to study an actual flight deck, but that it would be impossible due to issues of safety and constraints of space.

Furthermore, simulators are geographically located in maritime training colleges and the participants used in the studies are students of those colleges, undergoing routine training. Pourzanjani (1996) stated that students were aware that they were in a test environment and so were expecting something to go wrong or be placed in a dangerous situation.

But with these limitations over the use of simulated situations in collision avoidance research, borne in mind, the research has illuminated the variable nature of the way seafarers apply the COLREGs. For example, Curtis (1986) placed ten seafarers on ships heading North, with a ship crossing from the port side and a third ship in the vicinity. None of these ships were on a collision course at the start of the exercise. The ship crossing from the port side then turned so that it was heading directly at the student's ship. Curtis then recorded the various actions taken by the students as shown in figure 2.1.

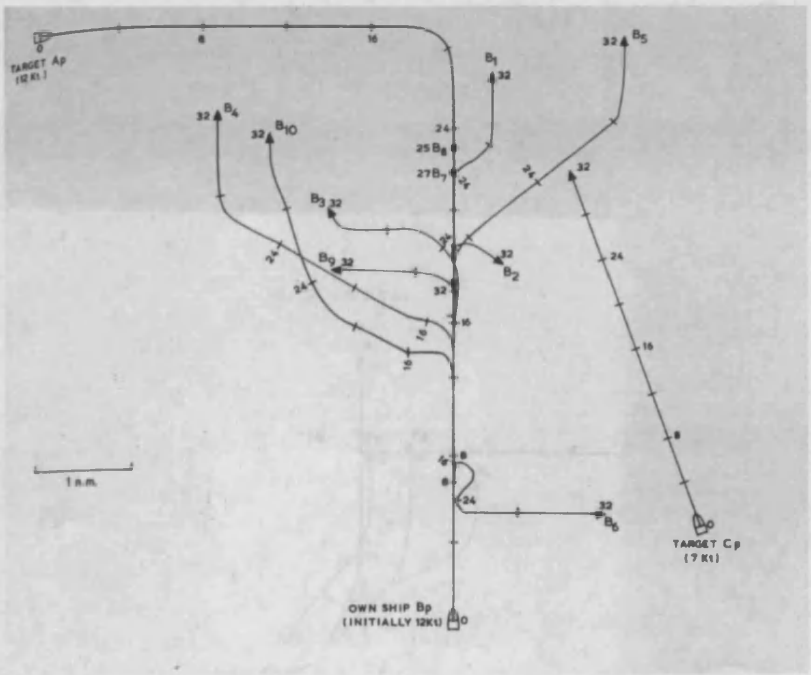

Figure 2.1, Curtis 1986

What can be seen is that none of the seafarers took the same action at the same time. Four altered course to port (in contravention of the COLREGs), four altered course to starboard and two stopped their ship. The ones that stopped subsequently collided with the other ship. All of the seafarers took differing action with regards to how much they altered course by and when they altered course. This illustrates the diversity of action which seafarers take in avoiding a simple collision situation. Corbet (1986) used four different scenarios to ascertain the collision avoidance manoeuvres. In this study 108 subjects were placed on a ship heading north. In the first scenario they were faced with a ship coming straight down on them from ahead, in the second the other ship was programmed to pass 0.5nm down their starboard side, this was increased to 1.0nm and 2.0nm in scenarios 3 and 4 respectively. The actions that the participants took are shown in table 2.2.

	Initial passing distances			
Action taken	0.0nm	0.5nm	1.0nm	2.0nm
Alter course to starboard	98 %	77.8 %	34.3 %	0.9 %
Alter course to port	0 %	12.0 %	25.0 %	14.8 %
Reduce speed	0 %	4.6 %	21.3 %	15.7 %
Stop engines	0 %	0 %	0 %	0.9 %
Stand-on	0 %	3.7 %	15.7 %	65.7 %
Undecided	2 %	1.5 %	3.7 %	1.9 %

Table 2.1, Corbet (1986).

As can be seen only in the first scenario where a ship was directly ahead of the participants did 98% of the subjects alter course in the same direction. This first scenario conforms closely to that described within the COLREGs for a head-on situation and so the people took very similar action in accordance with the rule. However, when the same participants were presented with varying passing distances, then there was great variability in their actions. This illustrates the problem of rule finitism in that people encounter difficulties in trying to extrapolate from the rules to cover situations not quite covered by them (Wittgenstein 1953) (see section 2.2). Similar diversities in participants

responses to collision situations were found in other studies (Cook and Crawshaw 1985, Colley *et al.*, 1984, Habberley and Taylor 1989, Taylor 1990, James 1994, Zhao *et al.*, 1995). This indicates that even when studies are undertaken at maritime colleges, in front of the instructors who, it would be presumed, are not teaching the students to break the COLREGs, the students adopt a flexible approach to COLREG interpretation. Pedersen *et al.*, (2003) for example used a simulator as a means to aid the process of collision avoidance for fast craft operators within Tokyo Bay. In this study a model of traffic within Tokyo Bay was used to test software designed to show areas of safety. In this the courses and speeds of the simulated ships were processed and areas of predicted safety were shown as areas on a radar screen. 19 students of the Tokyo maritime college took part in the study and they were taught to steer the ship across Tokyo Bay by keeping within the predicted safety areas. The researchers found that the participants maintained a safe distance around the simulated ship, however, it was also seen that a number of manoeuvres made by the participants may not have complied with the COLREGs.

> It should also be pointed out that some subjects showed that they were tempted to make frequent and minor course alterations that are difficult to detect by other ships and might be contrary to the requirements of the COLREGs.
>
> Pedersen *et al.*, (2003: 425).

In an earlier study Cannell (1981) placed the research participants in a multiple ship encounter situation. Again there were a variety of responses and differing interpretations of the COLREGs. Cannell described the process through which the participants went through in determining the actions that they would take:

> Observations of mariners during collision avoidance exercises on a radar simulator suggest that in most complex encounters, one ship is singled out as the main threat and action is taken to avoid it in accordance with the regulations for two-ship encounters. At the same time attention is paid to the other ships in the encounter to make sure its action does not endanger them by predicting their probable actions and also to make sure the action taken is reasonably predictable by them. This statement obscures the fact that the reasoning involved here must be rather complex.
>
> (Cannell 1981: 237).

From this, it is interesting that the seafarers concentrated their attention upon what they perceived to be the most serious threat and kept out of its way, but at the same time kept an eye on the other ships, but all within an interpretation of the COLREGs. However, it should be noted that Cannell did not actually ask the seafarers if this was the manner in which they went about the decision making process; the conclusion he came to was inferred from observation. This was the same situation for all of the other simulator studies. Even though the researchers had spent a large amount of time and energy looking at the actions of the seafarers, they did not report on whether they asked the seafarers why they took the actions that they did. Harrald *et al.*, (1998) stated that the ability to question the research participants was one of the major advantages in using this method of inquiry. Analysis from these studies, was undertaken through a study of the tracks of the simulated vessels in the light of simple compliance with the collision rules or passing distances. These studies were, in effect quantitative studies of collision avoidance differing from radar studies of real life traffic movements only by their hypothetical collision situations presented to the participants.

Direct observation of the bridge of ships have been undertaken in the past (Hutchins 1990, Richter 2001). Hutchins (1990) used observational techniques to study a section of a bridge team onboard a warship in order to see how communication aids teamwork. Richter (2001) observed the bridge team onboard a ferry so as to ascertain their cognitive work-load when leaving port. Neither of these studies looked at the issue of the application of the COLREGS, however, they do illustrate how effective observational techniques can be in the understanding of the manner of work on the bridge of a ship. Smeaton and Aldridge (1996), it should be noted, did use direct observation as a means of data collection in combination with questionnaires and semi-structured interviews in a study of collision avoidance in pilotage waters. As previously discussed, they did find a flexible approach to the application of the COLREGs due, in the main, to local custom and practice.

2.1.4 Summary, Marine Traffic Movement

From this review of the marine traffic research literature it is clear that the subject has been studied using a broad range of methods and techniques. These methods have included questionnaire surveys, direct observation of traffic movements through radar, ship simulators and, to a very limited extent, observation of the work of the people in charge of ships. These studies have shed light upon the actions of seafarers during general navigation and collision avoidance. The studies have further explored the variable interpretations of the COLREGs as illustrated by the actions of those navigating real or simulated ships. Furthermore, the interpretation of the manner in which the researchers have applied the COLREGs to their subjects actions have also produced considerable debate (see section 2.1.1). From this review, the skills required by the people applying the COLREGs are evident. The individuals need to analyse a considerable quantity of information and then take such action which will resolve the collision risk.

It is clear that there exists a major gap in the literature relating to the reasoning lying behind the actions taken by the seafarers. Only in two studies (Goodwin 1975a, Smeaton and Aldridge 1996) was there any attempt to draw out the manner in which the COLREGs were applied. Goodwin tried to bring together the observed movements of ships with the actions of students in a simulator. She was unsuccessful due to monetary and time constraints. Smeaton and Aldridge (1996), by comparison, observed the collision avoidance manoeuvres onboard ships and found that there were numerous deviations from the COLREGs due to local custom and practice. However, this gap within the literature shows the need for this study. Due to this, an analysis of the wider theoretical and empirical literature on risk management, rule non-compliance, trust and surveillance was undertaken.

2.2 The Management of Risk

The concept of risk permeated the literature relating to collision avoidance. However, as demonstrated above, the researchers did not explore the wider aspects relating to the perception of risk nor the reasoning behind the decisions taken to lessen that risk. This should be contrasted with the way in which the study of risk has permeated to many areas of social science enquiry (see, for example, Krimsky and Golding 1992, Luhmann 1993, Adams 1995, Lupton 1999). Risk, has been used as the unit of study with the case of the environment (Bennett 1999), road safety (Räsänen *et al.* 1999), nuclear power (Dien 1998), HIV transmission (Bloor 1995), nursing (Adams 2001), police work (Dorn and Brown 2003), high technology (Perrow 1999), health and safety at work (Bellaby 1990), health and safety on the railways (Hutter 2001), biological research (Lynch 2002) and banking (Power 2003). The list of studies employing risk as an analytical unit is near endless. The manner in which risk has come to dominate social science literature is encapsulated by Lash and Wynne in the introduction to Ulrich Beck's Risk Society (Beck 1992).

> Risk has become an intellectual and political web across which thread many strands of discourse relating to the slow crisis of modernity and industrial society.
> (Lash and Wynne 1992: 3).

This publication, The Risk Society,[1] probably more than any other, has come to epitomise the discourse on risk in late modernity. The concept of "risk" is of course nothing new, Knight (1921), for example, wrote about the need to distinguish between risk (which he stated could be calculated in terms of probability) and uncertainty (which was incalculable). Indeed Bernstein (1996) points out that since the middle of the last millennium the study and calculation of risk has been driven by the requirements of governments and industry in order to plan their future undertakings. Brown (1987) states that the calculation of the risk of ship and cargo loss enabled the insurance market of Lloyd's to flourish in the 1800s. The word 'risk' would appear to be derived from the Italian *risco* and *riscare*, meaning to run into danger (Trumble, *et al.*, 2002) a term with a

[1] The Risk Society was first published by Ulrich Beck in Germany in 1986 and entitled *Risikogesellschaft: Auf dem Weg in eine andere Moderne.*

maritime background. The term "to run into danger" was used by seafarers in the 14th and 15th Century upon entering uncharted waters (Ewald 1991, Giddens 1999, Lupton 1999, Mythen 2004). Interestingly, this phrase survives today as a warning to other ships contained in the meaning of the single letter flag U (Hydrographic Office 1999).

The main approach to the management of risk is the homeostatic approach[2]. This approach can be characterised as the setting of an acceptable threshold for a certain risk, an attempt to quantify that risk, followed by putting into place control measures in order to minimise the risk (Royal Society 1992, Seiler 2001, Fleury 1998). This has become the accepted paradigm by which risk is managed and this is the approach that people in charge of ships take to the collision risks that they are faced with. It should be noted that this approach to risk management aims to reduce and control risk rather than an attempt to eliminate the risk (Baldwin *et al.* 1999).

For example, Corby (1996) describes how people charged with the protection of children utilise a check-list of factors, which attempts to quantify the risk that a child faces. Once the risk is assessed some form of control would be placed over the care of the child in order to lower the risk that they were exposed to. Similar approaches are used by professionals in the realm of mental health (Ryan 1996), the probation service (Kemshall 1996) social work (Littlejohn 1996), naval flight operations (Rochlin *et al.* 1987) and nuclear power plants (Dien 1998). In many instances these measures to control the risk rely upon socially negotiated notions of feasibility and practicality (Royal Society 1992). For example, the Environmental Protection Act 1990 (HMSO 1990) uses various terms to represent the practical nature of risk reduction such as (as low as reasonably practicable) ALARP:

> As low as reasonably practicable is a wide statement of principles and forms the cornerstone of nuclear plant safety. A risk that has been reduced to ALARP corresponds to the concept of tolerable risk. This implies that any further

[2] For a full review of the approaches to risk management see Chapter 6 of the Royal Society Risk report (1992), Hood and Jones (1996) and Kemshall and Pritchard (1996)

> reduction in the risk can be achieved only at grossly disproportionate cost and that the benefits afforded by the risk are judged to outweigh the costs.
> (Defra 2002)

However, as Wynne (1992) has illustrated, such decisions about the tolerability of a risk are often based upon contested scientific knowledge. Therefore, there can be problems of legitimacy and acceptability of the control measures when there is a divergence between expert and lay beliefs on the control measures used to moderate risks (Baldwin and Cave 1999, Bennett 1999, Bloor 2000) or where the control measures conflict with ideas of those tasked to follow them (James and Walters 1999).

Furthermore, the quantification of the risk as illustrated by the use of check-lists obscures the qualitative nature of the risk assessment. In the realm of pharmacological or engineering studies, risk may be assessed through the application of statistical tests based upon simulated models, previous studies or accident statistics (CIA 1987, Räsänen *et al.* 1999, Reason 1990, Vogel 2001). However, in other areas involving people the use of a check-list of risk factors is not the only means by which the risk assessors assessed the risk faced (Corby 1996, Kemshall 1996). Other factors such as trust, previous history and experience has been shown to have an affect upon the level of the assessed risk (Coleman 1990, Corby 1996, Bachmann 1998, Viklund 2003). As I will demonstrate in chapters 6 and 7 the quantified collision risk as calculated by the ship's radar system becomes a qualified risk when the person in charge of the ship applies other factors such as trust, previous history and experience.

Control measures, in the main, take two forms, firstly, the attempt at designing out a particular risk from the system and secondly, the implementation of rules designed to manage the risk (Fleury 1998, Hutter 1999, Seiler 2001). Both of these approaches exist within the process of collision avoidance, however, the first is used to only a very limited extent. For example, as will be expanded upon in Chapter 4 and Chapter 7, attempts have been made at removing the risk of head-on collisions with the introduction of traffic separation schemes. However, the second element forms the bulk of this study, the operation of regulations designed to prevent collisions.

It should be noted that there is usually a third element to the risk management equation, this being the introduction of personal protective measures in order to minimise the effects in the event that the preventative measures fail. Examples of this normally take the form of personal protection equipment in factories and workshops (MCA 2002, Bellaby 1999). In the realm of ship to ship collisions their exists a collision bulkhead (wall) near the bow (front) of the ship, but this would offer only limited protection for the ship. However, such ship protection only comes into force after a collision has occurred and so does not form part of this study.

2.2.1 Regulating Risk

This research is concerned with the application of regulations designed to prevent collisions The main issues relating to this is why are the regulations being applied in the manner that they are? Therefore, in the analysis of the literature relating to regulations I will focus upon the reasons behind the application of, and non-compliance with, regulations.

Lack of knowledge or understanding of the regulations.

The people in charge of ships, it is reassuring to know, have to go through a considerable period of initial and refresher training. At various stages in this training the individual undertakes an oral examination on the COLREGs undertaken by a MCA surveyor. Therefore, it would be interesting to find that the individuals were ignorant of the requirements of the COLREGs. However, through a review of the literature a major reason for non-compliance was a complete lack of understanding or ignorance of the existence of the rules (Baldwin 1995, Hutter 1997, Hutter 2001a, Hutter 2001b, Räsänen *et al.* 1999, Leplat 1998, Davis and Kottemann 1995). Such a situation was particularly relevant when there had recently been a change in the rules. Räsänen *et al.* (1999) for example, in their study of road regulations found that 67% of drivers did not know about the change to priority regulations concerning bicyclists and a further group did not

understand the changes. The fault for this lack of knowledge was placed with the government authorities and driving schools. Similarly, Davis and Kottemann (1995), found that managers exhibited a lack of detailed knowledge and understanding regarding decision rules, due to frequent rule changes and also their complexity. Hutter (2001b) by contrast in her study of occupational health and safety on the railways, although agreeing that ignorance of rules was often a cause of non-compliance, in this case she found that it was not a cause. She stated that although the safety rules which were contained within 'voluminous' and complicated publications they also represented the accumulated 'wisdom' of the workforce (Hutter 2001b, 384).

Lack of surveillance and enforcement.

All of the ships navigating in the Dover Strait area are subject to a very intense surveillance scheme. A radar station sits above the cliffs of Dover and monitors the movements of all the ships in the area. Therefore, the issue of compliance with rules when people are subject to surveillance is of great importance to this research. The wider aspects of surveillance will be returned to in section 2.4 when I will review the literature relating to the metaphor of the Foucauldian Panopticon.

A number of studies have found that people account for their non-compliance with reference to a lack of surveillance (Hutter 2001a, Baldwin *et al.* 1999, Hutter 1997, Bennett 1999, Åberg 1998, Young 1999, Black 2002, Corneliussen 2004), or through an indifferent regulatory environment (Reason 1990, Rothstein 2003), or because of a lack of sanctions following a rule transgression (Kagan and Scholz 1984, Hutter 2001a, Baldwin 1995, Hutter 1997, Åberg 1998, Young 1999, Black 2002). Åberg (1998) for example states that in Germany 40% of drivers voluntarily wore seatbelts, this rose to 60% when it became compulsory to do so. However, when sanctions were enforced for not wearing one, compliance rose to 90%. Åberg also found that drivers were more likely to break speed limits and alcohol limits in the absence of surveillance. Hutter (1997) in a study of environmental inspection found that compliance with regulation increased with surveillance. Reason (1990) found that a major influence in non-compliance was that of the indifference by authorities to the rule in force. Rothstein

(2003) found in a study of governmental inspectors that the inspectors' own perception of the risk that the rule was designed to regulate, influenced the surveillance and enforcement of that rule. For example, National Radiological Protection Board (NRPB) inspectors are charged with the monitoring of radioactivity in workplaces. Rothstein found that artificial radioactive sources were closely monitored, however, natural sources such as Radon gas (which can present an equal risk to workers) were widely ignored. Baldwin *et al.*, (1999) in their submission to the Bristol Royal Infirmary enquiry claimed that weak sanctions following rule transgressions did not encourage compliance.

Clipsham (1990) studied the application of criminal sanctions following transgressions of the maritime collision regulations. In this he found that breaches of the rules were insufficient to trigger a prosecution, there needed to be additional factors present before the authorities took action. This was a similar finding to other studies in that a prosecution was only commenced when there was evidence of the most serious breaches of safety rules (Grabosky and Braithwaite 1986, Baldwin 1995, Hutter 1997, Hutter 2001a) (see also section 2.4.3 for details of MCA prosecutions).

Taking a short-cut or just getting the job done.

Taking a short-cut can have two different meanings in this research. The first being a physical short-cut, for example taking the most direct route across the Channel; and the second being taking a short-cut in the application of the COLREGs, for example the by-passing of the requirement to maintain course and speed for the stand-on vessel.

Non-compliance with regulations has often been attributed to either taking a short-cut or the desire to just get the job done (Reason 1990, Hutter 2001a, Lawton 1998, Olin and Wickenberg 2001, Corneliussen 2004). Olin and Wickenberg (2001) studied decision making by managers during new product development. In this they found that managers would routinely circumvent rules in order to facilitate the rapid development of new products. The managers believed that in a rapidly changing environment rigid rules were seen as too cumbersome and unweilding and so short-cuts needed to be taken. Hutter (2001a) found that many infractions of the rules governing crossing railway tracks was

due to the desire to get the job done quickly by taking a short-cut across the tracks. The belief was that large delays would be incurred if the proper procedures were followed, whereas the individual could achieve all that they wanted to through a brief infringement of the rules. Lawton (1998) observed similar routine brief track infringements whilst studying railway shunters.

Lack of acceptability of the legitimacy of the rule.

Another reason behind non-compliance with rules is that of a lack of legitimacy. This is a particular problem in command and control style regulatory approach (Ayers and Braithwaite 1992). The resonances within this study relate to the development of the COLREGs over the centuries (Plant 1996). It could be argued that rules designed to give rights of way for one sailing vessel, due to the direction of the wind, over another, have no relevance to the situation today for modern ships .

Corneliussen (2004) in her study of non-compliance with rules governing a biotech firm in Norway, found that there was a lack of acceptance with these rules due to a belief that the rules were neither legitimate nor fair. The issue of legitimacy is a common theme running through a number of studies of rules and regulatory practices (Aalders 2002, Badlwin 2000, Black 2002, Leplat and Hale 1998, Young 1999, Leplat 1998, Baldwin and Cave 1999, O'Malley 2004, Baldwin 1995, Baldwin 1990). Baldwin in his various publications on regulation and regulatory practices (2000, with Cave 1999, 1990, 1995) makes it clear that to ensure the legitimacy of the regulations, the body who both draws up and monitors the regulations must not only have a clear mandate to regulate but must also be in possession of the necessary expertise in the area. If these factors are found to be lacking then the regulatory effect of the rules will be limited and will not be seen as legitimate. Similarly Young (1999) found that there were certain rules which were not accepted when they were seen as a means by which individual managers were imposing their own agendas upon their subordinates. One method that has been used successfully to ensure the acceptance of rules is that of ensuring worker involvement during the creation and implementation of rules (Dawson *et al.* 1988, Walters *et al.* 1993, James and Walters 1999). Through this the workers are able to both understand the concepts behind

the rules and see the need for their implementation. This lends legitimacy to such rules and assists in the compliance with them through worker involvement and ownership of the risk.

Lack of trust where co-operation was required.

Within maritime collision avoidance co-operation and co-ordination between the parties are essential elements for the successful implementation of the collision avoidance rules (Cannell 1981, Plant 1996, Cockcroft 2005) (see also Chapter 4). This is because the COLREGs place differing requirements onto the parties involved in the collision situation. One ship is directed to maintain its course and speed and the other is required to keep out of the way. Therefore, the issue of trust in the give-way ship to resolve the situation is required for the successful implementation of the COLREGs. Similarly, where co-operation is required between parties for the implementation of rules then the issue of trust is of the greatest importance (Fukyama 1995, Renn and Levine 1991, Pidgeon *et al.* 1992, Slovic 1993, Cvetkovich and Löfstedt 1999, Poortinga and Pidgeon, 2003, Siegrist *et al.* 2003, Poortinga and Pidgeon 2003). Stein (1990) argues that a lack of trust between actors ensures that it is a rational for each actor to adopt a dominant strategy which will maximise their own profits at the expense of others. By way of contrast, Dorn and Brown (2003) showed how trust between police officers allowed traffic rules to be broken, because of a shared understanding of the situation and each others' roles within it. In Bennett's research on the implementation of environmental rules (1999) he states that corporations are theoretically disadvantaged by the full implementation of rules which have negative cost and efficiency implications if they implement them and other corporations do not (see also Taylor 1987, Ridley 1996, Hale and Swuste 1998). However, Bennett argues that such a situation ignores any ongoing relationship between the actors which can create an environment of trustworthiness, in that he states:

> The combination of a stable group who expect to continue to interact in the future, together with comprehensive information on the behaviour of others and the possibility of sanctioning facilitates trustworthiness.
>
> (Bennett 1999: 202)

Although, it should be noted that Bennett assumes transparency and the threat of sanctions to ensure trustworthiness between the parties. Corneliussen (2004) in her study of a biotech company found that one reason for non-compliance with a number of environmental regulations was due to the costs to be borne by that company and a lack of trust that others would also implement them. Aalders (2002) claims that an essential prerequisite of ensuring trust is that of ensuring communication pathways between competing companies and regulators are kept open. Räsänen *et al.* (1999) found that bicyclists would not force car drivers to comply with the priority regulations and give bicyclists right of way. This was due to a lack of trust that the car driver would comply with the regulations which, if they did not comply, would result in dire consequences for the bicyclist due to the asymmetrical injury risks involved in collisions between bicycles and cars.

Therefore, in order for people to trust each other to comply with regulations they require openness, transparency, the threat of sanction, a shared interest in the outcome and, most importantly, an ongoing relationship between the parties. Due to the co-operative nature required by the collision regulations I will return to the wider issues relating to concept of trust, in section 2.3.

As a demonstration of a workers professional skills.

The skills that a worker possesses are the hallmark by which they are judged and accepted by their peers (Keating 2001, Dorn and Brown 2003, Corneliussen 2004). This role of the peer group has particular resonances onboard ship where on-the-job training is the norm and the individuals' skills are gained through the close observation of their training mentors' activities. For example, I will illustrate in Chapters 6 and 7, the instillation of such routine non-compliance is an important aspect of training and fitting-in with the working practices onboard the ships. Similarly, Keating (2001) in his analysis of health and safety in the construction industry found that rule bending or out-right rule rejection was a means by which people demonstrated their competence with the job. In this respect Keating argued that workers showed how good they were at the job by

knowing the circumstances when certain safety rules could or should apply. Comparable results were also found in a number of other studies (Reason 1990, Reason *et al.* 1998, Dien 1998, Lawton 1998, Hutter 2001, Baldwin *et al.* 1999, Free 1994, Olin and Wickenberg 2001, Dorn and Brown 2003, Corneliussen 2004). Free (1994) for example, in a study of safety on the railways found that bending safety rules was viewed as the hallmark of skill and experience. Habberley *et al.* (1986) in a simulator study of navigator behaviour claimed that the navigators saw no reason to avoid passing close to other ships as from their past experience they knew that they possessed the skills to extricate themselves from that situation. In fact, by passing close to other ships they were regarded as being the most successful ship handlers. Reason (1990) in a study of car drivers found that those who rated themselves as better drivers also undertook the most rule violations. Reason believed these violations were a part of the driver's habitual behaviour and were seen by the drivers as being a means by which they displayed their superior skills. Similarly, Corneliussen (2004) studied non-compliance within a biotech firm and found that the firm did not comply with the rules because of their belief that their skills as professional chemists negated the need for such rules. In their minds the scientists within the biotech firm were operating from a position of principled disagreement based upon what they viewed as being superior knowledge. Baldwin *et al.*, (1999) claimed that doctors were more tolerant of rule breaking amongst each other than were midwives. They believed that this was in part due to the doctors being able to show that their decision was based upon their clinical judgement which was better suited to the job that they undertook than simply applying rigid rules.

Another interesting aspect of compliance is that identified by Bittner (1965) in his study of police rule enforcement. In this he found that police officers demonstrated considerable skill in their ability to retrospectively justify non-compliance as, in fact, being within the rules. Through this retrospective justification these officers were accorded membership of the organisation. Dorn and Brown (2003) identified a similar degree of retrospective justification among police officers in the aftermath of driving accidents. However, as Bloor (1980) has argued, any such actions whether in compliance

or not with rules, must conform to accepted norms held by the group in order to gain continued acceptance within that group.

> Where actors must engage in activities under the gaze of their work associates then they run the risk of being penalised for offending their colleagues sense of piety by engaging in practices which appear to others unacceptable formulations of the formal scheme.
>
> (Bloor 1980: 51)

Similarly, Zimmerman (1970) and Fortes (1983) regarded compliance with the group's norms as prerequisites of membership of a group or organization. Wittgenstein (1953) argued that not complying with the accepted norm of a society, whether through compliance with a rule or not, meant that the person was not complying with that form of life and so demonstrated that they had no membership of that grouping (see also Garfinkell 1967, Bloor 1983, Sidnell 2003). Such compliance with the operating norms of the workplace or organisation, rather than the formal external rules, was a common occurrence within other studies (Lawton 1998, Bailyn 2002, Leplat and Hale 1998, Schultz 2003, Reason *et al.* 1998, Olin and Wickenburg 2001, Aalders 2002). Lawton (1998) in her study of rule violations on the railway found that the essential element was that of compliance with the normal working practices of the group. Reason *et al.* (1998) in a study of workers within hazardous technologies claimed that the workers expected their colleagues to routinely breach safety rules. Therefore, it can be seen that an important aspect of gaining entry, acceptance and membership of an organisation is reliant upon compliance with the norms of that organisation. These norms often include routine rule violations which are seen as essential in order to demonstrate an individual's skills and professionalism.

Regulations could not cover all the circumstances.

The belief in the failure of the applicability of rules to cover all circumstances is particularly applicable to the Dover Strait's area. This is a Strait in which there are 400+ ship movements every day. This means that multiple collision avoidance situations are encountered by those crossing the Strait. However, as will be described in chapter 4, the COLREGs are designed to control two-ship interactions and not multiple encounters.

Others have stated that one aspect that is often cited as a reason behind non-compliance is that the rules can not or do not cover all circumstances encountered by people (Bittner 1965, Garfinkel 1967, Hutchins 1991, Black 2002, Bloor 1980, Bennett 1999, Leplat 1998, Baldwin *et al.* 1999, Sharrock and Button 1999, Fleury 1998, Dien 1998, Räsänen *et al.* 1999, Reason, *et al.* 1998). Reason *et al.* (1998) for example, stated that the variety of rules developed to govern safe behaviour will always be less than the possible variety of unsafe conditions. Sharrock and Button (1999) describe the problem as such:

> The number of examples which can be given to someone in order to teach them a rule is finite, but the number of applications which they may make of the rule once they have been taught it, is potentially infinite (or at least, indefinitely large) such that it is not possible for the teacher to give instructions in what to do in every case.
>
> Sharrock and Button (1999: 196).

The solution to this rule finitism is that which Garfinkel (1967) referred to as the *etcetera* clause. This is a clause within the rules which asks those applying them to extrapolate the existing rules to cover unforeseen, but similar, situations and to do it within the spirit of the existing rules. As will be explored further in Chapter 4, the COLREGs are no exception to this as they have an entire section devoted to it.

However this creates problems in the application of the rules as people are unsure about the application of rules in marginal cases. Räsänen *et al.* (1999); in their study of crossing points where bicyclists had right of way over car drivers, they observed that car drivers would not give-way in marginal cases. In a study of nuclear power station operators, Dien (1998) observed them trying to apply rules designed for emergency situations to operations which were just beyond the tolerances of normal operation, but beneath the level of an emergency. In this the operators referred to their responses as being an extrapolation from the rule in such a manner as to be both consistent with the rule as well as being within its spirit. Shultz (2003) saw how managers developed new in-house operating procedures in order to deal with new situations not envisaged by the rule makers, but such that these new operating procedures took into account the existing rules. In summary, when people are faced with circumstances beyond those envisaged by the

drafters of the rules, they then apply the *etcetera* clause, which is often included within the rules. This means that they try to extrapolate the existing rules so that they cover the new situation. This is an area of particular importance to this study as the COLREGs were written to cover two-ship situations. However, simple two-ship encounters were found to be extremely rare within the area of study.

2.2.2 Summary, Rule non-compliance Studies

The manner in which a set of rules are applied by a professional group is the subject of this research and all of the reasons behind the non-compliance with rules find resonances within this study. In summary, from this review of literature it was shown that there are a wide variety of reasons lying behind rule non-compliance. These may be listed as:

- Lack of knowledge of the regulations
- Lack of surveillance and enforcement
- Taking a short-cut or just getting the job done
- Lack of acceptability of the legitimacy of the rule
- Lack of trust where co-operation was required
- As a demonstration of a workers professional skills
- Regulations could not cover all the circumstances.

With regard to the reasons above, it should be noted that officers in charge of ships are required to undergo a considerable quantity of initial and refresher training throughout their careers and so their knowledge of the COLREGs should be very high. All of the participants within this study (bar two unqualified trainees) had sat for at least one MCA oral examination on the COLREGs and most of the participants were also master mariners. Therefore it would be of particular interest if the participants demonstrated a lack of knowledge of the COLREGs and this would indicate a massive failure of the nautical training regime. Furthermore, the physical area of the Dover Strait is under constant surveillance by the MCA and so any non-compliance should be detected (the surveillance aspects will be further explored in section 2.4). Therefore, any short-cutting

should also be observed by the authorities. However, such observation by the authorities would also be undertaken in conjunction with an acceptance that the rules are applicable to the situation and that they should be enforced in. For, as has been illustrated, without acceptance of the legitimacy of the rules then non-compliance often takes place especially within a highly trained work force who are able to demonstrate their superior knowledge and skills to situations which in themselves, deviate from those covered by the rules. The other factor that was highlighted was that of trust. Trust within the context of the application of the COLREGs is of vital importance. As will be shown in chapter 4, the COLREGs require one ship to maintain its course and speed whilst waiting for the other to take action to keep out of the way. This means that, the stand-on ship is directed to trust the other ship to resolve the situation. If the other ship does not take any action, or does so quite late, then the collision situation is not immediately resolved. Therefore, the issue of trust is highly relevant to this study.

There are a wide range of interrelated factors and issues which lie behind rule non-compliance. This review of the literature relating to this area has highlighted them. However, two issues are of particular relevance to this study and they are trust and surveillance. The former, because of the way in which the issue of trust is of paramount importance to the application of the COLREGs, where one ship is reliant upon the other to resolve a collision situation, and the latter, because of the strict surveillance regime that ships navigating in this area are under. However, this does not negate the importance of the other highlighted issues. As will be seen, trust and surveillance also emerged from the empirical data through the process of analytical induction as being of great importance to the respondents and this study.

2.3 Trust.

In this section I will explore the wider concepts relating to trust between people which were touched upon in section 2.2. Trust is an important concept due to the amount of trust that a person in charge of a ship must have in another person in charge of another ship which is on a collision course with their own, if they are to apply the COLREGs

correctly. For example, if a person is placed in charge of a ship which is directed not to take action, then that person has to rely on the other to resolve the collision situation. Thus, trust in the other is of primary importance to this study, for if trust does not exist then the COLREGs will not be applied in the way that they were intended.

Trust in another person or organisation is one of the founding preconditions of any form of social interaction. Garfinkel (1967) stated that trust was an irreducible condition of social action, that is without trust no social action could take place and that it was a part of the essential social capital. Tyler (2001) developed that concept by stating that the ability to trust someone is essential if a person is willing to take the risks in order to enter into a productive social exchange. Latour and Woolgar (1979) classified trust in a more economic sense when they included it as a form of investment within a cycle of credit. Luhmann (1979) stated that the function of trust facilitated the ability of people to live and work together in ever greater complexity. In essence, Luhmann saw trust as a means of facilitating risk taking in that without trust nobody would undertake a risk when an uncertainty was present (Luhmann, 1988). Therefore, for risk taking to occur, trust had to be present (Bachmann 1998, Viklund 2003, Beck 2002). Coleman (1990) took that idea further by suggesting that the concept of trust was simply a decision taken under risk. However, the issue of trust first came to the fore within risk perception studies through the work of Wynne (1980). In this work Wynne accounted for the differences between the lay and expert opinions on the risks associated with nuclear re-processing were due to the level of trust between the parties and in institutions. The issue of trust, however, continues to create great debate within the area of risk perception research (Viklund, 2003) and it is an important issue when co-operative action is required (Renn and Levine 1991, Pidgeon *et al.* 1992, Slovic 1993, Cvetkovich and Löfstedt 1999, Poortinga and Pidgeon, 2003, Siegrist *et al.* 2003, Poortinga and Pidgeon 2004).

Various attempts have been made to conceptualise trust through definitions. For example Rousseau *et al.* defined trust as:

> A psychological state comprising the intention to accept vulnerability based upon the behaviour of positive expectations of the intentions of or behaviour of another.
> (Rousseau *et al.* 1998: 395)

Whereas Siegrist *et al.* defines trust as:

> Trust is defined as the willingness to make one-self vulnerable to another based upon a judgement of similarity of intentions or values.
> (Siegrist *et al.* 2003: 706)

Both of these definitions of trust share the idea of placing one-self in a position of vulnerability and this would appear to be the crux of the issue relating to the concept of trust. However, they differ in their concepts of both the outcome and the intention of the other. With Rousseau the essential element is the willingness to accept vulnerability in return for a positive outcome. In contrast, for Siegrist *et al.*, the operative element is the combination of vulnerability with the belief in shared or similar values. This difference alludes to the idea that trust is more than a simple negotiation as shown by work undertaken upon risk perceptions which has allowed for a much more nuanced approach to theories of trust revolving around a combination of contextual variables (Poortinga and Pidgeon 2003, Renn and Levine 1991, Kasperson *et al.* 1992, Horlick-Jones *et al.* 2003, Pidgeon *et al* 2003, Siegrest *et al.* 2003).

Giddens (1991, 1994, and with Pierson,1998) takes the position whereby the individual takes a reflexive approach to the concept of engaging in a risk through the idea of active trust. This is where the individual engages with the other person so that trust is both created and won and so reflects a future orientated relationship. Giddens equates this to the reliability of a system in that it will perform to expectations, trust is therefore based upon the reliability of past performances being repeated in the future. Van Loon (2002) takes a contrasting approach in that for him trust is not only a reflection of past experiences but also one with more transcendental concerns. In this trust can also be experienced as a matter of faith or *fides* which stems from a moral obligation to place one's trust in the hands of another. In essence this could be equated to trust stemming from duty. Lane (1998) states that there are three assumptions present to constitute the

issue of trust: firstly there must be an interdependent relationship between the parties; secondly, trust forms a way of coping with risk or uncertainty; and thirdly, there is an expectation that the vulnerability inherent within the risk will not be taken advantage of by the other party. Zey, (1998) taking a rational choice perspective, acknowledged the concepts of trust relating to future expectations, vulnerability and risk by stating that:

> The likelihood of an actor, A, trusting, is the product of the value that actor B has for actor A plus the probability with which actor A expects actor B to realize that value in a particular interactional episode.
> (Zey 1998: 65).

Brenkert (1998) sees trust within business transactions as an attitude which is based around the shared beliefs of the other parties to the transaction. In this, there is an expectation that no one party will exploit or take advantage of the vulnerability of another, thus, trust is lost if they do. A similar view is taken by Boden (2000) in her analysis of international futures trading. In this study the issue of trust is based around the belief in common expectations and shared values for as she states there is no time available for any long winded rationalisation of whether to trust or not.

Liebeskind and Oliver (1998) in their study of trust within academic collaboration, state that trust stems from several factors which include social processes, calculation or shared values. Trust stemming from social processes is due to previous collaboration and friendship and so there is an expectation that the successful past partnership will result in future success. Calculative trust is based upon the clinical assessment of the value of the others' motives and interests. In this, a calculation is undertaken of the costs associated with the consequences of untrustworthy behaviour of the other person. Trust that is based upon shared values comes about through a shared understanding of values and outcomes. Fukuyama (1995) stated that this form of trust is most commonly influenced through shared social structures and institutions.

Renn and Levine (1991) analysed the specific factors that they perceived to be critical in the construction of trust through a review of literature. In this review five components

were identified, these being: a perception of competence in the other; a belief in their objectivity; the thought that the other will act in a fair manner; that the other's behaviour will be consistent with their past actions; and that there is a belief in the goodwill of the other. Kasperson *et al.* (1992) took a similar position in that they identified four elements in the construction and preservation of trust, these being: commitment to a common goal; competence in the other; a belief that the other cares; and that the other's behaviour is seen as predictable.

Siegrist *et al.* (2003) in their study of risk perceptions relating to electromagnetic fields ascertained a number of variables which constituted the construction of trust. In this they identified the following variables:

- General trust: a belief that most people are trustworthy most of the time;
- General confidence: the expectation that future events will unfold as expected;
- Value similarity: the assumption that values are shared between the parties;
- Past performance: judgements based upon previous actions of the other;
- Social trust: the willingness to make oneself vulnerable to another.

In addition, they stated that counter to the belief that regulations are attempts at increasing trust through ensuring confidence in a system, regulations can, however, be interpreted as signs that shared values do not exist and so distrust is created through lack of confidence brought about through the mere existence of the regulations (see also Nissenbaum 2001, Ribstein 2001).

Poortinga and Pidgeon (2003) in their study of lay perception of risk regulation used the term critical trust in order to reflect the manner in which trust is created from a multitude of factors which included the balancing of a concept of general trustworthiness with scepticism.

From this review of the theoretical perspectives relating to trust, it can be seen that no single uniting position can explain why people trust others in order to bring about a

required outcome. It must be seen that in constructing the issue of trust, people take into account a variety of aspects before entering into a relationship which places themselves in a position of vulnerability and these may be summarised as:

- Previous history;
- Predictable, consistent behaviour;
- The concept of shared values or vested interest;
- A belief in the competence of the other;
- A belief that the other cares about their welfare.

Furthermore, as alluded to by Garfinkel (1967), Tyler (2001) and Coleman (1990), for trust to exist there should be a willingness and desire to enter into a relationship with another. This is because the relationship is necessary when the desired outcome has to be facilitated by another. Therefore, a person who does not trust, in any way, the other party, who would be needed to cooperate in order to facilitate an outcome, would attempt to circumvent the need to enter into a relationship, with that person, by undertaking actions that do not require the other's cooperation.

The issue of trust within the maritime industry has always been highly regarded with such institutions as Lloyd's of London traditionally using "my word is my bond" as their motto (Lloyd's List 2003). Maritime commentators often lament the fact that trust is a scarce commodity and is often lost when past breaches have occurred (de Bievre 2003). However, there are few areas where the issue of trust is as fundamental as it is within collision avoidance. This is because in all collision avoidance situations, as envisaged by the COLREGS, there is always an element of co-operation between the two parties. Therefore, the element of trust within these interactions is of great importance for one ship must rely upon the other to take a mutually co-ordinating action in order to avoid a collision. As I will try to demonstrate in Chapters 7, the trust exhibited in the other party is constructed from a variety of factors.

2.4 Surveillance

In this section I will explore the wider concepts relating to surveillance which were touched upon in section 2.2. Surveillance is an important issue within this study for the MCA operate a radar station on the cliffs of Dover. I will draw upon the writings of Michel Foucault and the related work by others, to explore the concept of compliance with regulations due to the fear of punishment for non-compliance as observed though surveillance. The form and type of punishment for contraventions of the COLREGs is important for as previously highlighted in section 2.2, the lack of an enforcement regime often results in a greater number of rule infractions.

2.4.1 Discipline and Punish

In his seminal work *Discipline and Punish* (1975) Foucault describes how disciplinary power is used mainly to train the behaviour of the individual such that they conform to the regulations in force. Foucault described how the underlying requirement to ensuring compliance was that of complete observation:

> The perfect disciplinary apparatus would make it possible for a single gaze to see everything constantly...a perfect eye that nothing would escape and a centre towards which all gazes would be turned.
> (Foucault, 1975: 173).

Such a situation is encapsulated in the design and construction of the ideal carceral institution as designed and constructed by Jeremy Bentham in the Eighteenth Century. Foucault describes the design of the institution and its Panoptic tower, the Panopticon:

> At the periphery, an annular building; at the centre, a tower; this tower is pierced with wide windows that open onto the inside of the inner side of the ring; the peripheric building is divided into cells, each of which extends the whole width of the building; they have two windows, one on the inside, corresponding to the windows of the tower; the other, on the outside, allows the light to cross the cell from one end to the other.
> (Foucault, 1975: 200).

Through this architectural arrangement, the cell was constantly illuminated. The arrangement allowed light to fall upon the cell which allowed complete visibility, visibility for Foucault, became the trap, the opposite of the dungeon. Therefore, the person incarcerated in the cell could be observed at any time by the guard in the tower. However, an additional factor was that the prisoner could not observe the guard, the prisoner could only assume that they were being observed. This assumption would lead the prisoner to believe that any transgressions of the rules of the institution would be observed, resulting in the application of disciplinary measures. Through this fear of disciplinary measures, the prisoner complied with the rules of the institution, and the power of the institution functioned automatically. Hence the major effect of the Panopticon was to:

> ...induce in the inmate a state of conscious and permanent visibility that assures the automatic functioning of power.
> (Foucault 1975: 201).

Therefore, the role of the Panopticon was to ensure compliance with the rules of the institution through the inmates automatic conformity (Norris and Armstrong 1999). So, for Foucault, those subject to the gaze of the authorities' agents should automatically conform to the rules laid down.

2.4.2 The Metaphor of the Foucauldian Panopticon

The Foucauldian Panopticon has been widely, and critically, analysed as a metaphor for surveillance and control within the literature on surveillance (Dandeker 1990, Agamben 1998, Feeley and Simon 1994, Ditton 1999, Norris and Armstrong 1999, Bogard 1996, Gandy 1993, Ball 2000, Lyon 2001, McCahill 2002, Wood 2003, Vaz and Bruno 2003, Ball 2003, Yar 2003, Lianos 2003, Campbell 2004, Williams and Johnson 2004).

The role of closed circuit television (CCTV) systems has proved a very popular area of study (Feeley and Simon 1994, Ditton 1999, Norris and Armstrong 1999). Ditton (1999) for example, analysed the deterrent effects of CCTV camera systems in Glasgow. Ditton found that these effects were diluted through lack of knowledge about the system, as only 41% of respondents to a questionnaire were aware of the CCTV system's existence, 15

months after its installation. Norris and Armstrong (1999) rejected the idea that CCTV systems represented a movement towards panopticisation. Similarly, Yar (2003) claimed that although people are aware of CCTV systems, they take no practical cognisance of them. That is to say that, the observed do not self-regulate their actions to automatically conform to the rules of those undertaking the observation. Feeley and Simon (1994) claim that CCTV systems are not an attempt at self-regulation through self-surveillance, but are simply a technical means used to manage the threat posed by rule breakers. The CCTV pictures are simply used during the arrest and trial of suspects, rather than as a means of encouraging rule following. For example, police in Newcastle stated that between 1991-7 2,800 people were arrested following the inspection of CCTV pictures. Of those arrested 99% pleaded guilty to the offence when presented with the CCTV evidence (Economist 1997).

Agamben (1998) looked at other forms of post-Panoptic surveillance such as computer data collection. Rose (2000) theorised that visual surveillance would be surpassed by other forms of electronic surveillance constructed from the trail of data left by individuals during their daily lives. Visual surveillance would become dataveillance. Tam and Mui (2001) in their research on call centres in three different countries found that managers used information technology to quantify the work being undertaken through the analysis of measurable indicators, such as numbers of calls dealt with. However, the managers themselves accepted that this produced only a crude measure of efficiency and did not reflect some of the more complex tasks that the workers undertook. But for Green (1999), the opportunities that the collection and analysis of electronic data that people leave behind, a person's electronic footprint, represents a simple extension of the gaze of the Panopticon. Where once a whole population could be surveyed with one glance, now authorities can only observe at certain points, but the effects remain the same. Wood (1998) (see also Dandecker 1990) analysed the process of electronic data collection within the workplace and saw it as a means of ensuring the control of the forces of production remained with the employers. Surveillance was used to repress any differences between workers so as to guarantee uniformity within the workplace.

Hansen (2004), by contrast, saw workplace surveillance as having positive benefits to the worker under the gaze. In her study of employee assistance programmes, she found that through surveillance, management were able to identify employees on the verge of having problems which could reduce that person's productivity. Such potential problems, both work and domestic in source, once identified, could be dealt with before they affected the efficiency of the workplace. Of course, it could be argued that such a programme of preventative action is simply an extension of the control of the management has over the workers, in the same manner as identified by Wood (1998). However, Hansen's respondents stated that they saw it as extremely beneficial to themselves as they saw it in terms of concern by their employers, rather than as a means of control or repression.

Worker response to surveillance within the workplace has been studied, especially with regard to privacy and ethical issues (Sewell 1996, Oz *et al.* 1999, Miller and Weckert 2000, Ball 2001, Lankshear and Mason 2001, Lankshear *et al.* 2001, Findlay and McKinlay 2003, Whitty 2004). Lankshear *et al.* (2001) found that employee responses to electronic surveillance within a call centre represented a complex interaction between the employee and the management team. Similarly, Oz *et al.* (1999) found that worker responses to surveillance at work were situated within the dynamic of that particular organisation. They further identified that employees of companies that did not undertake workplace surveillance objected strongly to the concept of any form of surveillance. Interestingly, Findlay and McKinlay (2003) found that electronic data collection was only thought of as unobtrusive by the employees only when they accepted that it was objective in nature. However, a common theme running through the literature dealing with electronic data collection is that far more data was generated than could ever be managed by the collecting authority (Oz *et al.* 1999, Lankshear *et al.* 2001, Tam and Mui 2001, Findlay and McKinlay 2003).

However, even though these studies are critical of some parts of Foucault's writing, they retain the essential elements relating to the relationship between visibility, vulnerability and self-surveillance. Vaz and Bruno (2003) describe this self surveillance as:

> Self-surveillance is usually understood as the attention one pays to one's behaviour when facing the actuality or virtuality of an immediate or mediated observation by others who's opinion he or she deems relevant, usually, observers of the same or superior social position.
>
> (Vaz and Bruno 2003: 273).

Yar (2003) ascribes the true power of the Panopticon, outside of any ideal carceral institution, as lying within those being observed:

> The Panopticon is rather like Dorothy's Wizard- its power to command those whom it addresses rests upon their belief in its omnipotence, their taking seriously its sinister authority or menace, the barely veiled threat of sanction or reprisal should they refuse to obey.
>
> (Yar 2003: 267).

Yar ascribes a major sense of fragility to the metaphor of the Panopticon, this being that if people do not believe in the power of that which it represents, then the deterrent effects of any sanctions for rule breaking, are removed. So within the Dover Strait area, for those in charge of ships to automatically conform to the authorities rules, then they must believe that their transgressions would be both observed and punished. If they do not ascribe such beliefs to the surveillance regime, then it becomes an irrelevance and fails to ensure conformity and only serves to provide evidence in the aftermath of an incident in the same manner as CCTV systems.

2.4.3 The Channel Navigation Information Service (CNIS)

The MCA operate a radar station on the cliffs of Dover. This station overlooks the Dover Strait, observes and records the actions of the ships in transit through the area. Their stated functions are:

> The functions of CNIS are to keep the Dover Strait TSS under observation, to monitor the flow of traffic and to detect and report vessels which contravene the International Regulations for Preventing Collisions at Sea 1972, as amended (COLREGS).
>
> (MCA 2004b: 3).

These functions are broadcast to all seafarers in the area through warnings on charts, radio transmissions at 30 minute intervals and merchant shipping notices. Details of prosecutions following transgressions of the COLREGs are regularly reported in the maritime press and are posted on the MCA's website (www.mcga.gov.uk). Furthermore, one of the ferry companies have a policy of encouraging seafarers to visit the radar station in order to observe its operation. In addition, the scanner of the radar turning on the cliff directly above the port is clearly visible. It could, therefore, be argued that a surveillance regime similar to a Panopticon exists within the area of study. During a visit to CNIS I was informed by the deputy director that one transgression of the COLREGs occurs every 24 hours. Clipsham (1990) in an earlier study of the CNIS found that 69% of ships passing through the area failed to make the correct reports. He also found that in 1989, 335 ships were deemed to have contravened the COLREGs. Furthermore, it was found that 1127 ships were classed as 'rogues' for not reporting at all, from a total of 12,380 ship transits. I was further informed that such transgressions are treated seriously. When a ship appears to be contravening the COLREGs it is called on the radio by the operator. The ship is then informed of the situation and a report is made to the flag state. A prosecution for a breach of the COLREGs would then be commenced for any UK registered ships or, for any transgressing ships, upon entry into a UK port. Therefore, even when taking into account the fact that only a small proportion of the ships passing through the Dover Strait every day are either UK registered or will call at UK ports, there should still be a large number of prosecutions occurring from breaches of the COLREGs. Table 2.1 summarises all of the prosecutions undertaken by the MCA for breaches of the COLREGs between1999 and 2003.

Year	Offence	Aggravating circumstances	Punishment
2000	Yacht sailed for 24 miles in the wrong direction.	Aircraft and ship launched to identify the ship following failure to answer radio calls.	£15,000
2001	Breaching Rule 13, Overtaking. Collision between two cargo ships.	Collision with other ship.	£7,950
2001	Breaching Rule 13, Overtaking.	Collision with other ship.	£3,000

	Collision between two cargo ships.		
2001	Pleasure boat sailed for 20 miles in the wrong direction	Close-quarters situation[3] with 17 ships.	£2,500
2001	Fishing vessel sailed for 14 miles in the wrong direction.	Close-quarters situation with 4 ships, one of which reported the incident.	£11,164
2001	Fishing vessel sailed in the wrong direction. Collided with a cargo ship.	Did not show any navigational lights. Collision with other ship.	€7,500
2002	Fishing vessel, sailed in the wrong direction.	Master of the fishing vessel reported that he was lost as the vessel was not equipped with any navigational charts.	£9,110 (Owner fined £11,110 for not supplying the charts)
2003	Failure to keep a proper watch. Collision between two ferries.	Collision with other ship.	£4,500
2003	Breaching Rule 13, Overtaking. Collision between two cargo ships.	One fatality after one ship sank.	12 months imprisonment

Table 2.2 MCA prosecutions for breaches of the COLREGs, 1999-2003. (MCA 2004a)

In each of those cases, there were aggravating circumstances in addition to simply breaching the COLREGs. For example, the *Honeyborne III*, a UK registered fishing vessel, was observed sailing in the wrong direction up a traffic lane. The master of the fishing vessel reported to CNIS that he did not know where he was due to the electronic chart system not working and that he did not have any paper navigational charts. The master was subsequently fined £9,100 for breach of the COLREGs, whereas the owner of the *Honeyborne III*, was fined £11,100 for not equipping the ship correctly. In another case, the *Club Med,* a large fast yacht, sailed for 24 miles in the wrong direction, was involved in close situations with 13 ships and passed 0.1nm off a ship carrying dangerous cargoes. In order to identify the *Club Med*, operators at CNIS ordered the launching of a ship from Dover and an aircraft from Manston airfield, as the yacht did not respond to frequent radio calls. The master of the *Club Med* was subsequently fined £15,000. Furthermore, there were no prosecutions of cargo ships for breaching the COLREGs save

[3] The MCA uses the term 'Close Quarters' to cover all situations where there is a serious risk of collision. By this they mean that with slightly different circumstances a collision would have occurred. No distance is placed upon this definition.

for four cases each of which resulted in a collision. That is to say that no merchant ship was prosecuted for simply breaking the COLREGs, a collision with another ship had to occur before proceedings were commenced. The penalties for the collisions ranged from fines between £3,000 to £7,950 and in one case imprisonment for 12 months following a conviction for manslaughter. From this, it is clear that breaches of the COLREGs are not enough to warrant prosecution through the courts. Clipsham (1990) reported that prosecutions did not occur following transgressions of the COLREGs. Additional factors needed to occur before the authorities would take action.

Of course in such an international industry as shipping it is often difficult to find the people responsible for the ship in question due to layers of bureaucracy. Winchester (2003a) has stated that:

> Hand-in-hand with being offered vessel registration, the shipowner is often offered a means to register a company whose sole asset is the vessel. Offshore company legislation of the kind found in tax haven jurisdictions around the world have attracted a great deal of publicity for their derogation of the principle of publicness. Minimal local participation, the lack of registers of directors and the routine acceptance of bearer shares, often cloud the real ownership of a company through layers of bureaucratic opacity. In effect, the ownership of vessels appearing on open registers is often shrouded in corporate veils which may take many months to pierce.
>
> (Winchester 2003a, 78-7.)

For example, in the case of the *Erika*, which sank off the Brittany coast in 2000, after exhaustive enquiries lasting 14 months, the French authorities could not identify who actually owned the ship (Winchester 2003b). The *Erika*'s ownership was hidden behind ship management companies and a multitude of off-shore brass plate companies. The true ownership only became known when the owners voluntarily came forward. Therefore, an argument could be made that the MCA try to enforce the regulations, but cannot find those responsible. It could further be argued that, in common with many other forms of safety inspection, a prosecution is only commenced when there is evidence of the most serious breaches of safety rules (Grabosky and Braithwaite 1986, Baldwin 1995, Hutter 1997, Hutter 2001a). Baldwin (1995) reports that prosecutions are rarely undertaken for anything less than serious breaches of health and safety regulations as

viewed by governmental inspectors. For example, the Factories Inspectorate secured 1,488 convictions (from 1,771 cases brought) compared with the issuance of 10,457 warning notices in 1989. Hutter (1997) reports a similar situation involving the Railways and Industrial Air Pollution Inspectorates. In this she states that prosecution would only occur when there has been clear evidence of blatant and flagrant disregard of safety measures.

The surveillance regime covering the Dover Strait is designed to ensure compliance with the COLREGs through the fear of punishment for any transgressions of the COLREGs. Further, all seafarers should be aware that transgressions will be observed, as no actions escape the gaze of the radar. Therefore, the MCA have set-up what they believe will be a surveillance scheme that will ensure automatic compliance with the COLREGs due to concerns over the punishment that would follow from any non-compliance. However, as illustrated by the research on CCTV systems, the deterrent value of surveillance schemes is limited through lack of knowledge of the scheme and the associated punishments and so they have increasingly become the means by which the authorities collect evidence. I have illustrated that it would appear that the MCA, in common with other enforcement agencies, only prosecute when there are aggravating circumstances. However, the MCA expect that the surveillance system will ensure compliance with the COLREGs, therefore, the influence of the system upon the actions of the people in charge of the ships will be further explored within Chapters 6 and 7.

2.5 Summary

The research that I have undertaken is concerned with the application of the rules regulating maritime collision avoidance. These rules, known as the COLREGs, are applied by a professional group who have undergone a considerable quantity of initial and refresher training throughout their careers.

To this end I have tried to critically analyse literature relevant to this research and those underpinning questions. Firstly, the previous research on the application of the

COLREGs was analysed. From this it could be seen that the subject has been researched using a variety of methods including: radar observations; questionnaire surveys; and simulated collision encounters (see section 2.1). These studies have produced a wealth of data concerning the application of the COLREGs in both real and simulated situations. From direct observation of ship movements several researchers found that the people in charge of the ships wished to keep an area around them clear of other ships (see section 2.1.1), this area being termed the ship domain. However, the researchers were unable to ask the people in charge of the ships about what actions they took to maintain that area. Studies utilising radar and ship simulators were also reviewed (see section 2.1.3). In these it was shown that, despite both the wording of the COLREGs and the high level of training, the people in charge of the ships did not apply the rules in a consistent manner when compared with the other participants. The participants would take dissimilar actions when confronted with an identical collision situation. However, the researchers did not report on whether they pursued the reasons lying behind the participants' actions. Similarly, with questionnaire surveys, although the actions taken to resolve a theoretical collision situation were noted, the researchers did not ask questions regarding the reasons lying behind the participants' actions.

From this review, the researchers did, in part, explore the first of my two research questions, but they failed to investigate the second. The causes lying behind the phenomena were simply not reported. The main underlying cause of this was that the researchers either, could not, or did not, ask the respondents why they were taking the actions that they did. The human element of collision avoidance was not fully investigated. Such an omission does show the need for this study. However, these studies have shed light upon the actions of seafarers during general navigation and collision avoidance. The studies have further explored the variable interpretations of the COLREGs as illustrated by the actions of those navigating real or simulated ships. From this review, the skills required by the people applying the COLREGs are evident. The individuals need to analyse a considerable quantity of information and then take such action as will resolve the collision risk.

In order to adequately explore the issues relating to why people apply the COLREGs in the manner that they do, an understanding and review of the wider literature on risk management was required. This was due to the fact that this is the environment that the people in charge of the ships were operating in and that the COLREGs can be seen to be a risk management tool.

From a review of risk management literature it could be seen that risk management can be characterised as the setting of an acceptable threshold for a certain risk, an attempt to quantify that risk, followed by putting into place control measures in order to minimise the risk (see section 2.2). It should be noted that this approach to risk management aims to reduce and control risk rather than an attempt to eliminate the risk (Baldwin *et al.* 1999). The control measures used to minimise the risk are, in part, composed of rules and regulations. The other aspects involve the engineering out of risk and putting in place physical barriers to minimise any hazard. In relation to maritime collision avoidance, it is the application of rules which is of primary importance to this research. Therefore, the review of literature focused upon the issues surrounding non-compliance with rules. In summary, it was shown that there are a wide variety of reasons lying behind rule non-compliance (see section 2.2.1).

However, it was noted that the factors were not found in isolation from each other. Rule non-compliance has been found to be very complicated involving a whole range of inter-related factors. It is this inter-relation of factors which makes the study of this phenomena so fascinating. Trust and surveillance were of particular interest within this study. The former, because of the way in which the issue of trust is of paramount importance to the application of the COLREGs, where one ship is reliant upon the other to resolve a collision situation, and the latter, because of the radar surveillance regime that ships navigating in this area are under. Due to this I critically analysed previous studies undertaken in these area. However, this did not mean that the other issues were ignored.

Trust was seen to be one of the preconditions for any form of social interaction and one in which a state of vulnerability was accepted based upon a belief in positive expectations

(see section 2.3). Within the COLREGs one ship is required to trust the other to resolve a collision situation and so the ship places itself in a vulnerable position in order to gain the resolution of the collision situation, without having to take any action. However, it became clear that before a person would place themselves in a vulnerable position certain other factors were required to be in place. The balancing of such factors was termed by Poortinga and Pidgeon (2003) as being critical trust in which a concept of general trustworthiness was offset by scepticism. It will be shown in chapter 7 that the participants in this study also use a variety of factors to create a level of trust, or rather mistrust, in the other ship during the resolution of a collision situation.

The literature relating to surveillance, with special reference to the writings of Michel Foucault, was critically analysed with respect to the deterrent effects of surveillance systems upon potential rule breakers. The reason for this was that all the traffic passing through the Dover Strait is subject to a surveillance scheme. The scheme is operated by the Maritime and Coastguard Agency which has comprehensive disciplinary powers over those who break the COLREGs. In fact, this surveillance scheme was utilised in this study to explore the actions of ships navigating through the Channel (see Chapter 5). Further, the MCA expect that the surveillance regime would ensure compliance with the COLREGs. From a review of the sanctions undertaken by the MCA for rule transgressions it was shown that aggravating circumstances had to be present for the successful prosecution of those who broke the COLREGs. Therefore, the influence upon the actions of the people in charge of the ships will be further explored within Chapters 6 and 7.

Collision avoidance can be seen to be a complicated process involving the skilful interpretation of safety rules undertaken in an environment of risk, where trust is required in the other ship and where the authorities are able to monitor a ship's every movement. Therefore, all of this literature was of interest due to its relevance to a workplace that has a deep seated culture of risk aversion. This risk aversion is due to the consequences of a collision which should not be underestimated, as one could result in serious loss of life among the thousands of ferry passengers and crew onboard each of the ships in this study.

Chapter 3. Methodology.

3.0 Introduction

In this chapter I will discuss the methods that I used to investigate the issues that the research questions highlighted. I will explore the strengths and weaknesses associated with each of the methods and the strategies that I used to best employ those methods. The two main methods that I will describe are: a radar survey of traffic transiting the Dover Strait, and an ethnography of the work involved in avoiding collisions onboard ferries crossing the Dover Strait. Data was recorded during the ethnographic phase with the use of a hand held video camera. This enabled real time collision avoidance practices to be recorded at the same time as the justifications given by the participants for their actions.

Analysis of the radar data was undertaken using the novel analytical tool of the near miss encounter (NME). Whereas, analysis of the ethnographic data utilised the process of analytic induction within the paradigm of grounded theory (Glaser and Strauss 1967, Frankland and Bloor 1999).

Throughout this chapter I have adopted a reflexive approach. The main reason for this is the acceptance that research is never conducted within a vacuum and that the researcher will always have some effect upon the interactions with the participants (Punch 1993). In my own case I believe that my effects upon the research process should not be underestimated. This is because I am an ex-practitioner. I was a seafarer for 10 years and hold a Master Mariner's certificate of competency. To this end I have considered the ethical dimensions of this research as this is an under represented area within the social science methodological literature. Further, I felt that I owed the participants a special responsibility due to the trust that they had placed upon me, in part, by being an ex-practitioner.

3.1 Research Questions

The purpose of any form of inquiry is to ask and attain answers to particular questions (Giddens 2001, Eisenhardt 2002). This research is no different, for the purpose of this research was to explore the following two simple questions:

- How are the COLREGs being applied?
- Why are the COLREGs being applied in the way that they are?

The first question was used to explore the current everyday application of the COLREGs. In this I wished to explore the reality of collision avoidance practice and to undertake this a large quantity of data was required. Therefore, to answer this question the first phase of the research was concerned with the undertaking of a comprehensive survey of current collision avoidance practices and navigation. Through this process a dataset containing all of the details relating to how ships physically avoid colliding with each other will be built up.

The second question explores the nature of the application of the COLREGs. In this second phase of the research I expected to be influenced by what was found in the first phase of the research. The first phase survey raised issues which could not be answered by a survey alone as it was only able to show the results of the decisions of the people in charge of the ships, rather than their reasoning which led up to those decisions. Therefore, the most effective method for exploring this question was through an ethnographic investigation of the nature of the work of the people in charge of the ships. As was stated in the literature review (see section 2.1) an ethnographic investigation of the process of collision avoidance had not been undertaken before. Through this ethnographic phase I would be able to explore in-depth and in real-time, the decision making process lying behind the application of the COLREGs and the process of collision avoidance. I would be able to ask such questions, "why are you ignoring that ship?" or "why are you altering course at this moment?" Through such a process a deeper insight should be gained of the process of COLREG application and collision avoidance.

No one method can be used to answer all of the possible permutations of the research questions (Ackroyd and Hughes, 1981, Shipman, 1997) and so extend the possibilities of knowledge production (Flick, 1998) a mixture of methods was utilised. This is not to say that the mixture of methods was used as a means of triangulation (Denzin, 1970) but more as a means of exploring different areas through the use of different methods.

3.2 Access and Field Relations

The issue of access is one of vital importance within the research process for without access to the site the research cannot be undertaken (Johnson 1975). Hammersley and Atkinson (1995) describe how the process of gaining access can prove to be troublesome. In order to assist this process I gained letters of endorsement from the MCA; the Marine Accident Investigation Branch (MAIB), the UK's maritime accident and investigation body; the Nautical Institute, a professional body which represents the interests of navigators; and the National Union of Marine and Aviation Sea Transport officers (NUMAST) the UK's merchant navy officers union. These letters all stated that this was a valuable piece of research which had the potential to improve safety at sea. Following this access to the various companies ships was never a problem.

However, once onboard it became clear that access was not something that was simply switched on when the company said it was OK. Gaining access was simply the very first stage in the research process and the next was ensuring good relations with the research participants. Johnson (1975) claimed that the maintenance of good relations occurred through the gaining of trust of, and acceptance by, the members of the shipboard community.

The strategies that I used revolved around adopting a non-threatening and friendly demeanour as well as making it clear that I was an ex-seafarer. Beynon (1983) stated that he often used his own biography in order to facilitate his entry and acceptance within in the field:

> More significant by far, however, was my own background in teaching and experience in secondary schools, which I unashamedly employed to show staff that I was no stranger to teaching, to classrooms, and to school life in general.
> (Beynon 1983: 41)

My own background was of great help in demonstrating a level of technical proficiency as well as being seen as one of them. Wichroski (1997) found that her Catholic background was immensely useful in providing easier access to the cloistered communities that she studied. The Captain's were unfailingly helpful throughout the process. Another element that made the process of access easy was that the respondents were flattered that I wanted to talk to them. Several people remarked about how nice it was for someone to take an interest in their work and this appears to be a common issue within social research (Davies 1999, Finch 1993, Letherby 2000). Onboard the *Wye* Max stated that he was surprised but glad that I had come onboard (Fieldnote, *Wye* 4/4/02). Captain Damon on the *Usk* said that it was about time this sort of thing (collision avoidance) was looked at and he was pleased that people were taking interest (Fieldnote, *Usk* 2/5/02).

Throughout the research it was clear that access was something that could be withdrawn at any time. Hey (2002), for example, encountered problems with a head teacher part way through her research within a school, as he believed that the research was too disruptive and so should be stopped. Therefore, I adopted various means to try to ensure that good field relationships continued. Hunt (1984) and Punch (1993) both adopted the same unsociable working hours as the police officers that they researched. I adopted a similar strategy by being on the bridge for most of the sailings and so demonstrated my willingness to work unconventional hours. I also maintained my friendly demeanour and listened to the accounts of the people onboard. However, the major factor in maintaining good relations, as Johnson (1975), Beynon (1983), Armstrong and Harris (1991) and Wichroski (1997) found, was a shared biography with those I was studying.

3.3 Selection of a method to study vessel movements

In order to gain a comprehensive overview of the process of collision avoidance a large quantity of quantitative data was required. Through an analysis of this, pertinent issues would be highlighted which would then be used to inform the second phase of the research. From a review of the two main journals which deal with navigational issues (namely *Seaways*, the journal of the Nautical Institute and *Navigation*, the journal of the Royal Institute of Navigation) it became clear that radar observations had proved to be a key resource in the study of maritime traffic movements (see Chapter 2, section 2.1).

Large quantities of vessel movements occur at choke points around the world and this also increases the risk of collision (Lewison 1980, Cockcroft 1983, Rømer *et al.* 1995, Cockcroft 1998). Such choke points include: the Turkish Strait; the Strait of Gibraltar; the Sound; the Strait of Malacca, the Gulf of Suez; and the Dover Strait. Of all of those options the Dover Strait was seen as the most advantageous site in which to set the study. There were two main reasons for this: the first being that it is the busiest of all the choke points with over 400 hundred ships passing through the area every day; and secondly, there is a very well established radar observation centre located at the Dover Coastguard station and operated within the CNIS. Furthermore, Dover is the busiest ferry port in the world with 16 million passengers and 49,000 ferry sailings in 2002 (ShipPax 2003). This meant that there would be the possibility of gaining access to ships of various companies and so provide the opportunity to conduct ethnographic research in the second phase of the research whilst being within the same geographical area as for the analysis of the radar records. In addition, the Dover Strait is geographically close to Cardiff and so taking into account financial constraints, it is close enough to allow for multiple visits.

The Channel Navigation Information Service was set up in 1972 with a mandate to provide an information service for vessels transiting the straits of Dover (HM Coastguard 2002). The strait is monitored from both the French and British sides of the Channel. The operators at the station observe vessels passing through the UK sector of the strait on their radar screens, take details of the ships and give out information broadcasts relating

to navigational dangers. The CNIS only has responsibility for the vessels that pass through the SW bound lane and the deep-water route in the NE lane, as these lie within UK territorial waters. The radar data archive covered all ship movements within the surveillance area for the last 5 years. The system did not allow for electronic transfer of the data due to it being a bespoke system. However, a printing facility did allow for all of the ship movements to be printed onto A3 sheets and so allowed for in-depth analysis off site.

Previous collision avoidance research looked at short time periods of single hours or multiple hours over several days mainly due to the constraints of the technology in its ability to handle the quantity of data generated (Goodwin 1975a, Lewison 1978, Lewison 1980, Barratt 1980, Goodwin *et al.* 1983, Wennink 1992, Judson 1992, Jingson *et al.* 1993). However, I believed that it would be better to concentrate on a longer continuous time period as this would provide richer data. Therefore, I chose to select one 24 hour period and analyse all the shipping movements within the Dover Strait area during that time. There are a multitude of factors that have an effect upon the navigation of a ship. These factors may be summarised, although not exhaustively, as follows:

- Visibility,
- Weather,
- Daylight,
- State of the tide and current,
- Type of vessel,
- Training and number of personnel in charge of the ship,
- Experience, health and alertness of the personnel in charge of the vessel,
- Technological equipment on the vessel,
- Speed of the vessel.

The first four factors were within my control to influence, in the sense that I could select a day where they had the smallest effect. The remaining factors were the ones that I was most interested in and formed the basis of further exploration during the ethnographic stages of the research.

With the use of a nautical almanac (HM Nautical Almanac Office 200X) a day was selected which was half way between an equinox and a neap tide. For the day in question

there were 12hours and 3minutes of daylight with sunrise at 0602 and sunset at 1805. Meteorological data was also obtained from the UK's meteorological Office in Bracknell in order to find out whether the weather on that day would be acceptable. On the day wind speed never went above Beaufort scale 5, fresh breeze, and the visibility was very good, with a slight reduction in the early hours. For these reasons the day was acceptable for the purposes of data collection.

3.3.1 Data collection and analysis

After reviewing the traffic flows on the radar screen the research became focused on one area of the south-west bound traffic lane, between the MPC buoy and the Varne bank (See figure 3.1) (please also note figure 1.1 for the overview).

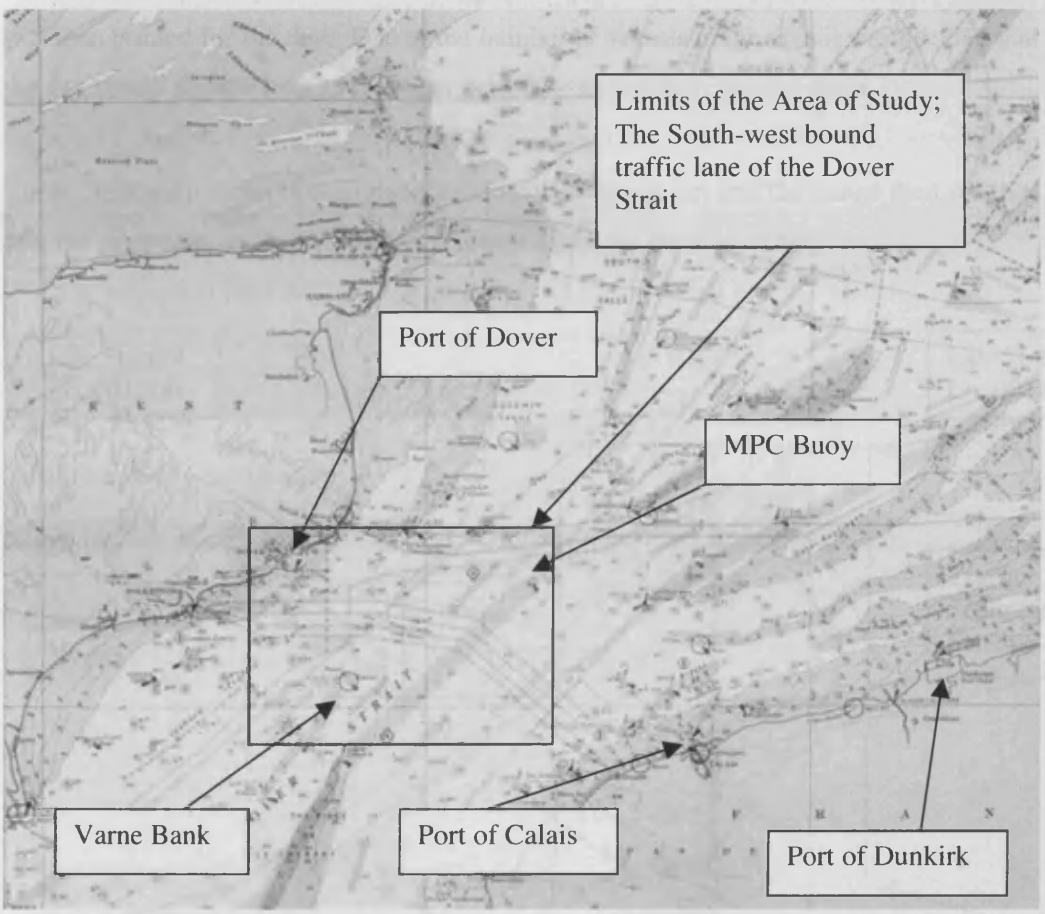

Figure 3.1, area of study.

The main reasons for this were:

- This is the closest area to the radar site and so the radar returns are of very high quality and reliable, thus, allowing close analysis of the vessel tracks.
- This area covers both the main cross-channel route as well as a natural choke point for vessels in-transit through the area.
- The south-west lane is within the UK's territorial waters and all vessels must call Dover Coastguard, rather than the French coastguard, to pass on their information. This means that the vessel information is of a primary source.
- The courses of vessels in-transit through this section should remain constant, as there are no navigational features to pass around, and so any alterations of course would be due only to collision avoidance.
- This was the area which represented the greatest numbers of crossing and overtaking situations due to the concentrating effect of the Varne and the proximity of the ferry traffic from Dover.

Once the area of analysis was decided upon the paper record of all the traffic in the area was then printed for the day. Due to the number of vessels in the area it was decided that the day would be split into 24 one hour periods with overlap between them.

These plots were then photocopied, the area of study cut out and the image then scanned into the computer. Figure 3.2 shows a scanned plot for the area of analysis.

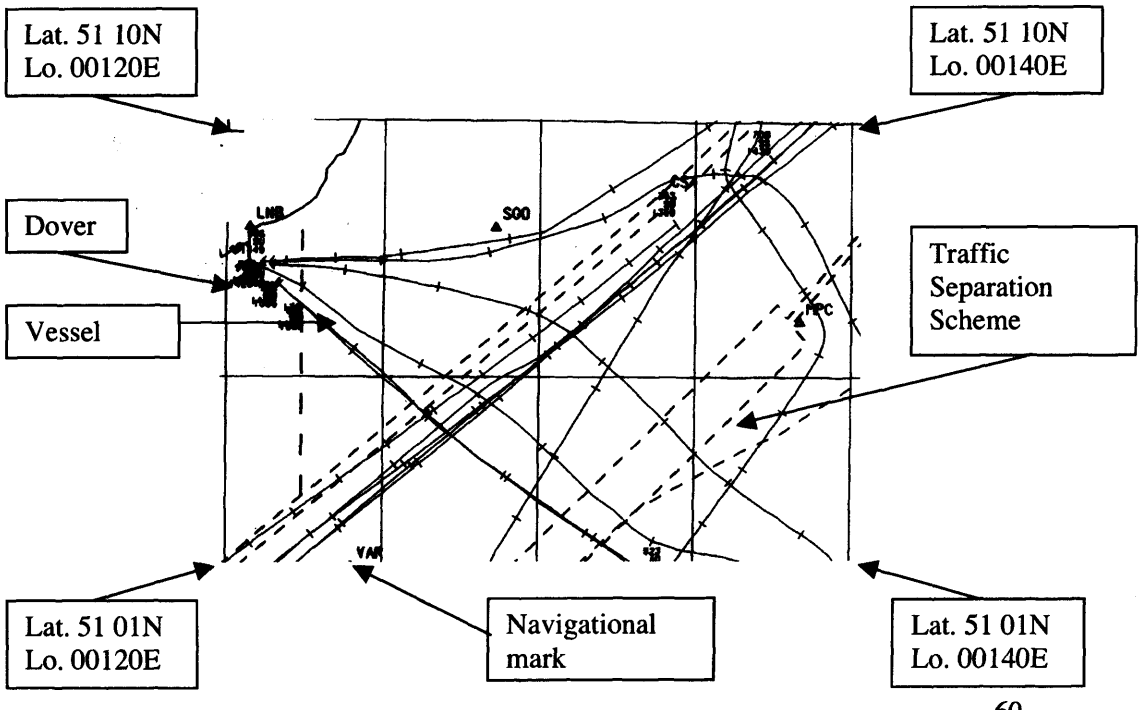

Figure 3.2. Scanned Image.

The solid horizontal and vertical lines represent lines of latitude and longitude respectfully. The hashed lines delineate the traffic separation scheme and the navigational marks are shown by the three letter acronym, for example the Varne Bank light vessel is marked by "VAR". The port of Dover is drawn on the top left of the diagram and a representation of the breakwater and detached mole can be seen. Vessel tracks are shown as solid lines with short perpendicular time marks attached to them. These time marks are printed at six minute intervals, six minutes being a tenth of a minute.

Once the image was scanned into the computer the image was cleaned with the objective of reaching a point where each track was isolated from every other one. To start the cleaning the image manipulation software, Corel Photo-paint 8 was used. Firstly, all of the individual bits of dirt, that are picked up in the photocopying and scanning stages, from the image and all the lines of latitude and longitude were removed. The next step was to isolate each individual track and so the cleaned general image was returned to the image manipulation software. Great care was taken at this stage to ensure that the correct track was isolated when several individual tracks crossed each other.

Through this process the individual vessel track was isolated, see Figure 3.3, Individual vessel track.

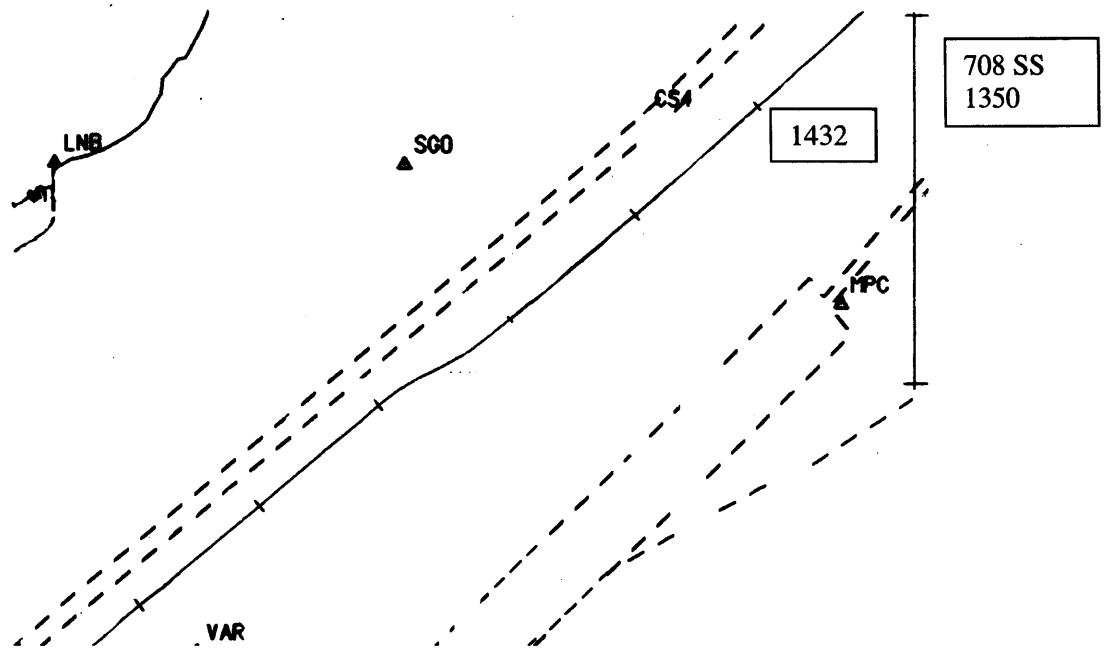

Figure 3.3, Individual vessel track.

Once a track was isolated a unique identification reference number was attached along with a time reference. In figure 3.3 the reference number "708 SS 1350" means that: it was the 708th target that the CNIS computer tracked; the first "S" refers to the vessel's southerly route; the second "S" means that the vessel has some form of specified dangerous goods onboard; and the "1350" refers to my track folder designation. This process continued over a period of two months until all the tracks were isolated.

Once all the individual tracks were isolated they were photocopied onto clear acetate sheets. Each track was then overlain on each other and the interaction noted, see figure 3.4.

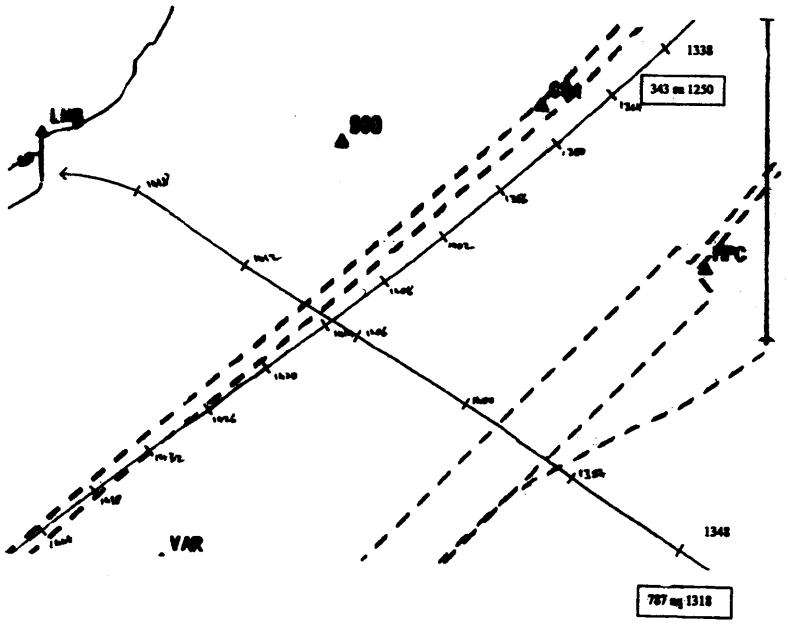

Figure 3.4, Ship to ship interaction.

Through this process 1946 ship to ship interactions were classified by their encounter direction (crossing, parallel passing or overtaking) and how close they passed to each other. Figure 3.4 shows how two tracks intersected with each other. The collision regulations were then applied to this and the situation was analysed in the light of Rule 15, Crossing situation. In this situation it was found that the vessels passed 1nm from each other at 1408 and no avoiding action was taken.

Through this method reliable data on the movement of ships within the Dover Strait was generated. These tracks related directly to the decisions taken by the person in charge of the vessel and so could be used to analyse collision avoidance manoeuvres within this area. They could also be used to generate descriptive statistics with regard to passing distances and encounter directions for all the vessels within the study area.

3.4 Selection of a method to study shipboard collision avoidance

The second phase of the research concentrated on the study of the process of collision avoidance and the application of the collision avoidance rules in practice. A description of the review of methods used previously to explore this area is given in Chapter 2, section 2.1.

3.4.1 Ethnographic studies

Ethnography, although having its origins located within anthropology (Geertz 1975), has a long tradition of use within social science qualitative research methods. Ethnographic investigation is typified by such classic studies as *Street Corner Society* (Whyte 1993) and *Boys in White* (Becker *et al.* 1961) in which the researchers spent an extended period of time immersed in the lives of those they were studying. This immersion involved direct observation and participation in the work and social life of the participants within the study (Agar 1996). As Davies (1999: 62) states:

> Participant observation is usually taken as the archetypal form of research employed by ethnographers.

However, I will use a wider definition of ethnographic research in that it should not just be conceived of as simply data gathered through observation, but a means that encompasses many methods of qualitative research (Marcus 1998). As Hammersley and Atkinson explain (1995):

> In its most characteristic form it involves the ethnographer participating, overtly or covertly, in people's daily lives for an extended period of time, watching what happens, listening to what is said, asking questions- in fact, collecting whatever data are available to throw light on the issues that are the focus of the research.
> (Hammersley and Atkinson 1995: 1)

From this, ethnography can be seen as a research approach which goes beyond simple observation so as to gain a full insight into the lives of those being researched. The end point of the research is to understand the lives and culture of those being research to the same extent as an insider (Collins 1998, Pinch *et al.* 1996, Davies 1999). Barker (1984)

in her study of a religious cult has stated that the level of understanding that is required is such that the researcher:

> [A]ttempts to recognise the assumptions or 'filters' through which their [the participant's] world is seen so that the actions and perceptions of the people he [*sic*] is studying make sense.
> (Barker 1984: 20)

One area in which ethnography has produced some of the best data is within the realm of work place studies as Smith (2001) states:

> The vantage position of ethnographic researchers - the direct experiences, the sustained observation, or the immersion - has allowed a degree of penetration into the inner workings of an occupation or a work setting that is not easily attained by other approaches.
> (Smith 2001: 223)

3.4.2 Workplace ethnographies

Ethnography has been used very successfully in the past to investigate the world of work. Researchers have been involved in almost every aspect of work from farm labourers (Thomas 1985) to phone sex workers (Flowers 1998) and have been able to gain the point of view, and understand the reality of, the workers they have been studying (Harper 1998). Ball (1967) in a study of the then illegal practice of abortion believed that it was the most appropriate means of studying that work-place as:

> It is only with such procedures that the natural context of deviance can be studied without the skewedness typical of the usual sources of data.
> (Ball 1967: 279)

Hutter (1997), in her two year study of the various regulatory government inspectorates, utilised a mixture of overt observation and interviewing. Through this she was able to ask questions of the inspectors when she was unsure of what was going on or to seek an explanation of the reasons behind their actions. In this research Hutter spent 18 months shadowing inspectors and surveyors from the Factory, The Industrial Air and the Railway Inspectorates, as they went about their daily business of checking various work places to

ensure compliance with industrial legislation. As she states, when recounting the research experience, observation was coupled with discussions of the inspector's work:

> The first weeks of the fieldwork were spent with the Inspecting Officer responsible for the enforcement of health and safety legislation and accident investigation. During this period I was able to discuss the nature of his work, observe him at work, including accompanying him on meetings.
> (Hutter 1997:252)

In this type of enquiry where a researcher is trying to ascertain reasons behind the application of legislation and rules, it is imperative that discussions and interviews are held with the participants for reasons of investigation and clarification. Hammersley and Atkinson (1995) state that:

> It should be noted that there are distinct advantages in combining participant observation with interviews.
> (Hammersley and Atkinson 1995: 131)

The main reason behind this statement is, as Hammersley and Atkinson (1995:132) go on to state:

> What people say in interviews can lead us to see things differently in observation.
> (Hammersley and Atkinson 1995:132)

Hutter followed up her research on the Railway Inspectorate with a later study on the health and safety of the British Railway (Hutter 2001a) in which she made extensive use of semi-structured interviews in conjunction with participant observation of safety officials.

In this research the research participants were interviewed in various situations and locations, both alone and with others present, all in order to seek as much information and clarity about their actions and beliefs as possible. Only during the interviews with personnel within the bounded space of their cabin, or private meeting room, was an interview schedule used. Later in the research the private interviews were dispensed with. The reason for this was that the time when people were available for interview coincided with the time when other people were navigating the ship. Therefore, the interviews that were undertaken within a private space, severely interrupted my ability to observe the

practice of collision avoidance. Instead, I worked the same questions and themes into the conversations and discussions that I had on the bridge. Through this method I was able to gain information relating to the same questions located within the context of the reality of the unfolding events on the bridge.

In addition to asking questions of the participants within this study, I also observed them in their work and social time. I participated in the bridge operations, ate my breakfast with them, watched the news and entered into discussions in areas such as politics and maritime safety and on one ship I even assisted in the training of cadets in basic navigational techniques. In all, I tried to participate in the daily lives of the personnel on the ship in order to understand their experiences and to see the work from their point of view. Punch in his study of an Amsterdam police unit stated that his desire to use participant observation was:

> ...to penetrate the social world of the policemen [*sic*]... inside the station, away from the public, relaxing in the canteen, taking time off when on duty, socialising with them outside of duty and out of uniform.
> (Punch 1993: 185)

In Punch's study he spent 6 months split into several periods, working and walking alongside police officers in central Amsterdam. He states that in addition to directly observing the police in their work he also became more and more involved with them as:

> I chased people, searched people, searched cars, searched houses, held people, and even shouted at people who abused my "colleagues".
> (Punch 1993: 191).

By doing this he felt that he better understood the work of, as well as the role of, the police within that society. Similarly, Bittner (1967) in his study of police discretion in emergency apprehension of people who appear to exhibit psychological problems, spent 10 months as a participant observer of police officers going about their everyday business. Bittner later recounted (1980) how he wanted to understand and analyse the workings of the force and to do this decided that the best way was to observe the lowest level of police officer in their everyday working life. Therefore, through this ethnography

of those actually undertaking the work of navigation and collision avoidance I was able to generate reliable data on how rules are operationalised.

3.4.3 Data recording

During the fieldwork, data was recorded both electronically (digital tape recorder and hand held video camera) and by hand (field notes). The fieldnotes were created both within sight of personnel on the bridge as well as in the private surrounds of my cabin. Hammersley and Atkinson (1995: 175) describe fieldnotes as:

> The traditional means in ethnography for recording observational data. In accordance with the ethnographer's commitment to discovery, fieldnotes consist of relatively concrete descriptions of social processes and their contexts.
> (Hammersley and Atkinson 1995: 175)

The writing of fieldnotes, I discovered, was not without issues. I found that my recording of observations within sight of the bridge personnel disturbed them to a certain extent. As I was writing I could see that the person in charge of the ship would become very self-conscious and double check something on the radar or the course that they had just changed, all in an attempt to discover what I was writing about. In fact I could see that the personnel were very curious as to what I was writing and on one occasion as the fieldnote extract below shows I could almost feel the Captain's breath on the back of my neck as he peered over my shoulder:

> As I was writing some notes I became aware of the Captain (Damon) standing behind me trying to read what I was writing. When I turned around he said "Oh so you make a little diagram of the traffic then do you, that's good". I'm sure he was trying to read my notes, just out of curiosity. Just glad that my handwriting is so bad.
> (Fieldnote, *Usk* 3/5/02)

However, I found it interesting that no one ever asked me what I was writing about, even though almost every other subject of conversation came up.

The second means of recording the work of collision avoidance was through the use of a hand held digital video camera. The use of video and photography is a widespread

technique within anthropology (Collier and Collier, 1986) and visual sociology (Emmison and Smith 2000, Banks 2001). In this research, the camera was aimed at the radar screen in order to record the traffic situation as seen by the person in charge of the ship. The radar screen was the means by which that person interacted with the world and so by recording that screen their comments could be placed within the context of how they, literally, viewed the world. In addition to the visual image, a simultaneous audio recording was made. As the fieldwork progressed it became clear that the visual recording of the radar screen was an essential element in placing the words of the participants within the context of the collision avoidance. Without recording the screen, making sense of what was said would have been incredibly difficult without copious diagrams, the drawing of which would have seriously impeded my ability to observe the scene.

3.4.4 Data analysis

The data was handled through the master document function of MS Word. Qualitative data analytical software such as NUD*ST and QADAS was tried. Such software packages have a history of being used (Lee and Fielding, 1991, Richards and Richards, 1991), have proved very effective as a means of data handling in the past (Kelle, 1995, Weitzman and Miles, 1995, Fielding and Lee, 1998) and this theme will obviously become more widespread in the future (Popping, 2000, Weitzman, 2000). However, the master document method was perfectly adequate for this process. Through the use of the master document I was able to create networks of themes, search for text and create linkages with the different parts of the data.

I transcribed all of the interviews held on audio or video tapes. I immersed myself in this data, a process which was aided by the action of transcription. In fact I viewed the transcription process as one of the first stages of the analytical process and fundamental to my understanding of the data. This was important as I believed that any theoretical findings of the research should be firmly grounded within the data (Glaser and Strauss 1967).

Grounded theory as espoused by Glaser and Strauss (1967) has at its heart the idea of emergent analysis. In this theoretical understandings of the researched subject are produced from the gradual examination of the data (Charmaz 2000). Ryan and Bernard (2000) states that:

> Grounded theory is an iterative process by which the analyst becomes more and more "grounded" in the data and develops increasingly richer concepts and models of how the phenomenon being studied really works.
> (Ryan and Bernard 2000: 783)

Lofland (1995) has termed this process analytic ethnography which has two basic process: the coding of data as it is accumulated; and writing notes about those codes. Frankland and Bloor (1999) describe the process of analytic induction whereby the researcher cyclically immerses themselves into the data in order to generate the recurrent themes and analytical categories which would be used to further examine the data. I undertook this process to generate the codes by which I would examine the data through a careful line by line reading of the text. Furthermore, by grounding the codes within the data I will have been able to shake off the biases or 'value inertias' (Sadler 2002: 124) of my own biography.

Eisenhardt (2002) states that coding themes should also include broader themes which derived from existing literature. Fielding (1993b) describes how these codes could be generated from either theory, coding down or from the data itself, coding up. I adopted a mixture of both coding up and down to generate the analytical coding framework. Therefore, a coding frame was initially constructed using broad theoretical themes such as risk and surveillance generated from the literature. Then, through an initial analysis of the data, themes revolving around the concept of trust and professional ability emerged from the data. The coding frame was then refined to incorporate these emergent themes. Through this process I was able to interrogate the data from the existing theoretical positions whilst at the same time allow any findings to be generated from the common themes found within the data. Through this process the ethnographic data could be effectively analysed.

3.5 Ethical considerations

In common with all other pieces of research, ethical concerns came to the fore from a very early stage. During the initial drafting of the research proposal the need to prevent harm to the people that I would be talking to and observing whilst they went about their daily working lives was of paramount importance. Indeed the idea that your research should not harm the participants that have willingly given their time and attention to you is one of the central tenets of the social sciences. In this section a discussion of the ethical concerns that were faced and the strategies that were employed will be undertaken. I will also discuss elements of risk experienced by myself in a reflective manner and how that affected my relationship with the research participants. Furthermore, I will also describe how the ethical dimensions of the research developed as it became apparent that my interactions with the research participants were influenced by my position as an ex-practitioner. This meant that I was accepted and trusted from the outset. For example, shortly after boarding the *Tawe* I was included in a meeting in which the professional abilities and career paths of several shipboard staff members were openly discussed (Fieldnote *Tawe* 29/5/02). To this end I have considered the ethical dimensions of this research at some length as I felt that I owed the participants a special responsibility due to the trust that they had placed upon me in part by being an ex-practitioner.

3.5.1 Preventing harm

Ethical considerations cover a very wide spectrum of concerns throughout the research process, from ensuring that the research participants freely give their consent, to how the research is disseminated. However, the one overriding concern that governs and guides all other considerations is that of not causing any harm to those being researched. The British Sociological Association (BSA) (2003) in point 13 of their Statement of Ethical Practice makes it quite clear that it is the researcher's responsibility to ensure that no harm is caused to their participants when they state that:

> Sociologists have a responsibility to ensure that the physical, social and psychological well-being of research participants is not adversely affected by the research. (BSA 2003:13)

The preservation of the anonymity of the participants is probably the single most effective means of preventing harm to those involved (McNeill 1992, Punch 1998). The main reason for this is fairly self-evident in that authorities or employers will be unable to attribute anything that is said that they either do not like or is illegal to the actual person involved. This has two beneficial effects as not only does it protect the individual from harm through unwelcome attention, but also allows them the freedom to say what they truly mean, free from the fear of identification (Coffield *et al.* 1986). The BSA takes the issue of anonymity very highly as not only do they make a general assertion, in point 34 of their Statement of Ethical Practice, for the need for anonymity (BSA 2003), but also provide guidance on how to achieve it, in point 36:

> Where appropriate and practicable, methods for preserving anonymity should be used including the removal of identifiers, the use of pseudonyms and other technical means for breaking the link between data and identifiable individuals.
> (BSA 2003: 36)

The importance of anonymising the data was shown by the way the wider industry, accident investigators and regulators view the non-compliance with the collision regulations as both illegal and reprehensible. These views were exemplified by the prosecutions of the personnel involved in the collisions between: the *Ash* and the *Dutch Aquamarine*; and the *Diamant* and the *Northern Merchant* (Maritime and Coastguard Agency 2003). Another example was the reporting of the Nautical Institute's study of the application of the collision regulations (Syms 2003), which argued that many seafarers apply the rules incorrectly, has been widespread and particularly damning (Irving 2003, Grey 2003). To this end great care was taken to ensure that as many identifiers as possible were removed from the data. Times and dates were altered, as were names of ships, people and companies. A further aspect of the participants' names was that of gender identification. Female participation within the maritime industry is much less than male. The Institute of Employment Research (Institute of Employment Research 2000) estimated that women seafarers made up a total of 8.3% of the total seafaring labour on the UK flag. However, their representation within the navigation department is much smaller. NUMAST state that 1.3% of their membership consists of women (Belcher *et al.* 2003). Within this study, the female participation rate was less than 1%.

Therefore, the decision was taken to use all male names as the women involved would have been instantly identifiable even with the use of all of the other anonymising strategies. However it should be noted that this is in no way any attempt to marginalise the contribution that that the women onboard the ships made to the safe operation and navigation of the vessels.

3.5.2 Informed consent onboard ship

The BSA takes the issue of informed consent very highly as, not only do they make a general assertion, in point 16 of their Statement of Ethical Practice, for the need for informed consent (BSA 2003) but also provide guidance on how to achieve it:

> As far as possible participation in sociological research should be based on the freely given informed consent of those studied. This implies a responsibility on the sociologist to explain in appropriate detail, and in terms meaningful to participants, what the research is about, who is undertaking and financing it, why it is being undertaken, and how it is to be disseminated and used.
> (BSA 2003: 16)

Furthermore, in point 17 they make it very clear that the participant should be conscious that they can refuse to take part:

> Research participants should be made aware of their right to refuse participation whenever and for whatever reason they wish.
> (BSA 2003: 17)

In addition to the BSA's points Davies (1999) contends that informed consent consists of two distinct elements:

> First, informing participants of the nature and likely consequences of their participation in the research in a way that is comprehensible to them; and, second, obtaining consent that is based on their understanding of this explanation and free of any coercion or undue influence.
> (Davies 1999: 47)

With these points in mind I sought to ensure that all of the participants had a clear idea of what the research was about, what I would be doing and what I would do with it later on. I would give a short talk to all of the bridge team and this talk consisted of:

> 'Hello, my name is Phil Belcher. I am onboard to conduct some research into how you go about avoiding collision and applying the collision avoidance rules. I want to make it clear from the start that I do not work for the Maritime and Coastguard Agency (MCA) or Iberian Ferries. I work for the Seafarers International Research Centre (SIRC) which is part of Cardiff University. SIRC was set up in 1996 to study the health and safety of the merchant seafarer with monies donated by the seafarers trust of the International Transport Federated workers union (ITF). I will spend most of my time onboard on the bridge during the passage. If it is OK, I will be using a video camera pointed at the radar screen and asking the officer of the watch (OOW) to narrate what is going on. I will also ask questions about the traffic and the application of the rules. For your information this research has been endorsed by the MCA, NUMAST, MAIB and the Nautical Institute. The purpose of the research is simply to find out how you go about the process of avoiding collisions. It will be written up as a PhD which should be completed in 2005. I take the issue of confidentiality very highly and so I will try to assure anonymity for all those who take part. Now you can never be 100% that people will not be identified but I will do my best to prevent that by changing your names, the company's name, the ship's name and the dates. All of this is undertaken to prevent anything you say getting back to you and also so that you can feel free to say anything that you want to. I also want to make it clear that you do not have to take part. If you do not want to take part then that is fine and I will not bother you. Thank you'.
>
> Field note, *Taff*, 16/5/2002.

After I had made this talk everyone would nod or mutter something to the effect that they would be willing to take part. I had no refusals and everyone seemed very willing to take part. However, there was one incident on the *Dee* which indicated how someone may state that they are willing to take part but are so uncomfortable, due to an awareness of my presence, that they are in effect withdrawing their consent. In this incident the Master and the officer of the watch (OOW) had a disagreement with regard to the course selection on leaving Dover harbour. There was such a breakdown in the relationship between the two that the Master simply took over from the OOW. When the Master left the bridge the bridge team discussed the incident and below is an extract from my fieldnotes made immediately after the incident:

> 'When the Master left the bridge Colin said that 'it's only in one in a thousand crossings that the master has ever countermanded what I believed should happen'. But the more sort of ethical questions appears is that Isaac the Master gives the impression that he is very very aware of my presence and so is changing his behaviour because of my presence and also very aware of the camera and I don't

> think that he is happy with that. I think that he believes that he is on show and is being checked. Also he seems to be altering his behaviour. Both Colin and Percy, another OOW, basically said the same thing. He regarded the Master's behaviour as strange and a bit out of the ordinary. So that then raises the question about whether it is ethical to record the movements and actions of a person who does not want them to be recorded? So with that in mind I went to see him [Isaac] after leaving the bridge and reiterated that if I am ever in the way, or if he is ever uncomfortable with the camera or uncomfortable with me then just say and I can turn the camera off or I can leave, that kind of thing. This was because I explained that it all hinges on being voluntary action and giving informed consent. He stated that he was behaving normally and this was the way it is done and its not an issue. But we'll see."
>
> Field note, *Dee*, 14/6/2002, 1535.

From this it can be seen that the issue of informed consent went beyond someone simply saying, "yeah, that's fine, I've got nothing to hide". In this consent was effectively withdrawn by one of the participants and this illustrates how the concept of consent can change throughout the research process. I also believe that this illustrates how consent was given on the basis of my being an ex-practitioner, rather than as a researcher. This distinction only became clear to the respondents when I started collecting data.

This incident also highlights the issue of coercion (Davies 1999) in that I felt that Isaac's consent in conducting the research was based more on his fear of upsetting Iberian Ferries than in any actual willingness to take part. I believe that my strategy of using letters of endorsement from the main regulatory and professional bodies, as well as obtaining consent from the companies, effectively bullied Isaac into complying with the research. For, although I stated that anyone was free to withdraw at any time, in the mind of Isaac this option was unavailable to him. It should be noted that I have not used the transcript from that incident in any section of this thesis.

3.5.3 Researcher risk and harm

An element that is quite often neglected within research is the negative aspects of risk and harm to the researcher of undertaking the research. Accounts of the risks and dangers that researchers face do not normally enter into the general sociological literature (Coffey

1999). In fact there seems to be almost no tradition of evaluating the risks to be faced by researchers undertaking the work. As Lee-Treweek and Linkogle (2000:197) state:

> ...the issue of protecting researchers is often disregarded and has never been fashionable to think about or to discuss.
> (Lee-Treweek and Linkogle 2000:197)

Neither Monaghan (2002) nor Calvey (2000) appeared to give much thought to the dangerous incidents they would undoubtedly face during their covert participant observations as door supervisors (bouncers) prior to the commencement of the fieldwork. Westmarland (2000: 26) even goes so far as to state that not only are threats to personal safety inevitable when studying policing but essential to the understanding as they positively informed the research.

Lankshear (2000: 80) in an ethnographic study of a research laboratory in a hospital did not consider the dangers that could be faced in this environment because:

> Initially I assumed the hospital to be a place of cleanliness and safety, a research site free from threat.
> (Lankshear 2000: 80)

In common with the cases cited above before undertaking the fieldwork, I did not consider to any great extent the physical dangers that I would face. This was almost certainly due to my own biography for I believed that I had the training and experience to cope with those risks (Bellaby and Lawrenson 2001, Hutter 2001a, Natalier 2001).

Going to sea for any individual is an undertaking which has many inherent risks. The Marine Insurance Act terms the act of going to sea as an 'adventure' (Hodges 1996). In 2001 155 ships were lost in maritime accidents around the world (Lloyd's Register-Fairplay 2002). In 2002 one vessel was lost in the Bristol Channel shortly after a former director of SIRC had completed 3 weeks of fieldwork onboard. However, it could be argued that the maritime sector that I would be studying had not suffered any major casualties since the loss of the *Herald of Free Enterprise*, back in 1987 (Department of Transport 1987), and this was one of the attractions of studying this maritime sector, the very lack of casualties. However, there had been several incidents in which lives have

been lost in recent times (Marine Accident Investigation Branch 2003a, Marine Accident Investigation Branch 2003b). Accidents have also occurred involving ships within this sector mostly involving their collision with parts of the port's infrastructure (Spurrier 2003, Porter 2003, Warner 2003) in fact one of the ships still bore the marks of its collision with a crane when I joined it and another hit Dover's breakwaters shortly after I left it. Therefore, major risks involving loss or damage to the ship which resulted in loss of life should not have been so casually disregarded.

One risk that I did think about before joining the ship, and took steps to avoid, was that of the risk of a traffic accident on the car deck of the ship. The car deck is an area in which vehicles of all types and sizes[1] are crammed in as tightly as possible. Therefore, there is an increased risk of accidents due to being run over or crushed between the vehicles. Because of this risk I avoided the car decks completely during the research. However, this approach led to issues relating to how I dealt with unwanted invitations to visit those places whilst still maintaining good relations with the invitors. In one incident, Donald the Master of the *Tawe* stated that the ship was fitted with enhanced stability protection and that I should go down to the car decks to see it as I would be interested as a professional mariner. The following day he asked me if I had been down to see it yet and when I said no, I saw an expression of disappointment cross his face and from that moment on he ignored me completely. A second incident occurred on the *Exe* when Spencer invited me down to the car deck to see how they packed the cars in. By this stage in the fieldwork I was more skilled in the rejection of those offers and explained that I caught up on my sleep when we were in port. This elicited a humorous comment about sleep patterns. These incidents illustrate how the process of maintaining good relationships with the participants is fraught with problems when any perceived snub can effect the relationship between the participant and the researcher (Sampson and Thomas 2003).

However, even though I had expected and taken steps to avoid the risk from traffic onboard the ship, I had not taken the possibility of being run over in the port into account.

[1] On one crossing on the *Tawe* the ship carried a number of circus animals including an Elephant in an oversized horse box.

When joining the ships of Iberian Ferries I was either escorted directly to the ship in a car or by bus, run by the port. However, as Sirius Line do not take foot passengers, such arrangements were not available and I had to walk across the whole ferry terminal which, taking into account that 4.3 million vehicles passed through the port in 2002 (ShipPax 2003), could be described as busy.

The lack of consideration given to the physical risks that were faced was a failing within the research design. However, even if those risks had been discussed, it seems unlikely that any part of the research could have been changed. Although during any future visit to the port of Dover I will be wearing a high visibility jacket.

Of concern, and an area that I did take into consideration, was the risk of the damage to my emotional health caused through research into maritime casualties. Emotional and psychological harm can occur throughout the research process especially when researching an area close to your biography (Peterson 2000). These problems are exemplified by Lankshear (2000) who undertook a research project located within a maternity ward of a hospital. This was the same maternity ward that she gave birth in and the research topic touched upon an important part of her life as a parent:

> It made me confront and remember things that I preferred to block from my mind. My view of and feelings about my life and past were threatened.
> (Lankshear 2000: 85).

This issue of emotional risks first came to mind when I was working on the data management of separate project, Transational Seafarer communities (ESRC ref: L214252036). During this project I was involved in coding thematically interview transcripts and I unwisely chose to start with the interviews undertaken onboard a ship that I had worked on two years previously. This brought to the fore all the reasons why I left the sea in the first place. A second issue was that of researching in the field of collision avoidance. On the 3rd of June 1993 the *British Trent* collided with the *Western Winner* with the subsequent loss of nine lives (Marine Accident Investigation Branch 1993). I knew most of those nine and this fact has, probably, more than anything else driven my desire to conduct research in this field.

3.5.4 Ex-practitioner research

This issue of ex-practitioner research was one that has been woven throughout this chapter. Punch (1993) claimed that a person's background will always have an effect upon the participants in any research. In essence, social science research can never be undertaken in a laboratory setting. Therefore, I could not, and should not, have ignored my own biography. Through the analytical methods that I have outlined (quantitative analysis of radar data coupled with an analytic ethnography of the shipboard workplace) I was able to limit my own biases or 'value inertias' (Sadler 2002: 124). This was undertaken by an objective analysis of the radar data, coupled with the analytical process involved in the exploration of the ethnographic data. By limiting my own biases based upon being an ex-practitioner, I was able to explore the richness of the data produced by those methods. However, biases stemming from my own biography were not the only issues that being an ex-practitioner brought forward. The other issues have revolved around informed consent due to the trust given by being a member of the same "club".

The access that I was provided with, in each of the venues in which I undertook data collection, indicated that my presence was both non-threatening and welcome. Each individual freely spoke to me and, in a number of cases, provided me with some very private information. In addition, I was included in meetings in which the career prospects (both positive and negative) of people onboard were openly discussed. None of this information would have been provided if the participants did not trust me to handle this knowledge in a sensitive manner. It appears that this trust was, in part, based upon my ex-practitioner status. As was explored in chapter 2 section 2.4, trust is based upon a number of factors including: a concept of shared values or vested interest; a belief in the competence of the other; and a belief that the other cares about their welfare. These factors resonated with my ex-practitioner status. Therefore, it appeared that much of the richness of the data was provided because of being an ex-practitioner, rather than through the participants' complete understanding of the research process. Therefore, I felt that I owed the participants a special responsibility to, not only to act in the most ethical manner possible, but to be seen to be doing so.

Being an ex-practitioner both assisted, as well as detracted, from the research process. The beneficial aspects meant that I was immediately accepted, could understand the technical and slang terms in everyday use and was able to place the actions being undertaken within the regulatory regime of the COLREGs. Lofland and Lofland (1995) illustrated these points by comparing the biographies of a number of researchers with their research topics, before stating that:

> [M]uch of the best work in sociology and other social sciences -within the fieldwork traditions- is probably grounded in the remote and/or current biographies of its creators[2].
>
> (Lofland and Lofland 1995: 12-15)

The negative aspects revolved around the need to ensure that my biases did not creep into the analysis of the data, that I did not become too emotionally involved in the subject; and that the trust placed in my hands by others was not betrayed.

3.6 Summary

The methodology that is used in any piece of research should at all times be fit for the purpose of exploring the issues brought to light by the research questions. The research questions revolved around the application of regulations designed to control collision risks. The first question being one where I wished to explore how the COLREGs were being applied in practice and the second, being an examination of why they were being applied in that manner. These questions suggested a mixture of qualitative and quantitative methods. By taking a mixed method approach disadvantages of each method could be minimised and a more comprehensive analysis of the process of collision avoidance could be undertaken.

From a review of the literature on the previous methods used to explore the area of maritime collision avoidance (see chapter 2 section 2.1), quantitative radar surveys have

[2] Of course, it should be noted that being an ex-practitioner is not a pre-requisite for producing high quality research as much work has been undertaken by non-ex-practitioners.

been used to gain data on ship movements. As outlined, I wished to gain a large quantity of data relating to ship movements and so I concentrated on one area of the Dover Strait. All of the ship to ship interactions and movements in that area were then analysed for a single 24-hour period, a unique study. From this, as will be seen in chapter 5, a unique data set was created which directly related to the first research question of how the COLREGs were being routinely applied.

The second question had not been investigated in the previous marine traffic studies and so a qualitative approach was adopted. Once again, from a review of social science literature, it was seen that a successful method for exploring workplace practices was that of an ethnography. By undertaking an ethnographic investigation of the process of collision avoidance, I was able to explore the issues raised by the radar survey and the decision making process involved in applying rules designed to mitigate a risk (see chapters 6 and 7). In addition, I have systematically analysed the qualitative data through the process of analytic induction within the paradigm of grounded theory. By exploring the second research question in this manner, a unique insight into the reasons lying behind the decisions taken to resolve collision situations through the routine application of the COLREGs has been undertaken.

As an ex-practitioner my biography impacted upon the research. This occurred throughout the fieldwork and in part, facilitated the process of gaining access and data collection. Because of this, the ethical dimension of the research was of great importance to me due to the issue of informed consent. I believe that in a number of instances, the consent to conduct the research was given, not through a complete understanding of the research process, but through my being an ex-practitioner. Therefore, I felt that I owed the participants a special responsibility to act in the most ethical manner possible.

Researcher risk is an under reported aspect of the research experience. In this chapter I have explored the physical and emotional risks that were present within the work. The physical risks to an individual should be considered to a much greater extent before undertaking research. Furthermore, the emotional aspects of the work should also be

considered. Of course, the work would almost always continue, but through a form of risk assessment, the issue should be explored and strategies could be adopted to minimise the risk. Such actions should be undertaken before any future piece of research.

Chapter 4. The International Regulations for the Prevention of Collisions at Sea.

4.0 Introduction

The aim of this chapter is to undertake a comprehensive analysis of the COLREGs. The underpinning principles of the regulations which are based upon rules first put in place in the 19th Century will be explored. I will then describe and analyse the make-up of the COLREGs before illustrating, with the aid of Admiralty court cases and diagrams, the way in which they are designed to be operated. These definitive examples of the application of the COLREGs will also be made with reference to the two leading authorities in this field, these being Cockcroft and Lameijer[1]. I will then move on to describe the conflicts and gaps within the COLREGs when faced with situations which deviate from those described in the COLREGs. The principles underpinning traffic separation schemes will then be depicted.

Through this, authoritative interpretations of the COLREGs will be produced which will then be used to analyse the actions of ships navigating through the Dover Strait. In this it will be shown that the parties to the collision situation have variable responsibilities in the resolution of the risk. These responsibilities include the requirement for one ship to take action to keep out of the way and for the other ship to initially maintain its course and speed. Such reliance upon the other presupposes a certain level of trust that the other ship will in fact keep clear as required. It will further be demonstrated that the people in charge of the ships are provided with considerable leeway in the interpretation of the COLREGs. In order to aid the reader's navigation of the COLREGs, and serve as a an *aide memoir*, they may be summarised as below:

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[1] Captains Cockcroft and Lameijer are regarded as being the leading authorities in the area of collision avoidance. Captain Lameijer served on the original drafting committee at the IMO during the 1970s in which the 1972 COLREGs were produced. He then served as the chair of the ships routeing working group until 2004 at the IMO. It should be further noted that Captain Cockcroft served on the drafting committee in the middle 1970s in which routeing measures for the English Channel were introduced, in 2006 he retired as head of the International Association of Institutes of Navigation delegation to the IMO.

Risk of collision:	No appreciable change in the compass bearing of an approaching ship. Open to interpretation as to the point when this occurs. COLREGS apply as soon as risk of collision occurs.
Give-way ship:	Must keep out of the way of the other by taking early and substantial action.
Stand-on ship:	Must maintain its course and speed until it is clear that the give-way ship is not complying with the COLREGS. The stand-on ship may then take action which does not conflict with the possible actions that the other ship may take. Stand-on ship must take action when a collision cannot be avoided by the actions of the give-way vessel alone.
Overtaking:	Ship overtaking is the give-way ship. Ship being overtaken is the stand-on ship.
Crossing:	Ship with the other on its own starboard side is the give-way ship (give-way to the right). Ship with the other on its own port side is the stand-on ship.
Head-on:	Both ships are the give-way ships and must alter course to starboard.
TSS:	Traffic separation scheme where opposing traffic streams are laterally separated, but all the COLREGS still apply.

4.1 History of the Collision Regulations.

Prior to the industrial revolution, ships were dependant upon either wind or muscle power for their propulsion. Various experiments involving the propulsion of ships utilising steam power had been conducted in Britain and the United States. This process culminated in the introduction of the first commercial steamship, designed by Robert Fulton in 1807, and registered in New York as the *North River Steam Boat* (KIAC 2004). By the time that Brunel's steamship the *Great Western* crossed the Atlantic for the first time in 1838, steamships had become widespread, although they would not entirely displace traditional sailing ships for another century (National Maritime Museum 2004). However, due to the increasing number of steamships, concern was raised as to the conduct of such ships with regard to the collision risks. In order to stem the concerns of the Captains and sailing Masters of the ships, the Elder Brethren of the London based Trinity House Corporation published a set of advisory regulations in 1840 (Cockcroft and Lameijer 2004, Plant 1996, Gaskell *et al.* 1997). The 1840 Trinity House advisory regulations were designed to co-ordinate the actions of a steamship with another (Cockcroft and Lameijer 2004). The Trinity House regulations were adopted by parliament and became law in 1846 with the introduction of the Steam Navigation Act

(1846). These rules required both steamships to keep out of the way of the other and so conferred a dual responsibility upon both ships. For example they stated that:

> That every Steam Vessel when meeting or passing any other Steam Vessel shall pass as far as may be safe on the Port Side of such other Vessel.
> (Steam Navigation Act 1846, section IX).

Criminal liabilities amounting to a fine of £50 were also imposed for any instance of neglect to comply with the regulations (Steam Navigation Act 1846, section IX). However, when these regulations requiring dual responsibility were extended in 1851 to cover sailing ship encounters, great resistance was encountered from the seafarers (Plant 1996). This was due to the fact that the principle of dual responsibility flew in the face of the accepted principles of right of way established between sailing vessels in which one ship would give-way to the other. This right of way had developed through custom and practice over time to take into account the relative manoeuvrability of the ships in relation to the wind direction. These practices were given added weight through their acceptance by the Royal Navy in the late eighteenth century. For example, the sailing vessel rule stated that, 'a ship on a starboard tack, to keep her [*sic*] wind' (Plant 1996: 378). This meant that a sailing ship which had the wind on its port side would maintain its course and the other ship, with the wind on its starboard side, would give-way. Due to the British seaborne hegemony of the time, these practices gained wide acceptance. From this, the new principle of dual responsibility, put in place by the regulations, was ignored in practice by the seafarers. This lead to the rule being reversed in 1863 with the introduction of a new set of regulations by the UK's Board of Trade (Plant 1996). These 1863 regulations, produced in consultation with the French government, not only codified the right of way principle within sailing ship encounters, but also extended them to cover steamships as well. To this end they stated that when two steamships met within a crossing situation, the one which had the other on the starboard side had to give-way (Cockcroft and Lameijer 2004). From this point on, the right of way system in which one ship had priority over another, was ingrained within the regulations to prevent collisions and so became an underpinning principle.

An international maritime conference was held in 1889 which created a set of internationally recognised and accepted rules governing collision avoidance. These rules, which entered into force in 1897, established the practices which are still recognisable today, that is: giving way to starboard for crossing vessels, altering course to starboard for head-on situations, making the overtaking vessel the give-way vessel and requiring the stand-on vessel maintain its course and speed (Cockcroft and Lameijer 2004, Plant 1996). Various changes to the collision regulations were agreed upon at maritime conferences over the following century and these resulted in major rewritings in 1910, 1954 and 1960, which reflected the increasing number of ships and technological changes. The latest major rewriting occurred in 1972 after an international conference and a consultative phase with serving seafarers and other professionals (Cockcroft and Lameijer 2004, Kemp 2001). These 1972 regulations remain in force today, with minor amendments added in 1987, 1993 and 2003. However, the origins of the regulations for the prevention of collisions at sea derive from the codifying of the customs and practices of the sailing ships over the centuries which included granting right of way for one ship over another.

4.2 The 1972 International Regulations for the Prevention of Collisions at Sea (COLREGs).

The COLREGs entered into force in 1977 and 145 states are now party to this agreement (UN 2004) The UK enacted these regulations in the form of a statutory instrument and so any breach of the regulations would constitute a criminal offence (Gaskell, *et al.* 1997, see Statutory Instrument S.I. 1996/75) The COLREGs (Merchant Shipping Notice M. 1642/COLREG 1, 1996) consist of 38 rules, arranged into 5 parts, with 4 annexes, the parts are shown below:

Part	Title of part	Rule Numbers
Part A	General	1-3
Part B	Steering and sailing rules	4-19

Part C	Lights and shapes	20-31
Part D	Sound and light signals	32-37
Part E	Exemptions	38

Parts C, D and E do not cover any part of the decision making or manoeuvring process involved in avoiding a collision and so will only be referred to where necessary for clarification. Part A deals with some general matters in that they set out where the COLREGs apply, the responsibilities for compliance and the definitions to be used. For example Rule 1a, states that;

> These Rules apply to all vessels on the high sea and all waters connected therewith navigable by sea going vessels.
> Rule 1a.

Rule 3c defines a sailing ship:

> The term "sailing vessel" means any vessel under sail provided that propelling machinery, if fitted, is not being used.
> Rule 3c.

It should be noted that the definition of a sailing ship is derived from its actions rather than its construction. So, for example, a yacht which had its sails up, but with the engine running, would not be classed as a yacht and would lose certain privileges under the COLREGS (Cockcroft and Lameijer 2004, Buzert and Holdert 1990).

Within part A of the COLREGs lies Rule 2, Responsibility. This rule contains some important elements with regard to liabilities and when departure from the COLREGs should be undertaken. Rule 2 a states that:

> Nothing in these Rules shall exonerate any vessel, or the owner, master, crew thereof, from the consequences of any neglect to comply with these Rules or of the neglect of any precaution which may be required by the ordinary practice of seamen [*sic*], or the special circumstances of the case.
> Rule 2a.

The effect of this section in the COLREGs is to state to all seafarers that, not only do you have to follow all of the rules, but you also have to take into account the 'ordinary practice' of seafarers (Cockcroft and Lameijer 2004, Plant 1996). One of the ordinary

practices is not to collide, therefore, a seafarer will always be at fault if they collide with another ship regardless of their responsibilities under the COLREGs (Meyer 2005, Caulkin 2005). Gaskell *et al.* (1997) adds to this when they state, in relation to the application of the liabilities within Rule 2, that:

> In other words a slavish observance of the Rules is not always enough to disprove negligence.
>
> (Gaskell, *et al.* 1997: 370).

The second part of Rule 2 (b) states:

> In construing and complying with these Rules due regard shall be had to all dangers of navigation and collision and to any special circumstances, including the limitations of the vessels involved, which may make a departure from these Rules necessary to avoid immediate danger.

Within the second part of Rule 2, it is made clear that a departure from the COLREGs can be undertaken. However, a departure from the COLREGs can only be undertaken to avoid immediate danger in the light of special circumstances.

> This Rule does not give any vessel the right to take action contrary to the Regulations whenever it is considered to be advantageous to do so. A departure is only permitted when there are special circumstances and there is immediate danger. Both conditions must apply.
>
> (Cockcroft and Lameijer 2004: 24)

Rule 2 is in effect an *etcetera* clause, (See Chapter 2 section 2.2) An *etcetera* clause is a clause within the rules which asks those applying them to extrapolate the existing rules to cover unforeseen, but similar, situations and to do it within the spirit of the existing rules (Garfinkel 1967).

Part B of the COLREGs states what actions are required to avoid collisions within various situations. Rule 13 deals with overtaking situations and it states that any ship that is overtaking any other shall keep out of its way. Overtaking is deemed to exist when one ship approaches another from an angle greater than 22.5° behind the beam of the other ship. Rule 14 deals with head-on situations and states that both ships should alter course to starboard. A head-on situation is one where two ships meet directly ahead on reciprocal courses. This is the only rule in which one ship does not have right of way

over another and when an actual course of action is dictated. Rule 15 deals with crossing situations and says that the ship which has the other on its starboard side shall keep out of its way. Crossing situations occur when ships are not overtaking each other, or meeting head-on. However, these rules only apply when risk of collision exists. Rule 7 (d)(i) states that:

> Such risk shall be deemed to exist if the compass bearing of an approaching vessel does not appreciably change.
>
> Rule 7 (d)(i)

This simply means that if a ship continues to approach from the same direction, then risk of collision exists. It should be noted that within the COLREGs there is no statement of distance within this definition of risk of collision. This could mean that provided that the compass bearing of another ship does not change, risk of collision could exist at great distances. Cockcroft and Lameijer (1990) state that this is not the case as they claim that the distance at which risk of collision commences is dependant upon the circumstances and the relative speeds involved. They go on to say that:

> The 1972 Conference rejected a proposed definition that risk of collision exists between vessels when their projected courses and speeds place them at or near the same location simultaneously.
>
> (Cockcroft and Lameijer 2004: 54)

This view echoed the precedent set within English Law in 1887 which involved a collision between the *Banshee* and the *Kildare* (the *Banshee*, 1887). In this collision the two ships collided during an overtaking manoeuvre in which there was a very slow relative speed of approach between the ships. The court addressed the issue of when the collision regulations applied by reference to when risk of collision commences:

> Now at what period of time is it that the Regulations begin to apply to two ships? It cannot be said that they are applicable however far off the ships may be. Nobody could seriously contend that if two ships are six miles apart the Regulations for Preventing Collisions are applicable to them. They only apply at a time, when, if either of them does anything contrary to the Regulations, it will cause danger of collision. None of the Regulations apply unless that period has arrived. It follows that anything done before the time arrives at which the Regulations apply is immaterial, because anything done before that time cannot produce risk of collision within the meaning of the Regulations.
>
> (the *Banshee* 1887: 136).

This issue goes to the heart of the process of collision avoidance, for before the point at which risk of collision exists a person in charge of a ship may do whatever they wish, after that point their actions are constrained by the COLREGS. The point at which risk of collision is deemed to exist is the crux of the matter. Yet, the only guidance provided by the COLREGS as to when risk of collision exists is that given in Rule 7(d) and that is devoid of any reference to temporal or situational aspects. Seafarers therefore, have to make an interpretation of this in order to work out when risk of collision exists and so when the COLREGs come into force. As will be seen in the following chapters, the point at which the COLREGs start to apply is of great importance..

4.2.1 Resolution of collision risks.

Once risk of collision has been established through a process of risk assessment and the situation determined (overtaking, crossing or head-on) then the ships involved will need to resolve the situation, or collide. Where one ship is directed to keep out of the way of another then it is the give-way ship. Rule 16 states that the give-way vessel should take early and substantial action to keep well clear. Rule 8 gives further guidance in that it states this ship should take action: in ample time; be large enough to be seen by the other ship; and that they should ensure that the action results in passing at a safe distance. Conversely, Rule 17(a)(i) 'Action by stand-on vessel' states that:

> Where one of two vessels is to keep out of the way of the way other shall keep her [*sic*] course and speed.
>
> Rule 17(a)(i)

Various court cases have addressed the issue of what is meant by keeping course and speed (the *Roanoke* 1908, the *Orduna* 1924, the *Ek* 1966, the *Aracelio Inglesias* 1968 and the *Toni* 1974). In the main the courts have held that maintaining course and speed means just that and slowing down or changing course is against the COLREGs. However, in the case of the *Roanoke* (1908), the *Roanoke* was the stand-on vessel but slowed down whilst approaching a pilot station. The judges held that:

> In my judgement, "course and speed" mean course and speed in following the nautical manoeuvre in which, to the knowledge of the other vessel, the vessel is at the time engaged.
>
> (The *Roanoke* 1908: 256)

Similarly in the *Aracelio Inglesias* (1968) the *Nidareid*, which hit the *Aracelio Inglesias*, was the stand-on vessel but had slowed to approach an anchorage. If the *Nidareid* had not slowed down then it would not have collided with the *Aracelio Inglesias*. However the judge held that the *Nidareid* was simply following a nautical manoeuvre by slowing down.

> That speed which *Nidareid* was under duty to maintain was the reducing speed to which she [*sic*] was committed to when risk of collision arose.
>
> (The *Aracelio Inglesias* 1968: 9)

Therefore, if a vessel is undertaking a nautical manoeuvre such as altering course to pass clear of a navigational hazard, then this could be deemed to be maintaining course and speed. It should however, be noted that for ferries crossing the Dover Strait, there are no navigational hazards located on the direct route between Dover and Calais, nor Dover and Dunkirk. Therefore, the stand-on vessel would have no grounds to justify a navigational course alteration which could fall within the test proposed in either the *Roanoke* (1908) or the *Aracelio Inglesias* (1968) cases.

However, it is not the case that the stand-on vessel should maintain its course and speed all the way to the site of the collision. Rule 17(a)(ii) does allow for the stand-on vessel to take action when it becomes apparent that the other ship is not following the COLREGS by stating that:

> The latter vessel [the stand-on ship] may however take action to avoid collision by her [*sic*] manoeuvre alone, as soon as it becomes apparent to her that the vessel required to keep out of the way is not taking appropriate action in compliance with these Rules.
>
> Rule 17(a)(ii)

This Rule does not, however, give freedom of action to the stand-on ship to do as they please as there must be an element of allowing the other ship to take some action to keep out of the way. As Cockcroft and Lameijer (2004) state:

> When risk of collision first begins to exist the stand-on vessel must keep her course and speed. A stand-on vessel which takes avoiding action before it can reasonably be assumed that the give-way vessel is not taking appropriate action is likely to be held to blame if practically simultaneous action by the give-way vessel causes a confused situation which results in collision.
> (Cockcroft and Lameijer 2004: 124).

Furthermore, Rule 17(c) dictates that a ship should not alter course to port for a ship crossing from its own port side. This is because the collision avoidance action that a give-way ship is most likely to take in a crossing situation is an alteration of course to starboard. Thus, if the stand-on ship altered course to port at the same time as the give-way ship altered course to starboard, then they would turn in upon themselves and this would cause confusion. In assessing whether another ship is taking appropriate action a sound signal may be used consisting of 5 or more short and rapid blasts sounded on the ships whistle (Rule 34). This sound signal may also be supplemented by a light signal consisting of 5 or more rapid flashes, but this would only be seen by night. Cockcroft and Lameijer (2004) do not state at what distance this warning should be given but they do regard that a ship in a crossing situation to have waited too long if it is not been given before 2 miles away from the other ship. However, the efficacy of this method of warning the other ship has to be questioned when in the technical Annex 3(c) of the COLREGs the maximum audible range of the ship's whistle is prescribed to be 2 miles in still air. Therefore, it would seem extremely unlikely that a ship would be able to hear the whistle signal of another at ranges of greater than 2 miles. The other means of contact that could be used is that of very high frequency (VHF) radio. However, the use of VHF radio is discouraged by the UK's maritime and coastguard authority (MGN 167 M+F 2001). In this notice they state that:

> The use of VHF radio in these [collision avoidance] circumstances is not always helpful and may even prove to be dangerous. Marine Superintendents would be well advised to prohibit such use of VHF radio and to instruct their officers to comply with the Collision regulations. (MGN 167 M+F, 2001: 1)

Harding (2002) takes a rather unsympathetic view of the consequences suffered by seafarers who used VHF during collision avoidance whilst discussing the events leading up to a number maritime casualties in which 102 seafarers died, he states:

> If navigators choose to believe information broadcast by another ship in relation to its manoeuvres, 'more fool them'; can be added to their epitaph.
> (Harding, 2002: 440)

The criticism relating to the use of VHF radio revolves around the problem of not knowing who you are talking to[2]. There is no means of positively identifying the identity of another ship when all you have is a disembodied voice coming through a speaker. However, the use of VHF radio to arrange passing manoeuvres has become widespread. Furthermore, it will be shown in Chapter 6 that the people in charge of ferries routinely use VHF radio to arrange passing manoeuvres between themselves which do not comply with the COLREGs.

Once it becomes clear that collision cannot be avoided by the actions of the give-way vessel alone, then Rule 17(b) states that the stand-on vessel must take action:

> When, from any cause, the vessel required to keep her course and speed finds herself so close that collision cannot be avoided by the action of the give-way vessel alone, she [*sic*] shall take such action as will best aid to avoid collision.
> Rule 17(b)

Therefore, the stand-on vessel must monitor the approach of the other ship, make an assessment of its manoeuvring characteristics and then at the point at which the stand-on vessel cannot avoid collision by its manoeuvre alone, then the stand-on vessel must take the best action to avoid collision.

[2] Carraige of the Automatic Identification System (AIS) became mandatory in 2005. This is an automatic system for identifying ships and so potentially solves the problem of not knowing the identity of another ship. However, the use of AIS during the process of collision avoidance, especially to aid VHF conversations is strongly discouraged by the MCA and has been cited as a cause of the *Sky Hope* collison by the MAIB (MAIB 2006).

4.2.2 The anatomy of a crossing situation.

If a simple crossing situation is used to describe a collision risk situation, then the ongoing, proactive nature of collision avoidance, and the way that the COLREGs interact, can be illustrated. In the first instance the persons in charge of the ships will be monitoring the traffic situation by sight and with the aid of the radar. The people in charge of the ships will be presented with information relating to the approaching ship in the form of computer generated radar data. Therefore, the risk of collision is presented to them in a quantified manner. See figure 4.1below.

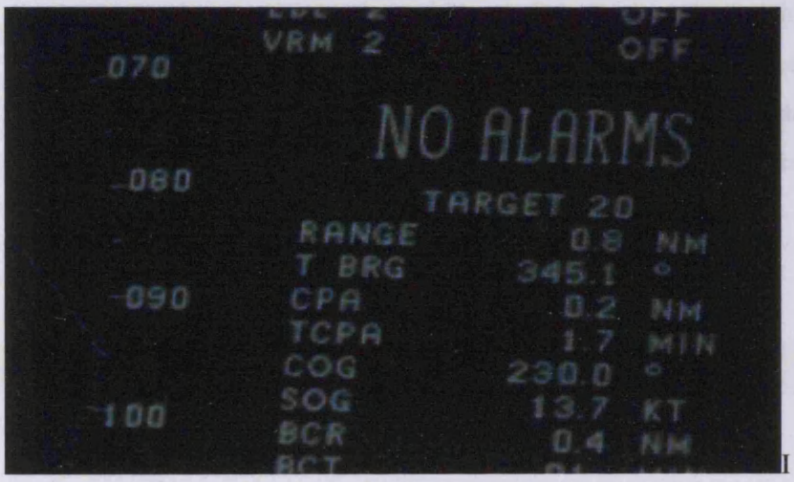

Figure 4.1, Radar information for approaching ship.

In figure 4.1 the course over the ground (COG) of 230° and speed over the ground (SOG) of 13.7 knots of the other ship are shown. In addition, the closest point of approach (CPA) 0.2 miles and the time to go to that closest point of approach (TCPA) 1.7 minutes are provided.

Rule 15 states that:

> When two power driven vessel are crossing so as to involve risk of collision, the vessel which has the other on her [*sic*] own starboard side shall keep out of the way and shall, if the circumstances of the case admit, avoid crossing ahead of the other vessel.

Therefore, the ship with the other on its starboard side is the give-way vessel and should keep clear of the other, simply put, the ship should give-way to the right. Conversely, the

other ship is the stand-on vessel and should maintain its course and speed, Rule 17(a)(i). The give-way ship should now take action to avoid the potential collision and this should be positive, made in ample time, with due regard to the observance of good seamanship, Rule 8(a) and be large enough to be readily apparent to the other vessel, Rule 8(b). Once the give-way ship has taken action, it should check that it has been effective and resulted in passing at a safe distance, Rule 8(d). Throughout this process, the stand-on ship will have been monitoring the situation and, if necessary, applying rule 17(a)(ii) which allows the stand-on vessel to take action by its manoeuvre alone, if the give-way vessel is not taking appropriate action. It should be remembered that this rule does not give licence to the person in charge of the ship to take whatever action they wish in order to resolve a collision situation (Cockcroft and Lameijer 2004). The stand-on vessel must take action when it gets to the stage when a collision cannot be prevented by the actions of the give-way vessel alone. The various stages in this crossing situation are shown in figure 4.2 below.

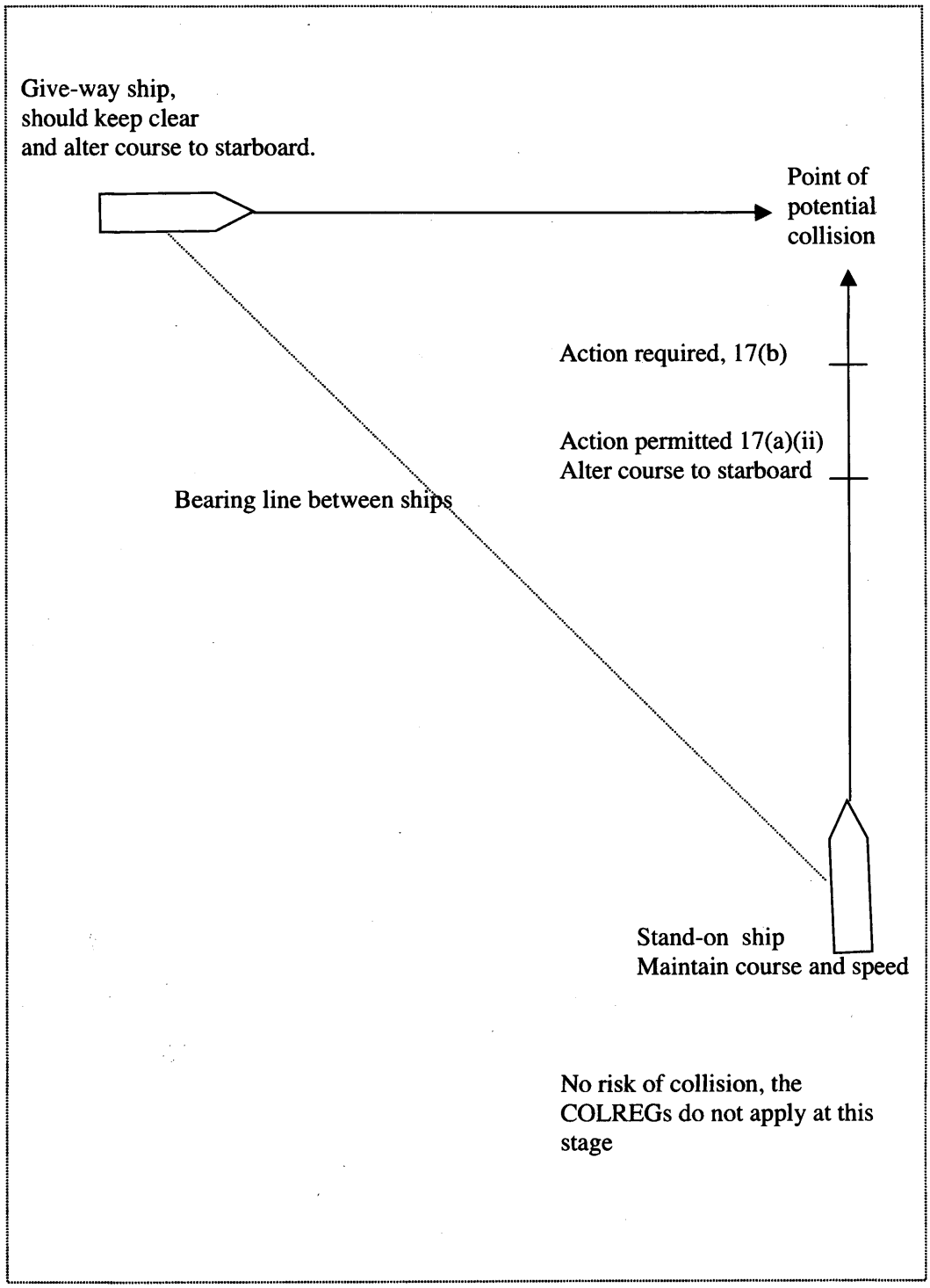

Figure 4.2, Stages within crossing situation.

From this description several points should be noted:

- No distances are prescribed for taking action.
- No time frame is given for taking action.
- No actions are specifically dictated.
- All the collision avoidance is undertaken without the need of radio communication between the vessels. (Weber, 1995).

From this it can be visualised how the COLREGs are intended to operate: the person in charge of the ship will have a complete understanding of the situation through the use of radar and observation; they know which rules are to be applied; they comprehend how those rules are to be communicated into action; and they know what has to be undertaken in the event that action does not occur. Therefore, the COLREGs are designed to operate in an environment of mutual comprehension, understanding and co-ordination, with clear logical steps ensuring clarity and predictability (Plant 1996).

However, if we a take situation in which three ships are crossing each others paths, then the outcome is more complicated. Such a situation is shown in figure 4.3.

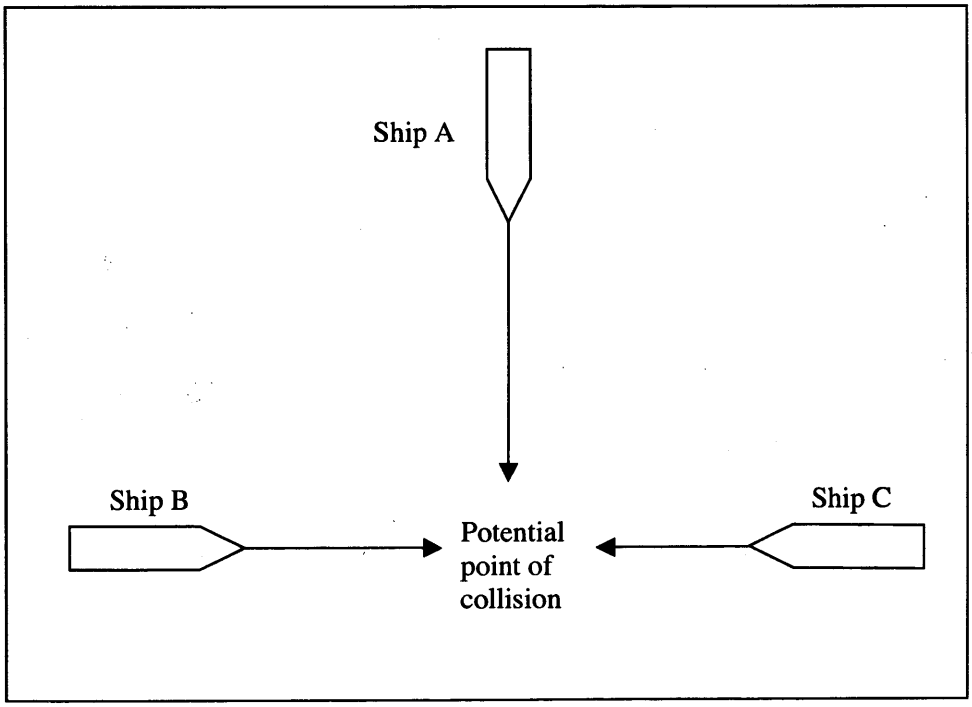

Figure 4.3, Multiple ship collision situation.

Rule 15 is quite clear, in that it requires only the vessel with the other on its starboard side to alter course. Conversely, Rule 14 states that ships head-on to each other should both alter course to starboard. Therefore, ship B is the stand-on ship for ship A, but give-way ship for ship C. This means that ship B is faced with conflicting requirements under the rules. However, it cannot be the case that a vessel should be able to stand-on and maintain its course and speed for one vessel and at the same time be required to keep clear of another (Cockcroft and Lameijer 2004). Therefore, the requirement for ship B to keep clear of the ship C must pre-empt the requirement to stand-on for the crossing vessel A. However, this position of standing-on for one vessel whilst under a duty to give-way to another was stated as a contribution to the collision between the *Norwegian Dream* and the *Ever Decent* (Bahamas Maritime Authority 2000). However, in this theoretical situation all ships would probably alter course to starboard. This would mean that the person in charge of ship A will need to analyse the situation in the light of the fact that ship B, that would normally maintain its course and speed, will not. Pike has stated that:

> [T]he collision risk could be compounded if each vessel does not anticipate the action of the other.
>
> (Pike 1995: 437)

From this description it is clear that the certainty and predictability of collision avoidance may be called into question. Furthermore, the resolution of the actions of the theoretical vessels discussed above was eventually reached after a period of time. However, in a real life situation (as will be demonstrated in chapters 6 and 7) the person in charge of a ship would be required to reach a decision in a matter of minutes, sometimes tired, stressed, and with the knowledge that if the decision is incorrect then it could result in an accident and subsequent prosecution (Challos 2001). In addition, this type of encounter is far from unusual within an area such as the Dover Strait (Lamb and Hunt 1995). With 400 plus ship movements in the Dover Strait everyday, it is seen that multiple encounters frequently occur and so the people in charge of the ships must constantly analyse the situation and see the conflicts in the COLREGs.

Taylor has claimed that this uncertainty within the COLREGs arises because, of the need to decide independently what to do, in a situation where other ships may also make independent decisions (Taylor 1990) and so collision avoidance becomes a game of co-ordination, since both players have to choose independently mutually compatible strategies (Cannell 1981). Therefore, it is hardly surprising that many collisions at sea occur after one or both vessels take action to avoid collision (Zhao-Lin 1984, Perrow 1999) when such ambiguities lie within rules designed to apply to all situations. In addition, as Taylor makes clear:

> Lying at the heart of the problem of applying the COLREGs is the fact that, each ship has to understand the actions of the other: actual, likely, and potential.
> (Taylor 1990: 238).

This brings forth a huge number of variables in almost any given situation and so the person in charge of the ship must use the COLREGS to analyse and interpret the situation and the subsequent actions of all the people involved. This further illustrates the manner in which the variety of rules developed to govern safe behaviour will always be less than the possible variety of unsafe conditions (Bloor 1980, Reason *et al.* 1998).

4.2.3 Traffic separation schemes (TSS).

The concept behind the traffic separation scheme (TSS) is that it removes head-on collision encounter situations by separating opposing traffic flows. Rule 10 covers TSSs and it states that ships should:

- Follow the traffic lanes in the general direction of flow, 10(b)(i).
- Stay away from the separation zone between opposing traffic directions, 10(b)(ii).
- Join or leave at the termination of the lane, 10(b)(iii).
- Join or leave the lane at as small an angle as practicable to the general direction of flow, 10(b)(iii).
- Avoid crossing a TSS, 10(c).
- Cross a TSS on a heading at 90° as near as practicable to the general direction of flow, 10(c).
- Not use the inshore traffic zone unless: going to a port within it; or if it is unsafe to navigate within the traffic lane, 10(d)(i).
- Compliance with this rule does not relieve the ship of any obligations under any other rule, 10(a).

Figure 4.4, illustrates these points.

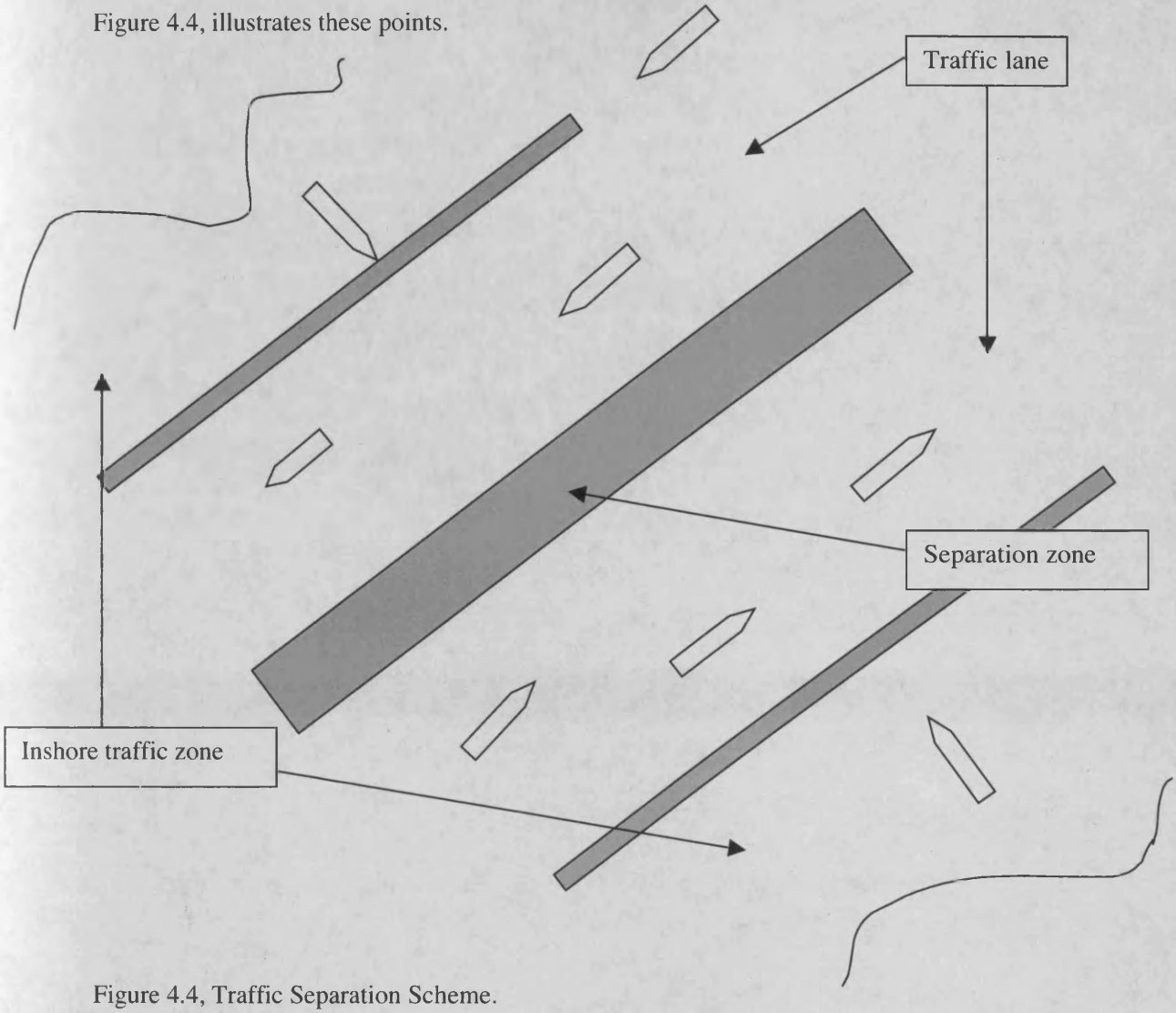

Figure 4.4, Traffic Separation Scheme.

From this it can be seen that ships in transit through the TSS will follow the appropriate traffic lane. Ships navigate on the starboard side of any channel, in effect, driving on the right and this is universal around the world. Therefore, opposing traffic flows are removed from the collision avoidance equation. Cockcroft (1982), illustrated the importance of the removal of head-on situations in his analysis of accident reports from vessels involved in collisions between the years 1968 and 1977. Cockcroft found that 26% (59 out of 227) of collisions in clear visibility resulted from head-on or fine crossing

situations and that in restricted visibility this proportion increased to 72% of collisions (357 out of 497). It should be noted that head-on situations will still occur between ships crossing the TSS, but the majority will have been removed. Ships will cross the TSS at right angles to the general direction of flow and those joining or leaving the TSS will do so at as small an angle as practicable. Rule 10(a) makes it clear that ships navigating within a TSS are still obliged to follow all the normal steering and sailing rules. This means that ships involved in crossing situations still have to give-way or stand-on as required when risk of collision exists. By following a TSS a ship is afforded no additional rights over ships crossing it.

The first TSS was introduced in the Dover Strait and the southern North Sea area in 1970. Prior to this the Dover Strait and the southern North Sea area accounted for almost half of the worlds' collisions (Richey 1966). Following the introduction of the TSS the incidence of collisions occurring in the area fell from 142 (for the period 1956-1965) to 37 (for the period 1971-1980) (Cockcroft 1982). Furthermore, in July 1994 a TSS scheme was set up in the Turkish Straits and the incidence of collisions fell from 155 (for the period 1990-1993) to 11 (for the period 1995-1998) (Cockcroft 1998; Grey 2001).

Thus, with the introduction of the TSS the seafarers should no longer be called upon to implement the head-on rules, as those situations are effectively eliminated for ships passing through the area. Vessels passing in different directions are separated from each other, by the TSS, and so head-on collision situations should not arise and so there is no need for the seafarer to attempt to operationalise the relevant COLREGs and thus, the casualty rate improves dramatically. Although it should be noted that some ships navigate the wrong way along the traffic lane (Dare and Lewison 1980).

4.3 Summary.

Through this review I have introduced the concepts that underpin the COLREGs, the means by which collision risk is managed. These concepts have been shown to have their origins located within the custom and practice of seafarers which have held true through

the centuries. For example, the concept of one ship having right of way over another dates from the days of commercial sailing ships and yet still remains within the COLREGs to this day. I have tried, with the aid of diagrams and court cases, to illustrate the various obligations required by the COLREGs to each ship. However, the COLREGs require a certain amount of interpretation upon the part of the seafarer. This is particularly true with regard to the issue of risk of collision. For it is at the time when risk of collision occurs that the COLREGs apply and limitations with regard to actions to avoid collision will be placed upon the stand-on vessel. Once it is determined that a ship is classed as a stand-on vessel, then it is required to maintain its current course and speed. Only when it is apparent that another vessel is not taking action as required by the COLREGs is it released from the obligation to maintain course and speed. Due to this requirement to wait to see if the other ship will comply with their obligations requires a certain level of trust in the other ship. The limitations of the COLREGs could be seen by the subjective judgements that seafarers needed to make when applying them and this was further illustrated through a simple three ship interaction. Therefore, it is clear that the people in charge of ships are provided with a considerable amount of leeway in the interpretation of the COLREGs, especially with regard to when they start to apply.

It was interesting to note the dramatic reduction in the number of casualties with the introduction of a TSS into an area. This indicates how a TSS acts as an effective means of reducing the incidence of collisions through the lateral separation of traffic. However, when risk of collision exists, the obligations under the relevant steering and sailing rules continue when ships are navigating through a TSS.

Chapter 5. Radar Data

5.0 Introduction

In chapter 4 with the aid of the authoritative examples, I outlined the manner in which the COLREGs are designed to be operated. In this chapter I will explore the reality of collision avoidance by looking at the manner in which the COLREGs are actually applied in practice. Therefore, the aim of this chapter is to undertake a comprehensive analysis of the movements of all of the ships within the Southwest bound traffic lane of the Dover Strait. The process by which the data on which this chapter is based was previously outlined in section 3.5 Radar Methods. Through this I will show the routes taken by the ships and how close they pass to each other. Through the tool of the near miss encounter (derived from previous studies on ship domains) I will also show the collision avoidance manoeuvres undertaken by the ships within the area.

The structure of this chapter starts with a overview of the radar data, including profiles of typical ship movements, crossing and transiting the Strait. I will then move on to an exploration and discussion of passing distances. I have undertaken the analysis of the radar data by grouping the collision situations by encounter direction. Therefore, I will present the data from the perspective of whether the collision situation was one of overtaking, crossing or parallel course. The underlying reason for this approach is that the COLREGs approach the management of collisions through the perspective of encounter situation. From this analysis, it will be shown that ships pass each other at different distances in different collision situations. Overtaking took place at much closer distances than did crossing situations. Furthermore, ferries passing each other did so with a relatively large lateral separation. Through this analysis, areas of further study were found which warranted investigation during the ethnographic stages of this research. It should be noted that for clarity in understanding the location of these tracks reference should be made to the figure 1.1 showing the Dover Strait traffic separation scheme.

5.1 General Overview

Within this study there were a total of 257 ships recorded by Dover Coastguard. This figure does not include ships which solely followed the Northeast bound traffic lane. As stated, I have used only the tracks of the ships that have used or entered the Southwest bound traffic lane. These ships were classified by their route as shown in table 5.1:

Direction classification	Number of ships
All directions	257
Crossing	124
Easterly Crossing	59
Easterly Crossing from Dover to Calais	47
Easterly Crossing from Dover to Dunkirk/Zeebrugge	12
Westerly Crossing	65
Westerly Crossing from Calais to Dover	47
Westerly crossing from Dunkirk/Zeebrugge to Dover	12
Westerly crossing from NE lane	6
Transiting the Strait	133
Transiting Southerly	131
Transiting Northerly	1
Miscellaneous	1

Table 5.1, Traffic routeing.

As can be seen, 124 ships crossed the Dover Strait, of which 59 crossed from the UK to the continent, whereas, 65 crossed from the continental side towards the UK. It should be noted that this difference in numbers was not generated by a greater number of ferries sailing from continental ports for Dover, but by 6 ships initially travelling up the Northeast bound traffic lane and then crossing the Dover Strait, near the MPC buoy (see figure 1.1), before heading up into the North Sea. These ships were included because they crossed the Southwest bound traffic lane. However, by excluding those 6 ships, it can be seen that there were 59 sailings and 59 arrivals at the port of Dover in this 24 hour

period. Of these, 12 sailed to or from either Dunkirk or Zeebrugge. The remaining 47 sailed exclusively between Dover and Calais.

133 ships were found to be transiting the Dover Strait, without crossing any of the traffic lanes. Of those 133 ships, only two did not follow the Southwest bound traffic lane. One was found to transit the Strait in a Northerly direction within the inshore traffic lane, adjacent to the port of Dover and the other, also within the inshore separation zone, followed a more circuitous path which involved travelling primarily in a Northerly direction in the vicinity of the port. Upon further analysis this vessel was identified as Dover coastguard's emergency tug. The remaining 131 ships followed the Southwest bound traffic lane and stayed within it throughout their passage.

5.1.1 Crossing vessel tracks

Within the crossing vessel tracks there were three separate routes taken within the study area: the Dover/Dunkirk or Zeebrugge route; the Northeast lane/North Sea route; and the Dover/Calais route.

The Dover/Dunkirk or Zeebrugge route is shown in figure 5.1 below.

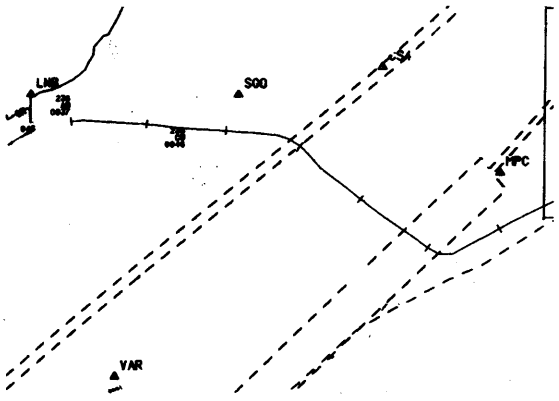

Figure 5.1 Dover to Zeebrugge track.

As can be seen the ship in this case has departed from Dover in an Easterly direction within the inshore TSS before altering its course to starboard to cross the TSS at right angles as required by rule 10(c) of the COLREGS. This rule states that

> (c) A vessel shall so far as practicable avoid crossing traffic lanes, but if obliged to do so shall cross on a heading as nearly as practicable at right angles to the general direction of traffic flow.

Once the ship crossed the Southwest bound traffic lane it altered course to port in order to enter and then follow the Northeast bound traffic lane. This ship was on passage to Zeebrugge in Belgium. For ships on passage to Dunkirk they continued on the course at right angles to the direction of traffic flow and headed straight for Dunkirk. The initial course was the same for both Dunkirk and Zeebrugge bound ships. 9 ships sailed from Dover for either Zeebrugge or Dunkirk.

Northeast lane/North Sea route is shown in figure 5.2 below:

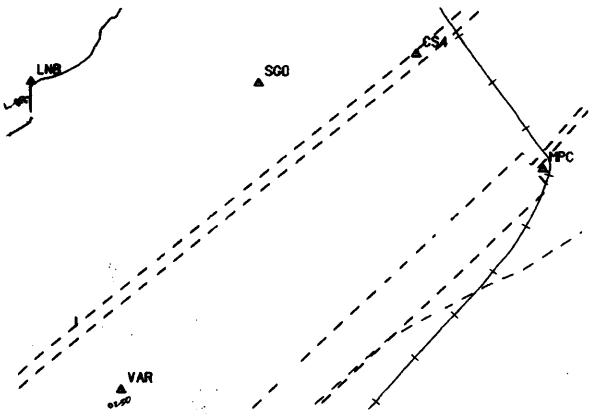

Figure 5.2 Northeast Lane/North Sea route

6 ships exhibited this track profile which consisted of following the Northeast bound traffic lane before crossing the Southwest bound traffic lane at right angles, between the MPC buoy and the CS4 buoy. On departing the Southwest bound lane they would alter course to starboard and head northerly up into the North Sea. These ships were the only

ones for which I gained track details for movements within the Northeast bound traffic lane.

Figure 5.3 indicates a typical track of a ferry which crossed from Calais to Dover.

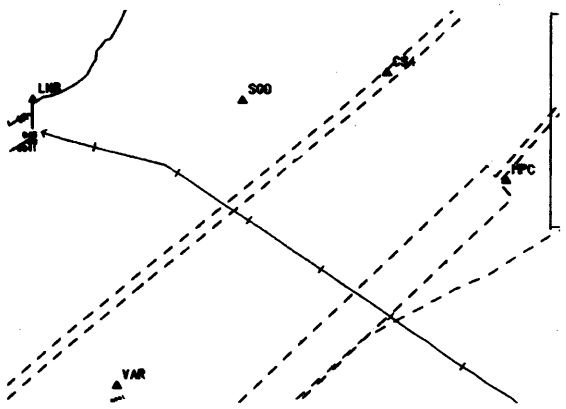

Figure 5.3 Dover/Calais route

The ferries would adopt a track across the Southwest traffic lane within approximately 10° of what would be perpendicular to the general flow of traffic. This approximately perpendicular course was used when travelling both to and from Dover. It should be noted that there are no navigational hazards located within this route across the Strait and so any deviation from the most direct route across would be due to traffic within the area.

5.1.2 Transiting vessel tracks

As previously stated 133 ships transited the Strait, of which 131 followed the Southwest bound traffic lane. The route was simply straight down the traffic lane as shown in figure 5.4.

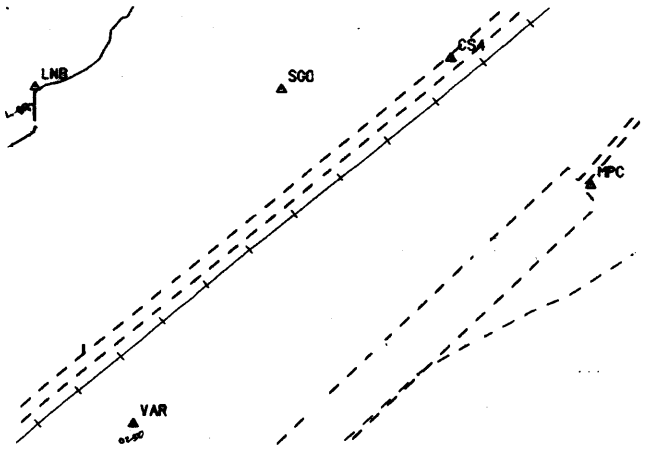

Figure 5.4 Typical Southwest bound traffic lane transiting track.

Here the track of this ship can be seen in the northern part of the Southwest bound traffic lane passing to the north of the Varne navigational mark (marked 'VAR'). The ship moved from right to left across the chart. No alterations of course were undertaken by this ship to keep out of the way of any other. Furthermore, ships in transit through this chart area would not have to make any alteration of course for navigational reasons. Any observed alterations of course would be due to the traffic within the area.

5.1.3 Traffic routes

From this it can be seen that ships moving in this area do so free from navigational hazards and that any deviations from the direct route either across or through the Dover Strait can be attributed to other traffic. Furthermore, ships would meet at right angles to each other for crossing situations, or at fine angles for both overtaking and head-on situations. This is in effect like a major crossroads for cars. Cars would cross at right angles, overtake each other whilst driving in the same direction and meet head-on for cars coming from the opposite direction. However, ships, unlike cars, have no brakes, no accelerators, no indicators, all are commercial vehicles and there are no road markings.

The only control over the situation is that exhibited by the people in charge of the ships who apply the COLREGs.

5.2 Passing distances

As outlined in Chapter 3, each of the individual tracks of the vessels were compared with each other. The ships' encounter directions and closest point of approach were all noted. In addition, the geographical position of the track in relation to either: the side of the TSS, for transiting ships; or the Varne navigational mark, in the case of crossing ships, were recorded. Through this process reliable data was recorded which related to the results of the collision avoidance practices of those in charge of the ships within the Dover Strait on that particular day. It should be noted that I make no claims about the generalisability of this data due it being confined to only one non-randomly chosen 24 hour period. Due to this constraint I will use the statistics derived from the data in a purely descriptive manner.

Each of the 257 ships' tracks were compared with each other. This produced 909 incidents of ships passing within 5 nautical miles of each other, see figure 5.5.

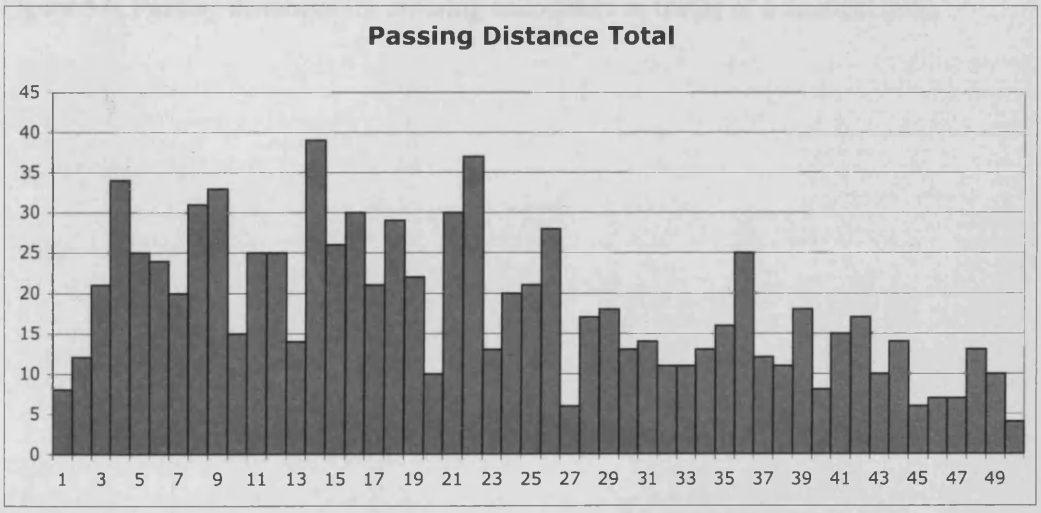

Figure 5.5, Total passing distances in tenths of a nautical mile.

Figure 5.5 shows a breakdown of the passing distances of all the 909 ships that passed within 5 miles of each other. Figures 5.6, 5.7, 5.8 show the passing distances for crossing encounters, parallel course encounters and overtaking encounters, respectively.

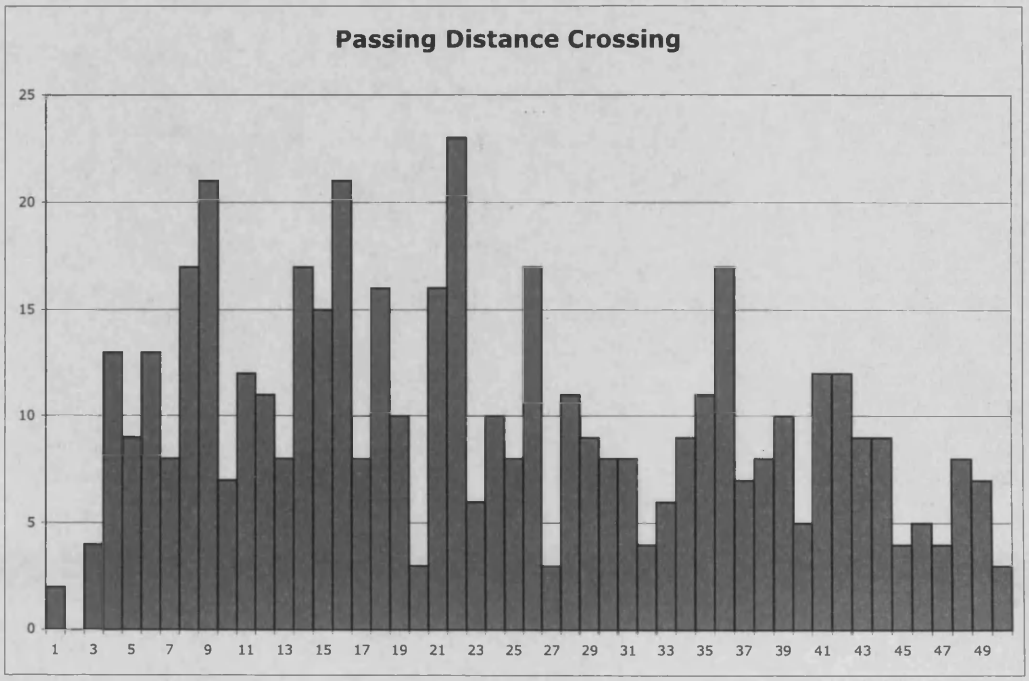

Figure 5.6, Passing distances for crossing encounters in tenths of a nautical mile.

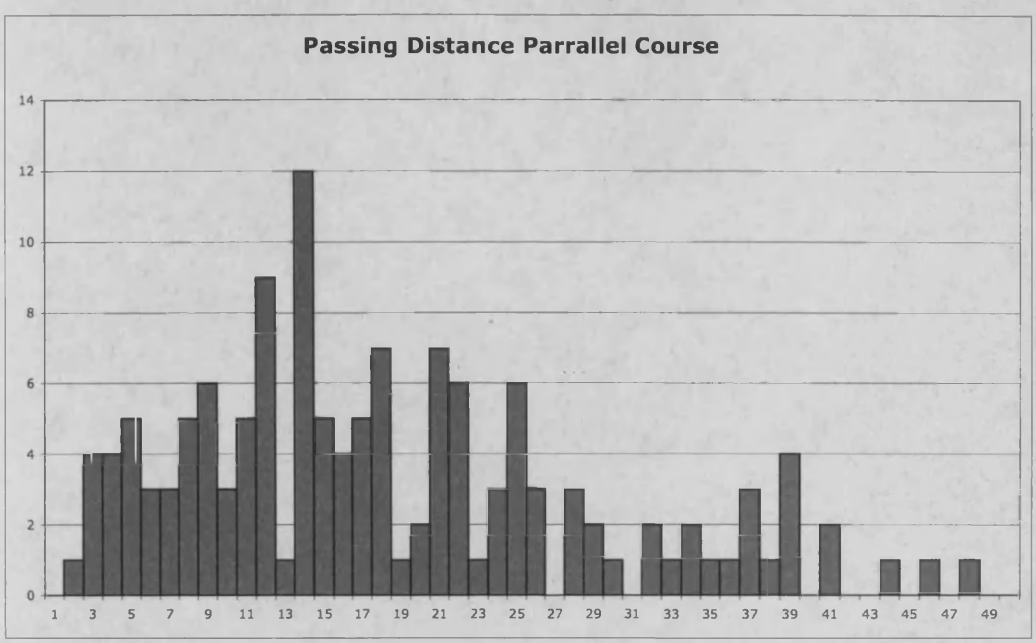

Figure 5.7, Passing distances for parallel course encounters in tenths of a nautical mile.

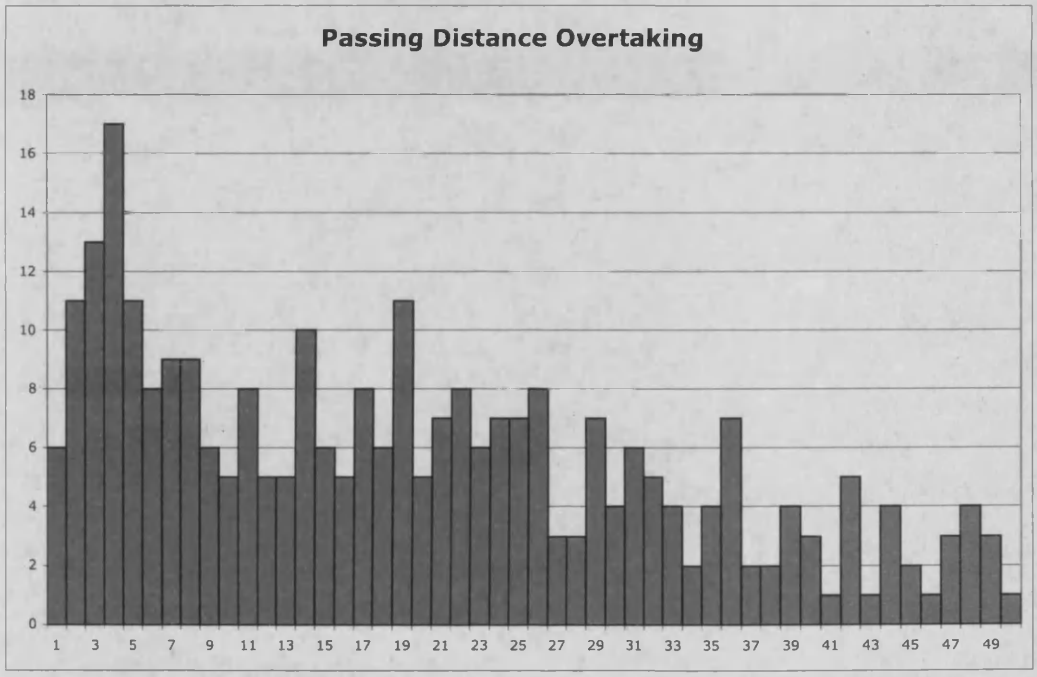

Figure 5.8, Passing distances for overtaking encounters in tenths of a nautical mile.

The mean and median passing distances in tenths of a nautical mile (cables) for each of these encounters is shown in table 5.2.

	All encounters	Crossing	Parallel Course	Overtaking
Mean	21.5	23.8	18.3	19.3
Median	20	22	17	18

Table 5.2, Average passing distances.

However, in order to undertake a more detailed analysis of those incidents I needed to focus on those encounters which involved a risk of collision. The concept behind this was two fold: firstly, in order to understand the manoeuvres undertaken by the ships, the ships must first have been placed in a position where there was a risk of collision, for that is the time when the COLREGS need to be applied (as outlined in Chapter 4); and secondly, by focusing on such near misses, a greater understanding of accidents could be achieved, as near misses can be viewed as near accidents. The study of near misses has become an accepted means of illustrating the causes of accidents within many industrial sectors (Phimister *et al.* 2003, Reason 1997, Perrow 1999). This is because by studying the events leading up to an incident, which nearly resulted in an accident, lessons can be learnt about the causes of actual accidents, provided of course that accidents and near accidents share the same causal factors (van der Schaaf and Kanse 2004). Additionally, the analysis of near misses has gained widespread acceptance within many industrial sectors because there is no need to punish mistakes if there are no losses (Tamuz 2002). The underlying assumption of near miss analysis is that one major incident is preceded by a large number of near incidents and an even larger number of hazardous conditions, all of which share the same causal factors (Phimister *et al.* 2003). Therefore, by studying the events leading up to near misses, accident precursors can be identified and safety improved.

The criteria which I used to classify whether an incident was a near miss was the violation of a ship domain, which consisted of a circular space 0.8 nautical miles (nm) in

diameter around the ship, by another ship. Thus, when two ships passed within 8 cables[1] of each other, then this would be classified as a near miss. To reflect the dynamic nature of the interaction I termed such a meeting as a near miss encounter (NME). The selection of this space in both size and shape was based upon a review of literature relating to ship domains (Fujii and Tanaka 1971, Goodwin 1977, Coldwell 1983, Jingsong *et al.* 1993).

Goodwin defines a ship domain as:

> [T]he surrounding effective waters which the navigator of a ship wants to keep clear of other ships or fixed objects.
> (Goodwin, 1977: 103).

This means that the person in charge of a ship will not only try to keep that space clear, but will also take steps to ensure the maintenance of such a space dependant upon future encounters. This concept of requiring a space to be maintained around the ship is derived from the idea of proxemics, where a person subconsciously requires an area to be kept clear around themselves, in order for them not to feel threatened in any way (Hall, 1963). Fujii and Tanka (1971) modelled a ship domain in relation to its length. For them the domain would alter dependant upon the size of the ship such that larger ships required a greater space than smaller ships. In this way the domain consisted of an ellipse centred upon the ship, apogee fore and aft, perigee athwartships. The width and length of the domain was 3.2 and 8 times the ship's length respectively, see figure 5.9.

[1] 1/10th of a nautical mile is termed a cable and this is approximately 185m.

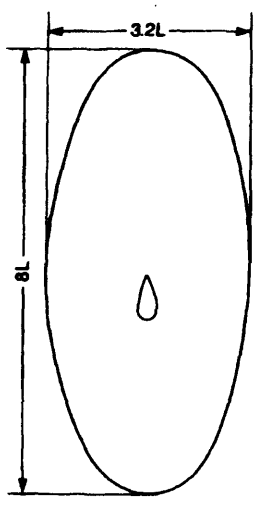

Figure 5.9 Fujii and Tanka ship domain (1971)

This would correspond to a very large crude carrier having a domain of approximately 6 cables wide by 14 long. Conversely a small ship's domain would approximate to one 2 cables wide by 4 long.

By contrast Goodwin (1971) adopted a model which reflected the COLREGS such that different sectors around the ship had different values, see figure 5.10.

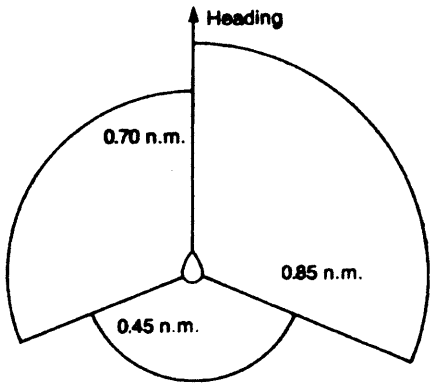

Figure 5.10 Goodwin ship domain (1977).

This model was based upon a survey of actions taken to avoid collisions in a simulator, coupled with observations of actual ship movements around the Thames estuary. With this model there is a reflection as to the duties of the ship as a give-way or stand-on vessel. The ship is a give-way vessel for all ships which are encompassed by the 0.85 nm arc and stand-on to those in the other two arcs. The reduced distance within the 0.45 nm arc is due to the low relative speed inherent within overtaking encounters.

The third model was one produced by Coldwell (1983) which was designed to model seafarers reactions when encountering another ship on a reciprocal course, see figure 5.11.

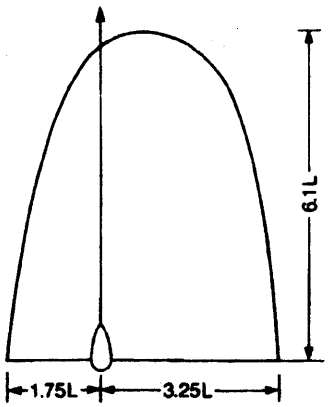

Figure 5.11 Coldwell ship domain (1983)

With this model, only head-on encounters were calculated for, consequently there is no domain extending behind the ship. This model contains elements common to both the preceding models, in that the space is defined by the length of the ship and the orientation of the partial ellipse is modified by taking into consideration the demands of rule 14(a) of the COLREGS. This rule states that:

> (a) When two power-driven vessels are meeting on reciprocal or nearly reciprocal courses so as to involve risk of collision each shall alter her [*sic*] course to starboard so that each shall pass on the port side of the other.

Therefore, the model reflects a desire to ensure the greatest freedom of action for the ship by preventing other ships coming into the area which it may be required to manoeuvre into. By this the starboard side was kept clear in order to allow for an alteration of course into this space to avoid another ship.

However, the major problem associated with these models, where different distances are attributed to various ship sectors, is that they do not take account of the dynamic relationship when two ships are involved. The models are constructed to take account of the movements of the single ship and do not consider what happens to the minimum distance around a ship when two ships pass each other. Figure 5.12 indicates what happens when Goodwin's model interacts with another ship, also navigating with a similar ship domain around it.

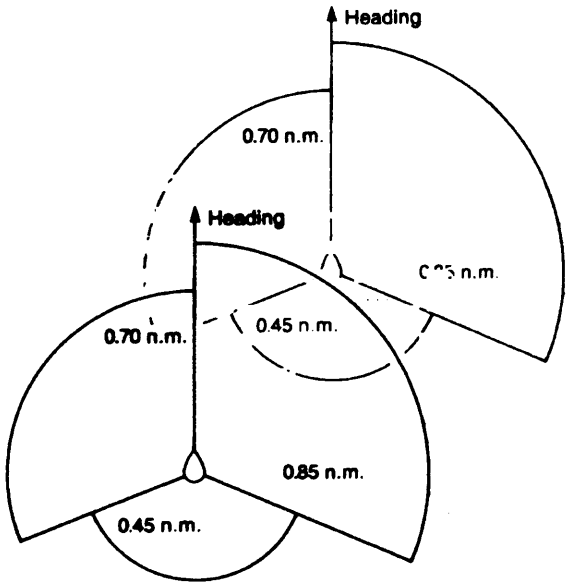

Figure 5.12, Goodwin ship domain overtaking 1.

Here we have two ships, one overtaking the other. According to Goodwin's model the first ship is quite happy with this situation as the other ship has not entered its 0.45nm domain arc. However, the first ship has already entered the second's 0.85nm arc and so the second ship will move so as to keep the first ship clear, see figure 5.13.

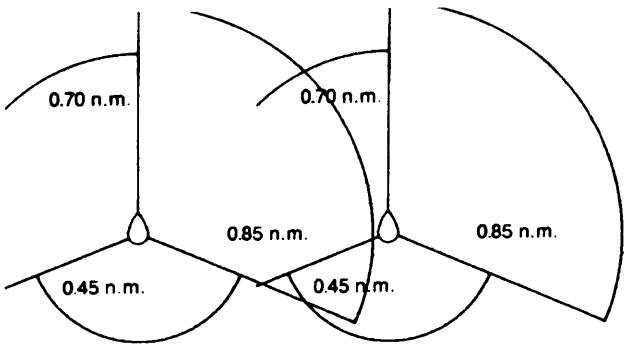

Figure 5.13 Goodwin ship domain overtaking 2

As can be seen, when the movements of more than one ship are taken into account the idea that ships wish to maintain certain distances from each other dependant upon arcs around their vessels is false. The ship domain which actually results when the dynamic interactional nature of collision avoidance is taken into account equates to a circular space around the interacting ships of 0.8n.m., see figure 5.14.

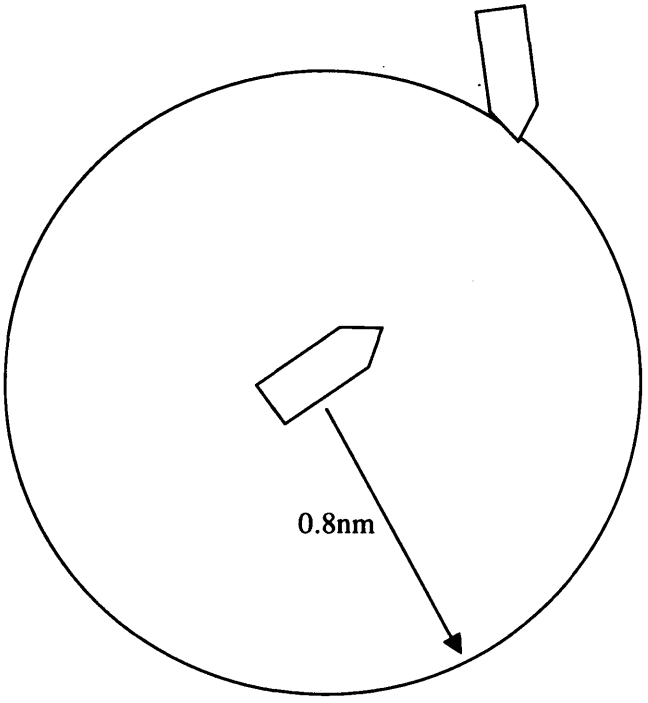

Figure 5.14, Near Miss Encounter.

Figure 5.14 shows a near miss encounter where one ship enters another's circular ship domain, radius 0.8nm.

Thus, by integrating the domains of Fujii and Tanaka (1971), Goodwin (1977), Coldwell (1983) and Jingsong *et al.* (1993) I have used a simple circle to represent the ship domain. The radius of this space is taken as 0.8nm. Through this process, a criterion was created which would define a NME, namely, a violation of a ship domain, 0.8nm in radius.

5.3 Near Miss Encounters

All of the individual tracks were compared with each other and it was found that there were 175 occasions when NMEs occurred, see figure 5.15.

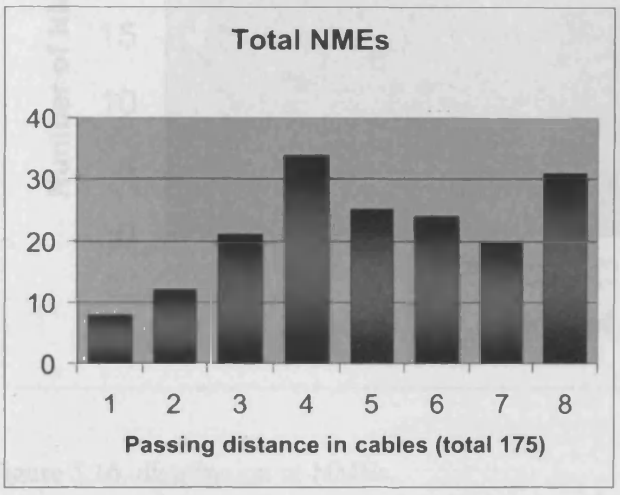

Figure 5.15, Total NMEs.

As can be seen, the NMEs were made up of a range of passing distances within the broad classification of a NME. The mean passing distance was 5.1 cables with a median of 5 cables. It should be noted that, I make no claim with respect to whether this is a safe passing distance or not, however, a passing distance of three cables or less should be regarded as being a remarkably dangerous situation. Three cables is a distance of 556m which is approximately twice the length of a large ship. Such a ship travelling at 14 knots would cover that distance in 77 seconds, which would be too short a time to react to a problem or unanticipated event. Additionally, for a ferry, this distance would be 3 times it's length and be covered in 47 seconds at 23 knots. Therefore, it was interesting to note that passing distances of three cables or less occurred on 41 occasions and represented 23% of all NMEs.

The distribution of the NMEs across the 24 hour period is shown in figure 5.16.

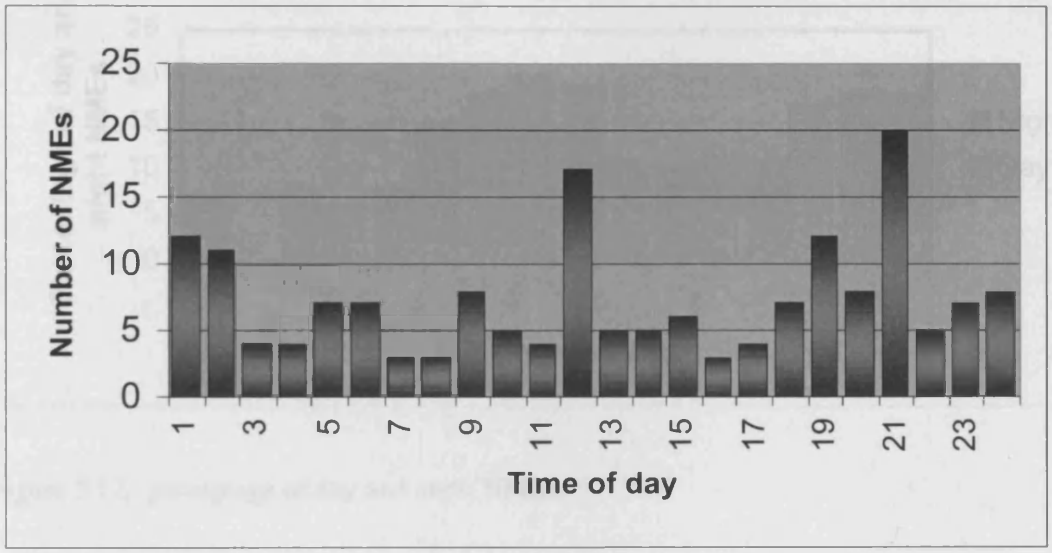

Figure 5.16, distribution of NMEs.

There was little difference between passing distances at night in comparison to passing distances during the day. The mean passing distance for the night was 5.20 cables compared with 4.99 cables for the day. Therefore, daylight does not appear to have an effect upon the passing distances selected by the ships. This is further illustrated when a comparison is made between each of the passing distances for daylight versus night time situations, as illustrated by figure 5.17.

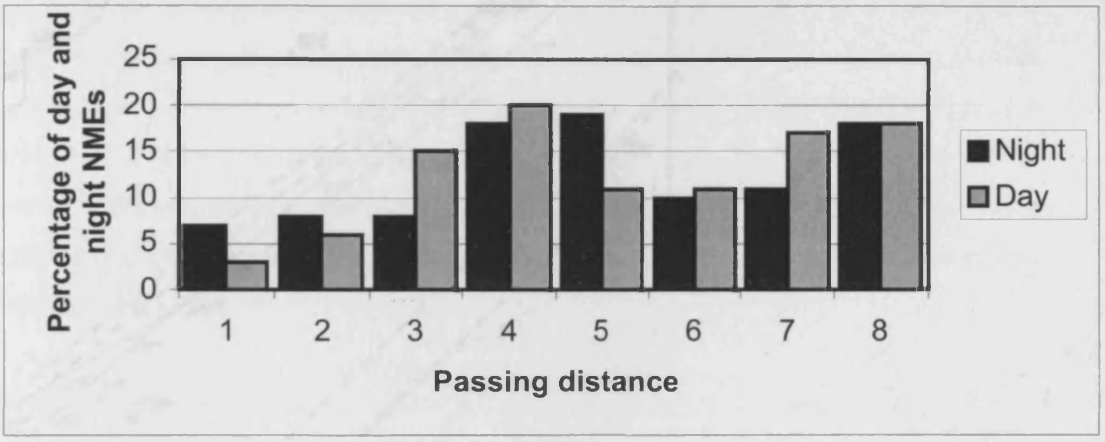

Figure 5.17, percentage of day and night NMEs.

However, these broad statistics do not allow for a more nuanced analysis of the collision situation and the application of the COLREGs. By grouping all together, it is impossible to see if there are any differences between the various collision situations. Therefore, I undertook an analysis of the NMEs for each of the three encounter situations, overtaking, crossing and parallel courses. Through this process, differences may be highlighted which would warrant further exploration within the ethnographic stage of the research.

5.4 Overtaking situations

There were 288 overtaking manoeuvres within the study period. An overtaking manoeuvre was recorded when one of two ships, within 5nm, on approximately parallel courses, passed the other at a higher speed. Figure 5.18 illustrates a typical overtaking situation.

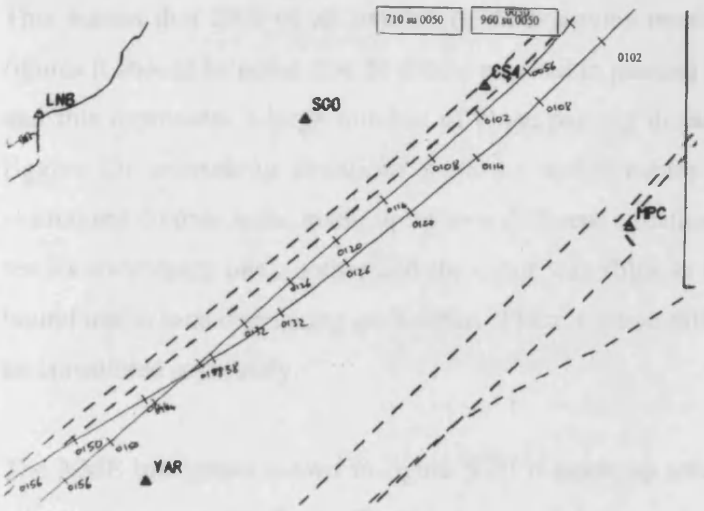

Figure 5.18, Overtaking situation.

In this situation, the ship which initially was placed more to the East than the other, with a first time marker of 0102, overtook the other at a distance of 2 cables at 01:43. Of these 288 encounters 84 resulted in a NME. The NME passing distances are shown in figure 5.19.

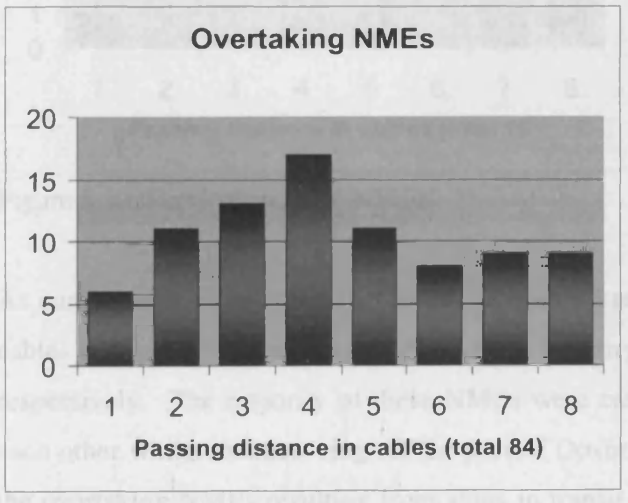

Figure 5.19, Overtaking NMEs.

This means that 29% of all overtaking manoeuvres resulted in a NME. Within these figures it should be noted that 30 (36%) resulted in passing at distances of 3 cables or less and this represents a large number of close passing distances. The mean and median figures for overtaking situations were 4.4 and 4 cables respectively. However, the overtaking figures were made up of two different situations. One situation was that of ferries overtaking one another and the other was ships in transit through the Southwest bound traffic lane overtaking each other. These are two different situations and so should be considered separately.

The NME histogram shown in figure 5.20 is made up solely of ferries overtaking each other as they cross the Dover Strait.

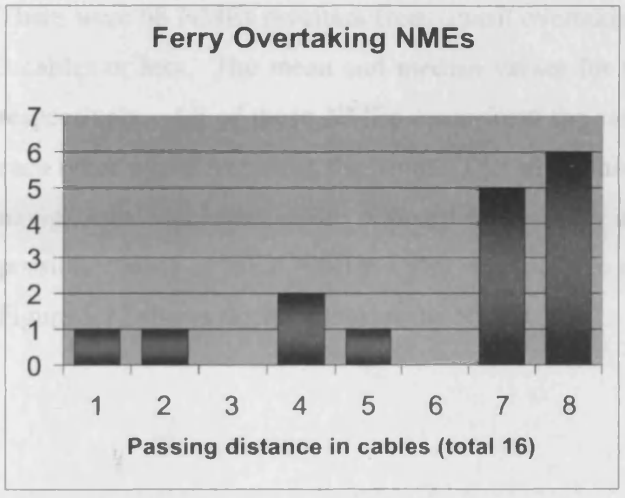

Figure 5.20, Ferry overtaking NMEs.

As can be seen there were 16 NMEs, of which 2 resulted in passing at distances of 3 cables or less. The mean and median values for ferry overtakings were 6.2 and 7 cables respectively. The majority of these NMEs were caused through the ferries overtaking each other whilst manoeuvring off the port of Dover. By contrast figure 5.21 illustrates the overtaking NMEs resulting from ships in transit through the Dover Strait following the Southwest bound traffic lane.

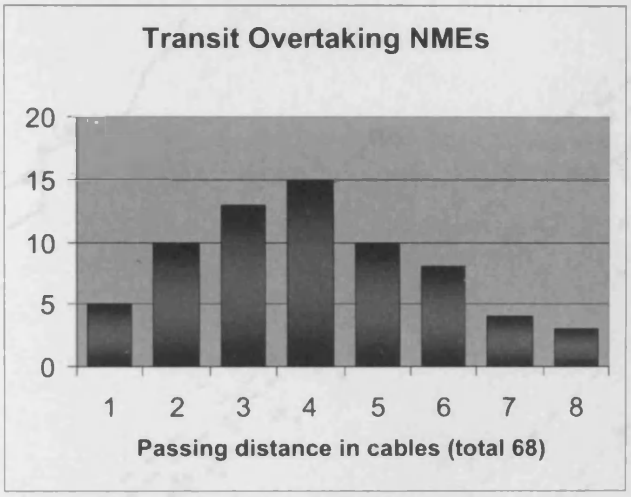

Figure 5.21, Transit ship overtaking NMEs.

There were 68 NMEs resultant from transit overtaking manoeuvres and of these 28 were 3 cables or less. The mean and median values for this situation were 4.0 and 4 cables respectively. All of these NMEs came from the same source, that is, ships overtaking each other whilst transiting the Strait. Therefore, this can be seen to be illustrative of the navigational decisions made onboard those ships in the area. In order to identify the possible causes of these NMEs a plot was made to identify their geographical location. Figure 5.22 shows the locations of the NMEs.

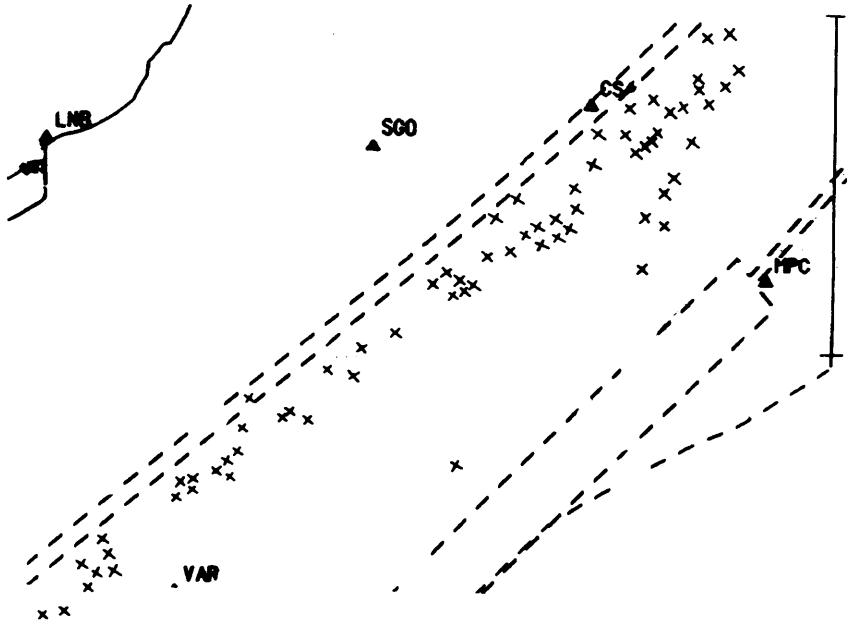

Figure 5.22, NME location.

All bar three of the NMEs involved ships that were lining up to pass to the north of the Varne bank. The Varne bank lies in the centre of the Southwest bound traffic lane and is marked VAR on figure 5.22. An effect of this bank is to provide the navigators onboard the ships with a choice as to going North or South of the bank. The second effect is to effectively halve the available space for ships that pass through the area. Therefore, when a navigator elects to pass to the South or North of the bank there is a great reduction in the area available for navigation. Such a space reduction would be less of an issue provided that equal numbers of ships passed to the North as to the South of the Varne bank. However, through an aggregation of the tracks of the 131 ships that navigated along the Southwest bound traffic lane it was found that the distribution was not equal. Figure 5.23 illustrates the situation by showing the aggregated tracks of the ships.

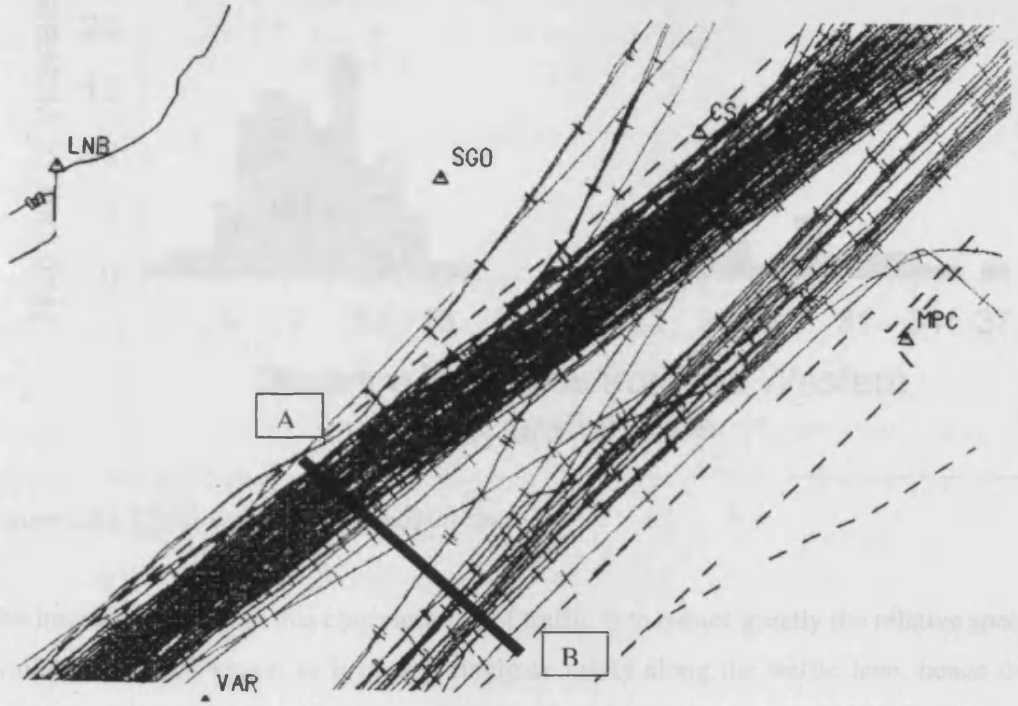

Figure 5.23, Aggregated vessel tracks.

From this figure the preponderance of ships taking the route to the North of the Varne bank can be seen. Of the 131 ships that passed through, 108 lined up to pass to the North of the Varne bank, whereas, only 23 lined up to pass to the South, a ratio of nearly 5:1. This issue is further illustrated by a cross-sectional distribution chart. To produce this chart, a line was constructed at right angles across the traffic lane (between points A and B on Figure 5.23 aggregated vessel tracks), the distance between the vessel's track and the separation line on the west side of the traffic lane was measured. This distance was then plotted on a chart to produce the distance distribution chart shown in figure 5.24.

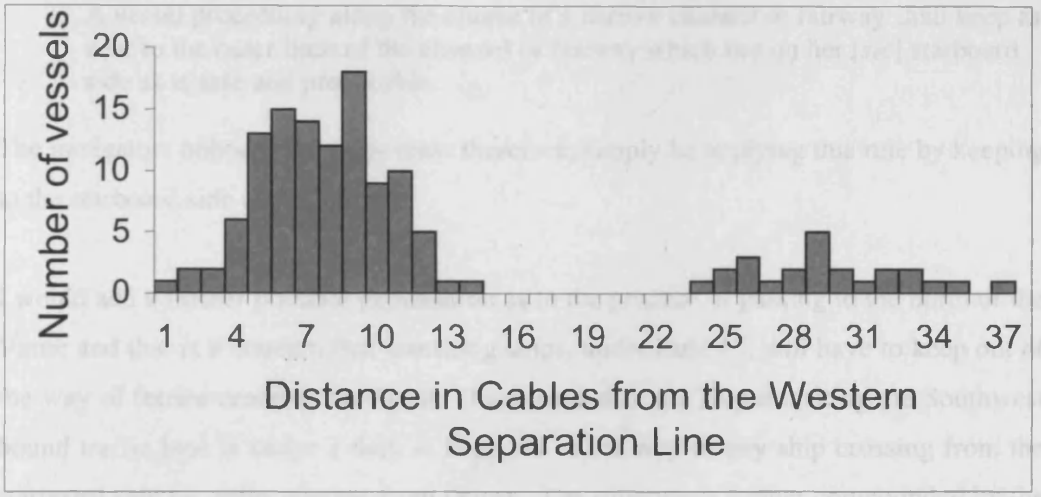

Figure 5.24, Cross-sectional distribution chart.

The immediate effect of this concentration of traffic is to reduce greatly the relative space available for each vessel as it tries to navigate safely along the traffic lane, hence the concentration of NMEs, as illustrated by figure 5.22, to the north of the Varne. The Marine Accident Investigation Branch in their report of the collision between the *Ash* and the *Dutch Aquamarine* (MAIB 2001) highlighted the issue of the greater number of ships passing to the North of the Varne. In the conclusion of that report they proposed a number of possible explanations for this:

- The seafarer's tendency to sail within the starboard (and so Northern in this case) part of a narrow channel;
- The fact that there are fewer navigational waypoints if a route to the North of the Varne bank is chosen;
- The tendency for smaller vessels to keep clear of the North bound deep draught vessels which would be navigating in the area adjacent to the route lying to the south of the Varne;
- Over-reliance upon previously existing electronic passage plans.

The first explanation being the tendency to sail in the starboard side of a channel would stem from the requirement within rule 9(a) of the COLREGS which states that:

> A vessel proceeding along the course of a narrow channel or fairway shall keep as near to the outer limit of the channel or fairway which lies on her [*sic*] starboard side as is safe and practicable.

The navigators onboard the ships may, therefore, simply be applying this rule by keeping to the starboard side of the channel.

I would add a further possible explanation as to the practice of passing to the north of the Varne and that is a concern that transiting ships, under Rule 15, will have to keep out of the way of ferries crossing the Strait. This means that any ship transiting the Southwest bound traffic lane is under a duty to keep out of the way of any ship crossing from the starboard side i.e. ships coming from Dover. The situation is further compounded by the warnings placed on the navigational charts covering this area. These warnings highlight the probability of meeting ferries and fast craft crossing the traffic lane and so would raise the level of concern and the perception of the risk, for those seafarers planning the passage. To keep out of the way of a crossing ship the transiting ship would normally alter course to starboard. Therefore, if a transiting ship chose a route to the south of the Varne, then the seafarer may think that there would be a danger of going aground on the Varne bank if they needed to alter course to starboard for the crossing traffic. Therefore, to allow for what is perceived as a greater risk, a collision with a crossing vessel, the passage is planned to pass north of the Varne bank even though this unwittingly exposes the vessels to a much greater risk of a NME from an overtaking manoeuvre, because of the reduction in space for each vessel, due to the concentration of traffic. It is probable that one or more of these explanations would account for the actions of the seafarers planning and navigating ships through the area.

5.5 Crossing situations

There were 484 crossing situations within the study period. The classification of a crossing situation was one where two ships crossed each other's path at an angle of more than 60°, within 5nm of each other. Figure 5.25, illustrates a typical crossing situation.

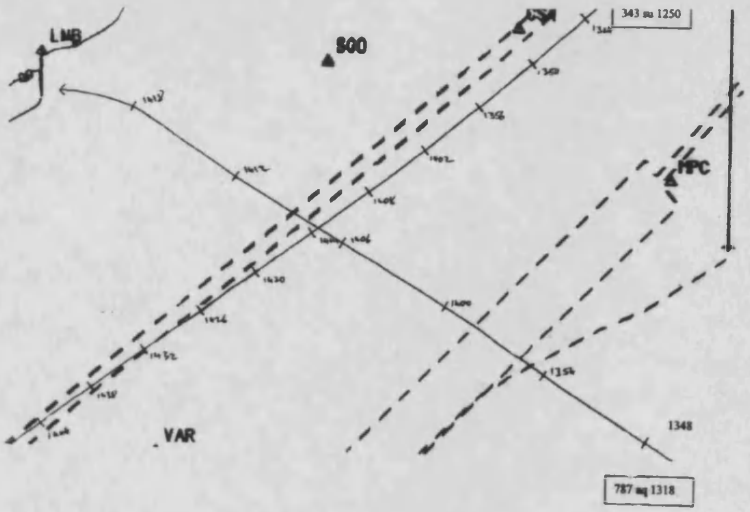

Figure 5.25, Crossing situation.

In figure 5.25, a ferry crossed from Calais to Dover and passed 1.3nm ahead of a ship following the Southwest bound traffic lane at 14:08. It was found that of those 484 crossing encounters 66 resulted in a NMEs. The NME distribution is shown in figure 5.26.

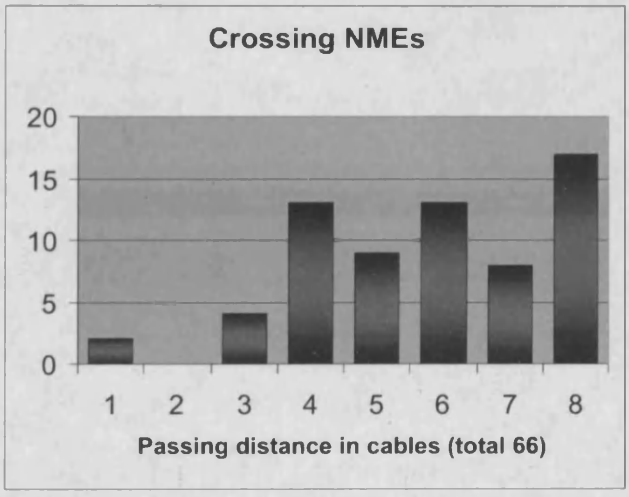

Figure 5.26, Crossing NMEs

This means that 14% of all crossing manoeuvres resulted in a NME, this should be compared to the figure of 29% for overtaking manoeuvres. Furthermore, there were only 6 NMEs with passing distances of 3 cables or less, whereas there were 28 similar NMEs involved overtaking situations. Similarly, there were great differences between the mean and median values for the passing distances of the NMEs for crossing and overtaking situations, table 5.3 illustrates the differences between the two situations:

	Crossing	Overtaking
Number of NMEs	66	68
Number of NMEs of 3 cables or less	6	28
Mean passing distance (cables)	5.8	4.4
Median passing distance (cables)	6	4

Table 5.3, Crossing v Overtaking NMEs.

From this it would appear that ships crossing the Dover Strait are, in the main, doing so with greater passing distances than the ships overtaking each other. Therefore, there is a greater margin of safety in place for crossing situations when compared with overtaking situations. From this I wished to explore possible reasons as to why this should be taking place by analysing the tracks of the crossing traffic.

Taking the example of a ferry leaving Dover and meeting a ship following the Southwest bound traffic lane, then the ship following the Southwest bound traffic lane will be the give-way vessel. Conversely, the ferry leaving Dover would be required to maintain its course and speed as per Rule 17(a)(i) which states that:

> Where one of two vessels is to keep out of the way of the other shall keep her course and speed.

The stand-on vessel is only relieved of this obligation when it becomes apparent that the give-way vessel is not taking action in compliance with the rules and then it may take action by its manoeuvre alone as per Rule 17(a)(ii) which states that:

> The latter vessel [the stand-on vessel] may however take action to avoid collision by her manoeuvre alone, as soon as it becomes apparent to her that the vessel required to keep out of the way is not taking appropriate action in accordance with these Rules.

Mandatory action by the stand-on vessel is required by Rule 17(b) in the event that the stand-on vessel finds itself in a position where collision cannot be avoided by the actions of the give-way vessel alone. Therefore, if the rules are being correctly applied to the crossing situations, then the ships leaving Dover will maintain the same course across the Strait and the ships following the Southwest bound traffic lane will keep out of their way. This would translate into the ships crossing from Dover maintaining the same tracks up to and possibly across the first lane of traffic. Tracks may deviate to some extent across the first lane of traffic dependant upon traffic in the second lane. This is with respect to the position of the ferries being reversed as they would now become the give-way vessel due to the ships following the Northeast bound traffic lane. To this end I isolated all the ships that had clear runs across the Southwest bound traffic lane. The criteria used in deciding whether the run was clear was that of no other ship should come closer than 1.6nm, twice the NME distance.

5.5.1 Dover to Calais ferry crossings

It was found that of the 47 ships that departed from Dover for Calais only 12 had a clear run. The tracks of the 12 ships were then aggregated as shown in figure 5.27.

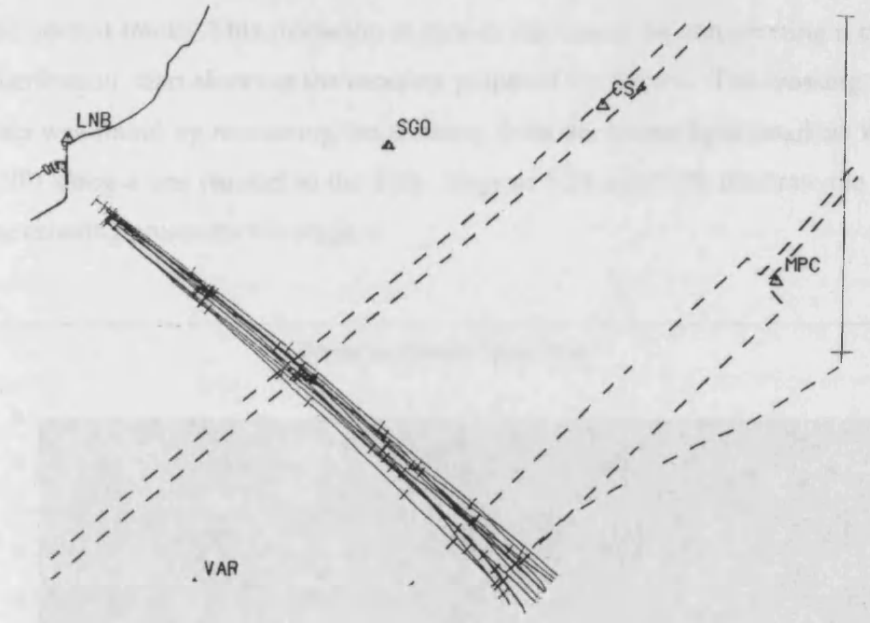

Figure 5.27, Dover to Calais Clear Run.

Similarly, all the tracks of the 35 ferries that did not have clear runs were also aggregated as shown in figure 5.28.

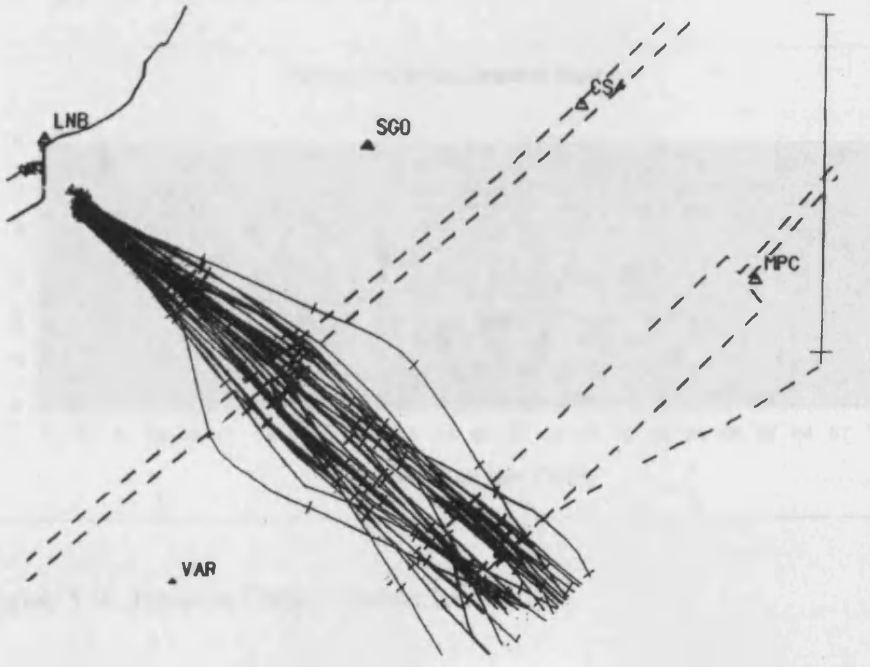

Figure 5.28, Dover to Calais Unclear Run.

As can be seen it is quite clear that ships that do not have clear runs are deviating from the normal track. This deviation is further illustrated by constructing a cross-sectional distribution chart showing the crossing points of the ferries. The crossing point for each ship was found by measuring the distance from the Varne light (marked VAR on figure 5.28) along a line parallel to the TSS. Figures 5.29 and 5.30, illustrate the differences in the crossing points for the ships.

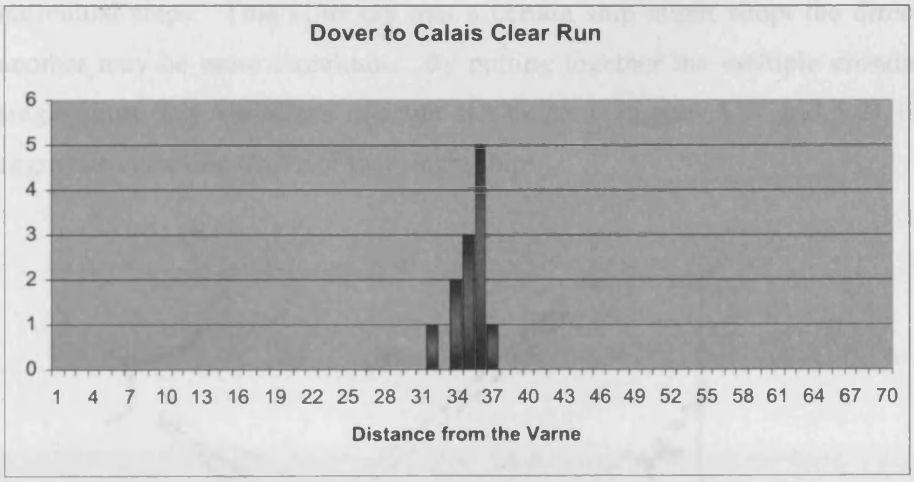

Figure 5.29, Dover to Calais, Clear Run.

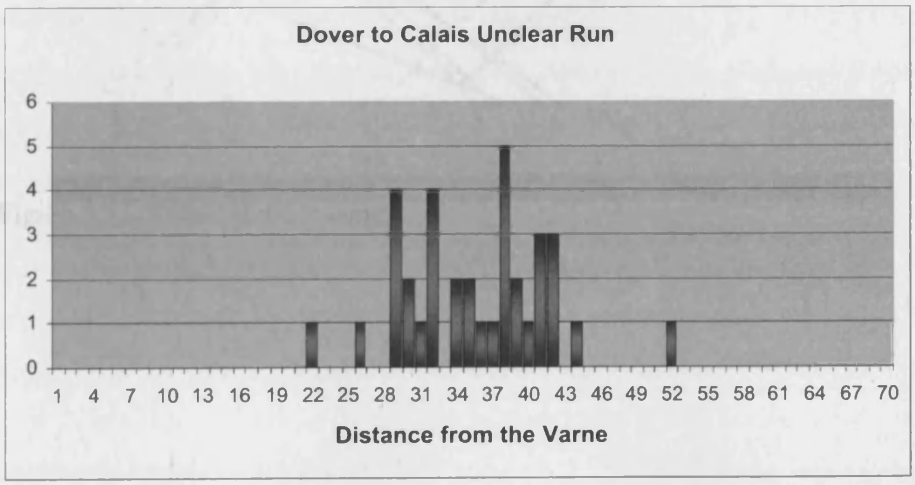

Figure 5.30, Dover to Calais, Unclear Run.

The differences between the clear and unclear crossings are quite striking. The vessels crossing the traffic lane and encountering traffic within it took considerably different routes from those that had a clear crossing. The mean distances from the Varne light buoy were similar for both clear and unclear crossings 35.5 and 35.6 cables, however, the standard deviations varied from 1.3 to 6.0 respectively. It may be argued that the differences in the crossing patterns could be accounted for by the routes selected by individual ships. That is to say that a certain ship might adopt the direct route and another may be more circuitous. By putting together the multiple crossing tracks of single ships, any variations in route can be seen. Figures 5.31 and 5.21 illustrate the aggregated crossing tracks of two single ships.

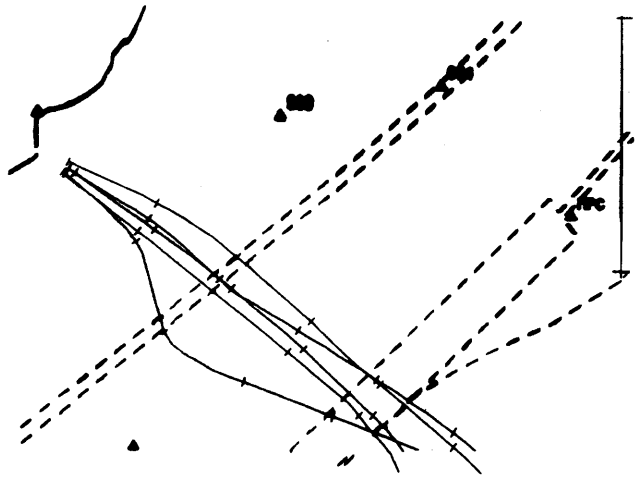

Figure 5.31, Single ship crossing 1.

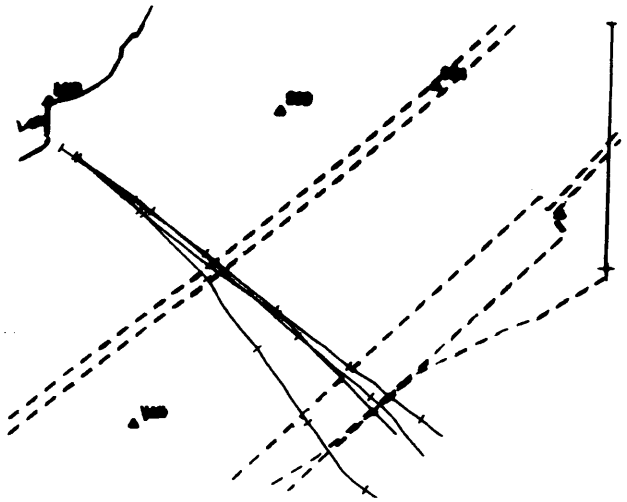

Figure 5.32, Single ship crossing 2.

Both of these two figures show how the tracks of the same ship alter throughout the day. Therefore, the selection of various tracks is taken by the people in command of the ships at the time of the crossing, rather than individual ships taking the same route across regardless of the traffic in the Southwest bound traffic lane.

An argument could be made that, apart from not following the COLREGS, it does not matter that the ships may deviate from their planned tracks. However, there is a serious cost element to these track deviations. The straight line route across the Strait is approximately 30 miles long. However, if the ship altered course by 30° and deviated by one mile from the straight line route then the crossing distance would increase to 35 miles. The ships burn 0.1 tonnes of fuel per nm, taking ten (five each way) crossings per day that amounts to a fuel consumption rate of 30t and 35t per day for the straight line course and the deviated course respectively. Fuel costs were approximately $160 per tonne when this data was collected and so over a year a ship deviating by a mile from the shortest route across would cost an extra $292,000 in fuel at the time of the fieldwork. Therefore, there is a strong economic argument to be made that the companies involved would want their ships to follow the shortest route across the Strait in order to reduce fuel

costs. However, as can be seen, the ships do deviate from the shortest route as a matter of routine.

From this illustration of the vessels' tracks, it was apparent that there was a clear variation in the routes chosen by the personnel onboard the ships crossing the TSS. Where the vessel was crossing, and there was no near encounter with another vessel, then the standard route, plus or minus 2.5 cables was taken. However, when a ship that did have a near encounter with another ship, then different tracks were taken. Rather than sticking within a narrow corridor 5 cables wide, the ship with an unclear crossing took a route plus or minus 18 cables of the mean line. From this it can be inferred that the ferries are keeping clear of ships following the traffic lane. This also means that the stand-on ships are giving-way to the other ships and we have a reversal of the positions under the COLREGs.

5.5.2 Calais to Dover Ferry crossings

The analysis was then conducted upon the 47 ships that crossed from Calais to Dover. The area of study within this analysis only covers the Southwest bound traffic lane and so I do not have any data covering the actions that the ships undertook within the Northeast bound traffic lane. This means that I cannot determine through this data whether the ferries coming from Calais gave-way to the ships crossing from their port side in the same manner as the Dover ships do. However, by Rule 15 the Calais to Dover traffic are the give-way vessels for the ships using the Southwest bound traffic lane. By the COLREGS the ferries are directed to take early action to avoid collision with the ships in this lane. By using the same criteria of clear and unclear passage any avoiding action taken by the ferries will be shown. Cross-sectional distribution charts were constructed for the clear and unclear situations as shown in figures 5.33 and 5.34.

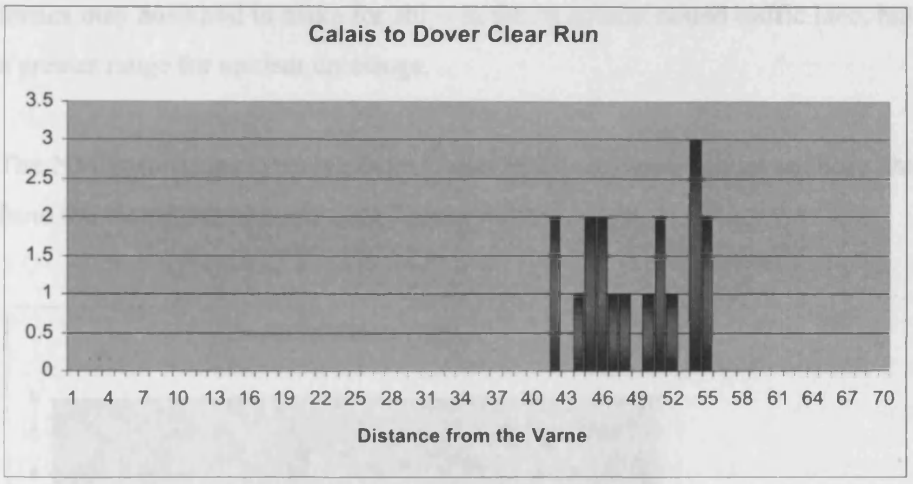

Figure 5.33, Calais to Dover clear run.

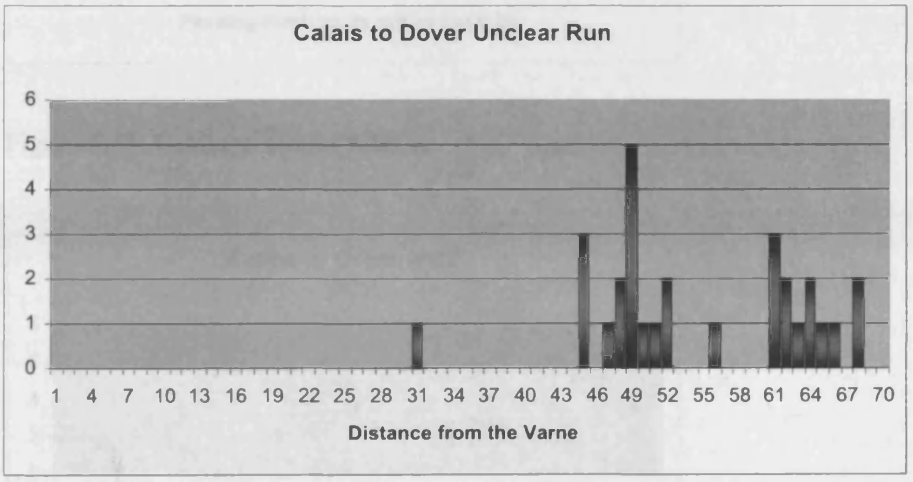

Figure 5.34, Calais to Dover Unclear Run.

There were 18 clear runs compared with 29 unclear ones with mean distances from the Varne of 48.9 and 55.3 cables respectively. As can be seen, there was a wider range of crossing points for both situations, reflected in the standard deviations for clear and unclear situations of 4.5 and 7.9 respectively, than for the Dover to Calais ferries. This range of crossing points is probably a reflection of any alterations of course that the

ferries may have had to make for ships in the Northeast bound traffic lane, but still shows a greater range for unclear crossings.

The NMEs for ships crossing from Calais to Dover were similar to those ships crossing from the reciprocal direction, see figures 5.35 and 5.36.

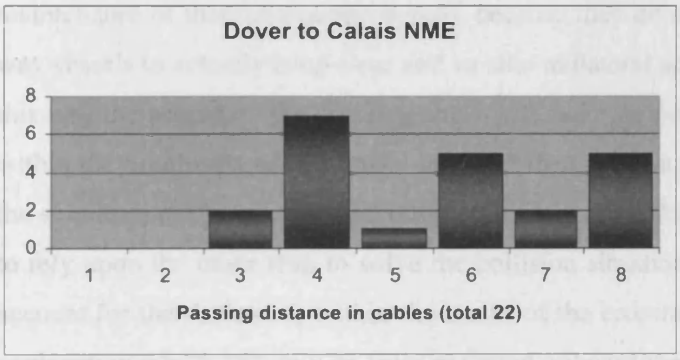

Figure 5.35, Calais to Dover NMEs.

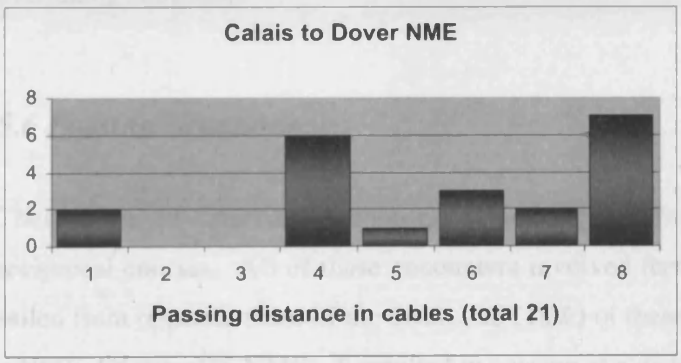

Figure 5.36, Calais to Dover NMEs.

This shows that the passing distances for ships, which had different obligations under the COLREGS, were broadly similar.

The conclusion to be drawn from the variance between clear and unclear crossing routes for Dover to Calais crossing traffic is that the vessels that should be maintaining their course and speeds are not. Rule 15 is not being applied as required by the rules, as vessels preparing to cross the TSS are taking action to keep out of the way of vessels crossing from their own port side. A reasonable explanation for this is that the people on the ships crossing the TSS do not want to have their actions constrained by the rules (the maintenance of their course and speed), because they do not trust the people on the give-way vessels to actually keep clear and so take unilateral action to keep out of the way. In this way the people on the crossing ships will make an assessment of the traffic situation within the Southwest bound traffic lane and then adopt a route across in such a way that the ship does not have a near encounter with any other ship. This then removes the need to rely upon the other ship to solve the collision situation. This explanation would then account for the deviations within the tracks of the crossing vessels. However, this is an explanation which can only be fully explored onboard the ships through observations of, and speaking to, the personnel taking those decisions. What is clear is that the margin of safety involved in crossing situations is of a higher order than that shown within overtaking situations.

5.6 Passing situations

There were 137 passing encounters which were defined as two ships meeting on reciprocal courses. All of these encounters involved ferries meeting each other as they sailed from opposite sides of the Strait. 25 (18%) of these passing encounters resulted in a NME. Of these 25 NMEs, 5 resulted in passing at a distance of 3 cables or less and the full details are shown in figure 5.37.

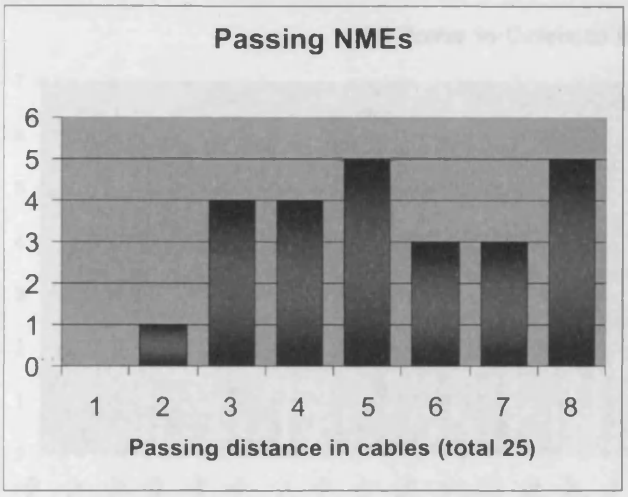

Figure 5.37, Passing NMEs.

Rule 14(a) of the COLREGS governs the actions to be taken when ships meet on reciprocal courses and it states that:

> When two power-driven vessels are meeting on reciprocal or nearly reciprocal courses so as to involve risk of collision each shall alter her course to starboard so that each shall pass on the port side of the other.

Therefore, when two of the crossing ships met on reciprocal courses both are directed to alter course to starboard. Through the analysis of the crossing points of the ships it can be seen that ships crossing from Calais to Dover take a more Northerly route than ships crossing from the other direction. Figure 5.38 shows the cross-sectional distribution of all the ships.

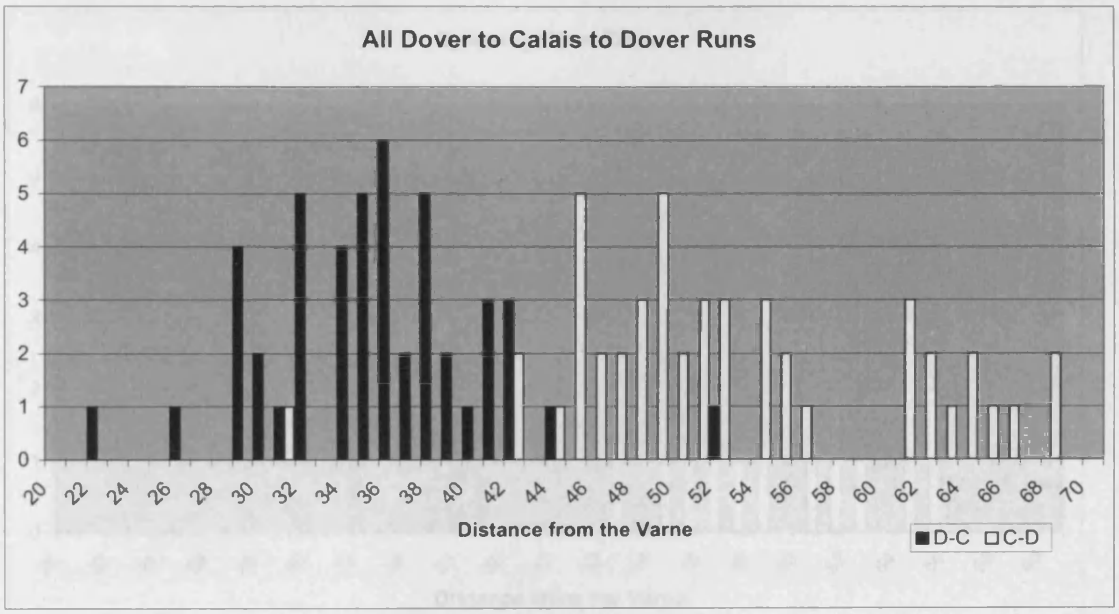

Figure 5.38, Cross-sectional distribution of all crossing traffic.

However, these course selections were not due to the ferries altering course for other ferries as the route selections were also evident when the ships had clear runs across the Strait. Figure 5.39 illustrates the clear runs for the ships crossing in both directions.

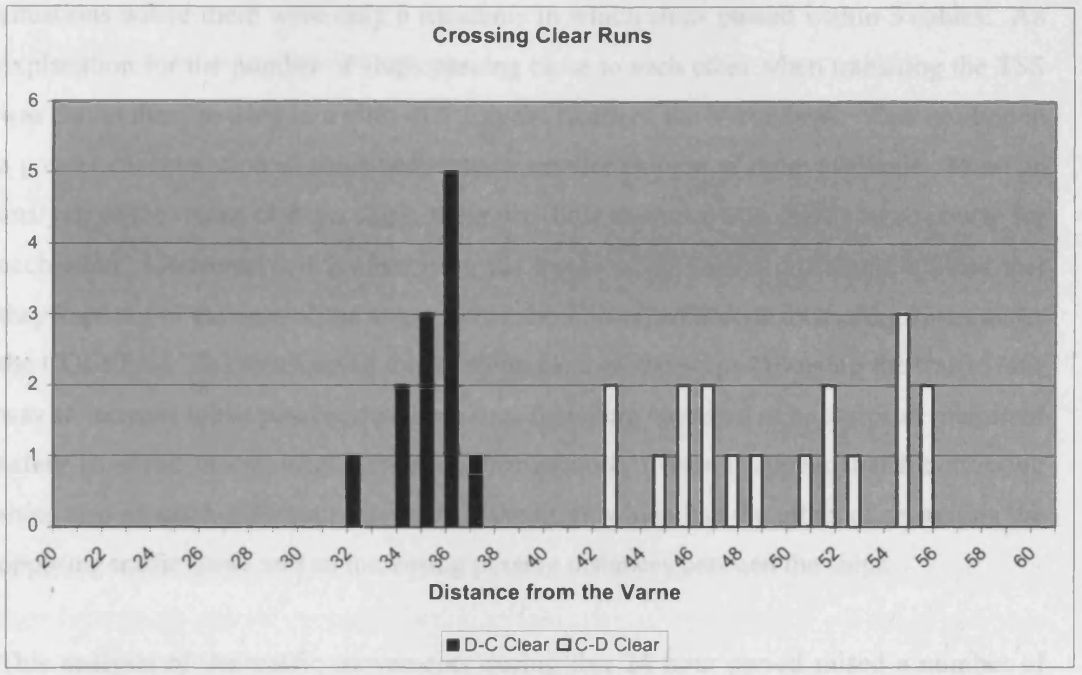

Figure 5.39, Cross-sectional figure for ships with clear crossing runs.

From this it appears that the adopted routes are there through choice rather than resulting from alterations of course for other ships. The appearance is that ships crossing from either direction adopt a route across which does not conflict with ships crossing from the other direction. This will be an aspect that is explored further in Chapter 6.

5.7 Summary

Through the analysis of the ship track radar data I have been able to highlight the collision avoidance practices for all of the ships using or crossing the Southwest bound traffic lane of the Dover Strait for one 24 hour period. This analysis has been further refined with the classification of the near miss encounter which has been used to describe the passing distances of all the ships within the area. From this it appeared that the ships crossing the Dover Strait exhibited a mixture of non-COLREG following behaviour. It was found that ships overtaking each other did so at very close distances with 28 incidents in which ships passed within 3 cables. This is in comparison to the crossing

situations where there were only 6 incidents in which ships passed within 3 cables. An explanation for the number of ships passing close to each other when transiting the TSS was due to them passing in a ratio of 5:1 to the North of the Varne bank. This resulted in a greater concentration of ships and hence a smaller amount of room available. From an analysis of the tracks of those ships, there was little evidence that ships altered course for each other. Conversely, it is clear from the tracks of the ferries crossing the Strait that they kept out of the way of the ships within the TSS regardless of their obligations under the COLREGs. The resultant of this keeping clear of the ships following the traffic lane was an increase in the passing distances such that there appeared to be a greater margin of safety involved in crossing situations. Furthermore, it would appear that the crossing ships also adopted different routes across the Strait which had the effect of separating the opposing traffic flows and so increasing passing distances between the ships.

This analysis of the traffic movements during this 24 hour period raised a number of questions which I found both interesting and intriguing. Why for example, do the ships crossing the Strait keep clear of ships within the TSS regardless of the COLREG obligations? In the second, ethnographic stage of the research the actions taken by the people in charge of the ships will be explored. In addition, the reasoning behind those actions will be investigated. This should then allow for a more nuanced understanding of the process of collision avoidance and the application of the COLREGs. The application of the COLREGs would not then be simply black or white matter of compliance v non-compliance. Through the ethnographic phase in which the people in charge can be interviewed, actions and explanations placed in context and a fuller understanding gained.

Chapter 6. Crossing the Dover Strait

6.0 Introduction

In this Chapter I will explore the strategies and actions taken by the people in charge of ships crossing the Straits of Dover. The aim of this exploration is to investigate the second of the main research questions, namely "why are the COLREGs applied in the manner that they are?" Through the utilisation of a number of representative examples based upon the detailed analysis of 52 crossing (33 of which were recorded using a hand-held camcorder) and 12 interviews, I will illustrate how the people in charge of the ships, undertake a process of risk analysis and assessment of the situation before taking what they view as the most appropriate action to avoid the collision risk. It will be shown how these practices provide an explanation for the deviations from the most direct route across the Channel as illustrated in figure 5.27 Chapter 5 [Dover to Calais unclear run]. I will show how the strategies employed to cross the first lane of traffic differs greatly from the requirements under the COLREGs. Conversely, it will be shown that the people in charge of the ships actively complied with the requirements of the COLREGs when crossing the second lane of traffic. I will then try to show that this paradox of active non-compliance followed by active compliance with the regulations actually fits into a pattern of avoidance of all ships regardless of the requirements under the COLREGs due to the lack of trust in the other, lack of enforcement of the regulations and compliance with a company rule. By contrast, I will then describe the co-operative actions adopted by crossing ships to ensure that they are not in conflict with each other when crossing from opposite sides. Through this co-operation undertaken between the crossing ships and their respective companies, the need for the application of the head-on rule of the COLREGs is removed. The net effect of all these actions is to ensure that the collision risk is minimised. Such co-operation occurs due to the level of trust that exists between the actors due to an ongoing relationship combined with a concept of shared values. The justification for these actions will be returned to in chapter 7.

6.1 Fieldwork data and analytical method

The data collection during this ethnographic stage in the fieldwork was undertaken onboard seven different ships and from two different companies. This represents half of all the ships and companies which operate out of the port of Dover. The ships were employed on runs between three continental ports and the port of Dover, see table 6.1.

Name of ship	Company	Run between
Wye	Iberian Ferries	Dover and Zeebrugge/Calais
Usk	Iberian Ferries	Dover and Zeebrugge/Calais
Taff	Iberian Ferries	Dover and Calais
Tawe	Iberian Ferries	Dover and Calais
Dee	Iberian Ferries	Dover and Calais
Cam	Sirius Line	Dover and Dunkirk
Exe	Sirius Line	Dover and Dunkirk

Table 6.1, Ship details.

Whilst onboard these seven ships I observed 52 separate crossings of the Dover Strait. I recorded contemporaneous fieldnotes of each of the crossings, in addition to notes made shortly afterwards in the privacy of my cabin. Additionally, with the use of a hand-held video camera, I recorded the radar picture and speech of the participants during 33 of those crossings. Furthermore, I undertook 12 tape-recorded interviews with the officers onboard the *Wye* and the *Usk*. The number of the participants is shown in table 6.2.

Rank	Observed	Interviewed
Captain	14	4
Chief Officer	11	3
Second Officer	18	4
Cadet	3	1
Total	46	12

Table 6.2, Number of participants.

From this it can be seen that the data recorded represents a significant dataset relating to the actions undertaken by people in charge of ships as they apply the COLREGs whilst crossing the world's busiest shipping lane. The data was explored using the methodology outlined in chapter 3 section 3.4. Through this, I was able to immerse myself in the data and explore the recurrent themes and analytical categories. In order to retain the richness

of the data, as well as to represent the temporal aspects of the process of collision avoidance, I have reproduced sections of the ethnographic transcripts. These ethnographic transcripts include radar screen shots that show the manner in which the person in charge of the ship relates to the outside world and the traffic situation. Through these representative crossing transcripts the decision making process and the application of the COLREGs to resolve the risk of collision will be demonstrated.

6.2 Requirements under the COLREGs

The varying obligations under the COLREGs are important for the analysis of the actions taken by the ships in the following collision avoidance situation. As previously outlined in Chapter 4, Rule 15 states that

> When two power driven vessel are crossing so as to involve risk of collision, the vessel which has the other on her [*sic*] own starboard side shall keep out of the way and shall, if the circumstances of the case admit, avoid crossing ahead of the other vessel.
>
> Rule 15

Therefore, the ship with the other on its starboard side is the give-way vessel and should keep clear of the other, simply put, the ship should give-way to the right. Conversely, the other ship is the stand-on vessel and should maintain its course and speed, Rule 17(a)(i). The give-way ship should now take action to avoid the potential collision and this should be positive, made in ample time, with due regard to the observance of good seamanship, Rule 8(a) and be large enough to be readily apparent to the other vessel, Rule 8(b). Once the give-way ship has taken action, it should check that it has been effective and resulted in passing at a safe distance, Rule 8(d). Throughout this process, the stand-on ship will have been monitoring the situation and, if necessary, applying Rule 17(a)(ii) which allows the stand-on vessel to take action by its manoeuvre alone, if the give-way vessel is not taking appropriate action. The stand-on vessel must take action when it gets to the stage when collision cannot be prevented by the actions of the give-way vessel alone. What this means to the Dover Strait traffic is that any ship crossing the first lane of traffic is the stand-on vessel and any ship following the first lane of traffic is the give-way

vessel. However, the situation is reversed when a ship crosses the second traffic lane as it becomes the give-way vessel and the one in the traffic lane becomes the stand-on vessel. In essence these requirements simply boil down to:

Give-way vessel:	give-way to the right and make it clear that you have done so.
Stand-on vessel:	keep the same course and speed until you think that the other ship is not going to give-way.
Ferry leaving port:	stand-on vessel for the first lane, give-way vessel for the second lane.

However, these rules only apply once risk of collision exists. As shown in chapter 4 section 4.2 the only guidance given as to when risk of collision exists is that given in Rule 7(d) which is devoid of any reference to temporal or situational aspects. The net effect of this is that before risk of collision is deemed to exist, the restrictions of the COLREGs do not apply. Therefore, before this point the ferries (who would become the stand-on vessels when risk of collision exists) are free to take what ever action they wish to resolve the collision situation.

6.3 The Risk Assessment

In the first instant the people in charge of the ship undertake a quantitative assessment of the risk of collision with other ships in the Channel. To facilitate this process all of the ships are fitted with sophisticated radar systems. These systems, known as an Automatic Radar Plotting Aids (ARPA) allow for the tracking of other ships in order to assess their movements and their passing distance. It should be noted that the terms radar and ARPA are used interchangeably. The person in charge looks at the radar screen as it starts to pick out the ships which look as if they may be a problem when the ship departs. I asked during interviews onboard the *Wye* and the *Usk*, how the people in charge undertook this first assessment of the risk:

> Cameron: Before we'll leave harbour we'll be picking up the ships which will be known, you've got a rough idea of lets say if all the ships coming in the south west lane that are roughly at the CS4 buoy [a navigational mark] or just coming up to it and some of the slower ships just after coming down to the Goodwin [a

large sandbank to the North] any of those ships there you know that you'll probably meet with those. So before you leave you start to pick those up. So you can give yourself a good indication then of roughly what you are going to meet.

Cameron *Wye*.

OK, to start with, what I do, I like to set the radars up, the Quartermasters set them up but I like to have the final little play and put them where I want. I always have them up on the twelve mile range, and start acquiring everything coming down the lane so that I know what's out there. Basically, as for here because it's a longer departure [Zeebrugge] and there's more things going on before you get to the pier heads, I have the radars on, because it's a more concentrated area because of the channels, then I have the radars on six miles. Start acquiring anything in the channel on six miles, its impossible to acquire everything. But, so that gives me an overview of what's outside. I mean it would be foolish of me to say that I am only interested in the big echoes and not the small ones but the little ones tend to be much more unpredictable than the big ones if you see what I mean. You can identify the actual cargo vessels in the channel and you know where they are going.

Morris, *Usk*.

You look at the close traffic first, anything further away than 3 miles isn't a problem leaving Dover, because, obviously, you look at the first problems before the next problems. But before you leave you have already acquired the targets in the South-west bound lane, so you've got a fairly good idea.

Damon, *Usk*.

This was the practice that was seen for each and every crossing that I observed during the field work. The person in charge would start up the radar systems, look at the screen to see what ships' echoes were displayed, acquire them using the radar's software and ascertain which of them could be a problem. Figure 6.1 shows a typical radar screen image.

Figure 6.1, Radar Screen

The ship, the *Taff*, is located at the centre of the two circles. The *Taff*'s heading is indicated by the green line extending from the central point. The purple diagonal line across the centre of the screen indicates the edge of the traffic separation scheme (TSS). The yellow lumps to the right of the screen are radar echoes of ships with a green vector line extending from them to indicate their movement relative to the *Taff*. As can be seen one of the ship's vector's passes very close to the position of the *Taff*. This means that this ship poses a risk of collision to the *Taff*. Figure 6.2 shows the way in which the radar's software quantifies and displays the information relating to that radar target.

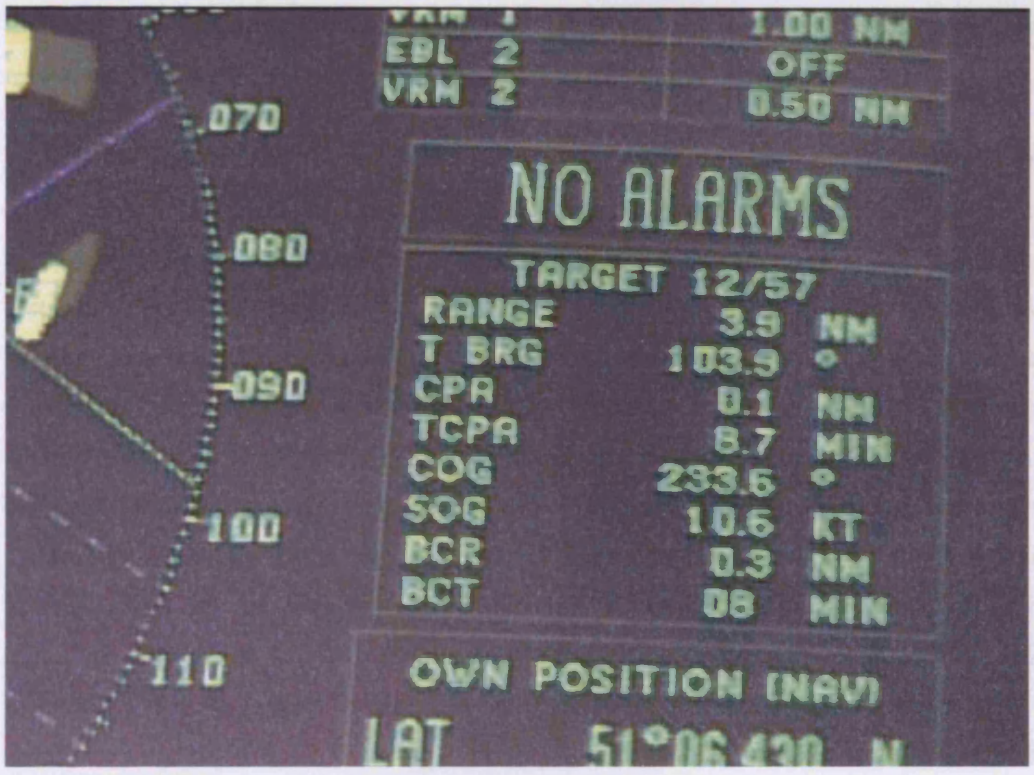

Figure 6.2, Quantified data on the collision risk

Figure 6.2 shows the data relating to the movement of one particular ship. At this point the other ship is 3.9 nautical miles (NM) away bearing 103.9°. Its closest point of approach (CPA) is 0.1NM (1 cable) and this should occur in 8.7 minutes (time to closest point of approach TCPA). It is moving on a course (course over the ground, COG) of 233.6° at a speed (speed over the ground SOG) of 10.6 knots. Its bow crossing range (BCR) is projected to be 0.3NM (3 cables) and this will take place in 8 minutes time (bow crossing time BCT). This was the data that the person in charge of the ship used in order to assess the risk of collision. This data was based purely upon the computers' calculations of the radar information and represents a quantified statement of the risk of collision. This process by which the individual attempts to quantify the risk that they are faced with is similar to that found in other studies). Rochlin *et al.* (1987) for example, in their study of naval flight operations, described how through the use of checklists and performance data, the risk of certain operations being undertaken was quantified and then compared with acceptable parameters. If the risk lay within the acceptable parameters

then the task would be undertaken. However, if it lay outside of it then additional measures were put in place in order to return the risk to an acceptable level.

In the situation outlined above, there exists a risk of collision between the *Taff* and the other ship which represents a breach of the acceptable risk parameters. It is problematic to find any form of definition for what is and is not acceptable with regard to passing distances. The COLREGs only specifies that risk of collision exists when the compass bearing of an approaching vessel does not appreciable change. In that case the closest passing distance would be 0 NM. In addition, nowhere within the COLREGs does it specify the parameters of the risk and neither do the IMO nor the MCA offer any definition. Furthermore, as explored by Curtis (1986) and Corbet (1986) in cases where the passing distance is more than 0 NM people undertake considerable variations in their actions. From the previous studies of ship domains it would appear that 0.8 Nms is regarded as the inner limit of the risk parameter (Fuji and Tanka 1971, Goodwin 1977, Coldwell 1983). In fact, following the early results of this study, the MCA now use a definition of a ship domain as being a circular area of 8 cables in diameter (MCA 2006) (this will be returned to in chapter 8). Iberian Ferries do specify the minimum parameters by which their ships must operate. This rule is that the person in charge of the ship must not pass closer than one mile ahead or half a mile astern of another ship. This rule was well known by all of the officers and cadets onboard Iberians' ships.

> You must run half a mile astern of a vessel and one mile ahead, that's a minimum. That's the safe distances and so that was what he was doing, just looking for a gap to get across.
> James, Deck Cadet *Usk*.

> I can squeeze in there with a mile ahead of someone and half a mile astern of others. So if there is a mile and a half gap, then I can go through.
> Max, Second Officer *Wye*.

> A mile ahead, half a mile astern, that's the rule.
> Morris, Captain *Usk*.

This rule giving the parameters were also passed on at a very early stage in the training of new officers as they joined the ship.

Similarly Sirius Line, also stated that when crossing the ship must not pass closer than 1 mile ahead of the other.

> [T]here is this sort of general rule, and I think that is for most of the operators, is that we do not cross closer than a mile ahead of any vessel.
> Gus, Captain *Exe*.

> PB- So what do you normally work on as passing distances astern of other ships?
> Spencer- Half a mile. Sometimes we follow the sterns pretty close. But on this route it's a mile ahead of them, which is more important I would say.
> Spencer, Second Officer *Exe*.

> PB- What's the passing distance?
> Jack- CPA is six cables. So we'll pass a mile ahead of him.
> Jack, Second Officer *Cam*.

Such a common approach is not surprising as there had been a considerable number of people moving from Iberian Ferries to Sirius Line. This was because Sirius Line attracted experienced officers to work on their ships when they first moved into Dover with generous pay offers. I will return to this issue in chapter 7 section 7.5.

Therefore, on all of the ships within this study the people in charge firstly undertook an assessment of the risk of collision. If the radar predicted that the other ship would breach the safety parameters around the ship then they would take steps to ensure that that safety threshold was not breached.

6.4 Collision avoidance risk management

As outlined in chapter 2, once it has been found that a safety threshold is predicted to be broken steps are then put in place to manage the risk (see chapter 2, section 2.3 and Royal Society 1992, Seiler 2001, Fleury 1998). In the case of collision avoidance this means the application of the COLREGs. During the approach to the first traffic lane, ships will be crossing from the port side of the ferries and so they have right of way over those ships. The other ship following the traffic lane will then take actions to keep out of the way, whereas the ferry is directed to maintain its course and speed. Those are the requirements under the COLREGs which if applied will manage the risk. However, on

only one crossing throughout the entire period of the fieldwork, did I observe a ferry maintaining its course and speed whilst waiting for the other ship to keep out of its way. Furthermore, as illustrated by figure 5.28 [Dover to Calais Unclear Run] in chapter 5, the crossing ships alter their courses as a matter of routine to avoid ships which represent a risk of collision.

6.5 Crossing the first traffic lane

The following examples illustrate the actions taken by the people in charge of the ships when faced with a situation in which risk of collision was present. It should be noted that consideration was never given to the idea that they might give the other ship a chance to give-way to them.

In this example the *Dee*, operated by Iberian Ferries, had just sailed from the port of Dover for Calais.

> PB- If it's OK can you just tell us what's going on?
> Ross- OK, so about 5 minutes before we sailed I acquired all the stuff in the SW lane here. Looking at what Miles [C/O] just done there and putting it on relative and looking at the relative speeds, what I'm going to do is actually pass in between the fast one and the two slow ones there.

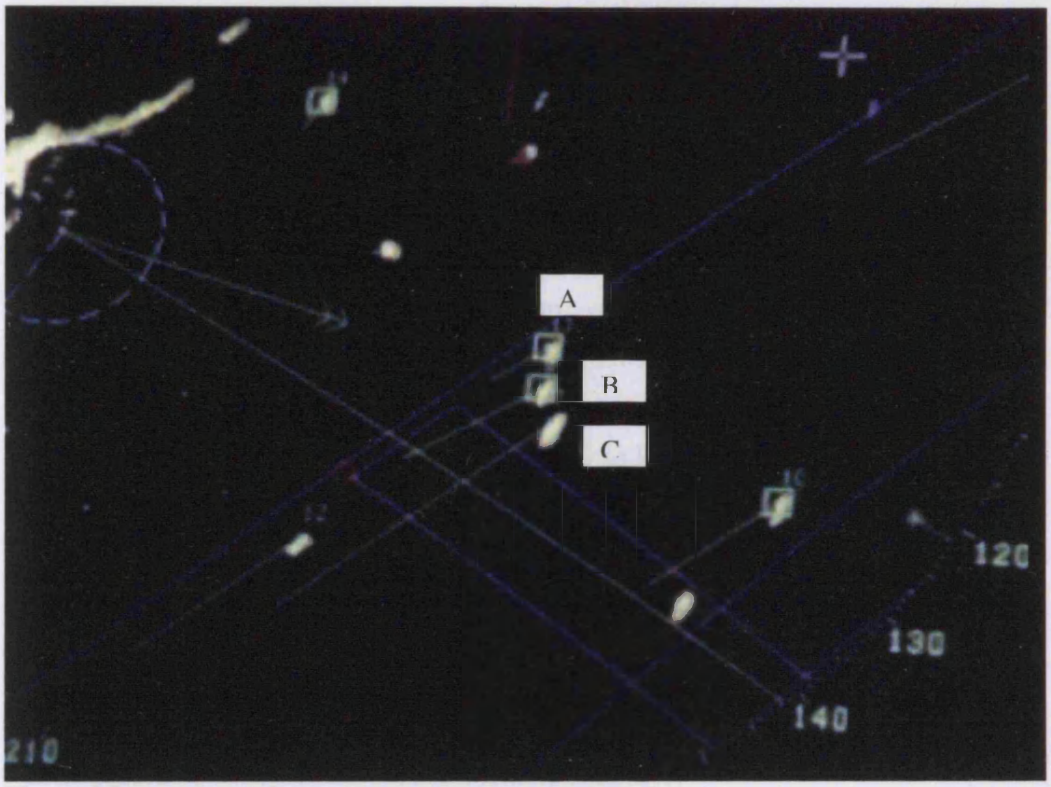

Figure 6.3, crossing 1.1.

The situation that Ross is describing is shown in Figure 6.3. Ross is concerned with the three ships crossing from the port side in the South-west traffic lane, marked A, B and C. Ships A and B are the two slower ones and ship C is the fast one. If Ross continued on the course that is currently being steered (121°) then the *Dee* would be in a collision risk with ship A. Ross's intention is to alter the course of the *Dee* to starboard to pass ahead of A and B and behind C. Ross has come to this decision within half a mile from the port of Dover.

> [to helm] Chris, nice and gentle around to 135° please. We'll see what that looks like. In fact 145° please.
> Helm- 145° easy.
> Ross - Yeah, looking at 145°, looks quite reasonable. The tide is actually really shooting us up that way [NE]. So we'll pass astern of that and in front of these two.
> PB- Fair enough. So you simply look at the length of the true vector and see where you'll be in a few minutes' time?
> Ross -That's exactly that. I wouldn't want to pass closer than eight to nine cables

off their stern. Also bearing in mind all the time that he [is] supposed to give-way to me if he feels that way inclined. 155° please.
Helm- 155°.
Ross - Probably won't be enough so [to helm] 160° please.
Helm- 160°.
Dee sailing Dover to Calais.

From this it can be seen that Ross has carefully assessed the situation, noted the risk posed by several ships and then taken action to avoid that risk. This action has involved taking the decision to alter course to starboard within half a mile from the port of Dover. This means that Ross is taking action at a very early stage. It could be argued that risk of collision does not apply at such an early stage and so Ross is free to take whatever action he likes as the COLREGs are not in operation (see the discussion in chapter 4 section 4.2 and this chapter section 6.2). However, Ross does make reference to the responsibilities between the ships as he states that the other ship is the give-way vessel. Furthermore, Ross understands that there is a risk of collision posed by the other ship. Additionally, Ross makes a series of small alterations of course to starboard by asking the person steering to go from 145° to 160° over a period of time. Such small alterations have been found to be a breach of the COLREGs (Cockcroft 2005). The net effect of these actions is that Ross has resolved the collision situation through unilateral action. It may be argued that Ross is utilising the flexibility found within the COLREGs (i.e. taking action before they apply) but it could also be argued that by stating that the other ship is the give-way vessel and through the taking of a series of further small alterations, he has gone beyond the flexibility and is simply ignoring the requirements of the COLREGs to unilaterally resolve the collision situation. As will be seen, this unilateral strategy to resolve collision situations becomes the normal pattern of behaviour for ships crossing the first traffic lane.

In the next example the *Cam*, operated by Sirius Line, had just sailed from Dover to cross the first traffic lane before heading to Dunkirk.

PB- So how is it going then?
Albert- So what we've just left Dover. Ships plotted coming down the lane. One... we've got one coming down the inshore zone. Quick look ahead.

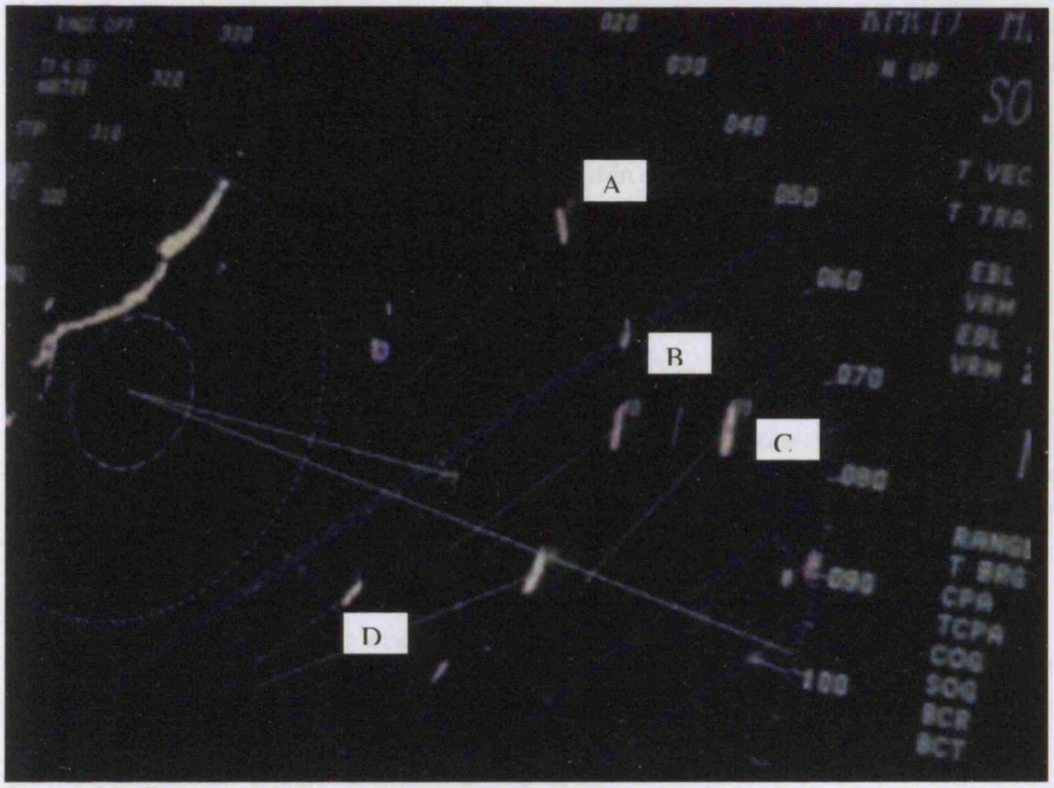

Figure 6.4, Crossing 1.2.

> We've got a fishing boat here crossing. And nothing else further up the lanes. So at the moment the plan is to come around the stern of this one. So by the time we get across here, that one will be at a bit further down. So by the time we're over here, he'll be long gone down there. Just this little one here and to keep an eye on. It's the end of a flood tide pushing us along up there. Southerly wind as well.

Albert (the ship's Captain) described the situation shown in figure 6.4 where ship A is coming down the inshore traffic zone and ships B and C were within the South-west traffic lane. Ship D was a fishing vessel. The *Cam* had just left Dover, about 1.2 miles from the port during which time Albert altered course to 100° following an initial assessment of the traffic in the Channel. Due to this alteration the *Cam* would then pass well ahead of ship A and astern of ships B and C. However, under the COLREGs a ship crossing a traffic lane should do so at right angles to the traffic flow. Such a course would be approximately 135° and so the *Cam*'s steered course was considerable different from that. Furthermore, under the COLREGs a ship should not take any action which could conflict with action taken by another ship. If either ship B or C did give-way to the

Cam and they complied with the requirements under the COLREGs, then they would have altered course to starboard. This would have meant that the *Cam* and ship B or C would have turned towards each other and so created a much worse situation. However, the action taken by Albert did resolve the collision risk and so there was no need for either ship B or C to take any action.

Albert then handed over control of the navigation of the ship to Jack.

> Albert- [Handing the ship over to Jack]. You are steering of 100. Automatic. You've got a couple of ships in the lane. The plan is to run astern of them. One incoming down the inshore zone there. Crossing ahead of him [ship A]. A few small ones behind, probably fishing boats or coasters struggling with the weather. End of the flood and a South-west wind. So if you are happy with that?
> Jack- Yep. [Turning to me] As the skipper said we've got these two here. So don't want to cut ahead of them so we've got the ideal passage here. We can decide whether we want to come astern or ahead of it. If we want to come astern then we can just go to port a bit and travel up till we want to come across. It's really handy. So you just come around a bit.
> PB- To port?
> Jack- Yeah, so that I don't worry these guys.
> *Cam* sailing Dover to Dunkirk.

In this Albert passes on all the relevant information relating to the traffic, the controls of the ship and the weather. The term automatic means that the ship is being steered by automatic control rather than in the case onboard the *Dee* where it was steered by hand. The flood means the flood tide in which there is a current running up the Channel which combined with the wind pushes the *Cam* to the North.

Jack explained that he would continue with the actions put in place by Albert (the skipper) and keep astern of ships B and C. He then described how this was an ideal passage in that he could decide to take whatever action that was required to get across. So once again the ferry is taking unilateral action to resolve the collision risk. Furthermore, there was no consideration given to the idea that the other ship should give-way to the *Cam*. It could be argued that the people in charge of the *Cam* were free to act as the COLREGs were not in force at the time of the initial decision making. However, as

was seen, the taking of unilateral action was the only action that was ever under consideration.

In the next transcript the *Exe*, a ferry operated by Sirius Lines, had just sailed from the port of Dunkirk. In contrast to sailings from Dover, Dunkirk has a long navigational fairway (an open channel) which has to be negotiated before the crossing of the Dover Straits. This means that the ships travel along this fairway and then turn to cross the traffic at right angles. Consequently, as the ferry navigates the fairway the person in charge has a much greater time in which to plot all the traffic in the lane than when leaving Dover. The person in charge is then able to work out the effect that their turn to cross the traffic lane will have upon the other traffic. In effect this is like turning from a side street into a main road and then coming up to a roundabout where other cars have to give-way to your car. The driver of the car then alters their approach in such a manner as to allow the other car to pass without having to give-way at the roundabout. In this example Boris uses a trail manoeuvre facility on the radar to work out the course to take across the Channel which would ensure that the *Exe* passes astern of the ships in the traffic lane. It should be borne in mind that Boris is taking this decision to keep clear of ships in the lane, long before he actually gets to a point where the other ship is on a constant compass bearing and so before the COLREGs start to apply.

> PB- So then Boris, how's it going?
> Boris- Well not too bad. We'll be coming down [the fairway] and then setting a course from the anchorage [the end of the fairway] up to the Goodwin [a navigational mark]. The only real thing to worry about this morning at the moment is this fella here [Ship marked B in figure 6.5, Boris is pointing to the end of the ship's vector in the figure]. By doing a trial manoeuvre we can work out the best time to come around in order to pass astern of him. Just increase the vectors. If we come down a range we can see that if we come around in about 11 minutes through the anchorage he will have already passed our head and we can pass safely around his stern. That's the biggest thing to worry about this morning, passing across his head at a safe distance there. That's the situation we are in at the moment.

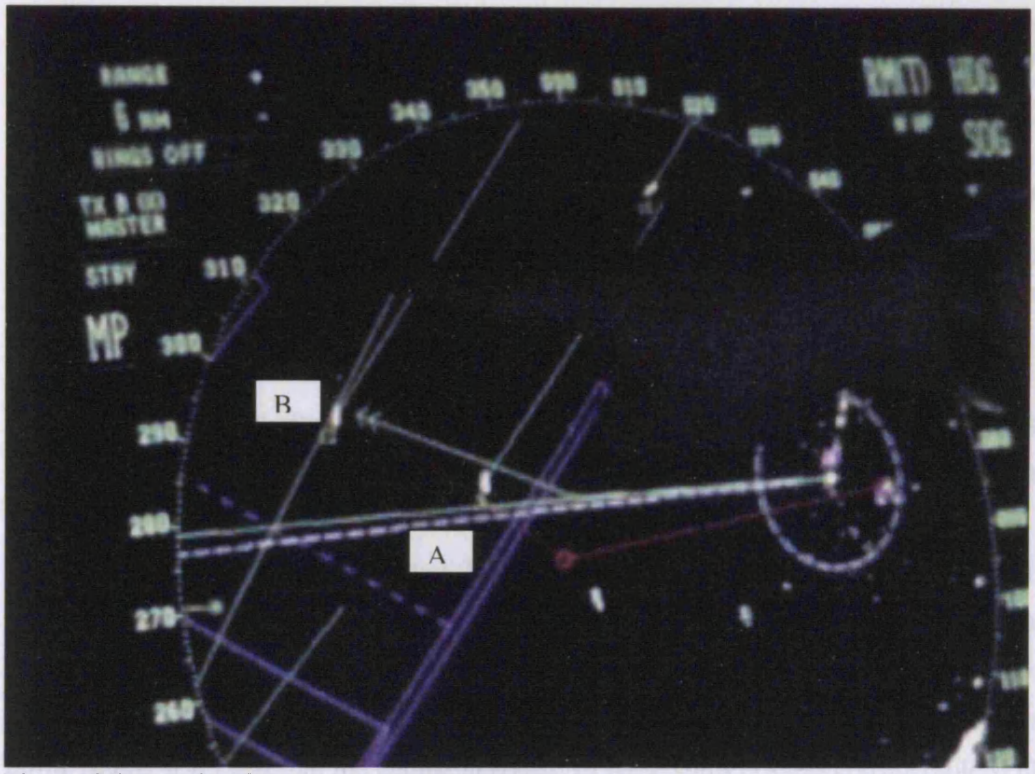

Figure 6.5, crossing 2.1.

In this Boris described how he worked out the time when he would alter course to cross the traffic lane in such a manner as to pass astern of ship B. In figure 6.5 the *Exe* is located at the centre of the hashed circle to the right of the screen. The passage plan [red line] for the route is shown as a red line, with the TSS marked in purple. Ships A and B are located within the Northeast bound traffic lane and so would be the give-way ships if risk of collision existed between either of them and the *Exe*. The passage plan indicates the pre-planned route across the TSS and shows how the *Exe* should cross at right angles. However, Boris has fed this pre-planned route into the radar system and it has indicated that if he proceeded on this course then a risk of collision would result with ship B. Boris then altered the timing of the turn to find a course which did not put the *Exe* on a collision course with ship B and instead found one that would ensure that the *Exe* passed astern of the other ship. I then asked if that was the usual practice to take into account the traffic in the lane.

PB- Hm OK. This is quite normal coming across like this is it?

Boris- Yeah, yeah obviously it changes on a daily basis, you never know what you are going to get but yeah it's a normal route to take. So a pretty standard morning really.
PB- Except the weather is lovely.
Boris- Yeah it's not blowing a hooley. Might even be some sunshine today.
PB- So do you always take into account the traffic in the lane when working out when to turn?
Boris- Well yeah, I know we could turn into the lane anytime and they are all, we are the stand-on vessel in this situation here. But again we're joining and leaving a lane so try to cause as less disruption as possible.

Exe sailing Dunkirk to Dover

If Boris had continued along the pre-planned route then this would have resulted in a risk of collision with the other ship. Therefore, Boris, in common with the other examples undertook, an assessment of the risks and then took a course of action which resulted in a reduction to that risk. He stated that this was the normal course of action to take and I observed that this was true on each and every crossing from Dunkirk on both the *Exe* and the *Cam*. Therefore, we can see the pattern continuing of keeping clear of all other ships, regardless of the obligations under the COLREGs once risk of collision exists. Furthermore, it is clear that the people in charge of these ships possess considerable skills to interpret the situations, understand how they will evolve and put in place actions which should resolve potential collisions.

In the next example of a crossing the Iberian Ferry, the *Tawe*, with Milton in charge undertook a considerable number of course alterations to get through the traffic without the slightest consideration given to maintaining course and speed for the ships crossing from the port side.

Milton- So we've um just departed Dover at the moment and currently we're increasing speed. 2 south bounds here keeping an eye on and them two coming across into Dover. The vectors are still very much sorting themselves out at the moment. I haven't made any firm decisions about which way we'll be going. Chances are that we will out run them just depends on how the vectors on these two pan out, very much in a state of flux at the moment.
PB- OK.

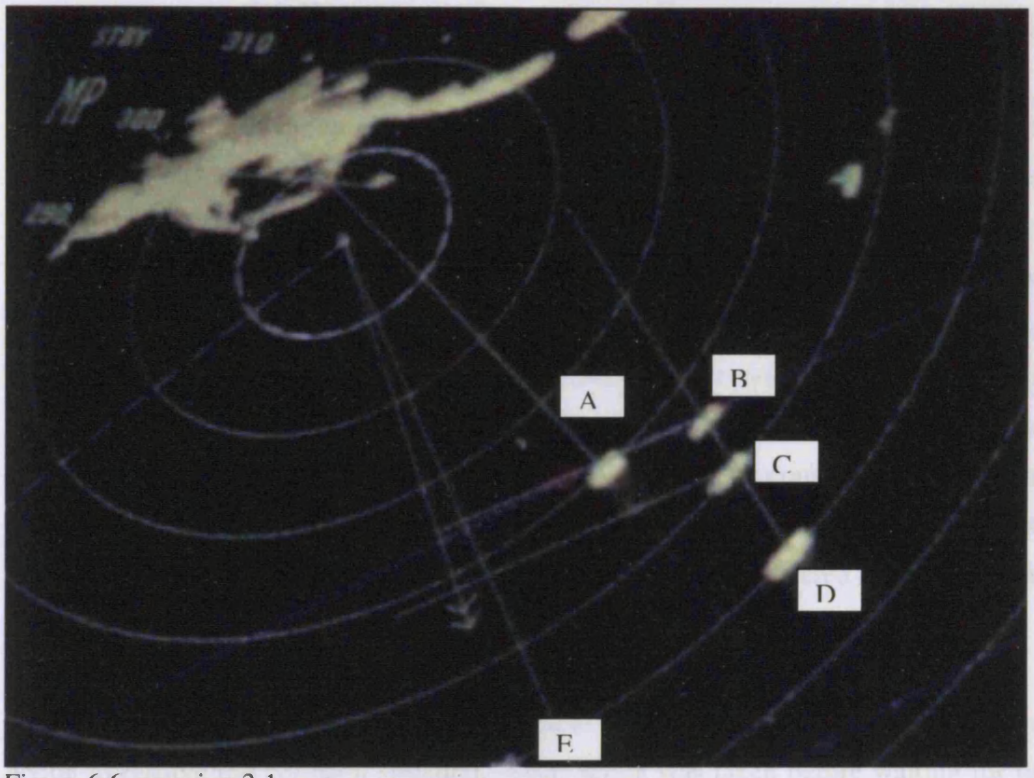

Figure 6.6, crossing 3.1.

Once again an assessment of the risk of collision was made and all the ships in the lane were acquired on the radar screen, see figure 6.6. However, Milton stated that he could not at that point decide upon the action to be taken as the situation was still in a state of flux due to the acceleration of the *Tawe*. In this situation ships A and D were ferries inbound for Dover and ships B, C and E were following the Southwest bound traffic lane.

> Milton - Up to 20 knots now. We are out running one of them already now [ship B] and the other one is getting very close to a CPA of zero [ship C] as the speed increases. So we'll be keeping an eye on him as well. But we can always get ahead of these two here [ships B and C] and tuck under behind him so [ship E]. It'll depend on how it pans out. Only just a mile off the break waters. So you could come astern of those two [ships B and C], but if you get too close to those two then there is always a danger that they could come around to starboard, so. We are now up to 21 knots.
> PB- So how long does it take for it all to settle down then?
> Milton- It's starting to settle down about now, now that we are up to 21 knots. Best to leave it a little while just for the vectors to sort themselves out. To get a mile ahead of those you come down here and you still got plenty of room to cut astern of this little fella here. I mean it's not ideal. In a perfect world it would

> have been nice to set your course up and go astern of those. But those two inbounds means that that is not the most brilliant thing to do.

Milton allowed the situation to settle down, ensuring that the information that he based his risk assessment on were reliable. His plan was to alter course to starboard and pass ahead of ships B and C and then passing astern of ship E. He stated that his ideal course of action would have been to pass astern of ships B and C by altering course to port. However, the two ships A and D, prevented him from taking that action as he did not want to become involved in a head-on situation with them. It should be noted that Milton took this action without waiting to see if the other ships would give-way to him. Furthermore, he describes the possibility of the ships altering course to starboard and hence giving way to him as a "danger". Milton subsequently altered course by 40° to starboard and passed one mile ahead of ships B and C. He then altered course to port to pass astern of ship E.

As can be seen from these examples the person in charge of the ship undertook unilateral action to resolve the collision situation. Such action was taken before waiting for the other ship to take the avoiding action required under the collision regulations. It could be argued that the people in charge of the ships were just using their skills to interpret the COLREGs in the most advantageous manner. This most advantageous manner is one in which they took action before risk of collision existed and so before the COLREGs applied. This meant that they were free to take whatever action they wished as they were not bound by the requirement to maintain their course and speed. However, although this may be the case for the very first alteration of course, as time went on the people in charge of the ships continued to alter course. Furthermore, no regard was given to the possibility of maintaining course and speed as there was no expectation that the other ship would alter course for them. Therefore, there was simply a pattern of taking unilateral action to resolve the risk of collision without having to rely upon the actions of the other ship. However, although this unilateral action taking from the very first instance was the norm, in one case there was an attempt to stand-on and maintain course and speed. This could be viewed as deviant as it departed from the operating norms. However, as will be seen, even though there is an attempt made at standing-on for the

other ship, this continues for only a very short period of time before the normal pattern of keeping clear of all ships is undertaken.

The analytical process of grounded theory (Glaser and Strauss 1967, Lofland 1995, Frankland and Bloor 1999) requires scrutiny of deviant cases, including partially deviant ones. This case involved one crossing of the *Taff* (an Iberian Ferry) in which the decision was made to stand-on and maintain course and speed for a ship crossing from the port side. The *Taff* sailed from Dover to Calais with a bridge team consisting of the officer of the watch Joseph, a deck cadet (who is a trainee officer) Drew, a quarter master Nick and a lookout Ben. The ship was under the control of Drew, who was under Joseph's instruction. I commenced recording just after the ship had left the port of Dover when approaching the South-west bound traffic lane. The elapsed time is shown in the square brackets.

> PB- So how's it looking?
> Drew [00:30]- At the moment we've got a coaster [ship 3] which is that one and it's CPA is only 2 cables at the moment. And we are going to stand-on with caution.
> PB- Oh, [hesitation] OK.

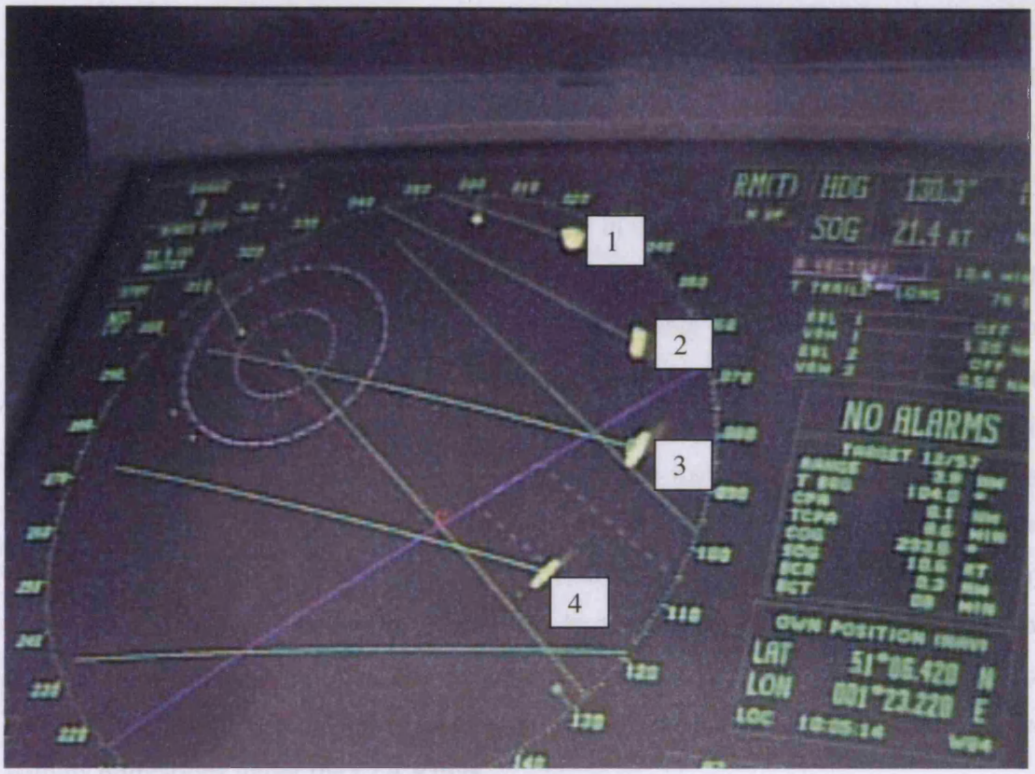

Figure 6.7, crossing 4.1.

Figure 6.7 shows the navigational situation. Ships 1 and 2 are inbound ferries that are passing to the North and ships 3 and 4 are following the South-west bound traffic lane. Drew describes the traffic situation by stating that ship 3 is a coaster, which is a small ship that trades on the coast, that has a passing distance of 2 cables. This means that there is a risk of collision posed by ship 3. Under Rule 15 of the COLREGs the *Taff* is directed to maintain its course and speed. Drew states that this is what they intend to do by standing-on. Drew, however, qualifies this statement by adding, "with caution". I was very surprised that they would maintain their course and speed and comply with the requirements under the COLREGs and showed this through a very hesitant "OK". I had never seen anyone adopt such a strategy during any of the crossings that I had previously observed. Furthermore, I had observed this particular bridge team on several previous occasions taking unilateral action by keeping out of the way of all other traffic. However, on this occasion it had been decided that keeping the *Taff*'s course and speed was the most appropriate course of action. It later transpired that this route was a

continuation of the initial course of departure that the Captain had set upon leaving the port. The Captain had misinterpreted the speed of ship 3 and set a course that he thought would pass 0.5 miles astern of it. However, as the *Taff* accelerated, a risk of collision developed with ship 3. The control of the ship was then handed over to Drew. Drew being a trainee officer then took a period of time in deciding what actions to undertake. Joseph's training style was one in which he believed in total delegation and would only step in if Drew asked for help or if he thought that the ship was in danger. Therefore, he allowed the situation to continue under the total control of Drew. It appeared likely that Drew continued on the course set by the Captain, in part, from not wishing to countermand the Captain's decision even though he had left the bridge. This was coupled with Drew's lack of experience in avoiding the development of collision situations. Furthermore, Drew was still under training and so would have been very aware of the obligations under the COLREGs. In addition, Joseph was about to leave the bridge and hand-over to Dean and so this may have diverted his attention from the situation at hand. The resultant of all of these factors was that the *Taff* actually complied with its obligations under the COLREGs.

At 01:08 elapsed time, Drew then adds to the first statement that the ship would "stand-on, with caution" with the action that would be taken in the event that the other ship did not keep out of the way.

Drew [01:08]- Otherwise come around.

By this Drew meant that he would alter course and keep out of the way of ship 3. Figure 6.8 shows the quantification of the collision risk.

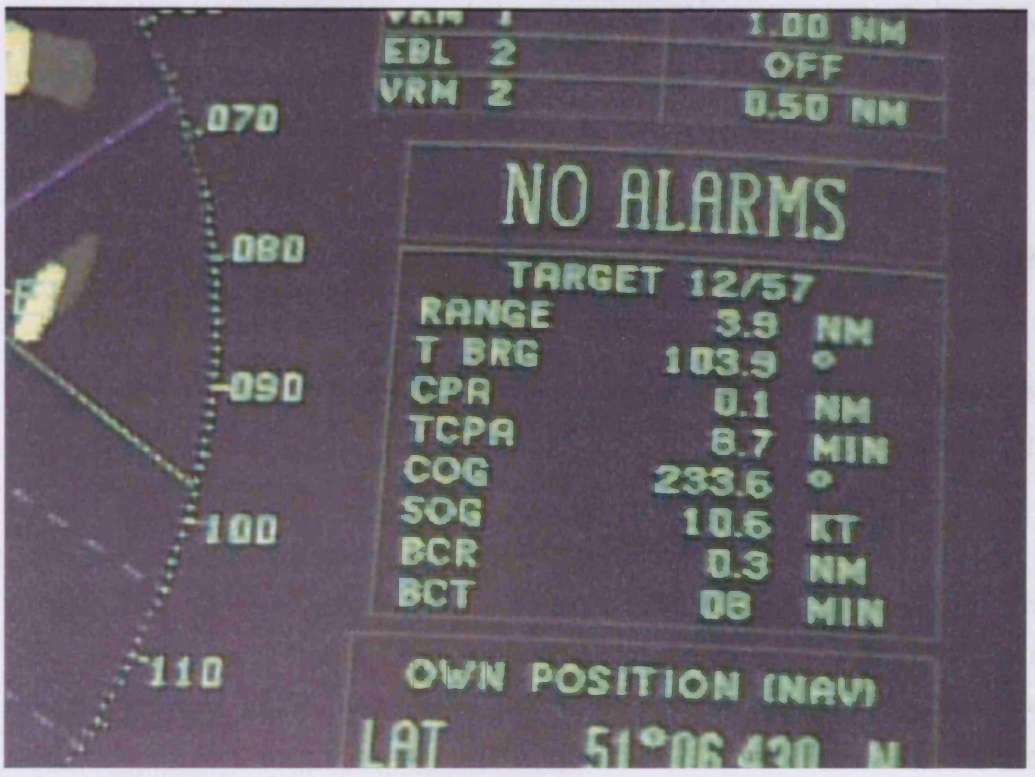

Figure 6.8, crossing 4.2.

In this figure the radar's computer has calculated that ship 3 is 3.9 miles away with a closest point of approach of 0.1 miles. This closest point of approach would occur in just under 9 minutes. The other information related to the course and speed of the other ship. It should be noted that above this information there is a line which states "NO ALARMS" even though the *Taff* was on a collision course with another ship. The reason behind there being "no alarms" is that the alarm conditions were set by the people on the ship and those parameters had not been breached.

> Drew [01:40] Otherwise we will come around to starboard.
> PB- OK.
> Drew - Other option is to slow down but it's easier to come to starboard.

Drew reiterated the that he would alter course to starboard if the other ship takes no action. The option of slowing down is disregarded by stating that it is easier to alter course to starboard. Dean then arrives on the bridge and receives a hand-over from

Joseph. A hand-over consists of a verbal description of the state of the ship and the navigational and collision situation. It is designed to include all relevant information so that another person can take control of the ship. Joseph then informed Drew that Dean is taking over.

> Joseph [02:10]- Tell Dean what you are going to do. Dean is taking over from me.
> Drew - OK. We've got this coaster here about 2 points and at the moment got a CPA of 2 cables with her, about 1/2 a mile ahead but if she doesn't come around a bit, probably come around to starboard.
> Dean - Yeah I think what I would do is see the one that has just been overtaken by the container ship I'd follow him around all the way.
> Drew - OK. So starboard to 135.
> Nick - Starboard to 135 aye.

Drew explains the situation regarding ship 3 and describes its position as "about 2 points". This refers to where the ship is located in relation to the *Taff*'s heading. The horizon is split into 32 "points" such that a single point consists of an angle of the arc over the horizon of 11.25°. Drew stated that ship 3 was about 2 points and so Dean was able to see that the ship was located approximately 22.5° from the heading of the ship. Drew explained that the intention was to watch how the situation developed before altering course to starboard. Dean's reaction to this was that he advised Drew to start to alter course immediately and steer straight towards ship 4. Drew then commenced this course of action by giving the instruction to alter course from 130° to 135°. At this point the bridge then fell silent for just over a minute. During this time the bridge team gave the traffic situation their complete attention, alternately staring at the radar screen and peering out of the window at ship 3. This period was characterised by tense concentration by all the people involved. Further alterations of course were undertaken as the ships got closer and ship 3 never altered course.

From this case it can be seen that even though it was the intention of Drew to maintain the *Taff*'s course and speed, he was unable to do so following direction given by Dean. Furthermore, this intention to maintain course and speed was brought about by a miscalculation by the ship's Captain during the initial course selection. In addition the *Taff* did not maintain its course and speed for very long after its departure from Dover.

Therefore, although in this case the ship did stand-on as required by the COLREGs, the *Taff* did take unilateral action consistent with the pattern of actions undertaken on all other crossings.

Crossing the First lane, summary.

From this it can be seen that there was no intention by the people in charge of the ships to comply with the requirements of the COLREGs. That is that on every single crossing that I observed, in which there was a risk of collision with a ship crossing from the port side, the ferry took action to keep clear of that vessel. This was undertaken even though it had right of way over that other ship. Action was taken, or at least the decision to take action, was undertaken at the very earliest moment. Whether the people in charge took this action through a clear understanding of the freedom to act before the COLREGs had started to apply can be debated. However, it was clear that when faced with a risk of collision from ships coming from the port side, then the decision was taken to keep out of their way regardless of the requirements under the COLREGs.

6.6 Crossing the second traffic lane

When crossing the second traffic lane the requirements under the COLREGs are of course reversed. Therefore, it is the ferry that is directed to keep out of the way of the other ship and where possible avoid crossing ahead of the other ship. In order to comply with the requirement not to cross ahead, the ferry will have to either slow down or alter course to starboard. The following examples illustrate the actions taken by the people in charge of the ships when faced with a situation in which risk of collision is present. It will be shown that the people in charge of the ships took early action to keep out of the way of ships crossing from their starboard side in compliance with the requirements of the COLREGs.

In this first example, the *Exe* (operated by Sirius Line) had sailed from Dover bound for Dunkirk and was approaching the second traffic lane. Spencer described the situation to me.

> Spencer- On a course of 128 and making 120 over the ground with the Northerly set. And we've got three vessels on the starboard side. It is the Southernmost of the three, target 14 [Ship C] here that is going to give us a problem. Got a CPA of 2 cables at the moment. So envisaged to come around to starboard in a while to come under her stern. I don't want to come too early, just want to check what the Iberian boat is going to do [Ship B]. Because he is going to follow her [Ship C's] stern.
> PB- Yeah I see.
> Spencer- It should be quite clear-cut, there is nothing to interfere with us. Just be a small alteration on the auto pilot. Even 5 degrees now should bring it up to the mile. Nothing special.

The traffic situation is shown in Figure 6.9.

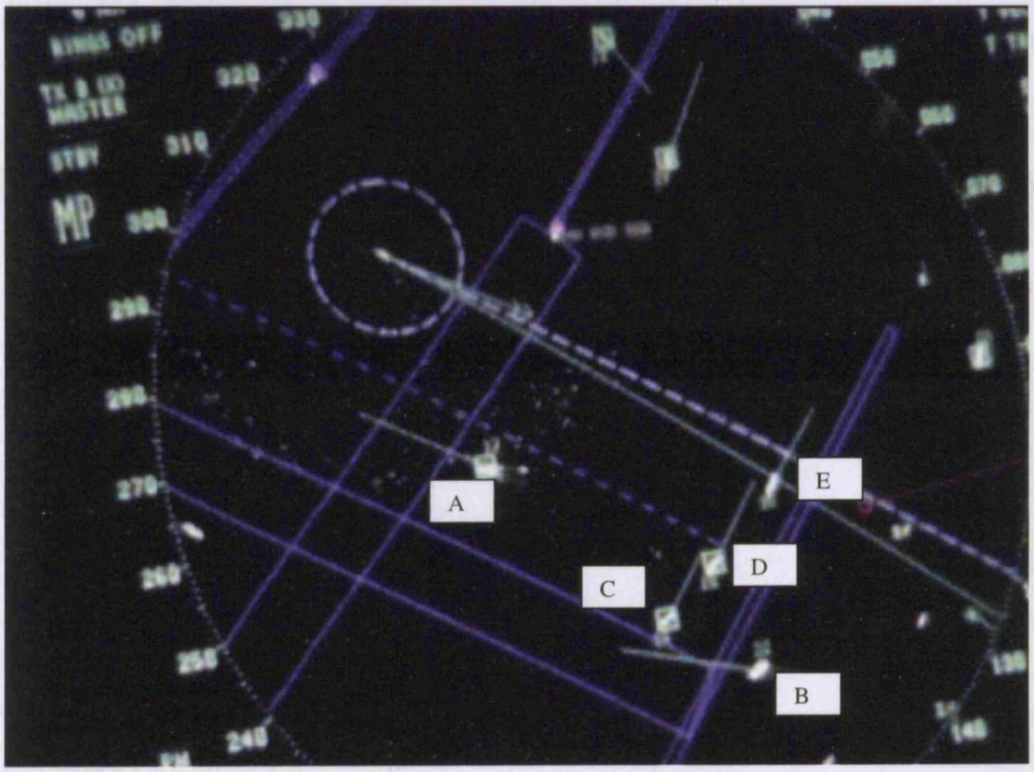

Figure 6.9, crossing 5.1.

As Spencer has described the *Exe* was being pushed to the North by the flooding current so that although they were steering 128° but making 120° over the ground. In Figure 6.9

two ferries can be seen coming across the Channel, ships A and B. Ship B was the Iberian ferry noted by Spencer. Ships C, D and E were all following the Northeast bound traffic lane. As with crossing the first traffic lane, the person in charge of the ship undertook an assessment of the collision risk. Spencer identified that ship C posed a collision risk to the *Exe*. He then stated that his intention was to alter course to starboard to pass around the stern of ship C. However, before he undertook the alteration Spencer was concerned that an Iberian ferry, ship B, would pose a collision risk once it had passed behind ship C. It should be noted that this Iberian ferry gave-way to ship C by altering course to port even though it had right of way. It should be noted further that Spencer could see that ship C did not give-way to ship B.

Spencer then stated that this was a routine alteration of course undertaken on the auto-pilot control and amounting to approximately 5°. Spencer also stated that he intended to pass the other ship at a distance of about 1 mile. This was in line with the company regulations.

3 minutes later Spencer altered course by 10° to starboard to pass astern of ship C. The traffic situation is shown in figure 6.10.

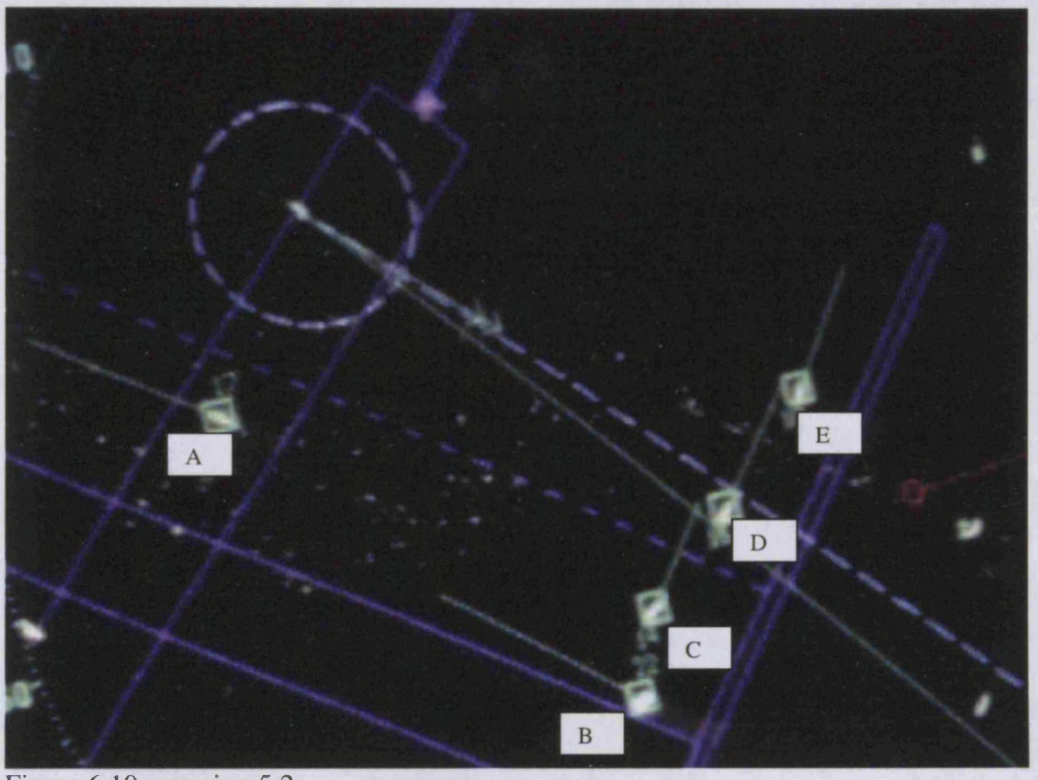

Figure 6.10, crossing 5.2.

> PB- So you altered course there 6 degrees and you've already opened up to…
> Spencer- I increased it up to 10. And its now giving a CPA of 7 cables. And cross our head at a range of 2 miles. So once he sees my red I'll stop worrying and follow his stern around and not get involved with any out-bound traffic from Calais.

Figure 6.10 shows how the *Exe* altered course to starboard such that it would pass safely astern of ship C. Ship B proved not to be a major concern for Spencer as it can be seen to be passing well to the South. Spencer described how he had altered course by 10° to clear ship C such that the closest point of approach was 0.7 miles. The radar's computer had predicted that ship C would pass ahead of the *Exe*'s bow at a range of 2 miles. However, Spencer stated that situation was still causing him some concern and that he would not be happy until "he sees my red". Seeing the red referred to the red port sidelight of the *Exe* which would only be visible to ship C once ship C had crossed the bow. So once ship C had crossed Spencer stated that he intended to alter course back to port to follow the stern of the ship around.

From this example it can be seen that an assessment of the risk was undertaken. The person in charge of the ship then identified the risk of collision and took action to minimise that risk. The action taken consisted of an alteration of course to starboard which was in compliance with the requirements of the COLREGs.

In the next example the *Tawe* (operated by Iberian Ferries) had just cleared a group of fishing boats in the Northeast traffic lane after sailing from Calais and was approaching the second traffic lane. The traffic situation approaching the second traffic lane is shown in figure 6.11.

Figure 6.11, crossing 6.1.

The vectors on the ships in this figure were shown in relative motion. This meant that the vectors indicate the movements of the other ships relative to the *Tawe*. Therefore, if a vector is pointing directly at the *Tawe* (located at the centre of the hashed circle) then

there is a risk of collision. Ships A, B and C were a number of small fishing boats. Ships D, E and G were ships navigating down the Southwest bound traffic lane. Ship F was a Sirius line ferry bound for Dunkirk. By looking at the vectors it can be seen that it was predicted that ship G would pass very close to the *Tawe*. Figure 6.12 shows the predicted movement of ship G, marked target 13.

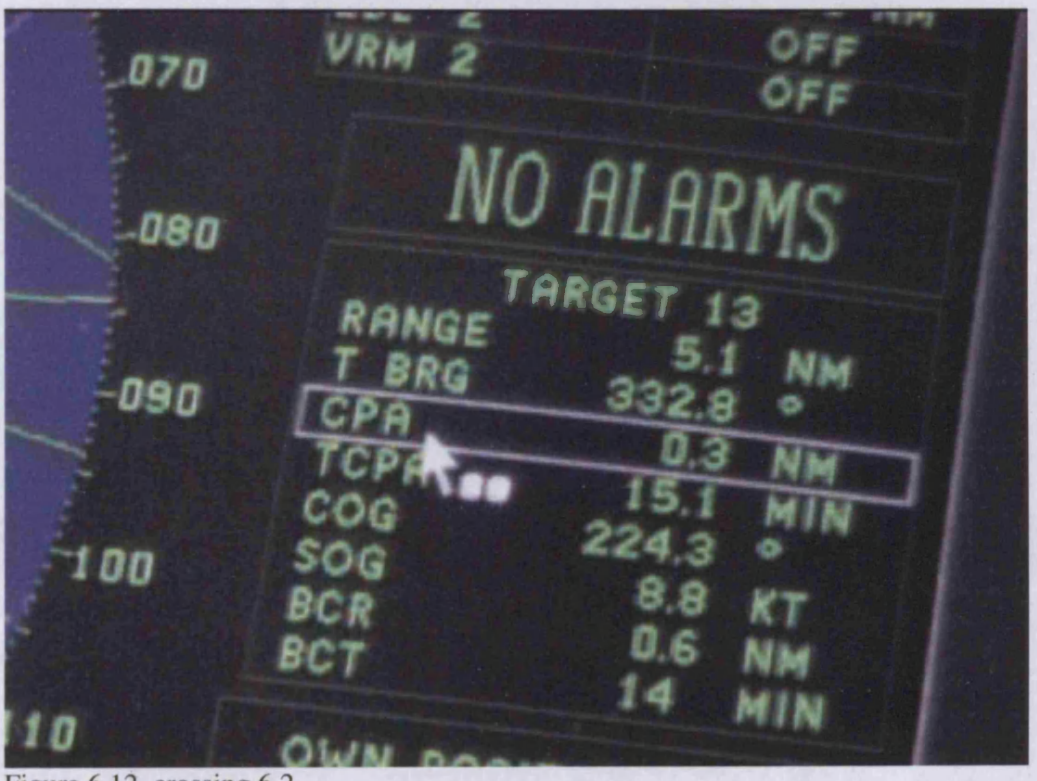

Figure 6.12, crossing 6.2.

Tom, the officer in charge of the ship then stated how close it would pass and the action that he intended to take to resolve the situation.

> Tom- He's crossing the bow now, point 4. And CPA point 3 and so I'll need to come to starboard a tad.
> PB- OK.

Tom then altered course to starboard

> PB- So what you came around there 10 degrees did you?

> Tom- Just come round 5 degrees to open the CPA on number 13 there. He's now crossing the bow 1.4, CPA 0.6. CPA will be as we go under his stern. 0.7 opening .
> PB- Hm OK.

Tom then explained how by altering course at that early stage he was saving himself from having to make a much larger alteration at a later stage. It should also be noted that Tom stated that he wanted to make the situation clear to the other person on ship G. It should further be noted that Tom makes it quite clear that he knew that he was the give-way vessel.

> Tom- 5 degrees alteration done early on has a big difference. I suppose I could carry on and carry on until we get within 2 or 3 miles of him but then you've got to make a large alteration of course. He's in doubt as to your intention. If you do it nice and early, gives him time to think and see the situation. And at the end of the day, I am the give way vessel.

I then made a comment about the interaction between ships G and F. In this Ship F made a large alteration of course to starboard and passed ship G at close range. The traffic situation can be seen in figure 6.13.

> PB- He's probably more concerned about that number 7 [Ship F].
> Tom- Yeah well he's obviously making his way around his stern now. Large alteration of course to starboard. But that number 7 there if he'd altered when he was back here, he wouldn't be making that large alteration now would he.

Figure 6.13, crossing 6.3.

Tom was reasonably critical of the actions taken by ship F to clear ship G. He made it clear that it would have been better to take action at an earlier stage in the manner that he did in order to resolve the situation. Tom then decided to alter course a to starboard a bit more to ensure a safe passing distance.

> PB- So you are happy with that distances and everything or...
> Tom- Yeah, I might come around another couple of degrees to starboard. I'll just do that a moment. So I've just come around 5 degrees more and he's got a clear aspect then to what I'm doing and as he crosses our bow, I'll follow him back. Keep him on the port bow and follow him back.

From this last section it can be seen that Tom, in a similar manner to Spencer on the *Exe*, altered course back to port once the other ship had crossed the bow.

In this next example Vince a second officer was in charge of the *Cam* (operated by Sirius Line) on a crossing from Dunkirk to Dover. Figure 6.14 shows the traffic situation as the *Cam* passed through the first lane of traffic with Vince looking ahead to the traffic in the

> So what I would do. You play it either way here. The rules say go to starboard, but they don't say you can't go to port. So if you go to port, then you have to pass him by more than a mile.

Vince undertook an assessment of the risk and found that ship E had a close CPA of 0.2 miles. This was not within the acceptable parameters of the company rule or protocol as he termed it. Vince then explained that he had two options, alter course to port or starboard. He clearly understood that he was the give-way ship through his reference to the rules. He then stated that he would have to make a large alteration of course to port, in order to comply with the company rule. However, a much smaller course alteration would result if he altered course to starboard. Vince then immediately altered course to starboard to pass astern of ship E. This situation can be seen in figure 6.15.

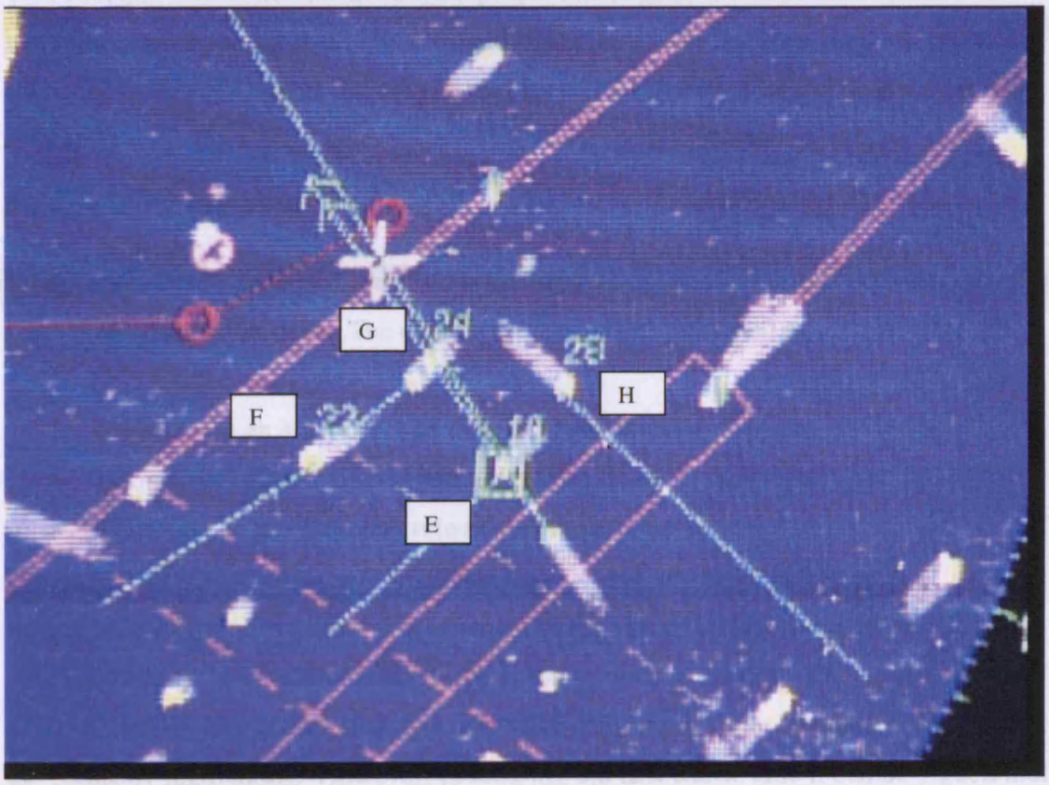

Figure 6.15, crossing 7.2.

> PB- So you are happy with that?
> Vince- I'm happy with that. That's a good situation where a small amount at an early stage is a lot better than 40 degrees three minutes to go.

As can be seen, the *Cam* altered course to starboard and passed astern of ship E. Vince, in a similar manner to Tom above, made it clear that he viewed a small alteration at a larger distance was much more preferable than a large alteration at a short distance.

> PB- So you are just coming back to port now are you?
> Vince- Yeah, I'm just going to chase this guy around. Now what I should be able to do is as I come around here, I can just really continue to turn onto a westerly leg to leave the lanes rather than taking a steep turn.

A few minutes later Vince began to alter course back to port as ship E passed safety across the bow of the *Cam.*

This example further illustrates how the people in charge of the ships alter course as a matter of routine for the ships in the second traffic lane. Furthermore, they also make reference to the COLREGs and the fact that they know that they are the give-way vessel.

6.7 Crossing the lanes

From this it can be seen that there are both differences and similarities between how the ships resolve collision risks. The common points can be classified as:

- Undertaking an assessment of the collision risk.
- Taking early action to resolve the risk.
- Adherence to the company rule on passing distances.

In each of the crossings a careful assessment of the risk of collision was made. This was then followed by a decision to take early action to resolve the risk. The action consisted of alterations of course such that they resulted in passing at a safe distance as required by the company regulations. However, in crossing the first traffic lane it can be argued that the person in charge of the ship did not comply with the COLREGs, but when crossing the second lane, they did. Furthermore, in crossing the second lane, in the main, the respondents stated that they were the give-way vessel. In contrast, such statements were not made in crossing the first lane. This then raises the paradox that the people in charge

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of the ships are actively undertaking both compliance and non-compliance with the COLREGs within a short space of time. This is to query why the people in charge of the ships will break the rules when crossing one lane, but a few minutes later comply with the same rules. However, I would claim that the respondents are simply taking unilateral action to keep out of the way of all other ships. It is just a co-incidence that the action complies with the requirements of the regulations when passing through the second traffic lane. For the people in charge of the ships, the risk of collision is simply too great for its resolution to be placed in the hands of those onboard other ships. Therefore, they have to take unilateral action to resolve the collision risk. I will explore the reasons behind this phenomenon in greater detail in chapter 7.

6.8 Parallel crossings

In chapter 5 section 5.4 it was found that there were only 25 NMEs resulting from ships on parallel courses. From the analysis it appeared that the adopted routes for crossing vessels came about through choice rather than resulting from alterations of course for other ships. The appearance was that ships crossing from either direction adopted a route across which did not conflict with ships crossing from the other direction. This deduction was proved to be true shortly after stepping onboard the first ship, the *Wye*, during the second phase of the research. On the first crossing I observed that there was a voluntary traffic separation scheme put in place to de-conflict the crossings of the ferries. Figure 6.16 and 6.17 show the radar screens of the *Dee* (Iberian Ferries ferry) and the *Exe* (Sirius Line ferry) in which the outline of the voluntary traffic separation scheme can be seen marked as a rectangular box perpendicular to the flow of traffic.

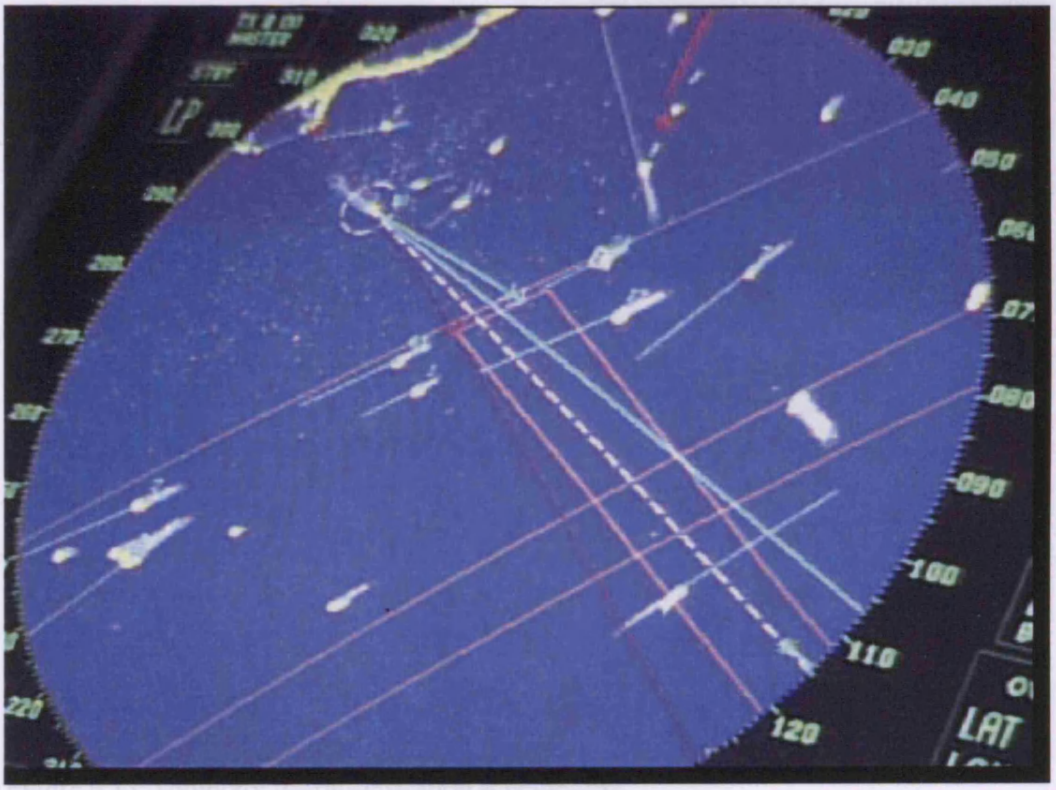

Figure 6.16, voluntary traffic separation scheme, *Dee*.

In this the voluntary separation scheme can be seen as a rectangular box running at right angles to the main TSS. The heading line of the *Dee* can be seen passing though the voluntary scheme.

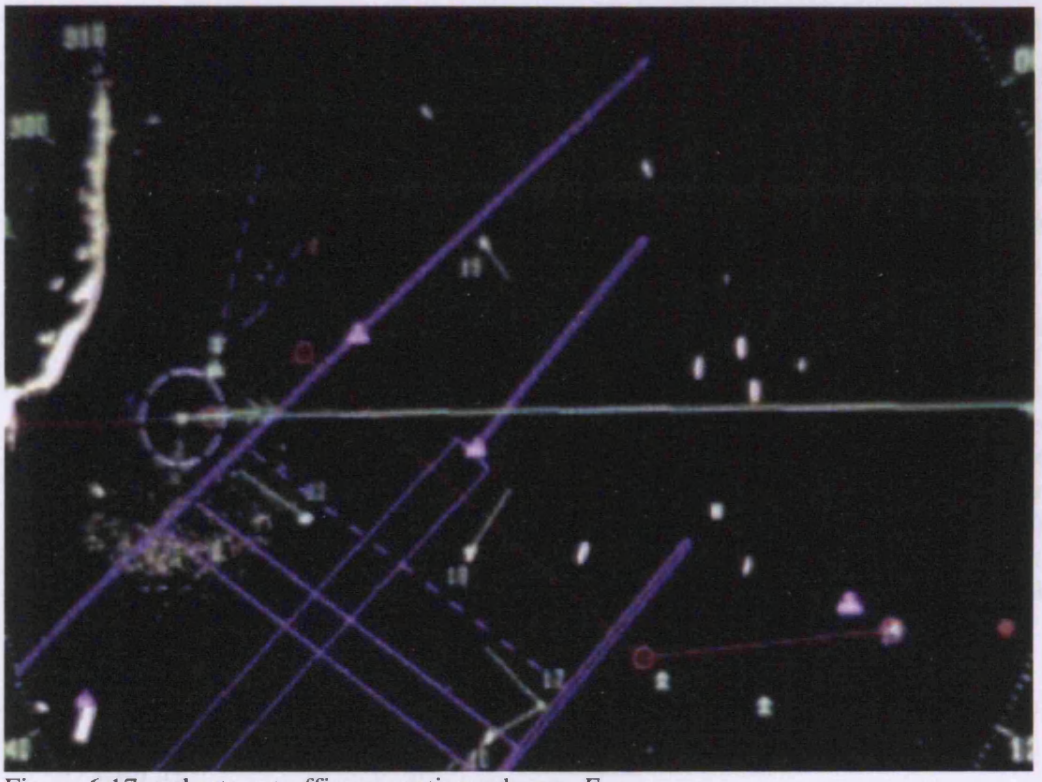

Figure 6.17, voluntary traffic separation scheme, *Exe*.

The *Exe*'s radar screen can be seen in figure 6.17. Again the voluntary scheme can be seen as a rectangular box at right angles to the main traffic scheme.

This voluntary scheme came about through a meeting between all the ferry companies. This forum still meets at intervals of approximately 6 months and is called the Dover Strait Navigation Committee. In this committee problems between companies are aired and solutions found. The problem of de-conflicting ferries as they crossed was raised in the 1980s and it was proposed that the ferry operators should unilaterally adopt a voluntary traffic separation scheme. The operation of this scheme was such that Dover to Calais ferries would pass to the South and Calais to Dover ones would pass to the North. The separation zone between the traffic flows was one mile. It was further agreed that those ferries on routes to and from Dover and Zeebrugge and later Dunkirk would pass well to the North of the voluntary scheme.

The effectiveness of this scheme is demonstrated by the passing distances in chapter 5 section 5.4. Before this scheme was put in place ferries would have been meeting head-on and would be directed by the COLREGs to alter course to starboard. This, as explained by Captains Cameron and Neil, could result in problems and confusion with regard to other ships in the area and so through its introduction has improved the safety record.

> Cameron- No doubts about that it keeps the ferries apart and it's... We do need that separation. If you get on the wrong side of each other then you can imagine it if you have to alter course to starboard for something that's coming, that's on your starboard side. At the present time with the voluntary separation scheme you are not going to be hindered by traffic coming facing you, coming at you from ahead. Because they are going to be over on your port side but take that voluntary separation scheme away and they could well, you could well find them suddenly on your starboard side as well. Which would make your alteration to starboard for something that is you know 90 degrees to you it could make it very difficult. You've got another element to worry about.
>
> Interview with Cameron onboard the *Wye*.

> PB- This voluntary TSS seems to work very well, do you get anyone problems with it?
> Neil- We don't worry about that, between the companies we have regular meetings between all the companies and we chat about these things. Since it was introduced it has reduced the number of end-on situations with other ferries dramatically.
>
> Interview with Neil onboard the *Wye*.

This removal of the head-on situation was one of the main aims behind the introduction of TSSs in the first instance. As stated in chapter 4 section 4.2.3 with the introduction of the first TSS in the Dover Strait and the Southern North Sea area in 1970 the incidence of collisions occurring in the area fell from 142 (for the period 1956-1965) to 37 (for the period 1971-1980) (Cockcroft 1982). Furthermore, in July 1994 a TSS scheme was set up in the Turkish Straits and the incidence of collisions fell from 155 (for the period 1990-1993) to 11 (for the period 1995-1998) (Cockcroft 1998; Grey 2001). Prior to this the Dover Strait and the southern North Sea area accounted for almost half of the worlds' collisions (Richey 1966).

The benefits to the people in charge of the ships following the introduction of the voluntary scheme have been high. By reducing the head-on risk posed by other ferries, the people in charge of the ships are able to concentrate on the risks faced by the ships following the traffic lanes as they cross them. In effect a risk has been designed out of the situation. This is a means identified within the risk assessment process (Fleury 1998) in which the designing out of a risk removes the need for people to apply rules to control that risk.

6.9 Summary

In this chapter I have looked at the process of collision avoidance through the assessment of the risk of collision followed by action to minimise that risk. At all times the people in charge of the ships attempted to minimise that collision risk. Firstly they undertook a quantitative assessment of the risk through the use of the electronic navigation equipment. They then decided upon an action to resolve the risk. In the case of the collision risk posed by ferries meeting head-on, the risk had been greatly reduced through the introduction of a voluntary traffic separation scheme. In effect this was an example of the process of designing out of a risk. The companies operating the ships, following a series of meetings, co-ordinated the actions of their employees in order to ensure that conflict between their ships was removed. The result of this was to allow the respondents to ignore other ferries and concentrate upon the risk posed by the crossing traffic. In crossing the traffic lanes the resolution of the collision risk took the form of a unilateral alteration of course. This occurred in every case that I observed. In crossing the first traffic lane this action could be seen as being in violation of the COLREGs, whereas in crossing the second lane, this was in compliance with the COLREGs. This paradox of conflicting rule compliance should be viewed as a pattern of risk minimisation. It could be argued that the people in charge of the ships were using the flexibility within the COLREGs such that they did not apply during the very early stages. However, as was seen, in only one case was there any attempt to maintain course and speed and see if the other ship would comply with their obligations under the COLREGs. Therefore, it can be stated that very little regard was given to the concept that they should comply with their

obligations under the COLREGs and maintain course and speed. In every case unilateral action was undertaken to resolve the collision risk. Furthermore, by taking unilateral action the collision risk was resolved without reliance upon another person. The reasons underlying the reluctance to rely upon the other person will now be explored in chapter 7.

Chapter 7. Risk, Trust and Surveillance in Collision Avoidance

7.0 Introduction

In this chapter I will draw upon the ethnographic data in order to analyse the reasons behind the actions taken to resolve collision risks whilst crossing the Dover Strait. These actions were identified in Chapters 5 and 6 and may be summarised as the taking of unilateral action to resolve the collision risk. Such unilateral action can be seen to be not complying with the requirements of the COLREGs. These actions were taken by people with a great deal of knowledge regarding their obligations under the collision regulations. Therefore, the aim of this chapter is to analyse the reasons lying behind the taking of unilateral action to resolve collision risks by people with good knowledge of the COLREGs whilst under a strict scheme of surveillance.

Firstly, I will look at the 5 recurrent themes provided by the people in charge of the ships during the ethnographic and semi-structured interviews. These themes were the result of an in-depth analysis of the ethnographic interviews and observations of the 46 participants on 52 crossings. The themes related to the concept of trust, and issues revolving around consideration of others, rule flexibility, the precedence of a company rule and ease of unilateral action. The issue of surveillance and its effects upon the actions of the individuals is then analysed. Surveillance is of relevance to this study due to the presence of the surveillance regime at Dover Coastguard. It will be shown that due to a lack of rule infraction enforcement, the people in charge of the ships take very little account of the surveillance regime and so its deterrent effects are limited.

It will be shown that the people in charge of the ships adopt strategies to cross the Dover Strait which minimise their reliance on the other ship to resolve the collision risk. I will demonstrate that there is no one single reason lying behind this strategy, but that the actions of the people in charge of ships lie at the nexus of a number of interrelated factors

that impact upon the process of rule compliance. However, the underlying issue will be shown to be the wish to maintain control of the management of the collision risk at all times due to a lack of trust in the other ship to comply with the COLREGs.

7.1 Reasons for taking unilateral action

Through the process of analytical induction, undertaken within the paradigm of grounded theory (see chapter 3 section 3.4), the recurrent themes and analytical categories relating to the taking of unilateral action were identified. Table 7.1 summarises the 5 reasons given by those in charge of the ships for the taking of unilateral action.

Reason for taking unilateral action	Number of instances citing this reason
Lack of trust that the other ship will keep clear	22
Being considerate to the other ship	18
Using the flexibility within the rules	15
Complying with the company rule	14
Easier to take the action	11

Table 7.1 Reasons for taking unilateral action.

7.2 Lack of Trust

As can be seen, the most common reason for keeping out of the way of other ships was that the respondents did not trust the other ship to comply with their obligations under the COLREGs. For example,

> Dan- I wouldn't trust the way that they interpret the rules. So for that reason, I try not to be the stand-on vessel. It's very simple really.
>
> Dan- *Usk.*

However, as illustrated by the literature, trust is constructed from a number of components including: previous experience; encountering predictable, consistent behaviour; the concept of shared values or vested interest; a belief in the competence of the other; and a belief that the other cares about their welfare (see chapter 2 section 2.4). Furthermore, Luhmann (1988) found that without trust nobody would undertake a risk

when an uncertainty was present. In addition, Rousseau *et al.* (1998) and Siegrist *et al.* (2003) identified that for trust to be present the prerequisite was a state of vulnerability. This means that for a person to trust another to resolve an issue, they must place themselves in a vulnerable position and this is in itself a risk. Therefore, for risk taking to occur, trust had to be present (Bachmann 1998, Viklund 2003, Beck 2002). This issue of trust is of critical importance to the stand-on ship. The stand-on ship must maintain its course and speed whilst waiting for the other to resolve the collision risk. The means that the stand-on ship is placing itself in a position of vulnerability for it is relying upon another whilst getting closer to the point of collision. When I probed the issue of trust the manner in which the participants constructed the concept of trust came through. Thus, trust, or lack of, was constructed from a variety of factors which will be explored.

7.2.1 Vulnerability.

As identified above, the essential pre-requisite of trust is that of being willing to place yourself, and by extension the ship, in a position of vulnerability. This vulnerable state would exist where a person was reliant upon the actions of another to avoid a risk such that they no longer had control of the situation. This is the case for ships that are directed to maintain their course and speed.

> PB- So how do you see this avoiding a situation where they have to rely on others to keep out of the way?
> Morris- I see it as good practice. It's self preservation. All the time that you are relying on someone else to get you out of a situation then you are not controlling it are you? That's basically it.
>
> Morris, *Usk.*

> Gary- Very rarely do you have to stand-on. If you have to go charging in there then that means that you really don't have control. You've lost control of your own ship haven't you? Let alone the situation.
>
> Gary, *Usk.*

> Casey- Well we've really put ourselves in the position of the give-way vessel all the time. Whichever traffic lane we cross. So to be honest I like it that way because you are in control. If you put yourself in the position of the give-way

> vessel irrespective, then you've got control of the situation. I feel happy with that anyway. You know from a purely practical safety point of view I feel happy with that.
>
> Video transcript: *Exe.*

Therefore, there was an unwillingness to place themselves and the ship in a position of vulnerability which could only be solved through the actions of others. This risk of relying upon another to resolve the situation was just too great for the people in charge of the ships to undertake. They, at all times, wished to maintain control of the situation such that the only people that they needed to rely upon were themselves. However, this can be seen as a reversal of the position that both Rousseau *et al.* (1998) and Siegrist *et al.* (2003) required for vulnerability to be acceptable. For the people in charge of the ships, maintaining control of the situation was of primary importance. The participants did not wish to place themselves in a vulnerable position.

7.2.2 Previous history.

The experiences of the personnel involved was of prime importance in their construction of trust with regard to other ships. It was very common for people to state that they had considerable experience of other ships not following the COLREGS.

> PB- [question asked whilst observing a ship not observing the COLREGS] So that one crossing from the port side, he's altered course has he?
> Sam- No, he's not. See this is the worst thing... you have to be very careful.
>
> Video transcript, *Tawe* Calais to Dover.

> PB- So do you think that a lot of people don't know the rules then?
> Tim- Yes, I must say yes after 2 years in this traffic separation scheme most people think that when you cross the TSS on their starboard side they think that I am the give-way vessel.
>
> Interview with Tim, Second Officer *Usk.*

In this extract I asked the chief officer, Monty, how likely it would be that the other ships would follow the COLREGS and alter course for him:

> Monty- Very very unlikely. I've never seen ships alter when you are that close to Dover for you in that lane. They... it's not going to happen. They are locked into

> their tramlines, they've got their road, they are driving down and they are going to stay in it you know. It's a little bit like you overtaking something on the hard shoulder, it doesn't work.
>
> Video transcript, *Taff* Sailed Dover to Calais.

Alan the chief officer on the *Tawe*, was asked whether he would ever wait and see if the other ship would follow the COLREGS and keep out of his way?

> Alan- If you did that then 99.9% of the time you're going to have to alter course anyway, they never, you just cannot rely on other people altering course.
>
> Video transcript, *Tawe*, Calais to Dover

Noah, the chief officer on the *Exe* had experienced poor watch watchkeeping practice on other ships:

> Noah- ...maybe the guy has left the bridge as I've seen before or he's nodded off and then we've got to take our own action.
>
> Video transcript, *Exe*. Sailed Dunkirk for Dover

The level of mistrust for other ships was also reinforced by the on the job training through the passing on of tacit knowledge to junior officers and cadets. In the following extract James a deck cadet is relating how he has been taught to keep out of the way of everyone else:

> PB- What I'm wondering about is, I talked to somebody two weeks ago, and I was saying about this practice you know finding a gap and they said, "that was outrageous, they can't do this, that's against rule 15, they're meant to come out, stand-on and go through, wait for the other guy to alter".
> James- Well but it's a question of what's safer in the end isn't it? I mean the rules are there but you've got to adapt them, I've forgotten the exact phrase but, "only if it's safe to do so". I mean is it safer to storm out into the middle of the lane where there are five ships and they all have to come to starboard, or is it safer to come around to port 10° really early so you pass around their stern and everyone is happy. It's just a matter of what is safer. It just seems safer to come out and go to port 6 miles off while they are not doing anything and they can see your aspect and see what is happening. Certainly on here the other day, I was on watch with Tim and we did the same thing. There were three coming up the north east lane and we'd just come around the corner and they were three abreast, all 4 or 5 cables from each other, so all three of them coming to starboard you know, they would all get a bit worried all deep sea people as well, you know. So, instead of coming around to 290, which was our course, we just came around following their

sterns. And it worked well. They were all past, we were 6-7 cables astern of all of them. No one got embarrassed or anything so. Seems the way that everyone does it on here, seems to work.

Interview with James deck cadet *Usk*.

This should be compared with how Max second officer on the *Wye* failed a training course in a shore based training college when he applied the same thinking and operation to a simulated situation.

Max- I see that as excellent seamanship, because, unfortunately I was failed on my ENRAS for doing it. OK I did it a little bit closer, say at about 2 miles. But then again I was in a faster ship in my ENRAS course.
PB- Sorry what's the ENRAS Course?
Max-It's the navigation, ARPA simulator stuff and you have to do it for your 2:2. And I was picked up for this and failed when I altered course to port. Its done before the person has even altered most of them are looking at 2 miles to alter and if they haven't altered before 2 miles then you are looking at slowing down and you are talking about a ship that is 280000, gross tonnes, I can't remember the deadweight 200000t, you know and having to pull the handles right back. Basically putting the prop to stop at 2 miles.
PB- So were they trying to teach you or trying to indicate that you...
Max- That you shouldn't alter course to port. Because the rules say that an alteration of course to port should be avoided. But it should be avoided, but, I'm avoiding a collision situation altogether if I am doing it.

Interview with Max second officer *Wye*.

However, this lack of trust in others was also coached in terms of assisting inexperienced people on the other ship by keeping out of their way. Drew a cadet on the *Taff* explained how they are always taught to imagine the other person as being unsure and inexperienced and thus by extension, untrustworthy.

Drew- Yeah. Have to go into hand steering and come around a bit more. So I might as well come around a bit more now. I've always been taught to think as if you are the person on the other bridge and, you know, not used to coming down here and, you know, obviously a bit scared and so you don't want a ferry pointing directly at you, so just showing them what you want to do.

Video transcript *Taff* sailed Calais for Dover.

Therefore, through the training of cadets and junior officers the tacit knowledge relating to the unreliability and untrustworthiness of other seafarers due to their previous experience was passed on.

The experience of observing COLREG non-compliance by other ships was found across all ranks and most of the people involved in the study. Therefore, for a large number of the participants (if not all) there was a belief that the other ship had a past history of non-compliance with the COLREGs and so could not be trusted. For the participants it did not matter that they had no direct experience of that single ship or the people onboard it. For the participants the other ship was simply a representation of all other ships and so represented their past history. This form of risk reflection based upon the past history co-incides with the views of Giddens (1991, 1994, and with Pierson,1998) who claimed that the creation and destruction of trust reflects a future orientated relationship. Giddens equates this to the reliability of a system in that it will perform to expectations, trust is therefore based upon the reliability of past performances being repeated in the future. Similarly, Liebeskind and Oliver (1998) claimed that trust had a basis in the past performances of the individuals. Therefore, if there is a history of non-compliance, coupled with a training process that reinforces the unreliability of the other, then it is not surprising that the people in charge of the ships do not place their trust in the hands of the other.

7.2.3 Predictable, consistent behaviour.

Another factor that people would take into account when constructing the issue of trust in another ship was that of their predictable behaviour. This was of particular concern with regard to fishing vessels as many people onboard had a great deal of experience of their unpredictable movements.

> PB- Do you get a lot of problems with fishermen then?
> Ray- Yeah, but we expect it you know. They are just unpredictable. They are trawling away and they know where there is a wreck so they alter course to avoid

the wreck, but they do it regardless of what's about. It's you know, they've got to give-way to us, but you expect it.

Video transcript, *Dee*, Calais to Dover.

Tom- So we've got a gaggle of fishing boats in the middle of the separation zone there. They are, I think one of our biggest worries because, you don't know what they are going to do. One minute they are heading north and suddenly they are picking up their nets and heading south at full speed
Doug- And showing all their fishing lights.
Tom- Showing all their fishing lights. You just don't know where you are with those boys. Yeah, I want to get through these fishermen, coasters whatever they are. See this guy here, he's picked up speed. You see you never know what these guys are going to do.
Doug- You can be quite nicely set for a route through the middle of it, the fishing fleet and it seems that
Tom- They put their Kamikaze hats on
Doug- And start closing you down.
Tom- Yeah, I think that they are so busy with what's going on on the deck of their fishing boat that it seems that the traffic situation is almost irrelevant to them. Almost take it for granted that we aware of them. They could do almost anything and almost probably will.

Video transcript *Tawe*. Sailed Calais to Dover.

PB- What about fishing boats, do you get much problems with them?
Spencer- Going the wrong way up the lane?
PB- No, just generally.
Spencer- Generally, yeah you get quite a bit. They always seem to alter at the last minute and always end up in a cluster. Quite lucky in that we've got a few lads who are ex-fishermen. One of them is a class one who has been a master of big boats. So he's very helpful to have because he knows all the signs that they do and so he says right they are doing this. But you get some that are countering the rules so much that they've got their trawling lights on and their nets are fast on an obstruction and you check their speed and they are doing 14 knots. You just can't do it.

Video transcript *Exe* Sailed Dover 6/9/02.

The low level of belief in the general watchkeeping abilities of fishers was illustrated in one incident in which an American ship was overheard in its attempt to call a fishing vessel via the radio (VHF). In this the second officer Dean thought it highly unlikely that the American ship would successfully contact the fishing boat.

VHF- [American accent] Fishing vessel on my port bow at approximately 2.2 miles you're position is 51 degrees 06 minutes north and...
Dean- He's having a laugh if he thinks he's going to get a response from a fishing boat. He obviously hasn't been in the Channel before.
VHF- [American accent] this is the *Strong American* come in please.
Dean - That's definitely guaranteed a response.
VHF- [Second voice, fake American accent] Is that Forest?
Video transcript *Taff* Sailed Dover to Calais.

In another incident Noah a second officer on the *Exe* recounted how he had been involved in a collision with a fishing boat whilst working onboard another ship:

Noah- When I worked on the cable ship we had all our lights up and everyone had to get out of our way.
PB- Did you ever get situations where they weren't getting out of the way?
Noah- Oh yeah. We used to fire flares at them, maroons, yeah it was great fun. Had loads of pyrotechnics. One time we were putting in a fibre optic cable and quite wrongly they decided to use a barge instead of a proper ship and so we lived in this barge, with all the gear onboard, laying this cable and it had a single anchor mooring on it and it was dragging ourselves along with two anchors and so we had to do a total repositioning and at night we weren't working, so the tug would came alongside, we were anchored and made fast and there were all these big beam trawlers out there and the first thing you could see were these huge poles, like telegraph poles and one foggy night "clang" they took the top off the tug bridge front.
Video transcript *Exe*. Sailed Dover.

From this it can be seen that one of the factors influencing the level of trust for other ships revolved around the belief that they would be unpredictable in their behaviour. Such a belief in the predictability of the behaviour of the other is closely allied to the previous theme of the previous history. The belief in the predictability or not of the other ship is based upon the past history of the other ship. In the previous section the concept was constructed that the other ship would conform to their past history and not comply with the COLREGs. Similarly, in this section it is seen that the fishing vessels previous history is that of being predictably unpredictable in their movements. Thus, the participants to this research cannot rely upon them to comply with the COLREGs due to the belief in their unpredictable behaviour.

7.2.4 A belief in the competence of the other.

In many instances the competence and professional standards of the people onboard the other ship and in more general terms of the wider shipping industry were called into question.

> People need to properly understand the rules, I mean many people don't.
> Interview Mitch. *Usk.*

> One of the other things that annoys me about navigation, the number of times that I have been going up to Zeebrugge and you will find people, they must know you are there. They have seen you on their port side they have seen you alter around you know perhaps they are a couple of miles ahead of you and they are going exactly for a point on the chart, a point on the damned chart. I've seen it where I have had them on my port side where they have crossed over from the Thames or something coming to wherever and they have crossed on my bow, crossing ahead of me, got right on my bow, slower than me, and then they have gone directly ahead of me. You know and I am catching them up. And I'm thinking, "what on earth are these people doing".
> Max, Interview *Wye.*

> In the Irish Sea, when I was here we had Polish officers on here when we were running between Liverpool and Dublin and I used to tell them I used to say "all these ships you see out here, imagine there is a bloody idiot on the bridge of everyone of them and act accordingly and then you won't be surprised."
> Charlie, Video transcript *Exe* Sailed Dover.

> Standards have slipped amongst the flags of convenience or third world nations as the traditional shipping companies have off loaded their costs. I mean it started with the oil crisis in the 70's and then it carried on with the monetarism band wagon in the 80's. You know it became fashionable to cut costs at all costs and flag things out and there have been massive consequences as a result. You know you've only got to listen to some of the conversations that go on on the radio its scary.
> Monty, video transcript. *Taff.* Sailed Dover to Calais.

These were hardly surprising comments for in one of Iberian Ferries training and operations manual it stated:

> It is not uncommon for a vessel within the traffic lanes to wrongly assume it has right of way by virtue of the fact it is following the routeing, assumptions are often made that this takes priority over the collision regulations and there is a reluctance to alter course.
> Iberian Ferries training and operations manual.

Other instances were often based upon a false understanding of training around the world. In the following extract the chief officer Alan decried the standard of training that Filipino ratings undertook. A rating being a seafarer who was not an officer. He believed that the extent of the training that Filipino ratings undertook was directly comparable to UK ratings. UK rating training is based around a small number of months in a training centre and once completed they are awarded an efficient deck hand (EDH) certificate. This compares with the Filipino rating's training in which the person will spend three or more years in a college and upon successfully completing the training will be awarded an officer of the watch certificate of competency (Amante 2003). Once trained the rating would then sail as a rating at the rank of an AB (an able seaman) rather than as an officer. Alan's misunderstanding of the training system then impacted upon his level of trust for a Filipino crewed Liquefied Petroleum Gas (LPG) carrying ship, as demonstrated by his account of the VHF radio conversation in the second part of the transcript.

> Alan- So many people from like, I'm not decrying the Philippines or the Indians etc... The Indians they do almost the same exams as we do, but you've got a lot of the Philippines, I was on one ship, for example, where all the ABs on deck had a third mates ticket, all the ABs, because they are issued with it as soon as they come from college instead of getting an EDH certificate, they get a class 3 or an officer of the watch certificate. So, I mean they just employ them as officers and they haven't done any rules or. We had a third mate join as well, Filipino, and all he knew was alter course to starboard.
> PB-Well that's a start.
> Alan- You know it's sad. And the Captain had to be with him all the time. So what's the point in having him. All these companies are employing them as cheap labour. As long as they don't have an accident. There was another situation where, that was quite funny, north east lane there, there was a Philippine calling up and he was an LPG carrier, and we were looking at it on the radar and he was giving his position and there was for five ships around him and you could see the space, literally from the time he said that this is the Philippine LPG carrier all the ships just went right out and the space around him just expanded and you think, well that's what it's like at times. I don't know how some of these British captains can go deep sea now. I mean with the crew they've got, the officers. You know where it's a British Captain, Britain's chief officer and all the rest are Philippines. Must be pulling their hair out.
>
> Video transcript *Tawe* Calais to Dover.

There was also a belief that if the COLREGS were made hard enough it would protect their own jobs. However, there could also be an element of racism within this statement as 'monkey' is a derogative term at sea for a Filipino.

> PB- Do you think they should change any of the rules? Are there any of the rules that you would like to change?
> Peter-No, I don't think they should change them. I don't think they should add to them as often as they do. The basic principles remain the same. The main reason people change rules is to make them easier so that they can employ monkeys to do the job and they will do it by numbers.
> Video transcript, *Cam* .

In an interview with Damon, one of the captains on the *Usk*, he spoke about the incident where David Cockcroft, general secretary of the ITF union was able to buy a Panamanian chief officers licence without any seagoing experience thus reinforcing the idea that others cannot be trusted:

> Damon- One of the nautical people bought a Panamanian chief officers ticket two years ago, there was a big blurb on it. He paid cash for it. So you can understand why we are a bit apprehensive about trusting any other ship.
> Interview with Captain Damon Usk.

The issue of the perceived lack of competence of the people in charge of the other ships of course had a significant impact upon the level of trust. Many of the people in charge of the ships did not believe that the other people had received adequate training and so could not trust the other to comply with the COLREGs. Renn and Levine (1991) believed that a belief in the competence of the other was a pre-requisite in trusting another person. Similarly, Kasperson *et al.* (1992) believed, in part, that trust was built on a foundation of a belief in the competence of the other. Conversely, if the person doubted the competence of the other then trust would evaporate.

The comments relating to the competence of the other can also be seen as a reaction to a perceived de-skilling of the job of navigating ships. On many occasions comments were made by the participants as to their long-term employment prospects. There were considerable fears that other nationalities (primarily from Eastern Europe) would come in

and take their jobs. Hence the comments that other nationalities were not trained properly and could not do the job safely. So it is hardly surprising that the people onboard would take a defensive stand and claim that the people navigating other ships were not competent if they were seen as both a threat to their ship in addition to their livelihoods.

7.2.5 The concept of shared values or vested interest.

Trust based upon the concept of shared values is of particular importance in instances where a person is reliant upon another to resolve a risk (Kasperson *et al.* 1992). As previously outlined above it is clear that the respondents took a low view of the training, experience and competence of the people in charge of other ships. However, when asked about their relationship with other ferry operators it became clear, especially when coupled with the observed behaviour, that the respondents trust was based upon the concept of shared values and a vested interest. The basis for this appeared to be due to the ongoing relationship between all the parties, a belief in a shared outlook, good communications and the exchange of ideas. Bennett's research on the application of environmental rules (1999) claimed that trust could be greatly increased through a combination of a stable group who expect to continue to interact in the future and who share information.

For example, I asked Neil onboard the *Wye* and Damon on the *Usk*, if they encountered problems with other ferries.

> We don't worry about that, between the companies we have regular meetings between all the companies and we chat about these things.
>
> Neil, interview *Wye*.

> There were problems. You would see a ship coming out and you wouldn't know what was happening. You'd be thinking, "if he comes out past that one he come this way, or if he comes that way" and it has improved it immeasurably and they have meetings about it twice a year, the Dover Strait Navigation Committee. They bring all the operators including the fast craft operators which increases your understanding of other companies views. And the Sirius Line boys do the same as us.

Damon, interview *Usk*.

Neil on the Wye explains how he sometimes contacts other ferries with the VHF radio to explain what he is doing and that they seldom reply as they have a shared understanding of what he is up to.

> Sometimes we do contact other ferries, like last night when I tried to contact the *Monet*, all I was going to tell them was, of course, I should have come round to port for the other guys. So all I was going to tell them was that I will be keeping this course till I passed them and then come around. He didn't bother answering because he knew I wouldn't be embarrassing him by coming around to starboard. There was no problem.
>
> Neil interview, *Wye*.

Similarly, Casey on the *Exe* explained that they have a greater confidence in the other person because they are a known quantity.

> Casey- Like when we meet our own ships in the channel outside Dunkirk, going in and out of Dunkirk. I mean I get on the VHF I talk to him and OK we'll do that, we know exactly what is going on, both of us, that is not a problem. It's not an unknown quantity.
>
> Video transcript *Exe*, Casey Sailed Dunkirk.

The use of the radio to communicate with other ships was particularly widespread onboard the *Wye* and the *Usk* as they entered Zeebrugge. The following are brief extracts from my field notes written onboard the *Usk*.

> VHF contact made with the dredger and an arrangement to pass to the north was made.
>
> Fieldnote *Usk* 2/5, 0940.

> VHF contact made with a dredger within the harbour to arrange the passing. Also we passed a floating amphibious land-rover.
>
> Fieldnote *Usk* 3/5, 0805.

> VHF contact used to contact a dredger within the harbour of Zeebrugge. Did this by contacting Zeebrugge port control and asking for its name. Then with the name contacted the dredger direct to allow for an arrangement to be made to pass the other vessel. In this case it was green to green. VHF was again used to contact a ferry that was out bound to make a local arrangement to pass.

Fieldnote *Usk* 2/5, 1215.

It was viewed as being acceptable, this use of the radio as the other ships was known to them.

> Damon- Yes, if the facility is there. So we do use radio quite a lot. But we know who we are talking to and all the publications on this state identification. So as we use it a lot and so... take that dredger or the Dart line ship, we know it's the Dart 4, traffic centre knows it is the Dart 4 and so there is no risk. There is no other ship there, it is safe. The danger with it is when some one miss identifies or assumes then it is dangerous.
>
> Interview with Damon *Usk*.

> Casey- Like when we meet our own ships in the channel outside Dunkirk, going in and out of Dunkirk. I mean I get on the VHF I talk to him and OK we'll do that, we know exactly what is going on, both of us, that is not a problem. It's not an unknown quantity.
>
> Video Transcript *Exe*. Sailed Dunkirk.

The use made of the VHF should be compared with chapter 4 section 2.1, where the MCA discourages its use to resolve collision risks. Furthermore, this belief in the reliability of the other ferries translated into allowing much closer passing distances between the ferries and the fast SeaCats. On many occasions I observed the SeaCats passing at very close range. Such situations did not cause concern onboard the ferries among the people in charge. In fact the passage of the SeaCats was almost ignored as the attention was focussed onto the crossing traffic.

> PB- So that's fine then is it that Seacat coming past at what is it half a mile?
> Jacob- It's, it's OK, because we know what he's doing.
> Video transcript, *Taff* Sailed Dover to Calais.

> PB- Seems like the seacat's pass you quite close?
> Sam- Yes, that's normal. See she already agree with me. She'll be passing my stern and overtaking me, and then she's clear of the channel. You know passing in the channel it could be one cable, half a cable. In Calais pass into cables. It's not open sea.
> Video transcript, *Tawe* Sailed Calais to Dover.

> PB- So you are not worried about that Seacat coming in??
> Tom- No not worried about him. He'll... I'll go up to starboard in a moment.

Video transcript, *Tawe*. Sailed Calais to Dover

The shared values exhibited by the ferry traffic has come about through exposure to their practices over time. However, this belief in their shared values was tempered with a certain amount of scepticism such that the trust was more of a level of that identified by Poortinga and Pidgeon (2003) who termed it critical trust.

> PB- So this Seacat looks like it might pass really close is that a worry for you or...
> Drew- As long as it stays outside of 5 cables then it's OK. Sometimes they pass a lot closer than that, you can see them on there bridge they are that close.
> PB- What would you do then if it came within 5 cables then?
> Drew- Um, alter course but not too much because at the end of the day they have to keep out of your way don't they?
>
> Video Transcript *Taff*, sailed Calais for Dover.

It was interesting to note how the people in charge of the ships trusted the people onboard the SeaCats to such an extent that they allowed much closer passing distances. This was enhanced by the communication between the companies in such forums as the Channel Navigation Users group. Both Bennett (1999) and Aalders *et al.* (1999) saw communication and an ongoing relationship as being important in the generation of trust. This communication aided the exchange of beliefs and demonstrated the sharing of values and beliefs. Brenkert (1998) saw the concept of shared values and beliefs as a means of facilitating the creation of trust and the willingness to make oneself vulnerable. Such trust though, mirroring the research of Poortinga and Pidgeon (2003) and Horlick-Jones *et al* (2003), was tempered to reflect the risk and so could be viewed as critical trust which was trust balanced with scepticism.

7.2.6 Trust: a summary.

The issue of trust was critical to the decision to keep out of the way of other ships. The reason behind this was the concept of vulnerability in that the stand-on vessel should place itself in a vulnerable position in relation to the other ship in order for the other ship to resolve the collision risk. Rousseau *et al.* for example defines trust as:

> A psychological state comprising the intention to accept vulnerability based upon the behaviour of positive expectations of the intentions of or behaviour of another. (Rousseau *et al.* 1998: 395)

However, the concept of trust was constructed from a variety of factors. These factors reflected the previous research in this area in that they included: previous history, consistency in behaviour, understanding of the competence of the other and a concept of shared interest (Chapter 2 2.2 and 2.3). However, in previous research in this area these concepts have always been used to demonstrate how trust is generated between different parties. However, I have contrasted this literature with the situation found onboard these ships in which there exists a state of mistrust. In the previous research both empirically and theoretically the concept of trust revolved around the idea of the positive outcome of placing oneself in a position of vulnerability. Whereas, in this research the participants did all that they could to remove the vulnerability from the equation. This of course then has a detrimental effect upon the application of the COLREGs as trust that the other person will undertake their obligations is central to their operation. This does have resonances with the research undertaken by Räsänen *et al.* (2002) where they found that bicyclists would not force car drivers to comply with the rules and give-way to them. Räsänen *et al.* claimed that this was due to the asymmetrical risk experienced by the bicyclists. For the participants in this research the asymmetrical risk was of course present. The culture of the two companies reflected the total unacceptability of any un-controlled collision risk. The spectre of another *Herald of Free Enterprise*[1] was mentioned on a number of occasions by personnel working for both Iberian Ferries and Sirius Line. To this end, there was a reluctance to accept any vulnerability as this would mean relying upon the other ship to resolve the collision risk. This would entail loss of control of the situation and, in part, of their ship with major negative consequences. Therefore there was a great reluctance to trust the ships who had demonstrated in the past their non-compliance with the COLREGs. Furthermore, the people in charge of the ships did not believe in the competence of the other ship, nor that they would act predictably

[1] The *Herald of Free Enterprise* was a roll-on roll-off (RoRo) ferry that capsized and sank off the port of Zeebrugge in 1987 with the loss of 135 lives.

and that they did not share the same values as themselves. These themes when aggregated comprised the lack of trust that the participants had for the other ship. It should be noted that this mistrust, based in part on the past behaviour of the other ships, was directed at all the ships transiting the Strait, regardless of any previous interaction. It is unlikely that trust between the ferries and the ships in transit will ever be in place in the future. Therefore the efficacy of having trust placed so centrally within a set of collision regulations should be questioned.

However, the trust that was generated for the ships in transit should be compared with that shown for the other ferries. There was considerable levels of trust and a willingness to place themselves in vulnerable positions in order to gain a advantage in the future. This level of trust may be seen to have its foundation in the ongoing relationships between the ships. Zey (1998) saw the concept of the future expectation of a relationship as being vital to the generation of trust. Lane (1998) claimed that trust was required for an interdependent relationship to work. Such a relationship exists between the ferries in that they relied upon each other to conform to local custom and practice within the port areas. It is a complicated process manoeuvring a large passenger ferry off a berth during a storm and one that is facilitated by the co-operation of the other ferries. Through this belief in the shared values, past experience, the concept of an ongoing relationship and clear communication, trust was created between the ferries. Through this trust, the people in charge of their ships were more likely to place themselves in a vulnerable position. Although it should be noted that such trust was more akin to the critical trust as espoused by Poortinga and Pidgeon (2003). Such an ongoing relationship was missing from the encounters with the ships that navigated through the Dover Strait. In these, there was no expectation that they would have any form of relationship in the future. The phrase "ships that pass in the night" was coined to reflect such transitory relationships.

The construction of the concept of trust between the parties to the collision risk was seen as being of great importance in understanding the reasoning behind the taking of unilateral action to resolve the risk. However, it was not the only reason given by the participants. The other reasons will now be explored.

7.3 Being considerate to others

18 of the 46 respondents in this research talked about how they were simply trying to be considerate to the ships navigating within the traffic lane by not causing them any bother. By this they meant that by keeping out of their way then they would not be causing them any worry and that they would be helping them to have a stress free life. It was all for their benefit, truly altruistic gestures.

> PB- OK. So is that the way you prefer to do it, to get across without getting in the way of the traffic coming down?
> Gus- Yes, that's it. It's like I said to you earlier you must give them a little bit of consideration, don't steer straight for them, don't scare the hell out of them. Because they are watching us these fast ships coming in and out, so if we can help them at all we change course like we said we would that gives him ample distance, you know instead be miles and miles away and see what we are doing and he still doesn't have to do anything himself and it will be ample clearing.
> Video transcript *Exe*, Dover to Dunkirk.

> I personally I take the time not to inconvenience people, lets pick a course where I'll go astern no more than a mile away and then they don't worry.
> Interview with Max, *Wye*.

> Drew- I've always been taught to think as if you are the person on the other bridge and you know not used to coming down here and you know obviously a bit scared and so you don't want a ferry pointing directly at you, so just showing them what you want to do.
> Video Transcript *Taff*, sailed Calais for Dover.

> Joseph- You want to remove all of his anxieties, he knows exactly what you are doing and that means he should cross at least a mile ahead of you and he should be in no doubt. What we try to do is get about 2 miles so there can be no doubt that he knows that we are passing behind him, if you've got the chance.
> Video Transcript *Taff*, sailed Calais for Dover.

> Chris- Let's put it this way. What would the general average deep sea man want us to do- set a course that is nice and safe and not hassle anyone, or just come box standard out and make everyone's life a misery. Would they prefer that? I don't think so.
> Video transcript. *Tawe*, sailed Dover to Calais.

However, it would be hard to categorise such actions as being altruistic as the respondents also gained from such actions through a clarification of the situation. In this quote Neil used the word "embarrass" to mean not get in the way of the other ship.

> Now certain people would just plod on and let him sort it out because he is the give way vessel, but I'm a bit of a pragmatist and I will do my best not to embarrass another vessel and the payback for all of this is that if I show this guy a green light or if I bring myself around to a course of 150 when I really want to do 130 and I go to 150 to get ahead, the payback is that I don't get stressed. I'm not for the next ten minutes thinking "is this guy going to do anything". He doesn't have to do anything because I've altered course, so he can keep on plodding on drinking your tea mate.
>
> Interview with Neil, *Wye*.

There did appear to be a belief among many of the respondents that making life easier for the ships transiting the Straits was part of the underlying process of keeping clear of everyone else. Undertaking such action did of course produce perceived benefits for the people in charge of the ferries but should also be seen as being undertaken, in part at least, due to a concern for those transiting the area. Such concern for others was not seen in other studies on non-compliance. This consideration for the other person appeared to be related to the belief that the people onboard the other ship would not be able to cope with the collision situation. This was due, in part, to a lack of trust in their training and experience rather than as an act of altruisms. Therefore, this factor had direct resonance with the belief in the competence of the other (see section 7.2.4). The people onboard the ferries simply did not believe that the other was capable of applying the COLREGs and so to make it easier for them, they would remove the need for the other to take any action.

An additional factor in taking the actions in order to reduce the workload on the other ship was that of a demonstration of the superior professional skills possessed by those onboard the ferries. Such demonstrations applied to both within the shipboard structure and without. For example, it was viewed as unprofessional to alter course by too much in order to keep out of the way. When an officer did take what was seen as unwarranted action then they would be subject to ridicule from the quartermasters. Dean the person in

charge of the *Taff* explained his actions to keep clear of another ship. In this he stated that he had altered course to 140° in order to show clearly to the other ship what he intended to do. However, the actions were seen as too much by Dylan and Sean, the two other people making up the bridge team, both of whom were subordinate to Dean..

> Dean- So I've come to 140 so that they'll be able to see exactly what I am doing.
> Dylan- Sometimes we go looking at Boulogne.
> Sean- More often than not.
> [Laughter]
> Sean- It's very nice at this time of the year.
> Dylan- I thought that it was Margate that I normally aim for.
> Video transcript *Taff* Dover to Calais.

On two other occasions I observed Dean being the subject of ridicule due to 'excessive' alterations of course. Similarly, Drew a cadet under training was viewed as going too far North in his attempts to clear another ship.

> Drew- 325.
> Luke- We shouldn't be going this far North?
> Edgar- Penguin!
> Luke- Penguin on the starboard bow.
> Edgar- 325.
> Drew- Thank you.
> Video transcript *Taff* Calais to Dover.

Leaving aside the accuracy of the geographical distribution of Penguin's, the examples indicate the manner in which other work associates demonstrated their disquiet at what was viewed as deviations from the accepted practice. Bloor (1980) stated that such unacceptable formulations were subject to being penalised by the other workers.

> Where actors must engage in activities under the gaze of their work associates then they run the risk of being penalised for offending their colleagues sense of piety by engaging in practices which appear to others unacceptable formulations of the formal scheme.
> (Bloor 1980: 51)

In effect the criticism put forward by the work associates was a form of control through admonishment. The people who I observed gaining the greatest respect among their peers were the ones that altered course just enough to clear the other ships by a wide safe margin, but still remained close to the planned route across the Strait. This is in contrast to the research published by Habberley *et al.* (1986) who claimed that the people who were regarded as the most skilled navigators were those who passed very close to other ships, i.e. those who used the smallest margin of safety. Habberley *et al.* stated that this was because those with the greatest skills demonstrated that by placing themselves in positions in which they knew from their past experience that they would be able to extricate themselves from.

Many of the participants in this research attributed the taking of unilateral actions as being considerate to the other ships following the traffic lanes. The participants claimed that they were only taking these actions in order to make the lives of the others easier. However, this should also be seen in the light of a lack of regard for the skills and experience of the others navigating their ships through the Strait. A number of participants claimed that the other ships would not possesses the skills or have the experience to navigate through this area safety. Therefore, in order to relieve their stress, the participants would engage in practices to relieve the others of their obligations under the COLREGs. This strategy does show that the participants have concern for the well-being of the people onboard the other ship. Such a concern for the other is missing from the literature on compliance with rules. However, such concern for the other also goes on to further reinforce the concept that the other person does not possess the requisite skills and so cannot be trusted to perform their duties, therefore control of the situation must remain in the hands of the people onboard the ferry. Concern for the other person is therefore, used simply as an excuse for taking unilateral action in order to retain control of the management of the collision risk.

7.4 Using the flexibility within the rules

15 of the respondents in this research stated that they were not breaching the COLREGs but in fact using the flexibility found within them. In essence these people were applying what they perceived to be the *etcetera* clause (Sharrock and Button 1999). This is a clause within rules which asks those applying them to extrapolate the existing rules to cover unforeseen, but similar, situations and to do it within the spirit of the existing rules (see chapter 2 section 2.3). As was described in Chapter 4 (see section 4.2 and figure 4.2) there is a period of time before risk of collision exists. The only guidance that is provided for when risk of collision exists is that given in Rule 7(d) and that is devoid of any reference to temporal or situational aspects. Risk of collision is important as this is the point when the COLREGs come into force and it is at this point that the people in charge of the ships are constrained in their actions. The point at which risk of collision commences has not been addressed by either the regulators or the courts (the *Banshee* 1887). This means that there is a certain amount of flexibility as to when the COLREGs apply. Furthermore, Rule 2(b) allows for departures from the COLREGs to avoid immediate danger. Both of these factors were taken advantage of by the people in charge of the ships.

Cameron on the *Wye*, Monty on the *Taff* and Neil on the *Wye* spoke about the flexibility found within the COLREGs.

> It is, it is whilst keeping within the rules, you use all the flexibility that in actual fact the rules give you. I think that when you first come out of getting your tickets[2], you are very kind of rigid on the rules in a rather blinkered sense and you tend to stick to them like glue but the more experience that you have of using them and the more that you see that they are that they do have a fluidity about them then you can sensibly use it.
>
> Interview with Cameron, *Wye*.

> Monty- You know, effectively what we are doing is flexible passage planning put it that way, you know, dictated by traffic flow. It's something that the rules don't cater for and if they did try to cater for it it would be an absolute disaster because it would be so rigid and so inflexible because that is the nature of the legal beast.

[2] "Ticket" is the colloquial term for an officer's certificate of competency.

> There is no other way that you can do it. It really wouldn't work. This system works as proven by these ferries that maintain the schedule and you know keep out of the way of other vessels 365 days of the year and so I think that the trick is if it aint broke don't try to fix it.
>
> Video transcript, *Taff*, Calais to Dover.

> You do what's in common with the rules, but the rules have to be interpreted intelligently.
>
> Interview Neil, *Wye*.

Stan on the *Exe* referred to this flexibility as bendy when I asked him about his actions. In this he admitted that his actions were not as "bold" as specifically directed by the COLREGs but were both adequate to the situation and within the scope of the rules.

> Stan- It is very hard, especially on a certain level. So I'm just starting to alter now, just a few degrees. About 6 degrees should do it. Not exactly a bold alteration, but that's the bendy rules.
>
> Video transcript *Exe*, Dunkirk to Dover.

Similarly, Max saw the actions that he undertook as being both within the interpretation of the COLREGs as well as being taken before they applied.

> Max- Well you know they [the COLREGs] are open to interpretation. There is no risk of collision at 4 miles, you have to be a lot closer. So I'm, the way I'm looking at it I'm not getting into a collision situation. I'm avoiding a collision situation to start with. When its 2 miles and some one is not altering for me then I can start to think, this is a collision situation. And I will generally not alter course to port although I had to for a fishing boat the other night. Because if I had to alter course to starboard, it would just be a lot quicker to go to port.
>
> Interview with Max *Wye*.

From this it can be seen that these respondents viewed the COLREGs as having a certain flexibility with regard to their application. The respondents were seeing their actions, not as being in breach of the COLREGs, but as being in keeping with the spirit of the them. In this manner the people in charge of the ships justified, in part, the actions they took as being within the scope of the COLREGs. They were not seeing there actions as being in contravention of the COLREGs, but as being taken either before the rules applied or as a natural extension of the rules. The COLREGs were written to manage the risk posed

when two ships approach each other. However, with over 400 ships passing through the Dover Strait, and as illustrated by the ship to ship interactions in Chapter 5, collision avoidance in this area is much more complicated. Therefore, the people in charge take actions which they believe is consistent with the spirit of the COLREGs.

This form of justification has a resonance within studies which have identified that regulations cannot cover all circumstances (see Chapter 2 section 2.3.2) Bittner (1965) for example in his study of police officer arrest procedures, observed how the officers would apply procedures in a flexible manner when the situation deviated from them. Similarly, Dien (1998) in a study of nuclear power station operatives, noted that they would extrapolate from the existing rules for emergency situations and apply them to normal operating conditions. Shultz (2003), for example, saw how managers developed new in-house operating procedures in order to deal with new situations not envisaged by the rule makers, but such that these new operating procedures took into account the existing rules.

7.5 Complying with the company rule

Both Iberian Ferries and Sirius Line were fully compliant with the International Safety Management (ISM) Code (ISM Code 2002). This is an international instrument adopted by the UK and so forms part of the domestic law of the UK which applies to ships operating from UK ports. To this end both companies laid down their operational requirements for ships navigating within the area. With respect to passing distances Iberian ferries and Sirius Line in their training and operations manuals state minimum passing distances for their ships. These are shown in table 7.2 (see also chapter 6, section 6.2).

Company Rule	Iberian Ferries	Sirius Line
Passing distance	I mile ahead, half a mile astern	1 mile ahead, no distance astern

Table 7.2, Passing distance company rule.

14 individuals stated that the actions that they were undertaking were simply in compliance with the company rule to keep clear of other ships. For example, Morris on the *Usk*, explained Iberian Ferries' passing distance rule.

> A mile ahead, half a mile astern, that's the rule.
> Interview with Morris, *Usk*.

However, strict compliance with this rule did not always occur. Pat on the *Wye* for example explained the way that he operationalised Iberian Ferries' rule.

> PB- Do you have a minimum passing distance that you like to use?
> Pat- Well if I'm going around the stern of another vessel then it's no problem, but on here they insist on a mile. You must be at least a mile if you are going to be going across the head of someone.
> Interview with Pat, *Wye*.

Similarly Noah, onboard Sirius Lines' ship the *Exe* explained how he applied their rule.

> PB- What about passing distances, do you work on any minimum passing distances?
> Noah- Yeah. It has to be at a minimum of 1 mile across his bow, any closer than that and we will alter course and let him go first. So that's the rule, one mile.
> Phil- What about astern of them?
> Noah- I've never really had any problem, you can tuck in right astern of them, 2 or 3 cables. But I think that the official word on it, probably about half a mile.
> Video transcript, *Exe*.

In these extracts the individuals indicated how the most important aspect was the distance at which the ship passed ahead of another, rather than the astern distance. This would indicate their perception of the relative risk that would occur if crossing ahead at a reduced range.

Monty on the *Taff* also referred to these passing distances but claimed the source of them was a local bye-law rather than the company regulations. This bye-law was given added weight from a common law derivation.

> PB- So do you always try to maintain at least a mile ahead do you?
> Monty- Well we've got this rule which is a local bye-law or been interpreted as such and as I said to you the other day, people have been fined for getting closer than a mile ahead. There was a court case, don't know how long ago or what the

> details were but it was decreed that a mile was the safe passing distance you know if you are going to go ahead of you know alter to go ahead of traffic. That's what people tend to work on. Sometimes it can be a little bit limiting for certain ships, you know, does it really matter if it is 9 cables. That's what we work to.
>
> Video transcript, *Taff.*

It should be noted that no such bye-law exists nor did any court case which involved the application of such a rule. However, Monty indicated the significance of the passing distances by reference to the sanctions which would be imposed if the law was breached. This aspect of the enforcement of rules will be returned to in section 7.7, when issues surrounding surveillance will be analysed.

Mitch a second officer on the *Usk*, believed that such regulations should be followed as they provide specific guidance as to what actions should be undertaken.

> Mitch- Since I started working for this company I have always tried to work to the fleet regulations as there is information in the fleet regs in addition to what the rules of the road says. The fleet regs specify certain situations such that you must not cross ahead of a vessel that is meant to give-way at certain ranges. So it does make it clear in certain aspects. So a vessel that you are meant to give way to, you must not pass at a certain distance, cannot cross ahead of him at a certain distance. Also it covers a vessel that is meant to give way to you and isn't, what you will do. It does give distances that you have to cross to them, if you want to cross ahead of him. So all those things are just kind of there for the situations, which are there so we won't get into close quarters situations with other vessels. If you follow the fleet reg it is pretty good, well I personally stick to it. I won't speak for everyone.
>
> Interview with Mitch, *Usk.*

From this it can be seen that the companies running the ships have put in place additional rules which state the minimum passing distances. Now not one person said "well I have to break the COLREGs in order to pass no closer than one mile ahead of that ship", but the effect of the company rule, in its operation, is the same. In order to comply with the requirement, the people in charge of the ships had to take action at a an early stage. As shown in chapter 6, those ships crossing the Strait did take action to keep clear of the crossing ships by this minimum distance. Taking such action ensured compliance with this company rule. Therefore, it would appear that in order to ensure compliance with the

company rule, a ship crossing the Strait had to take unilateral action to resolve a collision situation. Furthermore, through the strict application of these company rules, the people in charge of the ships were able to avoid the restrictions placed upon them by the COLREGs. The avoidance of the restriction then dove-tailed with the lack of trust in the other person to comply with their obligations under the COLREGs.

7.6 Easier to take action

The last reason given for taking unilateral action was that it was simply easier to do it themselves. Non-compliance with regulations has often been attributed to either taking a short-cut or the desire to just get the job done (Reason 1990, Hutter 2001a, Corneliussen 2004). In 11 instances the respondents stated that the actions that they were undertaking were simply because it was easier to get out of the way of the other ship.

> Stan- That was the right choice, it is much easier to keep out of everyone's way.
> Video transcript, *Exe* Dunkirk to Dover.

> PB- Hm OK. So do you see this when you come out of Dover and sort of adjust your course to find this gap, do you see that as sort of courtesy or sort of...
> Casey- Just making life easier for myself.
> Video transcript, *Exe* Dunkirk to Dover

> You know in an awkward situation it's just easier to get out of the way. Get yourself into a gap which isn't going to cause a problem.
> Monty, *Taff.*

In an interview with Neil onboard the *Wye*, I asked whether he viewed their actions as being within the requirements of the COLREGs. He admitted that he was breaking the COLREGs but that it was just easier to do so given the other options open to him.

> We do follow the rules, but sometimes its easier, a classic example is what a lot of ships would consider to be wrong, but coming out of Dover to come out of the entrance you know that we come out at 125. You come to 125 the vectors stabilise and you realise that you have a ship on your port side that will be a problem. You then have 2 choices, say if he's reasonably fast, 3 choices: you can plod on and let him do all the work which probably mean a 90 degree alteration of course, you can come round to 200 and steam half way to down to

> Southampton to get ahead of him or after a few miles because that's how long it takes for the vectors to settle down to can come to port by 40 degrees, show him a green light, he knows what's going on, he's happy he's going to Southampton, I'm happy because I've got out of a port hand Charlie situation. So I've broken that rule, but that's good seamanship.
>
> Interview with Neil *Wye*.

Dave, on the *Taff* explained that when on refresher courses ashore the actions that the lecturers tried to get them to undertake were impractical in the "real" world.

> Dave- The times we go on our little courses up there bridge management and all that, we always end up having a heated discussion with these lectures saying come on this, this is the real world, you know it doesn't happen like this at all, you know, you can't do this.
>
> Video transcript *Taff*, Sailed Calais for Dover.

As illustrated, a number of the participants in this research were different from those found in earlier studies (See chapter 2 section 2.3.2). For example, in Hutter's research (2001a, 1997) she found that a large proportion of those not complying with rules did so through omission rather than acts. Safety gear was not worn or rail tracks were crossed because by following the rules required extra effort. Reason (1990) for example, claimed that an individual will always take the shortest route from A to B. Whereas in this research those admitting that their actions amounted to taking the easier route in fact involved considerable mental and financial effort of their part. In order to ascertain a course across the Channel that did not conflict with other ships, required a great deal of thinking and care on the part of the individual. Furthermore, as shown in Chapter 5 there was a financial cost to deviating from the most direct route across the Channel. Therefore, the people in charge of these ships undertook actions that they perceived to be easier, but which involved a great deal of effort on their part. It would appear that "easier" in this instance referred to it being easier to take action rather than to rely upon the other person to resolve the collision risk. In essence this factor refers back to the issue of trust. In this it would be both less mentally and financially taxing to allow the situation to be resolved by the other, but they cannot be trusted to. This then means that even though effort has to be expended, it is still beneficial to take action themselves.

7.7 Summary: Reported reasons for unilateral action

Through an analysis of the transcripts and fieldnotes taken during the ethnographic stage of the research, 5 recurrent themes came to the fore as to the stated reasons behind the taking of unilateral action to resolve the risk of collision. These themes related to the concept of trust, and issues revolving around consideration of others, rule flexibility, the precedence of a company rule and ease of unilateral action. The issue of trust was directly referred to by a large number of the respondents. However, trust was also reflected within three of the four other stated issues. The respondents did, in part, justify their actions with reference to the flexible nature of the COLREGs. However, trust in the other lies at the heart of the other reasons why the participants in this research took unilateral action. Being considerate to others, applying the company rule and it being easier to take action themselves, all have their grounding in the lack of trust that the participants have for the other person. As was illustrated within the review of literature (see chapter 2 section 2.3) the concept and issue of trust featured in a number of studies. However, the manner in which the COLREGs were written, with the emphasis upon one party resolving the collision risk, trust in the other to comply with this requirement, underpins the relationship between the ships. Therefore, if trust is not present, then the people in charge of the ships will not comply with requirements or will attempt to implement strategies that removes the need to rely upon the other ship. However, this area is under the constant surveillance of an authority that possesses the ability to apply sanctions in the event of rule transgressions. Therefore, the issue of why the people in charge of the ships routinely avoid complying with the requirements under the regulations needs to be analysed.

7.8 Surveillance and sanctions

As previously outlined in chapter 2 section 2.5.3 the Maritime and Coastguard Agency (MCA) operate a radar station on the cliffs of Dover. This station overlooks the Dover Strait, observes and records the actions of the ships in transit through the area. Their stated functions are:

> The functions of CNIS are to keep the Dover Strait TSS under observation, to monitor the flow of traffic and to detect and report vessels which contravene the International Regulations for Preventing Collisions at Sea 1972, as amended (COLREGS).
>
> (MCA 2004b: 3).

These functions are made known to all seafarers in the area through warnings on charts, radio broadcasts at 30 minute intervals and merchant shipping notices. Details of prosecutions following transgressions of the COLREGs are regularly reported in the maritime press and are posted on the MCA's website (www.mcga.gov.uk). Furthermore, Iberian Ferries have a policy of encouraging seafarers to visit the radar station in order to observe its operation. In addition, every ship that transits the Strait must call the CNIS to inform them of their movements. Foucault (1975) describes how through the use of a surveillance system, disciplinary power is used to train the behaviour of the individual such that they conform to the regulations in force (Rabinow 1991, Mills 2003, see also chapter 2 section 2.5.2). Therefore, the question must be asked, if there is such a surveillance regime, which is coupled with powers of enforcement, why are the COLREGs not being complied with?

The sociological literature on surveillance draws heavily upon and has actively developed the writings of Foucault (see for example: Dandeker 1990, Agamben 1998, Feeley and Simon 1994, Ditton 1999, Norris and Armstrong 1999, Bogard 1996, Gandy 1993, Ball 2000, Lyon 2001, McCahill 2002, Wood 2003, Vaz and Bruno 2003, Ball 2003, Yar 2003, Lianos 2003, Campbell 2004, Williams and Johnson 2004). However, what came to light during this research, was not the accounts of how people managed the pressures of the surveillance that they were under, but the very lack of such accounts. Only in a few cases did the issue of surveillance come to the fore. This finding indicates how little regard the people in charge of the ships placed upon the surveillance that they were constantly under. The radar surveillance played such a small part in their daily routine that it was almost inconsequential to them.

In a number of studies it was found that people accounted for their non-compliance with reference to a lack of surveillance (Hutter 2001a, Baldwin *et al.*, 1999, Hutter 1997, Bennett 1999, Åberg 1998, Young 1999, Black 2002, Corneliussen 2004), or through an indifferent regulatory environment (Reason 1990, Rothstein 2003), or because of a lack of sanctions following a rule transgression (Kagan and Scholz 1984, Hutter 2001a, Baldwin 1995, Hutter 1997, Åberg 1998, Young 1999, Black 2002). Hutter (2001a) found that railway workers would ignore certain safety rules if they believed that they would not be caught. In studies of CCTV systems it was found that the mere presence of them did not ensure compliance with regulations and laws by the people under observation and were mainly used as a means of collecting evidence of transgressions (Feeley and Simon 1994, Ditton 1999, Norris and Armstrong 1999).

7.8.1 Lack of knowledge regarding the enforcement powers.

For any surveillance system to work, those subject to the surveillance must be aware that if they break the rules then they will be punished. There must be a deterrent effect, otherwise the surveillance simply becomes a means of collecting evidence (Ditton 1999). This was the situation that I found onboard these ships, a lack of knowledge of the punishments that could be meted out. For example, Stan on the *Wye* was not aware that the coastguard were able to enforce the COLREGs. In this extract, Stan asked me about my opinion regarding the requirement to cross the traffic separation scheme at 90° to the direction of flow.

> Stan- So what's your view on not crossing the traffic lanes at 90 degrees, obviously when there's no traffic.
> PB- Well all I can say is what I've seen from up in Dover coastguard, where they will come down heavy on you if you don't cross at 10, 15 degrees off. But if anything that is starting to get a bit naughty they do crack down on. And they prosecute as well.
> Stan- Do they?
> PB- Yeah.
>
> Video transcript *Wye*.

Similarly, Morris on the *Usk* did not know that the coastguard recorded all of his movements.

> PB- So when you are coming out of Dover and you are picking a course do you see this as well within the rules? Somebody could argue that you are not standing-on for these ships and that you are taking action.
> Morris- They could, but how could they prove it?

Similar findings were noted by Ditton (1999) in a study of CCTV systems. In that he found that nearly 60% of people were unaware of the surveillance system. Furthermore, Feeley and Simon (1994) found that CCTV had no practical effect in reducing the crime rate and were used as a technical means of evidence gathering. Therefore, people who are not aware of the surveillance regime cannot comply with that which it is trying to enforce.

7.8.2 The lack of visible rule transgression enforcement.

The lack of the enforcement of rules was observed on a daily basis by the people in charge of the ships. As illustrated in chapter 5 and 6 the people in charge of the ships adopted actions which were not in compliance with the COLREGs and saw numerous rule infractions undertaken by ships transiting the Strait. The MCA state that they chase every observed infraction of the COLREGs (Toogood 2005). This is undertaken through either visits by MCA personnel to ships which call at UK ports or through letters sent to the flag state and owners of the vessel. However, this enforcement is invisible to the people in charge of the ships crossing the Strait and so rule infractions appear to go unpunished. This lack of punishment was seen by Casey on the *Wye* as giving tacit agreement to the practices by the power behind the surveillance.

> Casey- Well Dover coastguard are monitoring our progress on their radar and I've thought often enough that if they are not happy with us doing that then they'll send us a letter about it. And I haven't had any letters yet, so.
> Video transcript, *Wye*.

Similarly, Ditton (1999) found that the deterrent power of the CCTV system was undermined due to a large portion of the observed being unaware that they were subject to surveillance. This should be compared with the deterrent effects of speed camera signs and camera boxes in the reduction of traffic speeds (Ball 2000, Department for Transport 2003). Furthermore, the lack of enforcement of regulations has been seen as a major reason behind rule transgressions (Kagan and Scholz 1984, Hutter 2001a, Baldwin 1995, Hutter 1997, Åberg 1998, Young 1999, Black 2002). Hutter (2001a) for example, claimed that if rule infractions were not visibly punished, then any deterrent effects of the mere presence of sanctions would be limited.

7.8.3 Justifications for non-compliance.

Where people knew that the actions they were taking could be construed as breaching the COLREGs, they often blamed their actions on a *force majeur*. The most common example would be to use the weather as an excuse for their actions. Peter on the *Cam* for example, explained how the coastguard do, on occasion, inform the people on the ship that they were breaking the COLREGs. However, he stated that he would use the state of the weather as an excuse for his actions.

> Peter- Yes, if you carry on in this direction Dover coastguard will be giving us a call. When the weather is bad we of course do weather courses. That gives us a little bit more leeway.
>
> Video transcript, *Cam*.

A similar point was made by Vince, also on the *Cam*. In this he explained that the weather could dictate the manner in which they crossed the Strait due to the limitations of the vessel. Iberian Ferries' ships are all fitted with stabilizing fins. These are large sheets of metal that fold out from the side of the ship and limit the quantity of movement of the ship in bad weather. The reason behind this is to provide comfort for the passengers and limit damage to the ship's equipment. However, the *Cam* was fitted with a different system which was not as effective. Therefore, Vince was able to use this as an excuse for not complying with the rules.

So if you go to port, then you try to pass him by more than a mile you'll have to go over here which is sort of stretching the 90 degree rule a little bit. Sometimes you can say I'm going to cross on the weather course because we don't have fins. We just have a flume tank system which if we have a swell its sometimes nice to go across on about 290 degrees to give a more comfortable course. Whereas, if we went on about 310, 315 which is the normal course, then rolling and crashing all the plates.

Video transcript, *Cam.*

7.8.4 Resistance to coastguard control.

One very interesting incident occurred onboard the *Tawe*, whilst crossing from Calais to Dover which illustrated how the bridge team did not welcome any interference by the CNIS. In this incident the CNIS called up on the radio to inform the bridge team that the ship in front of us had a deep draught. At the time that they called the bridge team onboard the *Tawe* had just altered course to keep out of the way of that deep draughted ship as it was crossing from the starboard side. The implication of the radio call from Dover was that they were reminding the *Tawe* of its obligations to keep out of the way of that ship. The ship was under the control of Karl, Alan was the Chief Officer onboard and just happened to be on the bridge and Seth was steering.

Seth- I wonder if he [the deep draughted ship] called them up and went "Oiy, who's that ferry".
Alan- Now I could have seen the point if he'd been on our port side and we would be expecting him to alter course for us. But you know...
Karl- my action there wouldn't have shown up yet on their plot [their radar screen].
Alan- ...but it doesn't matter whatever ship, if he's deep draught or not.
Karl- Would have given way.
Phil-yeah, yeah, you've got a good point there. Why have they decided to call you?
Alan- Silly.
Phil- Shows how much faith they've got in you then Karl.
Karl- Yeah.
Alan-Well it's not just Karl.
Karl- 22 m that's deep.
Alan- That's the only other thing I would change is coastguards don't really know what they are doing. Because most of them have never been at sea. They've never read the rules. They've never passed any exams, not to the same extent you know, that we sit exams about collision avoidance. And yet they are sitting at a radar screen telling you where you are going wrong sometimes.

In this the bridge team were unhappy at the idea that the coastguard would attempt to point out the *Tawe*'s responsibilities under the COLREGs. Karl, for example, was very indignant that his actions could be subject to criticism. Seth blamed the actions on the deep draughted ship in that it forced the coastguard to call the *Tawe* on the radio. This could be seen as to having similarities with the way in which the MCA only appear to prosecute ships for breaching the COLREGs in the light of aggravating circumstances such as one ship reporting another (see chapter 2 section 2.5.3). In addition Alan called into question the whole idea that the coastguard operators were capable of directing traffic due to their lack of training and experience. However, Alan's lack of respect for the coastguard probably derived from what, he thought, was an unfair allocation of blame following an incident that occurred some time before. In this incident a ship did not give-way to him and so he reported the incident to the coastguard station.

> Alan- I had a situation where a vessel, to me, was contravening the traffic regulations, he didn't give way to me and so I slowed down and let him cross ahead, I reported him to Dover and the coastguard then turned around and said it was my fault. And he was the vessel on my portside who should have given way. So the MCA turned around and said that and so since then, my attitude has been I won't say anything, ever.
> Phil- How could it have been your...
> Alan- That's what I couldn't understand, they just read it the wrong way.
> Phil- OK.
> Alan- I mean it wasn't my fault, it was just them saying. But since then I thought, well as long as I miss the guy, I don't care. No point complaining.

Resistance to control by an authority that a person holds in low regard or when one does not identify with the role and purpose of the body, has been found identified in a number of studies undertaken by Baldwin (1990, 1995, 2000, and with Cave 1999). In this Baldwin argues that the legitimacy of the enforcement of regulations must be underpinned by regulators with a clear understanding and expertise of the subject. Alan and others expressed doubts regarding the training and experience of those monitoring their actions.

7.8.5 CNIS Surveillance.

From this analysis of how the surveillance by CNIS is viewed and received onboard the ships, it is clear that the deterrent effects of the surveillance system are somewhat lacking. The deficiency of deterrent effects commences with the lack of knowledge of the enforcement of infractions of the COLREGs by the authorities. This has the effect of reinforcing in the minds of the people in charge of the ships that what they are doing is either within the requirements of the COLREGs or condoned by the authorities. Furthermore, the people onboard the ships observe rule infractions on a daily basis by other ships going unpunished and so their regard for the authorities enforcement powers is further denuded. In addition, a number of people in charge of the ships resented having their actions being called into question by people who they consider to lack sufficient training and experience to judge their actions. The lack of the deterrent effects of the radar surveillance system was further reflected in the lack of comments on the subject. This finding indicates how little regard the individuals placed upon the surveillance that they were constantly under. The radar surveillance played such a small part in their daily routine that it was almost inconsequential to them. The CNIS operation (in a similar fashion to CCTV systems as identified by Feeley and Simon 1994) merely acts as a technical means of evidence gathering to be used in the event of a major rule transgression, rather than as a means of deterring rule transgressions.

7.9 Summary

From this analysis of the actions undertaken to avoid traffic in the Strait of Dover it is clear that people deviate from the COLREGs as a matter of routine. The maintenance of course and speed for other ships in the approach to the first traffic lane did not form part of the usual practices found onboard the ships. The justification for taking such actions was seen to be varied and demonstrate the complicated nature of rule non-compliance. Non-compliance, as shown in chapter 2, section 2.3, is made up from a variety of reasons ranging from lack of trust to a demonstration of professional skill. Such varied concerns were mirrored in this research. Trust or rather a lack of trust in the other was one of the

main reasons for the deviation from the COLREGs. The COLREGs required co-operation with the other ship for the successful negotiation of the collision risk (Cockcroft and Lameijer 2004). However, this required trust in the other, due to a diversity of reasons, was not present. Another reason for the non-compliance was that of making the situation easier for themselves and the other ship. By this the people in charge of the other ship kept clear of the other ship, in part, through a desire to be considerate to the other ship. This was a particularly interesting finding as the perceived easier course of action actually involved considerable effort on the part of the individual. This should be contrasted with the reason behind taking the easiest option found in other studies in which the individual undertook such actions, in part, in order to avoid expending additional effort (Reason 1990, Hutter 2001a, Hutter 1997, Habberley *et al.* 1986, Lawton 1998, Baldwin *et al.* 1999, Young 1999, Olin and Wickenberg 2001, Corneliussen 2004). However, the basis for this "easier" course of action appeared to be related to a belief that the other ship would not be able to handle the collision situation and apply the COLREGs correctly. This reason once again relates back to a lack of trust in the abilities of the other people. However, it was interesting to note that a number of the people in charge of the ships believed that they were taking these actions in order to benefit the other person. Such reasoning is missing from the literature on rule non-compliance. The flexibility found within the COLREGs was cited as a further reason for deviation from the rules. This was also closely allied with a belief in the inadequacy in the COLREGs when applied to situations which went beyond simple encounters. Such instances can be seen in the light of previous research on the *etcetera* clause, see Chapter 2 section 2.2 (Sharrock and Button 1999). In this the people in charge of the ships inhabited the "real world" in which they had to take action to deal with situations which could not be managed through the COLREGs.

Compliance with the company rule of not passing closer than one mile ahead of a crossing ship was very closely observed. The effect of compliance with this company rule was that people would take action to avoid the situation developing regardless of the collision situation. One reason lying behind the compliance with the company rule was that the person in charge of the ship was able to avoid the restrictions placed upon them

by the COLREGs. The avoidance of the restriction then dove-tailed with the lack of trust in the other person to comply with their obligations under the COLREGs.

One interesting aspect was that lack of knowledge of the rules was missing from this research. The lack of knowledge of the rules is an oft cited reason behind non-compliance (Baldwin 1995, Hutter 1997, Hutter 2001a, Hutter 2001b, Räsänen *et al.* 1999, Leplat 1998, Davis and Kottemann 1995). In this research every single respondent demonstrated clear knowledge of the COLREGs and their duties and obligations within them. Furthermore, each respondent had sat for at least one MCA oral examination on the COLREGs and most were master mariners. They knew that they were under an obligation to maintain course and speed for ships crossing from their port side. Furthermore, as demonstrated above, they knew that their actions deviated from the COLREGs.

Surveillance was an aspect that had to be dealt with in some detail. The main reason being that the Dover Strait is under constant surveillance by the MCA's body the CNIS (see chapter 2 section 2.5.3). Furthermore, the MCA have the authority to use the CNIS collected information in order to prosecute people in charge of ships. Such prosecutions were publicised and so at first glance it was surprising that the surveillance regime did not appear to affect the respondents behaviour. The main reasons behind this was the lack of knowledge of the enforcement of the regulations, the lack of visible rule transgression enforcement and a resistance to coastguard control. Rule infractions were undertaken and observed on a daily basis which were without consequence. Furthermore, a number of respondents voiced doubt as to the knowledge and expertise that the coastguard personnel possess. Therefore, when there are no apparent consequences for taking actions then this negates the deterrent effects of the surveillance system.

From this analysis it can be seen that the reasons underlying the actions taken by the people in charge of the ships are complicated, inter-related and diverse. However, the overriding desire of the respondents was to take action that ensured the safety of the ship that they were in charge of. The moderation of the risk of collision was their primary

concern and all their actions were directed towards keeping their ship out of danger. Compliance with the requirements under the COLREGs would have removed their freedom to act in a situation in which they did not trust the other ship. Therefore, it is hardly surprising that non-compliance with the COLREGs became an accepted everyday practice, especially when the disastrous consequences of any collision are taken into account.

Chapter 8, Conclusions and Recommendations

8.0 Introduction

The aim of this chapter is to bring together the findings from the empirical research, discuss these conclusions in relation to the management of risk and suggest some practical recommendations which may improve safety at sea. Conclusions will relate to the application of the COLREGs, the construction of risk, the critical role that trust plays within collision avoidance, the operation of regulations, the failure of a surveillance system and the role of the ex-practitioner in the research process. This research has involved the analysis of radar records of collision avoidance practices using the concept of the near miss encounter and the field use of hand-held video cameras for data recording. Both of these methods have been successful in the production of reliable and useful data.

A number of recommendations relating to the management of collision risk within the Dover Strait as well as for the management of risk as applied to researchers will also be made. I am keen to stress the practical applicability of this research to the wider world. In the same sense that no researcher works within a vacuum, the recommendations should be both practical and pragmatic. To this end recommendations relate to: the encouragement of widespread debate on the routeing of ships through the area which involve all the stakeholders, with particular reference to the crowding of ships in the Southwest bound traffic lane North of the Varne Bank; an honest debate on the efficacy of the stand-on vessel rule; and a more visible enforcement of the regulations by the regulatory authorities. It is hoped that a number of these recommendations will be taken onboard by the regulatory authorities, so addressing the problems highlighted by this study. Additionally, this research has highlighted the need for a wider use of risk assessment before researchers enter the field.

8.1 Conclusions

This study has involved a variety of methods which have been used to investigate the practice of collision avoidance and to answer two simple questions.

- How are the COLREGs being applied?
- Why are the COLREGs being applied in the way that they are?

Previous studies have tried to undertake an analysis of this subject, but have not involved the people who are in charge of the ships and who undertake the process of collision avoidance. This research has attempted to give those people a voice in order to understand the culture in which they work and to comprehend their management of the collision risk.

8.1.1 How are the COLREGs being applied?

Navigation and collision avoidance are complicated processes undertaken by well trained professional seafarers. This research has identified how this process is constructed from a wide range of interrelated factors. Chapter 4 looked at the manner in which the COLREGs should be applied. From this it was clear that seafarers are given a large amount of discretion in deciding when the risk of collision exists. The issue of risk of collision is important as this is the point at which they are required to both apply and be constrained by the COLREGs. No definitive guidance is given within the COLREGs on when they come into force nor, on what actions should be taken to avoid the risk of a collision. Action to avoid a collision could involve an alteration of course, a change in speed, a combination of the two, or nothing, depending upon the roles by which the COLREGs attribute to the ships. Only in head-on situations do the COLREGs direct both

of the ships to alter course to starboard. Furthermore, the actions of each of the ships must be co-ordinated with the others, for uncoordinated action could result in conflicting action. However, problems have been identified with this co-ordinating approach as there is no communication between the ships[5]. This means that there is a need to decide independently what to do, in a situation where other ships must also make independent decisions (Taylor 1990). So collision avoidance becomes a game of co-ordination, since both players have to choose independently mutually compatible strategies (Cannell 1981) and must trust the other to comply with their obligations. In such a situation as argued by Stein (1990), a lack of trust between actors ensures that it is a rational for each actor to adopt a dominant strategy which will most benefit them at the expense of others. However, the COLREGs are designed to negate the taking of dominant strategies for they direct both parties to take co-ordinating actions.

Case law does not provide hard interpretations of the COLREGs with regard to when risk of collision exists, nor what actions should be taken (for crossing and overtaking situations) or at what time. Case law is unhelpful in providing information as to when risk of collision exists as they do not consider cases which do not involve a collision. Therefore, in each case that they deal with risk of collision has existed otherwise a collision would not have occurred. Whereas, in no case did a collision result from any of the collision situations studied during this research. It is for this issue, the practical resolution of collision risks, which is so interesting. This is because, as identified, the COLREGs have within them a number of critical problems: no specific guidance on when they should apply; no specific guidance on what should be done to resolve the situation; a requirement to rely upon the other ship to resolve the risk of collision; and no guidance on what to do in the event of meeting more than one ship at a time. And yet, collisions are still relatively rare occurrences even though, as demonstrated in the analysis of the near miss encounters, collision situations are not.

[5] Communication can of course be established through the use of such technology as radios, however, such communication is not written into the COLREGs and the MCA strongly discourage the use of VHF communication within collision avoidance.

Chapter 5 illustrated how, in practice, these collision risks are resolved. From this analysis of the radar records of the movements of all of the ships using or crossing one lane of the Dover Strait, for a single 24 hour period, reliable data were produced. This data showed how routine collision avoidance occurred on that day. Overtaking was observed to be taking place at very close distances in the lane. The cause of this close overtaking appeared to be the crowding of ships as they lined up to pass to the North of the Varne Bank. It was found that nearly five times as many ships passed to the North rather than the South of the Bank. Furthermore, in all bar three of the 68 NMEs involving transiting ships overtaking each other, involved ships lining up to pass to the North of the Varne Bank.

The very close passing distances observed during overtaking however, should be compared with the observed passing distances during crossing situations. It was found that the mean passing NME distance for crossing situations was 5.8 cables compared with 4.4 for overtaking situations. Furthermore, there were only 6 instances when crossing ships (ferries) passed within 3 cables of another ship, compared with 30 for overtaking situations. Such close passing distances should be seen as a cause of concern as a large oil tanker is approximately 2 cables in length. From the analysis of the tracks of the crossing traffic, it was clear that the ferries leaving Dover were adopting routes which did not conflict with those of the ships in transit through the Strait. The result of the adoption of those routes was an increase in the passing distances between the ships. However, this appeared to represent a deviation from the requirements of the COLREGs as the ferries were directed, by the regulations, to firstly maintain their courses and speeds and wait for the other ship to resolve the collision situation. Furthermore, this deviation from the COLREGs was also being undertaken under the gaze of the regulatory authorities located within the CNIS. This surveillance system was backed up by the sanction wielding authority which was designed to ensure the correct following of the rules. Therefore, the fact that the COLREGs appeared to be being breached whilst under observation by the authorities warranted further investigation.

The interactions between ferries were also observed. It became clear that they were adopting routes across the Channel such that they did not encounter each other when on reciprocal courses. The result of this was that there was a lateral separation of approximately one nautical mile. This lateral separation removed the need for the ships to alter course for each other as risk of collision did not exist. This derives from an agreement between the Companies that operate the ferries, for the imposition of a voluntary traffic separation scheme, perpendicular to the existing scheme. This voluntary scheme did not, and does not, have the approval of the IMO, nor the governments within the area. It is purely based upon a local agreement between the operators and is a reflection of local custom and practice. The effect of this scheme was to allow the people in charge of the ferries to concentrate their efforts on resolving the collision situation with the crossing traffic rather than the head-on situations with other ferries. This was an interesting finding as it indicated the level of trust and co-operation that occurred between the ferry operators and the people in charge of the ships.

From the analysis of the movements of ships within the area of study, it is clear that the process of collision avoidance involved deviations from the requirements of the COLREGs. Ships did not appear to be maintaining their courses and speeds. However, the reasons for these actions were not clear from the use of this single analytical method of analysis utilising the tool of the NME. The analysis of the radar records could only provide details of the actions taken to avoid collisions, rather than the reasons behind those actions. Only through a mixture of quantitative and qualitative methods could such data be produced. Previous research in this area has been limited by the failure to ask the people in charge of the ships why they were taking the actions that they did. The second phase of this research attempted to give those people a voice and answer the second research question.

8.1.2 Why are the COLREGs being applied in the way that they are?

An ethnographic investigation of the process of collision avoidance involving the use of a hand held video camera was undertaken onboard seven ferries sailing from the port of Dover and continental ports. During this investigation, the people in charge of the ships were observed undertaking the routine process of collision avoidance and questioned about the use, and operation, of the COLREGs. From this it was found that an initial assessment of the collision risk was made before unilateral action was taken to resolve the collision risk. Such unilateral action was undertaken regardless of the obligations under the COLREGs. In only one instance was there any attempt at compliance and this only resulted in delaying the taking of unilateral action. The unilateral action consisted, in every case, of an alteration of course either to port or starboard, but never a reduction in speed. No consideration was given to the maintenance of course and speed, the assumption being that the resolution of the collision risk would be undertaken by their actions alone. Ships were observed to weave their way between the traffic in the lane, trying to ensure that they complied with a company rule that dictated that no ship should be passed closer than one mile ahead or, in the case of one of the companies, half a mile astern. The result of this was that the need for the other ship to take action to resolve the collision risk was removed.

Through observation and interviews the underlying issue for the taking of this action was found to be the wish to maintain, at all times, control of the management of the collision risk due to a lack of trust in the ability of the other ship to comply with the COLREGs. Respondents spoke about the need to be considerate to other ships as they would not be familiar with this area. Therefore, to remove the element of stress from the lives of the people onboard the other ships, the respondents took unilaterally action to resolve the situation. However, this consideration for others and the taking of, what could be seen as, altruistic action, was simply a reflection of the lack of trust in the other. The assumption on the part of the respondents was that they did not believe that the other ship would comply with the regulations due to their lack of competence, knowledge and/or experience of the COLREGs. Due to this lack of trust that the other ship would comply

with the COLREGs, the ferries deliberately did not comply with them. It was argued that such unilateral action could be seen as being applied before risk of collision existed and so before the COLREGs came into force. Therefore, if the rules were not in force then they could not be broken. However, at no time was consideration given to maintaining course and speed upon leaving port and the working assumption was that unilateral action to resolve the risk would be taken in every situation. Furthermore, the manner in which a number of crossings involved the ferry weaving in and out of the traffic within the lane demonstrated the disregard that the respondents had for the COLREGs.

It was particularly interesting that these actions were being undertaken whilst subject to a sanction wielding surveillance scheme. However, for a surveillance system to operate effectively, people under observation must believe that if they break the rules, then there will be retribution. As Yar (2003) stated, the authority of the surveillance system rests on the belief in its omnipotence. There was a lack of knowledge that sanctions would, or could, be brought for infringements of the COLREGs. As illustrated in chapter 2, only serious infringements of the COLREGs, which had to be undertaken in conjunction with some form of aggravating circumstance which then resulted in a conviction in the courts, were ever reported. There is no public information on how many prosecutions fail nor of any other forms of reprimands. Furthermore, the people in charge of the ferries observed routine infringements of the COLREGs by ships in transit through the Dover Strait. These infringements were commented upon on a daily basis by the respondents. In many cases it is very probable that these incidents were the subject of official action, however, all the respondents ever saw were the actions of ships going unpunished after breaking the COLREGs. In addition, the people in charge of the ships never received any notices that they were not complying with the COLREGs. This meant that, for the few who believed that they were breaking the COLREGs then, they believed that their actions were being sanctioned by the CNIS. Moreover, for the majority who believed that they were not breaking the COLREGs, then this belief was further reinforced up by the lack of official censure. From this, the CNIS fails to deter rule non-compliance due to the lack of visible consequences following rule infractions.

A number of previous studies identified routine non-rule following behaviour as being, in part, caused through lack of knowledge of the regulations (Hutter 1997). No such finding could be given in this research for all of the people in charge of the ships were both aware, and demonstrated that awareness, of the COLREGs. Furthermore, they were all highly trained professionals who had undergone oral examinations in front of MCA examiners in which lack of knowledge of the COLREGs would have lead to the failure to gain their certificates of competency. The issue of lack of knowledge of the COLREGs was involved in the non-compliance with the COLREGs, but it was due to a belief on the part of the people in charge of the ferries that it was the other person, on the other ship, who did not have the knowledge of the COLREGs. Due to this supposed lack of knowledge, the other ship could not be trusted to follow the COLREGs and keep out of the way.

As identified in chapter 4, the COLREGs have at their centre the principle that one ship should give-way whilst the other stands-on. From this it can be seen that the stand-on vessel is placed in a position of vulnerability as it watches the point of collision come ever closer, whilst waiting for the other ship to take action. Rousseau *et al.* (1998) and Siegrist *et al.* (2003) identified that for trust to be present, the prerequisite was a state of vulnerability in anticipation of a beneficial outcome. This means that for a person to trust another to resolve an issue, they must place themselves in a vulnerable position and this is in itself a risk. From the analysis of the ethnographic interviews it was clear that the respondents would not accept such a state of vulnerability. For them the risk of a collision was simply too great to be, as they saw it, placed in the hands of people who did not know their responsibilities. For the respondents, this would have meant passing control of the situation to the other. Such findings were consistent with previous studies where the actions of two parties need to be co-ordinated and one party is reliant upon the other to resolve the risk. In taking the decision of whether to trust the other the issue of vulnerability was key. If the consequences of the action that the rules are trying to prevent is relatively minor then the level of vulnerability is low. However, where the consequences are high then the vulnerability is also high. Räsänen *et al.* (1999) in their study of bicyclists behaviour identified the personal risk to a cyclist following a collision

with a car as being a key element in the adoption of strategies that would reduce the cyclists reliance on the motorist to resolve the risk. Similarly, the risk faced by the people in charge of the ferries was of such an extent that it could never be allowed to occur for it could result in great loss of life. Therefore, the ferry could never be placed in a position of vulnerability with regard to ships that they did not trust. The people in charge of the ships then adopted strategies to minimise that risk. Furthermore, the perception was that the risk of collision would either increase or not be resolved if the COLREGs were complied with.

In addition to a belief that the other ship lacked the competency to deal with the collision situation, the issue of lack of trust was also based upon previous encounters with ships in the Strait. For the people in charge of the ferries it did not matter that they had not previously personally observed that particular ship before. All of the ships in the Strait were regarded as being unable to follow the COLREGs, therefore, all were perceived as being equally untrustworthy. Furthermore, it has been previously identified that for trust to exist there must also be a concept of shared values or a vested interest in the successful outcome of the endeavour. In the case of other ferries, there was such a belief which resulted in a certain level of what could be termed critical trust (Poortinga and Pidgeon 2003). In this, the respondents did have trust that the other ferry would comply with local custom and practice but dosed with a certain level of scepticism. This critical trust had its basis in the ongoing relationship between the people in charge of the various ferries. In contrast to the ships in transit through the Strait, the other ferries would be met again on a daily basis. This created an ongoing relationship. A belief in future relations, Bennett (1999) argued, ensured a belief that it was in the best interests of each party to comply with the regulations. However, this never resulted in uncritical trust, for the people in charge of the ferries still kept an eye on the actions of the other ferries.

In summary, the process of collision avoidance was seen to be a complicated example of rule following behaviour. Compliance with rules designed to manage a risk were ignored and unilateral action was taken to resolve the risk, due to a lack of trust in the other to comply with those rules. This lack of trust was due to past experience in dealing with

other ships, a lack of belief that the other had the same shared values and a lack of confidence in the abilities and competence of the other. This resulted in a unwillingness to place the ferry in a vulnerable position which would have required the actions of the other to resolve it.

The people in charge of the ferries either did not believe that their actions were in contravention of the rules, as they were taking action before the rules applied, or they sought to justify their actions as consideration for others in order to make the other's life easier, by removing the need for them to take action. The result of the actions was that regardless of the collision situation and the obligations under the COLREGs, the ferry would take unilateral action to resolve the collision risk. The radar data showed the effect of this in an increased margin of safety when compared with overtaking situations. This increased margin of safety is witnessed by the safety record of the cross channel ferry route.

8.1.3 Ex-practitioner research

The role of the ex-practitioner is often neglected in the research process even though many researchers share a biography with those that they are researching. Lofland and Lofland (1995) illustrated this by comparing the biographies of a number of researchers with their research topics. Furthermore, both Beynon (1983) and Wichroski (1997) illustrated the use that can be made of a shared biography with their respondents by facilitating access in order to gain a deeper insight into the subject area. But these are rarities and a gap remains in the methodological literature. I have tried to explore the issues raised by my status as an ex-practitioner in order to fill that gap. Further, as the research progressed it became clear that the issue was integral to the research process. Being an ex-practitioner facilitated access to the sites, assisted in gaining the trust of the respondents, allowed an immediate understanding of the technical and slang language in use onboard ship, and assisted in the gaining of acceptance within the maritime community. All of these factors facilitated a fuller understanding of the reasons behind

the decisions taken by those in charge of the ships. Being an ex-practitioner, I would argue, assisted in the exploration of the research questions. The issue of trust, due to shared backgrounds, was important. Once trust became established between myself and the respondents, the data relating to the decision making process flowed freely.

There were, however, disadvantages to being an ex-practitioner. The first was that of bias in data interpretation, or value inertia as Sadler (2002: 124) termed it. This was combated through the use of mixed research methods and careful analysis utilising the analytical induction method, based upon a process of grounded theory. A second aspect was the emotional risks involved in going back to sea. I became an ex-practitioner because I no longer wished to be a practitioner. In a similar manner to Lankshear (2000) in her research within maternity wards, by returning to sea to undertake this research, I risked raising all the issues which had encouraged my leaving the sea in the first place. Further, due to the issues of revisiting one's own biography, as both Himmelweit (1998) and Lankshear (2000) have argued, fieldwork such as this may be better classified as a form of emotional labour. The third major issue was that of the ethical dimensions brought forward by the aspect of informed consent. Hand in hand with the trust came the responsibility to ensure that the respondents were freely giving their consent to take part in this research. A number of problems occurred when it became apparent that their consent was removed. Therefore, ethical issues were of great relevance throughout this research. For example, were they telling me what they were doing because they thought that they were helping out another seafarer, rather than assisting in a post-graduate research project? It is probable that by being an ex-practitioner obscured the respondents' full understanding of the research process.

It should be noted that I do not claim that only ex-practitioners can undertake valid, empirical research. However, the issues raised by ex-practitioner research as well as research undertaken by researchers who share a biography with their respondents are interesting. This research has illuminated some of those aspects, but it is an area which may warrant a much fuller study.

8.1.4 Summary

This piece of research has produced a range of interesting and diverse findings which have contributed to the discourse on risk, risk management and rule following behaviour. It has involved the bringing together a range of research and analytical methodologies to explore the complicated area of maritime collision avoidance. Further, observations have been made of the ethical and practical problems associated with ex-practitioner research. However, the most important contribution that this research may make is in the realm of the recommendations. It is hoped that a number of these practical recommendations will be acted upon and safety at sea may be improved.

8.2 Recommendations

The findings of this investigation into navigation in the Dover Strait and the operation of the COLREGs warrant a number of recommendations. As I have stated, such recommendations should be practical in their outlook otherwise they will be swiftly ignored.

8.2.1 Review of Ships' Routeing in the Dover Strait

This research has highlighted a number of issues which warrant a review of the Ships' routeing in this area. Such a review is currently being undertaken within the technical committee of the Honourable Company of Master Mariners (HCMM). The HCMM is a city of London livery company whose members are all master mariners and is well placed to undertake this study. I will also be taking a lead role in this review. This review should also be taken up by other interest groups such as the Royal Institute of Navigation and the Nautical Institute, to ensure as wide as possible input into the process. Any outputs from this process should then be submitted to the MCA and put in front of the IMO's sub-committee on the Safety of Navigation.

8.2.2 The efficacy of the stand-on rule

As has been demonstrated, within this geographical area, the stand-on rule is routinely ignored. Thomas (2001) claimed that basing the COLREGs on the concept of give-way versus stand-on vessel, fatally flawed them and increased collision risks. I would advocate a wide consultation and discussion on this subject. If the stand-on rule were removed and all ships were directed to keep out of the way, then the ambiguity would be removed. Such a situation already exists within head-on situations and for the rules relating to collision situations within restricted visibility. Therefore, a consultation process and widespread debate would be necessary in order to ensure that all options are explored.

8.2.3 Sanctions following rule breaking

If the CNIS radar station is designed to deter rule breaking, then the sanctions following rule breaking should be widely disseminated. The current knowledge of the sanctions is limited due to the MCA's policy of only placing details of successful prosecutions. It is recommended that all sanctions following rule breaking should be disseminated to as wide an audience as possible. This should assist with ensuring the deterrent effects that are required for such a surveillance system to operate successfully.

8.2.4 Researcher risk assessment

The issue of the risks faced by researchers, both physical and emotional is an often neglected aspect of research. During the planning stages of the research an assessment of the risks to the researcher should be undertaken. Measures should then be put in place to ensure the reduction of those risks. Such a measure, within the realm of the maritime industry, should include the undertaking of a basic safety at sea course by researchers before they step onboard ship. Other measures would depend upon the situation, but the safety of the researcher should not be compromised.

8.2.5 Future research

I would recommend that there are a number of aspects of this project that should be the subject of further research. These being:

Firstly, the undertaking of comparable research in other parts of the world. This study was necessarily limited to a small geographical area and I made no claims regarding the applicability of the findings to other areas of the world. It would be interesting to ascertain the manner in which the COLREGs are operated in other Straits around the world. For example, such sites could include the Malacca Straits, the Straits of Gibraltar and the Turkish Straits. All of these areas have considerable numbers of ships crossing and in transit through them. Furthermore, they are also covered by radar surveillance. Therefore, it would be interesting to use the same methods as employed in this research in order to explore these findings in those areas.

Secondly, to undertake research on ships following the traffic lanes so as to investigate the actions of those overtaking other ships. Further, light would be thrown on their understanding of the COLREGs with regard to the crossing ferry traffic.

Thirdly, other research incorporating these methods could be undertaken in other transport areas such as on the railways and on flight decks.

Fourthly, the subject of the role of the ex-practitioner is an under researched subject. Many researchers share a biography with those that they are researching and so this must be seen as a subject worthy of further investigation.

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Annex II Interview Guide, Topics.

Previous experience

How long have you worked here

Can you go through the procedure that you utilise to cross the TSS

What are you thinking about when you are putting the rules into practice

How do you view the competence of the people following the TSS

Future of collision avoidance

Future of the rules

Anything that you wish to add.