CREATING SAFETY IN A CONTEXT OF CONFLICTING INTERESTS: THE WATCH OFFICER ON BOARD OF A DUTCH FRIGATE

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ABSTRACT

The watch officer on board of vessels of the Netherlands Royal Navy has to deal with a wide variety of interest during his/her duty.

Despite the wide variety of interests the watch officer has to manage, the amount of incidents and accidents is few. Apparently, the watch officers of the Netherlands Royal Navy are well able to manage this wide variety of interests. The aim of this thesis research was to find out how this could be, how the watch officers apparently are able to create safety in a context of conflicting interests.

To answer the question how the watch officer creates safety in this context of conflicting interests, a case study has been performed on board of one of the frigates of the Netherlands Royal Navy.

During a three-month deployment, a total of six watch officers were interviewed and observed. The data from these interviews and observations was complemented with data gathered through the thorough study of relevant documentation.

A total of one hundred and thirty-eight interests were identified during this thesis research. It is plausible to suggest, from this number, a context of conflicting interest to arise.

What this study points out is that the success of the watch officer in the creation of safety is explained by the fact that he/she uses different strategies, such as the creation of rest on the bridge (by ordering people to be quiet or to leave), the creation of time on the bridge (by maneuvering the ship) and the management of workload in different ways, to manage these conflicting interests.

A finding of particular interest is the fact that these strategies in itself also form part of the interests of the watch officer.

TABLE OF CONTENTS

LIST OF FIGURES & APPENDICES

INTRODUCTION

In the late summer of 2014, during the pre-deployment training of a Dutch Navy frigate a serious incident occurred when the ship was executing flight operations with its ship borne helicopter.

The watch officer ordered the helmsman to turn the ship gradually, to alter course into the wind, to make a relative wind suitable to launch the helicopter. In this turn, while the helicopter was locked on deck, flight crew on board, rotors turning, the roll-limit was exceeded by more than 12 degrees (25 degrees registered, while 12 degrees is the limit). Fortunately nothing happened. However, another possible outcome could have been the loss of a helicopter and in the worst case also the four flight crewmembers on board.

The watch officer on the bridge did not maneuver the ship with the intention to sweep the helicopter off the deck. His/her decision at that time to turn the ship into the wind was made with the intention to create an opportunity to safely launch the helicopter. Taking into regard the prevailing environmental conditions at that time, it was necessary to turn the ship to comply with the SHOL's[1]. These SHOL's prescribe the relative wind, pitch and roll limitations to conduct ship borne helicopter operations (VCZSK ALG 010, 2014).

During his/her duty cycle, a period of four consecutive hours, the watch officer is responsible for the safe navigation of the ship from A to B. This navigational process takes into consideration many facets. In the first place he/she has to make sure that the ship remains clear of shallow waters, so that she does not ground. At the same time he/she has to make sure that the ship remains clear from navigational hazards, i.e., oil-rigs, windmills. Another import facet in the navigational process is the presence of other shipping. In relation to other shipping, the watch officer has to follow the rules of the road, which is comparable to road traffic rules.

Another important factor the watch officer has to deal with is the weather. He/she cannot manage the weather, however he/she has to take into account the limitations depending on the meteorological conditions. For example, in dense fog, he/she has to decrease speed. In heavy seas he/she has to adjust speed so that no structural damage to the ship occurs and he/she orders a prohibition on passage on the outer decks. The weather at the day of the incident was

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[1] Ship Helicopter Operating Limitations

good. However, there was a lot of wind. The preceding days were stormy as well, which resulted in rough seas, on top of the oceanic swell.

The watch officer not only has to manage the navigational process in which he/she has to take into account the limitations depending of the weather. He/she has to manage the mission or exercise schedule as well. No matter what deployment the ship is performing, there is always an extensive exercise schedule that has to be taken into account. Besides the execution of the exercise or mission, the watch officer has to guarantee the timely arrival of the ship in the starting position of this exercise or mission.

On board of Dutch navy vessels there are different departments, i.e., the Executive, Warfare, Logistics and Marine Engineering department. The watch officer on the bridge cooperates with nearly all these departments during his/her duty cycle. He/she has to be informed, or asked for permission by these departments to execute matters that have direct influence on the ship and its safety. Safety for both the ship and its crew. For example, the Marine Engineering department has to ask the watch officer permission to perform maintenance on the radar, because radar is one of the watch officers primary aids on the bridge. The same applies to the Marine Engineering department which is responsible for among others the availability of ships engines and propulsion systems.

The watch officer on the bridge is the junction of all the abovementioned factors: the navigational process, the meteorological conditions, the execution of the mission or exercise schedule, and the interaction between him and the different departments on board of the ship. All these factors, and perhaps even more, create a context of conflicting interests in which the watch officer is key. The watch officer has to manage this context of conflicting interest. Giving priority, in this process, to one interest is often at the expense of others. Therefore it is plausible to say, in case of more than one interest, that the management of a context of conflicting interests potentially can have a negative influence on safety.

Interest, in this study, refer to all those factors that influence the work of the watch officer by confiscating at least part of his/her cognitive capabilities.

Despite this context, the amount of negative outcomes within the Dutch Navy involving the watch officer on the bridge is nearly zero. Apparently the watch officer succeeds in managing this context of conflicting interests. However, as the abovementioned "roll" incident illustrates, he/

she sometimes does not. The question is: How does the watch officer succeed in creating safety in this highly dynamic environment?

Events like aforementioned happen more often, and not only within the Netherlands Royal Navy. In September 2013, two flight crewmembers of a helicopter on board of the USS William P. Lawrence lost their lives, when their helicopter was hit by large wave due to excessive roll of the ship (Beardsley, 2014).

Safety

The watch officer on the bridge creates safety in a context of conflicting interests. There is a wide variety of literature available in relation to the notion of safety and when thinking about safety most people have a pretty good idea of its definition.

However, common understandings and definitions of safety found in literature, e.g. "…freedom from unacceptable risk" (Hollnagel, 2011, p. XXIX) and "…the ability of individuals or organizations to deal with risks and hazards so as to avoid damage or losses and yet still achieve their goals" (Reason, 2000, p. 5), make clear that the focus on safety is mostly done by looking at adverse events. Adverse events in relation to this are losses, incidents and in the worst case accidents.

When the only focus is on adverse events, one important aspect is omitted. That the fact that these adverse events seldom happen and that most of the time, operations are being completed successfully. There is far more information available of these successful and uneventful events, of uneventful daily operations. People should take into consideration this valuable source of information. The focus should be both on adverse events and successful operations. After all, safety is an emergent property of the system or how Hollnagel and Woods put it "…safety shows itself only by the events that do not happen!" (2006, p. 6).

This focus on what goes right is underscored by Hollnagel (2014). Hollnagel distinguishes two types of safety, which he called Safety-I and Safety-II, which are respectively the old and the new way of safety thinking. While Safety-I focused on incidents and accidents and on making sure that nothing goes wrong, the focus of Safety-II is to make sure that as much as possible goes right. Therefore Safety-II focuses on both what goes wrong as well as what goes right. The idea is not to wait until adverse event happen. On the contrary, the focus is on the operator at the

sharp end, and the necessary minor adjustments in e.g. performance and procedures he/she makes which lead to successful outcomes.

After all, Amalberti refers to the fact that the human operator at the sharp end is nearly always involved in accidents and that this human is often being pointed at as human cause. However, more important is the above-mentioned focus on successful operations This success is according to Amalberti to a large extent thanks to the "…astonishing cognitive abilities of the operator" (2013, p. 43).

Resilience Engineering & High Reliability Theory

To build a theoretical framework for this thesis, reference is first made to Resilience Engineering (RE) followed by High Reliability Theory (HRT) (Hollnagel, 2011; LaPorte & Consolini, 1991). Although both theories originate from different periods, they offer the ability to explain the remarkable safety records of complex organizations. RE furthermore offers insight in the management of conflicting interests in relation to safety. This insight is not offered by HRT. Nevertheless, because of its association with the organization of modern navies, HRT offers a means to describe the organizational context of the watch officer's work environment. Therefore, HRT is a very useful framework to study the watch officer's context of conflicting interests.

In analogy with Hollnagel's Safety-II, Resilience Engineering (RE) focuses on both failures and successes at the same time. This focus on failures and successes to elaborate on the notion of safety is what the Resilience Engineering (RE) theorists see as two sides of the same coin. In their opinion, safety is defined by the ability of the system to adapt to and succeed under changing conditions (Hollnagel, 2011). The result of both positive as negative outcomes is the result of normal people doing normal work within these complex systems. Normal work means that the actions people take in normal work are made with good intentions and are expected to lead to good outcomes. People working within these complex systems have to cope with its unpredictable interactions between the different elements. They mostly succeed, however not always (Hollnagel, 2011).

For a system to be resilient, according to Hollnagel (2011), four necessarily abilities of this system must be in place: the ability to respond to events, the ability to monitor ongoing events, the ability to anticipate future threats and the ability to learn from past failures, and successes. The ability to respond to events refers to knowing what to do in case of actual disruptions by for instance preplanned responses laid down in standard operating procedures. The ability to

monitor is about looking for that which may become a threat in future. Anticipating future threats is knowing what to expect. On board this is attempted by, for example, planning meetings in which the most likely and the most dangerous course of action is assessed. Finally, the ability to learn from past failures and successes makes sure lessons learned from experience are implemented. With regard to the latter, the watch officer commences his/her on board career as a second watch officer. In this teaching practice period on board, he/she acts under supervision of an experienced watch officer, who is his teacher and coach. When the navigation officer and the CO consider the second watch officer to be sufficient skilled to run his/her duty cycle solo, he/she receives the status of watch officer. From that moment the watch officer acts as a teacher himself/herself when a second watch officer is assigned to him/her. In the meantime the watch officer has to train to himself/herself in order to qualify for next higher posts, e.g. navigation officer.

High Reliability Theory (HRT) researchers have studied organizations having remarkable safety statistics, having nearly failure-free operations (LaPorte & Consolini, 1991). Rochlin, La Porte and Roberts (1987) performed a study within the US Navy, in which aircraft carrier operations at sea is described, being an example of a self-designing High Reliability Organization (HRO). Being a member of a "Navy" organization, the watch officer on the bridge, and his/her creation of safety can be linked to this article. The success of these operations, having an almost zero rate of accidents, is due to four by Rochlin et al. (1987) identified factors, namely self-design and self-replication, the paradox of high turnover, authority overlays and redundancy. In the next paragraph these factors are briefly described, followed by a linkage of these factors to the abilities of a system to be resilient.

Self-design and self-replication is the ability of the organizational structure to adapt in time, depending on the ever changing demands of the situation. The paradox of high turnover is because, despite high turnover rates of crewmembers and the accompanied loss of skilled and experienced people, there is an on board climate of teaching and training, in which nearly all crewmembers are teacher and trainee at the same time and in which there is a constant incentive for acquisition and improvement of skills. The authority overlays within the organization guarantee that each crewmember has the authority to suspend operations in which safety is compromised. Finally, redundancy in the organization is the ability to execute a task in case of failure of a critical component (Rochlin et al., 1987).

Self-design and self-replication and the paradox of high turnover both are factors according to Rochlin et al. (1987) in which learning is key. Self-design and self-replication is due to the fact that almost everything is learned on the job, and the paradox of high turnover creates on board the atmosphere of a gigantic school of on the job learning and training. This focus on learning overlaps the necessary ability from RE to be able to learn from past failures and successes.

The paradox of high turnover results in a ships environment which is never stable, which keeps the employees vigilant, and therefore can have a positive influence on three of the by RE identified necessary abilities of a system to be resilient: the response to events, monitoring of ongoing events and even the ability to anticipate future threats.

The factor of authority overlays, the fact that during flight operations the steep hierarchical organizations transforms to a relatively flat and collegial organizations, and the factor redundancy, i.e., cross-familiarity with each others jobs and duplication/overlap of tasks, are overlapping the RE ability of being able to respond to events.

From the abovementioned can be concluded that RE covers all the by HRT identified organizational factors that lead to safe operations. This is acknowledged by Hopkins (2014) who argues that, although RE is newer than HRT, RE does not go beyond HRT.

The preceding paragraphs furthermore make clear, from both a RE and a HRT perspective, which systems abilities or factors of a system must be in place to achieve remarkably safety records. These are the organization's ability to monitor and respond to events, to anticipate future threats, to reconfigure the organizational structure during demanding situations, redundancy and the ability to learn from failures and successes.

In relation to a navy ship: the safest option is to remain moored in port. It needs little imagination to see that this is simply no option.

Conflicting interests

Safety, despite the fact that it may have the highest priority, is never the only interest when people perform their regular work. They often have to make choices between conflicting interests. This is due to the fact that in regular work people have to focus on several interests at the same time. In case of multiple interests, too much focus on one interest, is often at the expense of others.

The context of conflicting interests of the watch officer is outlined in the introduction above. Having the navigational process as a primary interests, he/she has to manage this process within the current meteorological conditions, the mission or exercise schedule and the interests of the different departments on board of the ship. In this continuous process of conflicting interests he/she is in charge of the people on the bridge, consisting of a helmsman, one or two sailors acting as lookouts, and one or two sailors doing the communications with external units. Besides this, he/she has direct links with the Commanding Officer (CO) of the ship, the Principle Warfare Officer (PWO) on duty in the Operations Room, technicians in the Ship Control Centre, the people in charge of the seamanship department and more.

Hollnagel, one of the founders of RE, described the management of efficiency and thoroughness as a process of continuous balancing on a scale. This process is labeled the Efficiency-Thoroughness Trade-off (ETTO) (Hollnagel, 2009). People have to choose between efficiency and thoroughness. When people choose for efficiency, people are risking to make decisions too early, when not all necessary conditions are met. Choosing for thoroughness, may result in being too late, missing critical time windows. Choosing both at the same time is rarely possible. The watch officer on the bridge is continuously attempting to manage this balancing process. When the watch officer chooses, for instance, the safe navigation of the ship being the only concern, this implies he/she is choosing for thoroughness. Doing so underexposes, however, all other interest he/she has to manage. Choosing for efficiency on the other hand implies that he/she underexposes the navigational process and thereby the safety of the whole ship. To omit to have to choose for either extreme, between thoroughness or efficiency, he/she is continuously attempting to balance both. This is represented in Figure 1. The fact that this continuous balancing process is acknowledged by RE legitimates the use of RE as a theoretical framework.
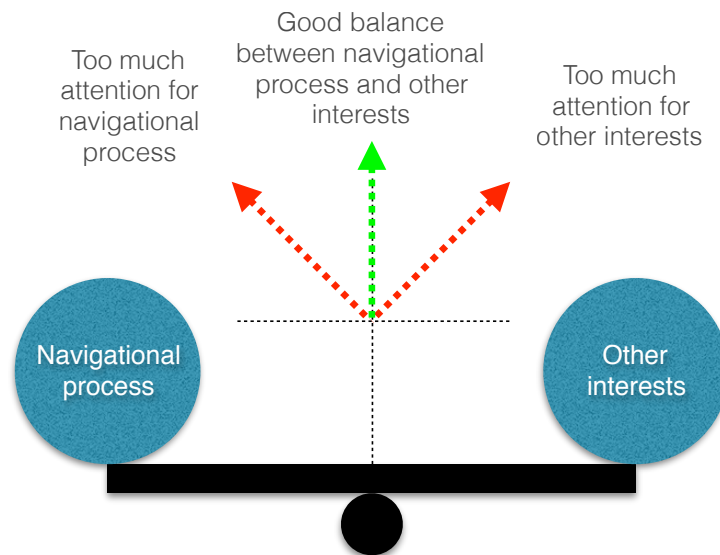
Figure 1: *Balancing the navigational process with other interests*

Tjørhom and Aase (2011) argue that balancing or handling multiple goals involves both downward (macro-level) and upward (micro-level) resilience. The downward resilience is according to Tjørhom and Aase (2011) "…macro-level directions [at a strategic level] and solutions [that] prepare for resilience through clear goal structures, infrastructure and procedures that handle the trade-offs between safety and efficiency" (p. 157). Absence of these directions create poor conditions for resilient operations for those people working at the sharp end. "Upward resilience means that decisions made at the micro level in a system reflect a commitment to safety in case of goal conflicts" (Tjørhom and Aase, 2011, p. 157). This commitment to safety becomes apparent when people at the sharp dare to make sacrifice decisions, e.g. decisions that sacrifice production at the expense of safety. Using their experience, flexibility and professionalism they dare to make these sacrifice decisions to adapt to changing situations, in which there is a gap between the formal (written) procedures and how actual work is accomplished.

From the abovementioned follows that there is scientific literature available of the role between RE and conflicting interests. When searching literature in scientific databases, e.g. using LUB search, Scopus or Web of Science, using keywords "HRT" or "High Reliability Theory" and "conflicting goals" or "goal conflicts" yields hardly any results. However, what HRT does offer is a useful framework to describe the organizational context of conflicting interests of the watch officers working environment and to be able to explain why he/she succeeds or not in the creation of safety within this context.

Research question

The watch officer on the bridge, being part of a highly dynamic environment, succeeds most of the time in creating safety in a context of conflicting interests. The aim of this thesis it to develop our understanding of how he/she succeeds in doing this and why is it that he/she does not and incidents or accidents do happen.

Are these incidents the by-product of normal work (Hollnagel, 2011), are these accidents preventable? Why does the watch officer succeed in creating safety? And why does he/she sometimes fail? These questions lie at the foundation of the research question:

How does the watch officer create safety in a context of conflicting interests?

Gaining a better understanding of the watch officer's context of conflicting interests, and implementing these insights, can contribute to an ever higher level of safety.

METHOD

This qualitative fieldwork research was performed to a large extend on board of a Navy ship, from the end of April until the beginning of August 2015. During this period of three months, the ship participated in a Standing NATO[2] Maritime Group (SNMG). This SNMG deployment, was besides being a NATO response force, the exquisite opportunity to exercise with different NATO and other allied partners. This "moving" exercise group, consisted of multiple ships and aircraft, navigated in three months throughout Europe. The extensive exercise schedule created multiple opportunities that placed the six watch officers on the bridge in a context of conflicting interests.

This research was conducted as a case study. A case study reveals context-dependent knowledge and experience. This was particularly useful in this thesis in which the watch officer and the context of conflicting interests was investigated. The focus on one subject, on a single ship, makes the case study, as Blaxter, Hughes and Tight (2006) put it, "ideally suited to the needs and resources of the small-scale researcher". It is the case study that offers intimate experiences and case study depended nuances (Flyvbjerg, 2006).

Because the researcher was an insider on board of the ship, which will be outlined below, the research approach for this thesis can best be labeled inductive, emic (Tracey, 2013). This inside-outside approach, i.e., trying to place oneself in the shoes of the person being studied, offers the best understanding with regard to the context specific situations (Dekker, 2014; Tracey, 2013). In the case of the watch officer, it offered therefore the best understanding to investigate the context of conflicting interest on the bridge.

Data collection

During the three-month period on board, in order to gather relevant data, the researcher focused on the six watch officers on the bridge. Therefore he used multiple ethnographic data-gathering methods, i.e., semi-structured interviews, observations and the analysis of documentation, which will be outlined below (Forsythe, 1999).

The semi-structured interview was the primary research method for this thesis. Using semi-structured interviews, gives the researcher more guidance, compared to unstructured interviews, during the interview and during the process of interview transcription and the resulting

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[2] North Atlantic Treaty Organization

comparison and integration of the transcripts (Rowley, 2012; Tracey, 2013). Despite the guidance, the semi-structured interview still offers the researcher and the interviewees the freedom to adjust the interview when deemed necessary. When compared to questionnaires, interviews offer the researcher more detail and insight and they give the researcher the necessary flexibility to zoom in on relevant topics, to gain in-depth understanding (Rowley, 2012). Therefore the semi-structured interview offered the best method for this thesis to get context dependent information. The focus in the interviews was on the identification of conflicting interests and more specifically on how the watch officer attempts to manage all these interests (the interview set-up is included in Appendix A). When necessary, further questioning was easily facilitated because the participants were on board during the whole deployment (Tracey, 2013). The average length of each interview was 45 minutes.

The interviews were recorded, as a result of which the researcher could focus completely on the semi-structured interview itself. The recorded data was then transcribed and coded. This coding was performed in two cycles, i.e., the primary-cycle and the secondary-cycle coding process. Both cycles were performed using the computer, making use of Microsoft® Word and Excel. In the primary-cycle coding process, the researcher identified all the interests mentioned by the interviewees. To provide more insight into the data, these interests were then subject to the secondary-cycle coding process, in which the identified interests were grouped into more general labels (the codebook is included in Appendix B). These two coding cycles helped in the process of synthesizing, of making sense of the data, and in drawing conclusions.

Participant observation was used as a secondary method of research. Therefore the watch officer on the bridge was observed by the participant observer, especially during peak-periods, e.g. during the approach to port and during a maneuvering exercise involving other NATO ships. It was expected that these periods would produce the largest number of conflicting interests. The participant observer observed the watch officer with regard to the four identified groups, i.e., the navigational process, the meteorological conditions, the execution of the mission or exercise schedule, and the interaction between him and the different departments on board of the ship, which resulted in a context of conflicting interests and how the watch officer managed these. Data gathered from observations for this thesis provided the researcher with a means to measure the completeness of the data gathered by the semi-structured interviews (Becker & Geer, 1957, p. 28). By observing the watch officer on the bridge the researcher was able to observe what took place in the real, often complex, work environment of the watch officer. These observations varied in duration between 60 and 90 minutes.

Data from participant observations was written down in raw records and/or headnotes an afterwards drawn up in typed fieldnotes. These fieldnotes were also subject to the abovementioned coding process (Tracy, 2013).

The third method contained the study of relevant documents, which were unclassified and accessible to the researcher. Data gathered from this method contained information from different sources, i.e., rules, regulations and standard operating procedures. In addition to this, the study of documentation offered the opportunity to gain insight into the gap between formal (written) work and work in practice.

The data from the study of documentation, the data from observations likewise, served to triangulate data gathered from the semi-structured interviews. (Blaxter et al., 2006). In the process of triangulation, in order to verify the validity of the data, the researcher checked the identified interests form the interviews against interests identified from the observations and the study of relevant documents.

Ethical considerations

This data collection process was highly dependent on the authorization by the higher command on board. Before the commencement of the deployment, the researcher had asked the CO of the ship permission to conduct this thesis research. In result of this, the CO of the ship granted full cooperation. Despite the CO's authorization, the CO was not involved in the research and therefore has not influenced the data collection process.

Due to the fact that there were only six watch officers on board of the ship, there was no process of sampling and selection for this thesis. To put it briefly, every watch officer on board of the ship participated in this research.

Because of the small number of interviewees, the relatively small size of the Dutch navy the anonymity of the interviewees on board was not easy to guarantee. However, the researcher processed all data such that it is not traceable to the individual watch officer. This resulted in the fact that the watch officers were cooperative in the data gathering process. This was furthermore strengthened by the fact that the researcher was completely independent of them.

The researcher for this study has worked within the Dutch Navy since 1996 and has been a watch officer in the past. During this thesis research he was employed on the ship as a ship borne pilot.

All this offered him the pre-eminent opportunity for this inside-outside or emic research approach. The experience as both watch officer and pilot, provided him with expert knowledge in shipping and aviation, of among others knowledge of rules, regulations, standard operating procedures within both the organization on board and on shore. Besides that, it makes him an expert in understanding the life on board of a ship of the Netherlands Royal Navy.

Having expert knowledge and doing research within your own organization can have positive and negative side-effects on research (Blaxter, 2010). Easy access to information, insider knowledge, easier in-depth research are examples of positive effects. It is this insider knowledge, on the other hand, which may hamper the ability of the researcher to see new points of view and which may result that he/she overlooks the significance of what seems to be obvious. Having insider knowledge could thus result in a biased researcher. A first step to overcome these negative side-effects is making the researcher aware of their existence. In this research also, it has been attempted all the time, to aim for this awareness, and to consciously consider each finding for how the own background could have influenced this finding.

RESULTS

This section successively describes the results from the interviews, the observations and the thorough study of relevant documentation. Following this the main interests of the watch officer found in this study are identified and represented. The section concludes with the strategies used by the watch officer in the management of conflicting interests.

Before we continue it needs to be addressed that the results include the four by the researcher identified interests mentioned in the introduction, which were based on his personal experience as watch officer. These were the navigational process, the meteorological conditions, the execution of exercises or the mission, and the interaction between the watch officer and the different departments on board. However, as follows from the results, except from the navigational process, the other three interests are part of a larger main interest. The meteorological conditions are part of the main interest *external interests*, the execution of exercises or the mission is part of the main interests *internal interests* and *external interests*, and the interaction between the watch officer and the different departments on board is part of the *internal interests*.

Results from interviews

Data from the interviews suggest that the watch officer is influenced by a total of one hundred and thirty-eight interests. These interests have been identified after the transcribing and first-order coding process of the interviews. An overview of interests is represented in Appendix C. After the first-order coding process of the interviews, the one hundred and thirty-eight interests were put trough a secondary-order coding process, which resulted in a total of eleven main interests. These main interests are described below.

Navigation

Navigation and the navigational process, to put it briefly, covers the process of sailing the ship according to schedule from a to b, without colliding to any hazard, i.e., sandbanks, buoys, oil rigs and other shipping. This process is considered by those interviewed to be the watch officer's most important interest. The watch officer therefore has to manage among all the other things the interest of knowing the exact position of the ship. He/she has to maintain the right fix interval, i.e., plotting the ship's position at a regular time interval on the navigational map. The closer the ship's position to shallow waters, the shorter the fix interval will be. He/she has to monitor the speed of advance, i.e., the speed necessary to arrive on time at the destination. He/

she has to take into account the relative position of other shipping by using radar or looking outside. One of the interviewees puts it like this:

> *"In fact the three major procedures on the bridge are navigation, so knowing where you are. Track control, where are you with regard to the planning and the anti-collision plot, where is other shipping and how do they interact with each other. Those are the three basic procedures."* (Interview 1, 17-06-2015)

External interests

The external interests contains all interests with regard to the environment of the ship which influence the watch officer during his/her duty and which he/she has to take into account. An example of an external interest are the ever changing external circumstances of the watch officer, which implies that he/she is working in a dynamic environment. One of the watch officers puts it like this:

> *"However, where you work, occupied with ever changing circumstances, you run the risk of making errors."* (Interview 1, 17-06-2015)

The meteorological conditions are another example of external interests. This is acknowledged by five out of six watch officers being interviewed. The meteorological conditions differ significantly between locations on earth and change with the seasons. In rough seas for example, the watch officer can prevent structural damage to the ship by adjusting course and/or speed. A change in course and/or speed in these conditions can also have a positive influence on the ship's crew comfort. Two of the interviewees explain it as follows:

> *"In other more northerly areas, like the North Sea, you are more occupied with it. Then the swell is of paramount importance. It has to be bearable inside of the ship."* (Interview 3, 21-06-2015)
> *"Yes. I think the weather is more important than one initially assesses. In case of bad weather, it has a considerable impact on yourself and your team."* (Interview 1, 17-06-2015)

Internal interests

The internal interests include those interests the watch officer has to take into account which unfold inside the ship, factors between the ship and the bridge, and are not covered by one of the other main interests. Most striking on the bridge is the fact that the watch officer is involved in many different processes on board. This involvement automatically results in the necessity for him/her to be informed. Therefore there is a lot of communication on the bridge by several means, e.g. phone calls, people entering the bridge to inform the watch officer and calls made via voice terminals. Although this communication can be very distracting during busy periods, periods in which the watch officer has to manage many different interests, it contains

information which is of importance for the watch officer to carry out his/her duty. On the other hand there is a lot of communication which creates unnecessary noise, e.g. chitchats between individual crewmen on duty or even chitchats between spectators on the bridge. This noise is distracting for the watch officer in the execution of his/her duty, especially during peak-periods. It is not uncommon for the watch officer to order spectators to leave the bridge or to ask people to stop their chitchat and to pay attention to their duty.

> *"I have other things on my mind. In the meantime standing with a phone in my hands. On a busy day everyone is well aware of this, but on a quiet day it creates an extra factor of noise, by the rest of the ship which is not or only partly involved in what we are doing with the ship."* (Interview 2, 19-06-2015)

Another example of internal interests, mentioned by all interviewees, is the interaction with the different departments during their watch. These different departments, i.e., the Executive, Warfare, Logistics and Marine Engineering department, all have their own interests. For example, as described in the introduction, the Marine Engineering department has to ask the watch officer permission to perform maintenance on the radar, because radar is one of the watch officers primary aids on the bridge. The same applies to the Marine Engineering department which is responsible for among others the availability of ships engines and propulsion systems. The Marine Engineering department cannot decide to perform maintenance on one of the engines, without informing the watch officer, because the watch officer is dependent on the availability of these engines. The weekly program for each separate department, and so the possible interaction of these departments with the work of the watch officer, is often scheduled in the weekly practice program. The watch officer can take this interaction into account before commencing his/her duty, so he/she is well prepared for possible conflicting interests. However, these departments also interact with the watch officer on the bridge on an ad hoc basis. In that case the watch officer has to deal with this interaction by surprise. This is explained by one of the interviewees:

> *"…what happens on a regular basis when under way ,is that at once someone is sitting on the canon. Weapon engineers who are executing their job over there. We have agreements for this, guys, not on the canon. If you have to work on the canon, give a call so I know that I cannot turn hard."* (Interview 2, 19-06-2015)

Team management

For the proper performance of his duty the watch officer is always assisted by other crew members in his/her team. Their number is depending on the (exercise)program. The assisting crewmen, e.g. yeomen, look-outs and a helmsman, are directed by the watch officer depending of what the watch officer deems necessary at that moment. In general it can be said that the watch officer, because he/she is in charge on the bridge, coordinates for the other team members what to do. In other words, the watch officer in his/her role is occupied with the management of his team, team management. This interest is a continuous effort.

> *"We have a helmsman and look-out. If they perform well, they can improve your situational awareness. If they perform well, then you will be aware which shipping is the most import. We also have the yeoman, who can do the   external communication in case you are busy. You really need your crew on the bridge."* (Interview 4, 22-06-2015)

Procedures

The watch officer has to adhere to a lot of different procedures, some of which are described below. These are laid down in checklists, rules and orders. On the bridge there are two different types of checklists. The routine checklist, which covers routine procedures such as the approach to port, anchoring and flight operations, while the emergency checklist covers all the in advance identified emergency procedures, e.g. man overboard and machinery breakdown drills. Furthermore he/she has to comply with the rules of the road when sailing the ship, and when participating in an exercise or mission he/she has to adhere to the Operation Order (OPORD) in the meantime. Besides that he/she has to follow the orders issued by the CO, in which the CO sets certain margins and limitations and in which he/she prescribes when the watch officer needs to warn him.

> *"The commanding officer has set margins and he did not set those without a reason."* (Interview 4, 22-06-2015)

> *"And then the prescribed procedure was not even followed."* (Interview 6, 23-06-2015)

Organization

The ship's organization sometimes puts the watch officer in situations in which he/she has to manage additional interests, e.g. compliance with direct orders from the CCO or CO. For example, the watch officer is practically never following a fixed plan. On the contrary, plans are often adjusted by the CCO or CO which implies that they change previous orders or they order

the watch officer to perform additional tasks. One of the interviewees puts it like this:

> *"I have to make sure we arrive in time in the position where we have to be, but I'm not in charge of the exercises. In the end I just have to execute what is ordered from below. Or from above."* (Interview 2, 19-06-2015)

Learning and teaching

Learning and teaching is a red thread throughout the interviews and is therefore identified as an important interest the watch officer has to manage. Learning and teaching is omnipresent on board of vessels of the Netherlands Royal Navy and so it is in the work of the watch officer. The watch officer embarks the ship as a second watch officer during a teaching practice period. During this period he/she is added to an experienced watch officer to learn on the job and eventually to become a watch officer himself/herself. Once he/she is a watch officer he/she teaches new second watch officers and in the meantime he/she gains experience and continues learning in order to make an on board career with the ultimate goal of becoming a CO once. Besides learning and teaching this interest of learning and teaching also manifests itself by supervision, coaching, briefing/de-briefing and not in the latest place the training program and the accompanied exercises.

> *"I have the idea, having a second watch officer added now, that I can transfer knowledge of what I am doing on the bridge and the way how we work. I like it to teach people something."* (Interview 4, 22-06-2015)

Human performance, working ahead, workload management, managing conflicting interests

So far, navigation, external and internal interests, team management, procedures, organization, and learning and teaching have been mentioned. During the study a few more interests have been identified that some would perhaps not regard as interests. However, because of the fact the watch officer has to pay attention to each of them when they arise, these have been taken up here as an interest for the watch officer to respond on and to spend resources on. These interests include human performance, working ahead, workload management and also the management of all the conflicting interests themselves. In the next paragraphs these interests are further described.

The label *human performance* contains factors that influence the individual performance of the watch officer, like leadership style, limitations set by the watch officer himself, can-do mentality, mindfulness, fatigue and many more. Although these interests are not so much goals to achieve (like the interests mentioned so far), they have to be taken into account during the duty cycle on

the bridge. For example, the watch officer has to determine, depending of the situation, which leadership style to use with regard to the management of his/her team. Or he/she is experiencing the pressure of the can-do mentality, which means that he/she tries to accomplish as many concurrent tasks as possible. However, in fact he/she probably knows that it would be better to bring certain tasks to a stop. Or it would be better to ask for help, so the accompanying workload remains manageable. As one of the interviewees puts it:

> *"However, in the end it is always attempted to execute the exercise program…"* (Interview 1, 17-06-2015)

Working ahead is an interest that deals with planning ahead and preparation of duty. During the interviews five out of six watch officers referred to these interests.

> *" Yes, in advance we check the program and then we assess how many persons we have. When we have a replenishment at sea, then we make a sort of manning schedule, a devision of responsibilities. "* (Interview 2, 19-06-2015)

An ongoing process on the bridge is the management of workload. *Workload management* is an interest in which the help of other colleagues dominates. All interviewees refer to the dependence of this support.

> *"…that we ask for support ourselves and inform the higher command, so our workload decreases when the support is offered and we can fulfill our task."* (Interview 1, 17-06-2015)
>
> *"…and when I do not have support, ask for support."* (Interview 2, 19-06-2015)

The final interest identified in this study is the *management of conflicting interests* itself. This is identified as a separate interest because the watch officer is frequently involved in conflicting interest. The management of this takes cognitive capacity which may be at the expense of other interests. The management of conflicting interests can be done for example by the management of workload or by prioritizing. One of the watch officers puts it like this:

> *"And if the workload is getting to high, then you have to bring the less important interests to a halt, or you have to make sure that someone else does it for you."* (Interview 1, 17-06-2015)

Results from observations

Data from the observations do not reveal any interests that were not already identified by the data from interviews. Nevertheless, the data from observations do confirm the results from the interviews. So as to illustrate the complexity and dynamics of the work of the watch officer on board of the ship, an episode from one of the observations is included.

Episode from observations

This episode is from the observation of the approach to the port of Rota, Spain. During this approach to port the navigation officer was present at the bridge, which is a standard operating procedure, to coach the watch officer when necessary. The observation was made on the 26th of June 2015, from 08:00 till 10:00. The episode below contains data from 08:20 till 08:36.

08:20, the watch officer gives the helmsman the orders to reduce the ship's speed. 08:22, the watch officer receives a phone call. At the same time a radar alarm. Afterwards he is calculating the speed of advance to be in time in the pilot station. 08:25, The watch officer receives a phone call about the expected time of arrival in the pilot station. The navigation officer asks the watch officer if he has already started the checklist for approaches to port. The watch officer answers "no", "why should I, we are still more than one hour before arriving in the pilot station". The navigation officer coaches the watch officer, that he has to plan ahead, and that it is normal practice, to start doing checklist in an earlier stage, so you will not be surprised later on. At the same time a communication check is performed, audible on the bridge. 08:26, the watch officer asks the second watch officer to phone call the engine control room and to tell them to be ready for the approach to port at 09:00 local time. 08:28, the flight unit reports by phone that the helicopter is standing outside on the deck with chains attached. The navigation officer asks the watch officer "what is the water depth?". This was a hint to the watch officer to adjust the brightness of the depth sounder's display. 08:30, the helmsman asks to leave the bridge to get a bottle of water. The lookout reports fishing vessels and the watch officer answers him to keep a good lookout in that specific direction. 08:32, the watch officer asks the navigation officer why he had to start with the checklist in such an early stage. The navigation officer explains this. His message to the watch officer is to plan ahead, especially because of the uncertain expected approach time of mooring in port. 08:35, the lookout reports a helicopter. 08:36, the navigation officer tells the lookout not to chitchat, and that he has to look out of the window.

Key findings from observations

The four observations resulted in the following key findings:

• In circumstances when spectators were allowed to enter the bridge, they entered the bridge on and off, while having no function to fulfill at that moment. This happened continuously and resulted in noise on the bridge.

- When two or more people were standing next to each other on the bridge, they nearly all started chitchatting. This resulted in noise on the bridge.

- There are many lines of communication between the watch officer and his/her team on the bridge, the operations room, the engine control room, and the rest of the ship. Besides many lines of communication there are many means of communication on the bridge, e.g. five telephones, six voice terminals, different VHF-radio sets.

- In advance of the maneuvering exercise, a DOR-list (division of responsibility) was made, and no spectators were allowed to enter the bridge. During the exercise there was a serene atmosphere on the bridge. The watch officer was very well supported by his/her team.

- The navigation officer coached the watch officer during the approach to Rota and the departure from Istanbul when necessary. This is an example of how learning (the watch officer) and teaching (by the navigation officer) is present on the bridge.

- The seastate on the day of the observation of the flying exercise was high. The fact that this seastate could hamper flight operations, because of the potentiality of the ship to exceed the pitch and roll limitations for flight operations in high seas, was recognized by the navigation officer (together with the watch officer). Recognizing this possibility is part of experience. Taking into consideration the meteorological conditions, and the resulting seastate in this case, is a continuously present interest for the watch officer to take into account.

Results from documents

The job description of the watch officer on board of HNLMS Tromp is described in the Permanente Order Commandant *(2015)*. This document is primarily based on three publications, which contain regulations, issued by the Netherlands Royal Navy. These are respectively the VCZSK DOPS NLMF STC number 161, 168 and 170.2.

Because the work of the watch officer is described in these documents, a study of this documentation was performed in order to triangulate data gathered from the semi-structured interviews. (Blaxter et al., 2006). These documents provide an important context to the work of the watch officer on the bridge. The study of the documents does, however, not reveal any new interests, which were not already identified by the data from interviews and observations.

Orders set by the commanding officer

The Permanente Order Commandant (2015) is an internal order of the ship, issued by the CO of the ship, which all the officers of the Warfare Department have to sign, for having seen and understood what the CO expects from his/her watch officers.

The CO issues in the document Permanente Order Commandant (2015) firm guidelines for the watch officer to adhere to. The document describes the responsibilities of the watch officer, a diversity of specific orders and guidance how to execute the duty cycle. At the end of the document the CO issues specific guidelines concerning the instances the watch officer must warn him. Furthermore the CO states that when the watch officer is on doubt he/she must inform the CO.

Part of the expectancy of the CO with regard to the execution of the duty is planning ahead in order to anticipate.

Regulations with regard to certificates, authorities and competencies

VCZSK DOPS NLMF STC 161 (2015) contains regulations with regard to certificates, authorities and competencies. It describes the authorities, the assignment requirements and the requirements with regard to the contents of the ZWST-A. Part of the assignment requirements paragraph are the validity and the recurrence requirements in case of discontinuity in days at sea. The document does not describe what the watch officer should do in case of conflicting interests. However, it describes that he/she must be able to deal with certain emergency

situations, e.g. machinery breakdown drills, man overboard, fire and the actions to take after a collision at sea.

Documents for the operational management of navigation

The document VCZSK DOPS NLMF STC 168 (2015) describes the operational management of navigation on board of ships of the Netherlands Royal Navy. In addition to this, the document covers additional items, such as Crew Resource Management (CRM, which stresses the importance of mutual cooperation within teams), maneuvering the ship, the Standing Orders of the CO, passage prohibits, and duties plus responsibilities of the watch officer. The document furthermore describes the responsibility of the navigation officer to formulate the Division of Responsibilities (DOR), description of the three steps in the process of navigation (actual position, track control and shipping). With regard to the execution of navigation, distinction is made between four navigational circumstances, sailing at open seas, sailing in coastal waters, sailing narrow waters and sailing in inshore waters. Depending which circumstance is applicable the document prescribes how to navigate, what fix interval to use, to pay extra attention to other shipping, the manning of the bridge, the technical readiness state of the ship, etc. The document describes the importance of training the watch officers by the CO and the navigation officer, in which both the CO and the navigation officer can act as coach. Although the document does not describe the actions the watch officer has to take in case of conflicting interests, it does state that the exercise is always subordinate to sailing safely. During exercises workload can increase significantly and therefore prioritizing and assistance of others are of vital importance.

Documents for the organization of management of larger vessels

VCZSK DOPS NLMF STC 170.2 (2015) describes the organization of management of larger vessels within the Netherland Royal Navy, which HNLMS Tromp is. Although the document does not clearly describe the CO's final responsibility, it describes the by him/her delegated responsibility to the watch officer, namely the responsibility for the safe maneuvering and navigating of the ship. In addition to this it describes the primary concern of the watch officer, namely the safety of the ship and its crew. Furthermore the document describes that the CO is responsible for the execution of on board education and training and that he/she has to make available sufficient training coaches, training means and training time. The document concludes with a paragraph which prescribes when the watch officer has to inform the CO. For example:

- In case of a special circumstance when the watch officer deems it necessary or advisable.
- When the watch officer anticipates the development of an unsafe situation for the ship and its crew, or when he/she is in doubt regarding this.

The watch officer's main interests

The eleven main interests influencing the watch officer on the bridge are represented in Figure 2. Because the main interests of navigation is considered to be the most important interest of the watch officer, it has a different color.
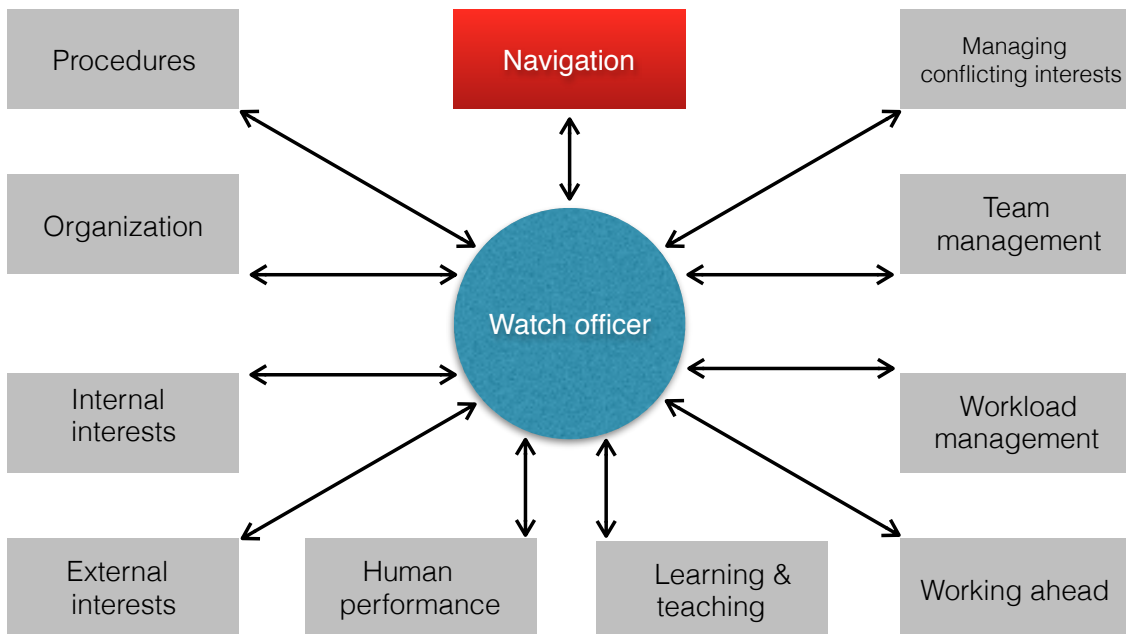
Figure 2: *Interests influencing the watch officer on the bridge*

Strategies used in the management of conflicting interests

Because the management of the different interests often goes unnoticed the interviewees have been explicitly asked after their strategies to manage these interest. In this way it was possible to gain some understanding on the nature of these management strategies and the resources and capacities that are needed for it. The list below that followed from this suggests above all, from the complexity that the management of interests apparently necessitates, that the management of interests was righteously defined as a separate interest among the others. These strategies are:

• **Creating rest**. The watch officer creates rest by dismissing people on the bridge who are not on duty and by being directive to the remaining team members on the bridge. By creating rest the amount of noise decreases which makes that the crew is better able to focus on their assigned tasks and will be less quickly distracted from it.

  "The first step is to create rest on the bridge. If I think I'm losing control, I will look around and check who is present on the bridge which does not have to be here." (Interview 2, 19-06-2015)

- **Creating time**. Creating time is done by team management or by decreasing speed. By team management the watch officer utilizes the maximum of his team. By optimizing the human recourses the watch officer can create time. By decreasing speed, the situation at hand develops slower and by having more time the watch officer is better able to manage multiple interests.

  "And there is always a solution which makes the situation very clear, namely by just decreasing speed." (Interview 5, 23-06-2015)

- **DOR**, devision of responsibilities. The exercise schedule is studied in advance (preparation) and peak-periods with many possible conflicting interests are identified. During these periods more personnel is on duty to share workload.

  "…DOR-lists are prepared, for periods when conflicts are expected…" (Interview 1, 17-06-2015)

- **Getting help from colleagues**. The watch officer asks for help from colleagues (including CO) when he/she is not able to manage the workload.

  "…that we ask help from colleges and inform the commanding officer, which reduces our workload, so we can execute our task." (Interview 1, 17-06-2015)

- **Informing key players**. The watch officer needs to inform key players in time when for example he/she thinks he/she looses control of the situation. For example the navigation officer or the CO.

  "…I will always ask the commanding officer, in case of conflicting interests, which interest he gives priority." (Interview 4, 22-06-2015)

- **Learning**. Although learning is not a strategy which is useable immediately, it is usable indirectly. This is due to the fact that by training watch officers they learn to recognize situations which tend to escalate. Learning is omnipresent on board of the ship, e.g. new watch officers learn on the job as second watch officers, watch officers during their duty cycle learn when they gain experience and they learn from briefing/debriefing exercises or other events.

  "If you don't recognize your mistakes, then you will not be able to improve yourself. So I think that de-briefing is very important." (Interview 6, 23-06-2015)

- **Planning ahead**. The watch officer needs to be able to plan ahead in order to identify periods with conflicting interests to be able to get help of colleagues in time.

  "However, I try to think ahead, and to ask for assistance when I think it is necessary." (Interview 4, 22-06-2015)

- **Prioritizing**. The watch officer set priorities when he/she looses control of the situation.

  "I try to prioritize. Sometimes that is hard, e.g. when a phone is annoying you while on collision course." (Interview 3, 21-06-2015)

- **Redundancy**. Watch officers, CCO's and the CO, all have the same background, which makes it possible to take over tasks of the watch officer or to coach him.

  "Fortunately, the navigation officer was present on the bridge…who solved the situation for me." (Interview 3, 21-06-2015)

- **Team management**. The watch officer manages a team consisting of at least three persons during regular transit (helmsman, yeomen, lookout).

  "I try to be on top of the situation and to involve those people on the bridge, which I need. In case they don't want to be involved, then I have to be more directive." (Interview 6, 23-06-2015)

- **Workload management**. The watch officer has to manage workload well before, e.g. DOR, and during his duty.

  "When I know I will get a busy duty, I will start using the yeomen. After all, that is why they are here." (Interview 4, 22-06-2015)

ANALYSIS

As can be inferred from the results section, the watch officer is acting like a spider in the web during his/her duty on the bridge. One hundred and thirty-eight interests have been identified which have been grouped in eleven main interest: navigation, external interests, internal interests, team management, procedures, organization, learning and teaching, human performance, working ahead, workload management and managing conflicting interests. From these eleven main interests, navigation is considered to be the watch officer's most important interest.

It had furthermore been found that the watch officer apparently succeeds in the management of the many conflicting interests by making use of different strategies. The success of the watch officer has been reported by the interviewees as being due to the fact that he/she creates rest and time, makes use of DOR-lists, gets help from colleagues, informs key players, learns, plans ahead, prioritizes, makes use of redundancy, manages his/her team and manages workload. Although this list of strategies is based on the results of this thesis research, it does not imply that this list is complete.

A first key to success as reported by watch officers in this study is to create rest, telling people to be quiet or to leave, and to create time, by maneuvering the ship, when necessary. On the bridge present are at least three persons, including the watch officer. However, as follows from the results, generally there are more. To a large amount these people are only spectators, which have no function on the bridge at all. This was observed many times during the three-month deployment and also during the particular observations by the researcher. Although in general there are no spectators allowed on the bridge during peak-periods, they are still sometimes seen during these periods. This frequency decreased by the end of the deployment, which could be a result of this thesis research.

The watch officer, in his/her attempts for success, uses the management of workload as another strategy to manage conflicting interests. From the results can be further made clear that this strategy of workload management can be subdivided in workload management well in advance and ad-hoc workload management. DOR, the devision of responsibilities, is what can be seen as workload management in advance. Based on the exercise schedule, peak-periods are identified in which workload is shared between watch officers. Ad-hoc workload management is the management of workload of the watch officer during his actual duty. Getting help from colleagues, another way of workload management, fits both strategies. A way of ad-hoc workload

management is the informing of key players. Although this interests is closely related to the ask for help it does not directly imply that somebody is coming to the bridge to assists. It can also mean that the key player coaches the watch officer from behind his/her desk. Planning ahead is another example of the management of workload. By planning ahead, the watch officer is as well prepared as possible, to execute his/her duty. The management or workload by the watch officer commences with his/her ability to set priorities. By managing workload as much as possible, work is distributed as evenly as possible, the watch officer and his/her team will be better able to manage conflicting interests.

Another reason why the watch officers consider themselves successful in managing conflicting interests is because they are surrounded by a learning and teaching environment. A new watch officer learns on the job as soon as he/she embarks on board as second watch officer. A watch officer learns during his/her duty cycle, gains experience and learns from briefing/debriefing exercises and other events. In turn all watch officers, second watch officers includes, are coached and supervised by the navigation officer and the CO. And they are taught by the navigation officer and the CO to execute special maneuvers, e.g. mooring the ship. A result of the on board learning and teaching climate is that there is a lot of redundancy. The most experienced officer of the Warfare Department, i.e., the CO, once started his/her career as a second watch officer on the bridge. As did all the other officers of the Warfare Department. When the watch officer looses control a more experienced officer of the Warfare Department can take over his/her tasks or coach him/her. The coaching of the watch officer by the navigation officer or the CO is regularly seen during the observations.

Up till now, only the separate strategies the watch officers reported during the study are discussed. As follows from the results, however, watch officers use more than one strategy at the same time. For example, DOR lists are made for identified peak-periods in advance, while during that peak-period the watch officer can use the different other strategies. Therefore, it seems that the success of watch officer cannot be explained by the use of separate strategies but by the use of multiple strategies at the same time. The flexible exchange of different strategies in the watch officer's attempts to manage conflicting interests seems to be another reason why these attempts are usually successful.

Linking the watch officer's success with the literature
The watch officer's success with regard to the management of conflicting interests, as follows from the results, can be explained by his/her use of the different identified strategies. These

strategies seem to correlate with the findings from literature, as described in the introduction, namely Resilience Engineering and High Reliability Theory.

Linking with Resilience Engineering

Hollnagel (2011) identified four abilities a system requires for being regarded resilient. The management strategies found in this study seem to fit these abilities.

<u>*The ability to respond to events*</u>

Found in this study is that the watch officer seems to use both the proactive and the reactive part of the by Hollnagel (2011) identified ability to respond to events. According to the latter, proactive response includes preparing for worst case scenarios and having preplanned actions available when necessary. Being reactive means dealing with the current situation, in case preplanned actions are not sufficient.

The proactivity in the work of the watch officer with regard to the ability to respond to events appears from the fact that he/she is always planning ahead in order to anticipate future conflicting interests. In line with this proactive stance is the use of DOR, devision of responsibilities. By creating rest, creating time, prioritizing and informing key players, the watch officer is able to deal with the current, not preplanned, situations. This can be seen as the reactive part of the ability to respond to events.

<u>*The ability to monitor ongoing events*</u>

Monitoring ongoing events is about being able to know what is going on in current situations with the aim of being able to prevent adverse outcomes. As follows from the interviews and observations, the monitoring role is not restricted to the watch officer. On the contrary, this role is also applicable to the navigation officer and the CO, especially during identified periods of increased risk, e.g. the approach to port or exercises in close vicinity of ships or other navigational hazards. The ability to monitor can in this case be expected to be influenced in a positive way by the teaching and learning culture on board the Dutch navy ships. Crewmen with more experience will, after all, generally speaking be better able to recognize possible hazardous situations. Because of the learning and teaching culture on board the ship the team can, above all, generally dispose of a high degree of experience. One comment, however, should be made on the factor unpredictability. Let us assume that the watch officer is prepared as good as possible, then he/she will be better able to manage situations in which conflicting interests arise. However, what will happen during a duty is not set in stone. There will always be a factor of surprise.

The ability to anticipate future threats

Planning ahead was often mentioned by the interviewees as a key strategy for balancing interests. This strategy obviously is a form of anticipating future threats. By planning ahead plans can be created to succeed. Anticipating future threats on board was reported by having "tabletop"-sessions, from which for example the most likely and the most dangerous courses of action emerged.

The ability to learn from past failures and successes

All interviewees in this study reported a learning and teaching culture on board the ship, and thereby a working environment in which coaching and supervision are omnipresent. These findings seem to fit the ability to learn from past failures and successes as stated by Hollnagel (2011). Because on board there are plenty opportunities to learn, both from failures and successes, effective learning can take place. Every event or exercise of the watch officer is pre- and debriefed, so lessons learned can be identified and learning in general can take place.

Downward and upward resilience

The study of documents as well as the findings from interviews seem to fit the description of downward and upward resilience by Tjørhom and Aase (2011) as referred to in the introduction of this study. From the Permanente Order Commandant (2015) both the ingredients for downward and upward resilience appear. By this order, the CO gives the watch officer clear guidelines of what to do in case safety is at stake (downward resilience). The document concludes, however, with the remark that the watch officer should not hesitate to warn the CO (upward resilience). The CO's principle is that the watch officer, when he/she is in doubt, needs to warn the CO. This paper reality seems to fit real practice, because almost all interviews mention that they inform key players when safety is at stake.

Linking with High Reliability Theory

The success of high reliability operations according to Rochlin et al. (1987), as described in the introduction of this study, is due to four identified factors. The management strategies found in this study seem to fit these abilities.

Self-design and self-replication

Self-design and self-replication, as follows from the introduction, is the ability of the organizational structure to adapt in time, depending on the ever changing demands of the situation. On board of a navy vessel, situations can change aggressively. Generally speaking, for a

wide variety of situations, e.g. man overboard drills and replenishment at sea, preplanned manning lists are present. In these situations crewmen, the watch officer included, are assigned dedicated tasks. However, when the situation at hand tends to escalate self-design and self-replication takes place, which is to a large extend possible by the wide cross familiarity with each other's work. This is the result of the watch officers having an on board career in a climate in which learning and teaching is omnipresent.

The paradox of high turnover

Within the Netherland Royal Navy there is a high turnover rate of crewmen. This turnover is the result of how the Netherlands Royal Navy manages the Human Resources. Crewmen usually follow a career, which alternates between on board and on shore postings with an average duration of two to three years. Despite or maybe even due to this high turnover rate, all interviewees mention the fact that there is an on board climate of learning and teaching, which seems to fit the onboard climate of teaching and training introduced by Rochlin et al. (1987), as described in the introduction, because of which it appears that the results from this study fit this "The Paradox of High Turnover" (p. 81) by Rochlin et al. (1987).

Authority overlays

Authority overlays work in organizations so as to enable each crewmember has the authority to suspend operations in which safety is compromised. For the watch officer this is laid down in the Permanente Order Commandant (2015). In general, the principle of authority overlays happens almost unnoticeable. This is due to the fact that during peak-periods, the navigation officer and the CO are both present on the bridge. In case the watch officer reports and acts in case he/she thinks safety is at stake, the navigation officer and/or the CO, both having more experience than the watch officer, can decide to continue or take over operations. The latter is represented in Figure 3.

Commanding Officer

Navigation Officer

Watch Officer

Figure 3: *Authority overlays*

Redundancy

Finally, redundancy in the organization is the ability to execute a task in spite of failure of a critical component, because the task can still be executed in that case by another component (Rochlin et al., 1987). The critical component in this case is the watch officer. Redundancy is created by the navigation officer and the CO. In case of many circumstances, for example exercises or approaches to port, the navigation officer and/or the CO are on the bridge, while the watch officer is still in charge of the bridge. The navigation officer and the CO have been watch officer themselves, and therefore have more experience than the watch officer. The navigation officer and/or the CO therefore monitor the actions of the watch officer and if necessary they can coach or ultimately take over, creating thus a form of redundancy

DISCUSSION

An interesting case to discuss in the light of the results presented here is a case that I recently ran into. It concerns the case with regard to the grounding of HNLMS Jacob van Heemskerck on the 14th of September 1999 in the Minches, Western Scotland. The ship was grounded on a rock at night, with an inexperienced watch officer on the bridge ("Uitspraak Van", 2000).

I found out that the report of the Marine Council with regard to the abovementioned grounding, clearly illustrates the context of conflicting interests of the watch officer. When reading the report of HNLMS Jacob van Heemskerck after having performed this thesis research, I think that it is easy to create a rough sketch in mind of a juggling watch officer who is attempting to manage all the interests, including that of the navigation task. To my opinion, this report illustrates the importance of the navigational process, which does not mean that the other interests are less important. However, what this research in particular points out is that this navigational process is embedded within all the other tasks that are no less important from a ship management's perspective. This implies that these tasks have to be equally managed and executed, because of which the navigational task and thus safety comes at strain at times.

The amount of other interests beside the navigational task of the watch officer at that time, as the report of HNLMS Jacob van Heemskerck illustrates, was large. The watch officer had to navigate the ship at night in narrow waters, while taking part in an exercise involving many different assets, e.g. ships and helicopters. At the same time machinery breakdown drills were performed and no use was made of the help of other watch officers. Above all, the watch officer in this particular case was very inexperienced. It was his/hers first week on board.

The question how it can be that, during the execution of the duties, there has been insufficient attention for the navigational task remains unclear in the report. However, as is made clear from this thesis research, the watch officer is involved in a context of many concurrent and often conflicting interests, of which the navigational task is only one of them. All these interests require after all, in one way or another, the watch officer's attention, the navigational task likewise, because of which the navigational task can be easily pushed aside. This research points out, in other words, that it is plausible to conclude that it may have been the contemplation of these many interests, which is regarded as normal by the watch officers interviewed here by the way, that caused the navigational task not to receive the attention that it, in hindsight, should have had.

Resilience Engineering & High Reliability Theory

As follows from the introduction, I have build a theoretical framework, making use of RE and HRT. What stroke me was that the data and the results fit both theories and that I have no findings from the data which contradicts them. Based on this finding I could argue that both theories are so broad that it is easy to fit any findings in these models, which could also be seen as a shortcoming of this thesis research. However, what both theories did was that they both offered me a valuable framework to gain a better insight in the question why the watch officer is successful in his/her management of conflicting interests.

ETTO

In the introduction reference is made to Hollnagel's Efficiency-Thoroughness Trade-off (ETTO) (2009). The model illustrates the balance between the choice for efficiency and the choice for thoroughness. I have used the model to illustrate the balancing proces, by the watch officer, between the navigational process and the other interests. However, as we have seen in the results section, this study has identified one hundred and thirty-eight interests. The watch officer has to manage all these interest, often at the same time. Even more, as this research points out, there are so many interests for the watch officer to balance that it may well be unclear at times which interest (e.g. the navigational task) should have priority over others at a particular moment. The ETTO model therefore seems to underexpose the amount of different interests, which can conflict anytime, and their possible interrelationship. Because of this, the ETTO model seems to simplistic perhaps to apply to the highly dynamic work environment of the watch officer and maybe even also for the analysis of any kind of daily work.

Safety

When reading this thesis it becomes obvious that the notion of safety is not explicitly apparent throughout the thesis. This needs some further explanation, because this thesis research is about how the watch officer creates safety in a context of conflicting interests.

Because this thesis studied this creation of safety, rather than the lack of it, I have asked respondents after successful events and normal work rather than after adversities and accidents, events that are normally closer related to what people commonly refer to when discussing safety. In short, safety has been incorporate throughout this thesis study, however, in implicit rather than in explicit ways.

Comments with regard to the method

This study has been performed around the issue of conflicting interests, and around the difficulties with managing these interest specifically. Managing conflicting interests would for some imply that the watch officer would always have a complete picture of what is happening around him/her at any time. Having a complete picture, in turn, would imply that the watch officer has time and means to set priorities and that the watch officer has full control of the situation, no matter what interests affect him/her, as long as he/she is working hard enough to set the right priorities. However, the System Safety perspective presented here shows otherwise, that it is not so much about managing all kinds of separate interests, but that all these interests intertwine somehow and have to be managed all together in some way. This research therefore has attempted to look at all the facets with regard to the work of the watch officer and what influences him/her. It is, after all, the study of systems in their entirety that offers us the best understanding (Dekker, 2014). It is therefore that for this research use is made of interviews, observations and the study of documentation to gain as much as possible information with regard to the work of the watch officer in a context of conflicting interests.

Because this thesis research contains a lot of data from interviews, this means that a lot of data is based on what people say what they do and say what they think. However, do what they say they do and what they say they think, correspond with what they actually do and think? Because of this I have performed observations of their work also, which does, however, not mean that what people think they do would be less important by the way.

I have observed the watch officer on the bridge during "peak-periods". As we have seen in the method section, I assumed that these periods were likely to generate the most conflicting interests and would therefore offer the best data to answer this thesis question. However, how the watch officer acts outside peak-periods was not observed and may be interesting for further research.

When doing observations, probably especially during peak-periods, I have experienced that there are (too) many factors to observe. Therefore doing observations was considered difficult. Nevertheless the results from the observations were very useful for the process of triangulation. In future, when I need to make observations in a similar setting, I would consider making use of a second observer and/or cameras. However, making use of a camera, for example, may result in people behaving differently compared to a setting without one. So before using a second observer and/or cameras I would first try to find out which possible negative side-effects result from it.

CONCLUSION

The total amount of different interests the watch officer has to deal with is large. Although these interest do not occur all at the same time, sometimes many of them do. The watch officer is thus regularly placed in a position in which he/she has to manage different conflicting interests.

On the bedrock of all identified interests of the watch officer lies the navigational process. It is considered to be the most important interests the watch officer has to manage. This does not imply that the other interests are less important, or are considered to be less important by the watch officer and his/her colleagues referencing the findings from the study of documents. The paramount difference between the navigational process and the other interests is the fact that disturbances in the navigational process can have far more and direct negative consequences for the ship and its crew. Complicating here is, above all, that the other interests have to be paid attention to simultaneously.

The watch officer uses different strategies to manage all these different interests in his/her attempts to create safety in a context of conflicting interests. The watch officer may, for instance, create rest on the bridge (by ordering people to be quiet or to leave), create time on the bridge (by maneuvering the ship) and manage workload in different ways.

The results of this study indicate furthermore that the watch officer does not only use the aforementioned strategies separately. In his/her attempts he/she even seems to use combinations of strategies or he/she makes use of these strategies by flexible exchange. It may thus be said that this thesis provides in this way an answer on the proposed research question

How does the watch officer create safety in a context of conflicting interests?

Knowing, or even applying these strategies so as to manage the conflicting interests identified here does not guarantee, of course, that a hundred percent safety can be achieved. This, however, was not the aim of this research, which was rather to describe how the watch officer attempts to create success despite all the different interests that he/she has to manage. As we have seen in the analysis the watch officer continuously attempts to manage the balancing of the navigational process with all the other interests.

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APPENDICES

Appendix A: Interview set-up

Introduction

Introduction of the thesis research

The researcher briefly explains the Master's Program Human Factors and System Safety and from there he introduces the thesis research. The researcher is looking from a Human Factors and System Safety perspective at how the watch officer on the bridge manages his/her work during his/her duty cycle.

Must tell:
- Human Factors
- System Safety

Don't tell:
- The watch officer creates safety
- Looking for conflicting interests

Introduction of the researcher and the procedural issues with regard to the semi-structured interview.

The semi-structured interview gives guidance to the interview and the subsequent process of data analysis. However, it also offers the researcher and the interviewee the flexibility to zoom in on relevant topics during the interview when deemed necessary. With regard to confidentiality the interviewee will be explained that the collected data will be processed in a way that it will not be traceable to the individual watch officer. Furthermore the interviewee is asked permission to record the interview. Recording the interview gives the researcher the best opportunity to fully focus on the interview. Significant here is to tell the interviewee the importance of the fact that he/she has to tell the researcher what he/she feels important. It is about what the watch officer experiences.

Must tell:

-        It is about what the watch officer experiences

The purpose of the semi-structured interview is to gain insight in the context of conflicting interests of the watch officer during his/her duty cycle on the bridge. The watch officer therefore has to refer to everyday situations on the bridge and to recall situations that led or might have led to negative outcomes. Besides gaining insight into this context of conflicting interests, the watch officer is asked questions to reveal why he/she thinks he/she succeeds or not in creating safety in this context of conflicting interest. These questions are built up by referring to elements of the theoretical framework form the literature review.

- Questions by the interviewee?

Questions

The questions are subdivided in three main themes. These are respectively "general", "conflicting interests" and "creating safety".

General

- Please tell me something about yourself (name, rank, experience etc.)[3].
- Please tell me how your duty cycle on the bridge looks like on an average day.
- Please tell me how your duty cycle on the bridge looks like on a busy day.
- Please tell me what you typically have to deal with during your duty cycle.

Conflicting interests

- When working on the bridge, please tell me which interests you have to manage during your duty cycle.
- What do you consider to be your primary interest during your duty on the bridge?
- In case you have a context of conflicting interest, how do you manage this?
- Please describe the ship's management commitment to safety and your position in it.

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[3] In order to maintain confidentiality the answer will not be published. The result is solely for the researcher to get a better understanding of the background of the interviewee.

Creating safety

- Please recall a situation on the bridge that tended to go wrong, but did not. Please explain, according to your opinion, how this event could have happened.
- Please tell me if you think you are successful in your work.
- Please tell me if you think you are successful in your work in relation to safety.
- Please tell me how you achieve that.
- Please tell me how you manage the bridge during peak-periods (periods that demand the most of you)?
- Please tell me your actions when you think you are about to loose control of the situation.
- Please tell me, from an organizational perspective, how safety is guaranteed with regard to your work on the bridge.

Don't tell keywords from RE: the ability to respond to events, the ability to monitor ongoing events, the ability to
anticipate future threats and the ability to learn from past failures, and successes

Don't tell keywords from HRT: self-design and self-replication, paradox of high turnover, authority overlays and redundancy.

- Is there anything else you would like to add to this interview?

Appendix B: Codebook

Second-order code	First-order code	Instances	Interview	Description	Quotes
Workload management	Getting help from colleagues	36	1, 2, 3, 4, 5, 6	The watch officer asks for help from colleagues (including CO) when he is not able to manage the workload.	"...dat wij zelf iemand erbij halen en het command informeren, zodat onze werkbelasting verlicht wordt om op het moment dat wij ondersteuning krijgen waardoor wij de taak kunnen uitvoeren." "...en als ik geen ondersteuning heb meer ondersteuning vragen." "ik kan ook gewoon een andere wachtsoffcier bellen: het is nu te druk boven, kan je helpen? Ik heb even een extra mannetje nodig, ik moet nog een checklist afwerken, ik moet nog een fix in de kaart maken, ik heb nu zoveel aan mijn hoofd voor een oefening of wat dan ook."
Learning & teaching	Learning	32	1, 2, 4, 5, 6	Learning on the job. Learning from incidents and accidents. Learning from experience. Learning during courses. Learning from the preceding duty.	"En zo een vervolgopleiding is juist mooi om even je ervaringen die je daarvoor hebt opgedaan even te reflecteren op hetgeen je gaat doen." "Iedereen maakt een keer, als hij een jonge wachtsoffcier is, een keer zo een moment mee en daar zal je altijd aan terug blijven denken. En de eerst volgende keer dat je ook maar denkt dat je in zo een situatie komt, denk je terug aan dat moment en dan denk je, ja, je komt er wel uit, ik haal de vaart eraf en we komen wel wat later." "En dan wordt je weer bijgestuurd en een beetje gekneed, gevormd inderdaad. En zo ga je door en op een gegeven moment ben je genoeg gevormd en gekneed, dat je je weg kan vinden in zo een organisatie en dan mag je het zelf doen. En dan begin je eigenlijk pas met leren."
Team management	Team management	17	1, 2, 3, 4, 5, 6	The watch officer manages a team consisting of at least three persons during regular transit (helmsman, yeomen, lookout).	"En je team is ook een factor waar je mee bezig bent. Zorg dat die uitkijken doen wat ze moeten, zorg dat de focus er is in het team, daar moet je ook effort in steken." "Wat ik vooral hier ervaar, hier aan boord, ik ben wel beter gewend, is dat je heel erg bent personeel aan het aansturen." "Mijn uitkijken, die praten dan vaak met de roerganger en die kijken af en toe eens om zich heen, en goede uitkijken hoef je niet aan te sturen, maar de meeste uitkijken hier moet je wel aansturen." "Van leren wordt je beter, wordt je zeewachtstandaard-A je zeewachtstandaard-B en dan ga je weer een opleiding in, dan ga je weer leren, dan word je LTZ2OC, CCO, vlieger, zo kom je verder denk ik. Ik wil zelf ook uitgedaagd blijven."
Organization	Redundancy	15	1, 2, 3, 4, 5	Watch officers, CCO's and the CO, all have the same background, which makes it possible to take over tasks of the watch officer or to coach him.	"Ja dan heb je gewoon nog drie mensen die met je meekijken. Als je dan een foute inschatting maakt, dan kan iemand je nog corrigeren." "En wat je ook leert is dat je die redundantie moet gebruiken. Dat die redundantie niet alleen een vangnet is voor als het misgaat, maar dat je die mensen ook gewoon erbij kan trekken, en dat het niet raar is." "Ja, tijdens een WW zijn we met twee wachtsoffcieren op de brug en nog eentje in de kaart. Vaak dan wel een PBI-er of een jongere wachtsoffcier, want de meest ervaren draaien dan in het algemeen de WW. En een navo. Dan heb je al drie zeewachtstandaard-A/B ogen die met je meekijken en beneden zit ook iedereen mee te kijken. En je hebt vier uitkijken dan. Dan is de sfeer er wel naar, dan kan dat. Dan worden er meer risico's genomen."
Learning & teaching	Experience	14	1, 2, 3, 4, 5, 6	The watch officer appeals to a large extend to his gained experience till so far. This experience is in favour of safety.	"Dat is denk ik een kwestie van gevoel wat je merkt en daar zit het gevaar in, want het komt met ervaring dat je het kan herkennen en daardoor zie je nog wel eens inderdaad dat het aankomt op een incident, vooral in de beginfase van een wachtsofficier, daarbij een risico." "En naarmate je meer ervaring opbouwt, in het begin heb je nog hulp nodig, als het complexe oefeningen zijn, om dat veilig varen te kunnen garanderen, maar in the end krijg je op een gegeven moment dusdanig, dan wordt je ervaren in je werk en dan kan je oefeningen tegelijk draaien met dat je veilig vaart." "Die andere serials dat is echt nog nieuw en dat is met name denk ik voor mij gewoon een kwestie gebrek aan ervaring."
Managing conflicting goals	Prioritizing	13	1, 3, 4, 6	The watch officer sets priorities when he looses control of the situation.	"Maar als het er op aan komt, dan zou het zo moeten zijn dat wij kiezen voor veilig varen een, en dan het andere gedeelte van de oefening zeggen van, oké, dit is een oefening die zetten we even in de hold en totdat de situatie overzichtelijk is en dan gaan we weer verder." "En er zijn ook oefeningen die dusdanig real-life zijn dat je daar meer prioriteit bij moet leggen, omdat je een risico loopt." "Ik probeer prioriteiten te stellen. Dat is niet altijd even makkelijk, want juist een telefoon die staat te rinkelen is veel irritanter dan een schip wat op je af komt varen."
Procedures	Standing orders	12	1, 4, 5, 6	The CO has published standing orders in which safety margins are determined. The watch officer has to adhere to these limitations and when limits are tended to be crossed, the CO has to be informed.	"Daarnaast heb je een verplichting conform de orders van de commandant als er bepaalde passage-afstanden plaatsvinden, dat je hem inlicht." "De commandant heeft marges gesteld en dat heeft hij niet voor niets gedaan." "Daarvoor heb ik natuurlijk de limieten die de commandant heeft opgelegd. Onder gewone omstandigheden."
Working ahead	Preparation of duty	12	1, 2, 3, 4, 5	The watch officer prepares his duty by looking at the program. If there are specific activities in the program he has to acquaint himself.	"De wacht op de brug zit inderdaad tjokvol met oefeningen, en wat daar dan bijkomt is dat je ervoor en daarna dingen moet gaan voorbereiden en dat plannen wijzigen op het laatste moment." "We hebben onze eigen organisatie door van tevoren het programma door te nemen."
Learning & teaching	De-briefing	10	1, 2, 3, 4, 5, 6	De-briefing is a means for the organization to share experiences and to learn.	"Maar waar je aan het werk bent, steeds met wisselende omstandigheden bezig bent, loop je het risico op fouten. En de enige manier om dat tegen te gaan is heel veel dingen die bijna fout gingen of fout zijn gegaan goed debriefen." "En die hebben we dan goed gedebrieft met z'n allen, daarbij zei de commandant: iedereen maakt dit een keer mee. Iedereen maakt een keer, als hij een jonge wachtsoffcier is, een keer zo een moment mee en daar zal je altijd aan terug blijven denken." "Als je dat niet doet, dan kom je nergens. Want dat is het moment, waar je van al die mensen die je misschien wel hebt afgeblaft eerder, te horen krijgt wat hun overwegingen en hun afwegingen op dat moment waren en wat hun afweging om jou op dat moment dat te vragen en we zagen het vandaag bij de boarding-oefening heel duidelijk..."
Working ahead	Planning ahead	10	1, 2, 3, 4, 5	The watch officer needs to be able to plan ahead in order to identify periods with conflicting interests to be able to get help of colleagues in time.	"Ja, we kijken gewoon van tevoren naar het programma en dan kijken we met hoeveel mensen we zijn. Als we een RAS hebben, we maken van tevoren een programma, een division of responsibilities. " "Dus die beoordeelt of jij dat vooruitkijken kan en dat hulp inschakelen dat je dat kan. Dat is een inschatting en dat is ook heel erg afhankelijk van hoe je jezelf presenteert en dat is heel moeilijk om die toekenning te geven natuurlijk. Maar op die manier garandeert de organisatie dat die veiligheid in orde is."
Interests	Navigation as primary interest	9	1, 4, 5, 6	The watch officer considers the navigational process to be his primary interest.	"Primaire verantwoordelijkheid was natuurlijk het veilig varen van A naar B en zorgen dat het schip het traject aflegt wat gepland is…" "Het belangrijkste is gewoon veilige navigatie."
Learning & teaching	Exercises	9	1, 2, 5, 6	The crew of the ship performs exercises throughout the day according to the exercise schedule, containing internal and/or external exercises.	"Dat is de omgeving waarin je zit, dat kan een drukke omgeving of een rustige omgeving zijn qua scheepvaart, en de druk van het aantal oefening wat draait." "Twee oefeningen tegelijk, dan wordt het al complex en dan loop je al een groter risico."
Learning & teaching	Teaching/ coaching the second watch officer	9	1, 4, 5	The second watch officer is linked to a more experienced watch officer during his duty. The more experienced watch officer teaches and coaches the second watch officer on the job when necessary. The second watch officer is allowed to work independently on the bridge when the navigation officer and the CO are convinced that it is safe to do so.	"En als we PBI-er op de brug hebben dan ben ik daar ook mee bezig. En dan probeer ik die zoveel mogelijk te ondersteunen, en te leren en uitkijken en roergangeren." "Ik heb het idee, ik heb nu een PBI-er onder mijn lopen, dat ik aan hem kan overdragen wat ik aan het doen ben op de brug en hoe wij werken en ik vind het ook leuk om mensen wat te leren."
Managing conflicting goals	Managing workload	8	1, 2, 4, 5	The management of workload, especially during periods of high workload.	"Maar in principe draaien wij een oefening tegelijk op de brug naast veilig varen en als er een tweede komt of als iets tegelijk gestart wordt dan schakelen wij direct hulp in, zodat iemand anders die andere oefening opstart." "Tegenwoordig met die CRM sessies op het KIM, waarbij er dus gekeken wordt naar workload, en je moet je workload blijven evalueren. En als de workload te hoog wordt dan moet je de minder belangrijke dingen, die moet je gewoon een halt toe roepen, of je moet zorgen dat iemand anders dat voor je gaat doen."

Navigation	Fix interval	8	1, 5, 6	The watch officer plots his position on regular times on the map and checks if the current heading and speed is safe within the fix interval. The fix interval offers the watch officer a timeline and therefore gives structure to his duty on the bridge.	"Eigenlijk ga bijna nooit naar een langere fixroutine langer dan 20 minuten. Daar voel ik mijzelf altijd niet prettig bij." "Met dat fixinterval bepaal je dus of je iets anders erbij kunt doen of niet." "En aan die fixinterval hangt alles vast. Want je doet een fix in de kaart, je stelt je navigatie voor jezelf veilig."
Navigation	Taking into account other shipping	8	1, 2, 3, 4, 6	The navigational process contains the process of managing the rules of the road in order to stay clear of other shipping, to avoid collision.	"En aan die fixinterval hangt alles vast. Want je doet een fix in de kaart, je stelt je navigatie voor jezelf veilig." "Voor de rest dan ben je weer zelf verantwoordelijk voor het stukje scheepvaart. Externe scheepvaart is belangrijk."
Learning & teaching	CCO	8	1, 2, 3, 4, 5	To become CCO, you have to be watch officer first. The CCO is an experienced watch officer and monitors, supervises, supports, coaches and teaches the watch officer on the bridge when he considers necessary.	"Daarnaast hebben we intern natuurlijk de CCO als die verwachtingen heeft…" "Een CCO, zeggen ze natuurlijk ook, die is er ook voor de waarborging van de veiligheid, die kijkt ook beneden in de centrale mee of alles veilig gaat." "Als ik zoiets heb, dat ik denk dat was niet heel erg veilig meer, bijvoorbeeld een stukje scheepvaart, dan komt het voornamelijk doordat het plaatje mij niet duidelijk was, dat ik wordt verrast. Als ik ergens een hekel aan heb is dat het wel. Dus ik probeer dat altijd eigenlijk voor te zijn."
External interests	Meteorological conditions	7	1, 3, 4, 5, 6	The watch officer takes into account the meteorological conditions during his duty cycle.	"Externe factoren zijn ook meteo, als het slecht weer is, dat heeft invloed op jouw personeel en op jezelf." "Ja. Ik denk dat het weer belangrijker is dan je initieel inschat. Als het slecht weer is dan heeft het een behoorlijke impact op jezelf en het team.""In andere gebieden, noordelijker, Noordzee, ja dan ben je er meer mee bezig. Dan gaat de zeegang een hele grote rol spelen. Dat moet intern allemaal dragelijk zijn."
Internal interests	Different departments	7	1, 2, 3, 4, 5, 6	The different departments onboard have to inform the watch officer when their program affects the ship and its safety. Onboard are four different departments. The watch officer takes into account their interests as much as possible when sailing the ship.	"Of mensen die naar de brug bellen, van kunnen jullie een andere koers varen, want ik lig in de schaduw. Ja donder op. Dat is een extra factor ruis die je makkelijke operatie toch vervelend kan maken." "De rest van het schip, die soms niet altijd meekrijgt waar je boven mee bezig bent, die dan belt van, of iemand wil in het kanon of iemand wil in het waaigat wat weggooien."
Organization	Responsibility	7	2, 3, 5	The watch officer's responsibility reaches to a certain extend. If a decision is beyond the watch office's responsibility, he has to call the CO.	"Uiteindelijk ben je als officier van de wacht diegene die zegt waar het schip heen gaat. Jij zegt uiteindelijk: we gaan dit doen. En dan kan iedereen wilde plannen hebben, ik ben uiteindelijk diegene die zeg: stel die vaart in of stuur die koers. En die verantwoordelijkheid is behoorlijk." "Voor mijzelf heb ik een vrij groot verantwoordelijkheidsgevoel. Als ik problemen signaleer voor de volgende oefening en we zijn bezig met de huidige oefening, de volgende oefening begint over een uur, maar de afstand is te groot die je moet afleggen om op tijd te zijn, dan voel ik mij daar verantwoordelijk voor."
Learning & teaching	ZWST-A: certificate	6	1, 2, 6	This certificate guarantees a certain level of quality of the watch officer.	"Als je met een schip komt zoals wij van de werf af kwamen, dan moet je terug vallen op het stukje opleiding en toekenning van certificering dat iemand het kan, anders krijg je dat je non-stop de navo op de brug hebt." "Na je PBI moet je eerst nog een examen afleggen voordat je echt je certificering rond krijgt. Dus het kan niet zo zijn dat iemand die zelfstandig mocht varen op een LCF, maar niet zijn zeewachtstandaard-A heeft gehaald, die wordt bij een ander schip, wordt hij nooit meteen zelfstandig gelaten, dat kan niet."
Navigation	The navigation planning	6	1, 2, 4, 5, 6	Part of the navigation process is the planning. To be in time in the required position requires calculation of the speed of advance (SOA). This is a continuous process running on the background.	"Hebben we tijd-afstand problemen, of komt het niet zo heel erg nauw, en kunnen we door wat harder varen een eventuele vertraging goed maken." "...SOA's en zulk soort dingen die we moeten monitoren."
Human performance	Fatigue	5	1, 4, 5	When people are fatigued, their performance is decreased which results in higher risk of mishaps.	"Nog iets wat speelt natuurlijk en dat speelt ook in de luchtvaart, is fatigue. Als jij een heel lang proces doorloopt, bijvoorbeeld een FOST, op een gegeven moment dan wordt je moe op de brug. En dat neemt jouw beslissingsscherpte, dat neemt dan ook behoorlijk af. Als je daarmee te maken krijgt dan, en ik denk dat we als marine daar wat slechter in zijn, dan zou je dat ook moeten erkennen en daar ook een halt op moeten toeroepen. Alleen ze zijn dan echt gebonden aan een oefenprogramma en daar laten wij denk ik wel eens wat liggen, aan veiligheid. En dan kun je afvragen of dat ge-ORM-d is, die fatigue."
Internal interests	Oracle	5	2, 3, 6	The watch officer needs to be informed of factors that affect the safety of the ship and its crew. This results in the fact that people tend to always ask the watch officer. This makes him a sort of oracle.	"Ik heb wel wat anders aan mijn hoofd. En dan sta je ook nog met een telefoon in je handen. Nou, dat is, op een drukke dag is iedereen zich daar wel van bewust, maar op een rustige dag is de extra factor ruis die er bijkomt, de rest van het schip die niet of slechts zijdelings betrokken is bij wat we eigenlijk met deze grijze boot aan het doen zijn."
Learning & teaching	Basic training at the Royal Netherlands Naval College	5	1, 2, 4, 6	On the Royal Netherlands Naval College, the watch officer is trained for the basics.	"En daarin wordt je uitvoerig opgeleid. Dat is die hele KIM periode, ben je daarmee bezig, plus je PBI." "Want het KIM leidt je op om veilig van A naar B te varen en netjes over het lijntje heen, maar ik heb hier nog geen wacht meegemaakt waar ik gevaren heb zoals ik het op het KIM heb geleerd. Ja ik ken de regels en ik ken de principes, maar er is niemand op het KIM die mij verteld heeft dat ik dat met zes verschillende lijnen op mijn hoofd en al die belangen die er nu bijkomen, en al die andere storingsfactoren om het zo maar te zeggen in het proces."
Organization	Quality assurance	5	1, 6	Before a watch officer is working independently on the bridge he is working as second watch officer until the navigation officer and the CO are convinced that it is safe to do so.	"Als wij nu een nieuwe wachtsoffcier krijgen, dan laten we hem een week toegevoegd lopen aan de navo, en dan kunnen we redelijk snel, dan kan de navo advies geven aan de commandant of hij het kan of niet. Zo doen we dat vanuit de organisatie." "Ja, maar ik weet ook dat er een bepaald aantal niet zo succesvol is, niet succesvol genoeg zou zijn. Maar dat dit ook wel herkend wordt in een PBI tijd, heel vaak. Je ziet toch heel vaak mensen hier van het KIM afkomen die niet het gewenste niveau kunnen bereiken. Dan wordt gelukkig wel de knoop doorgehakt, jij haalt het niveau niet, we moeten voor jou een ander traject starten, of een ander schip waar het misschien wat rustiger is."
Workload management	Division of responsibilities (DOR)	5	1, 2, 4	The exercise schedule is studied in advance (preparation) and peak-periods with many possible conflicting interests are identified. During these periods more personnel is on duty to share workload.	"Als oudste wachtsoffcier maak ik nu ook altijd DOR lijsten. En dan kijk ik gewoon wat voor oefening is het. Hoeveel man zou je daarbij nodig hebben en dan deel ik dat gewoon in." "Ja, division of responsiblity lijstjes. Gewoon personeelsindelingen. Er komt gewoon een matrix uit van de oefeningen, waar de overlap zit, en er wordt gewoon gezegd, oké, deze wachtsoffcier die handelt deze oefeningen uit, die wachtsoffcier pakt die oefeningen."
Interests	The safety of the ship as primary interest	4	3, 4, 6	The watch officer considers the ship to be his primary interest.	"Veilige navigatie, dus oftewel nergens tegenaan varen, niet tegen een schip, niet tegen de grond, niet tegen weet ik het wat. Dat is mijn baan en alles wat er omheen komt is voor mij een rand zaak."
Internal interests	Communication	4	1, 2, 5, 6	Besides the direct interpersonal communication on the bridge, there are many other different means of communication. Telephone, VHF, storno, VT, long lead.	"En naarmate er meer oefeningen draaien wordt er meer gecommuniceerd." "Wat wel enorm lastig is, is dat de TC daarbij in de lucht komt via de VT, en je hebt al 6 lijnen op de set staan, bij staan, en als er dan een TC doorheen komt, je kan ze negen van de tien keer niet verstaan, want iedereen zit in een headset te lullen, en zij lullen op afstand in zo een microfoontje, een plaat metaal, en dan moet je ze dus bellen ander hoor je ze gewoon niet en je kunt niet alle lijnen wegdrukken."
Internal interests	People management	4	2	Managing people outside your team on the bridge, with no functional relation at that time.	"We gingen chaff schieten vanmiddag, staan er in een keer dertig man op de brug. Ja, sodemieter op. Maar ja dat kan je dan niet meer zeggen. People management."
Internal interests	Phone calls	4	1, 3, 4	On the bridge are five phones that are being called very frequent during the duty cycle.	"Bijvoorbeeld hier op het LCF zie je het, je hebt vijf telefoons op de brug en dan wordt er naar de brug gebeld alsof dat een plek is waar altijd heen gebeld kan worden. Dan is een enorm verstorende factor. Dat zie je vooral tijdens nauw vaarwater procedures, waarbij er meer mensen op de brug zijn en waarbij we ook weer een fixroutine hebben met de dutycycle. Dus er wordt veel gebeld naar de brug."

Organization	Informing key players	4	3, 4	The watch officer needs to inform key players in time when for example he thinks he looses control of the situation. For example the navigation officer or the CO.	"Ik zie het dan weer als mijn verantwoordelijkheid, om hen deelgenoot te maken van het probleem wat er is, dat zij het weten." "Ten tweede de commandant op de hoogte houden van de situaties, externe situaties." "Daarna zal ik altijd de commandant vragen, als er zaken conflicteren, van wat is de prio."
Organization	Speak-up mentality	4	3, 4, 6	When the watch officer deems necessary he does not hesitate to speak-up to others.	"Ik ben niet bang om te zeggen dat ik niet happy ben." "Als de CCO het dan toch nog perse wil, dan zeg ik: neem maar contact op met de commandant. Of dan doe ik het zelf wel."
Organization	The commanding officer (CO)	4	4, 5	The watch officer is placed directly under the CO with regard to the responsibility of the safe navigation of the ship. Therefore they have a close relation to each other. The CO has the overall responsibility.	"Qua veiligheid, de commandant is natuurlijk verantwoordelijk voor het schip. En de CCO's die willen heel veel qua oefeningen en wat dan ook. Maar ik heb nog steeds het idee, qua veiligheid dat ik heel hoog sta in die schaal."
Workload management	Supporting the watch officer by automation	4	1, 6	Nowadays systems become more and more supporting to the watch officer, relieving workload resulting in more time available for the watch officer to manage the interests on the bridge during the duty cycle.	"Kijk naar de SHOL's, die tool die wij nu hebben voor de SHOL's, op het LCF, waar je ziet waar de wind zit en waar je ziet waar deze gezeten heeft in het verleden. Dat geeft jou situational awareness over de situatie en dan denk ik dat dat bijdraagt aan het inschattingsvermogen van de officier van de wacht."
Human performance	Can-do mentality	3	1	The mentality to always try to perform a certain action, even if it is better to refuse to take action.	"Maar in the end wordt het toch altijd geprobeerd het oefenprogramma uit te voeren en dan komt het toch altijd kijken. Ik denk dat het grootste risico is."
Human performance	Limitations	3	4, 6	The watch officer sets himself certain limitations that he is not willing to cross.	"En we zijn natuurlijk een oorlogsboot, dus we kunnen wel wat naar de limieten toe, maar zodra ik niet meer het idee heb dat het veilig gaat, dan doe ik gewoon wat ik acht dat veilig is." "En ik zoek het ook niet op. Want er zijn ook van die waaghalzende wachtsoffcieren die dan denken van: dat kan makkelijk."
Human performance	Mindfulness	3	2, 5	The watch officer needs to be mindful, which gives him a better opportunity to manage unexpected situations.	"Het is toch een aanname van mij geweest, wel een logische aanname, maar desondanks moet je altijd toch voorbereid zijn dat er daar misschien ook wel een onervaren iemand op de brug staat."
Interests	The ship and its crew as primary interest	3	1, 2, 4	The watch officer considers the ship and its crew to be his primary interest.	"We zijn verantwoordelijk als officier van de wacht voor de bemanning van het schip, dat is voor een fregat ongeveer 160 man. Dat blijft altijd prioriteit een, maar die andere taak moet wel uitgevoerd worden."
Internal interests	Internal exercises	3	1, 3	Exercises within the ship, without interaction with external units.	"En oefeningen bestaan uit interne oefening voor de scheepsorganisatie, die zijn wat rustiger voor de brug, dus dat gaat om brandoefeningen, averijoefeningen, waarbij in het schip aan damage control wordt gedaan en waarbij we onderdeel zijn van de informatieflow naar de commandant en het advies voor veilig varen." "Dan is er nog een derde en dat is het interne programma. Bijvoorbeeld er moet een RHIB te water, kleine dingetjes, maar ook weer de telefoontjes en dat soort zaken. Dat is voornamelijk van invloed op mijn wacht."
Internal interests	Spectators on the bridge	3	1, 2, 5	Besides the personnel on duty, there are often spectators on the bridge who enjoy the view outside and chitchat with each other and personnel on duty.	"Oplopers, dat is een hele belangrijke, die rust op de brug verstoren."
Navigation	Navigation	3	1,2, 3	The process of knowing the position of the ship, the intended route, and staying clear of shipping and other hazards.	"Personeel, navigatie, programma en andere storende elementen. Mensen die bellen, weet je veel, ja oplopers. Alles wat niet rechtstreeks te maken heeft met je product, maar je je wel om moet bekommeren en niet kan negeren." "Eigenlijk de drie grote procedures die lopen op de brug zijn navigatie, dus weten waar je zit. Baancontrole, waar je ten opzichte van je planning zit en anti-collision plot, waar de andere scheepvaart zit en hoe interact dat met elkaar. Dat zijn de basisprocessen."
Workload management	Sharing workload	3	1, 3	During peak-periods on the bridge more people are on duty on the bridge, for example two lookouts, two or three yeomen, and one or more officers of the warfare department.	"Maar in principe draaien wij een oefening tegelijk op de brug naast veilig varen en als er een tweede komt of als iets tegelijk gestart wordt dan schakelen wij direct hulp in, zodat iemand anders die andere oefening opstart." "Ik probeer taken af te splitsen. Het kan zijn aan uitkijken, als er een belangrijk stuk scheepvaart is, wat niet dringend is maar wel aandacht vereist, probeer ik daar een uitkijk op te zetten. Dan heb ik daarmee tijd gekocht."
Procedures	The need to be informed	3	1, 6	The watch officer needs to be informed of factors that affect the safety of the ship and its crew.	"De officier van de wacht moet overal van op de hoogte zijn, personeel wat aan dek aan het werk is op hoogte, dan mag er niet hard gemanoeuvreerd worden, dat geeft je weer een restrictie op basis van je externe factoren, daar moet je over nadenken. Interne oefeningetjes die gedraaid worden, dingen die gepraaid worden om de bemanning op de hoogte te brengen."
Workload management	Alarm generation	3	1	Automation generates alarms and requires the watch officer to take action.	"Je vaart daar geïntegreerde brug, ...die genereerden veel alarmen en dan werd er van je geëist dat je elke keer actie nam op dat alarm."
Workload management	Combining different interests	3	3	The watch officer manages different interests at the same time.	"Gewoon het van a naar b varen, je hebt wel wat scheepvaart maar niet veel. Daar hou je je primair mee bezig als officier van de wacht, dus dat combineren met zowel de uitkijken aansturen als je eigen radarplaatje."
External interests	External exercises	2	1, 3	Exercises with external units.	"En de operationele oefeningen voor commandocentrale daar is de brug meer involved qua manoeuvreren, dat houdt dus in dat wanneer je bijvoorbeeld een onderzeeboot bestrijdingsoefening doet dat je zorgt dat het platform op de juiste plaats is om wapeninzet te kunnen doen of de sensoren te optimaliseren voor detectie..."
External interests	FLYEX	2	1	During flight operations of the onboard helicopter, the watch officer is a key person who has to make sure that the ship's movements and relative winds are within the established limits. At the same time he manages his yeoman on the bridge to look out for the helicopter.	"Je eigen boordhelikopter is een asset die extern is in die vorm, waar je aandacht voor moet hebben."
Human performance	Average duty cycle	2	2, 3	A duty cycle that is considered to be normal by the watch officer. Duty cycles that can be executed by the watch officer and his team, without getting help of colleagues.	"Je hebt eigenlijk je standaard wacht en onder standaard wacht valt ook boottransfer en heli's afvliegen. Gewoon de dingen die je eigenlijk zelfstandig doet boven of redelijk zelfstandig kan doen."
Human performance	CRM	2	1, 5	Crew Resource Management. A course designed to create awareness of interpersonal relations that can have a negative effect on safety.	"Iedereen gaat die CRM cursus in, in ieder geval iedereen wordt het aangereikt van wat de risico's zijn. Ik denk dat iedereen, zeker in het management team, zich daar bewust van is." "Daar hebben we met z'n allen, met de wachtsoffcieren, een gesprek over gehad, ook met de commandant erbij. Want onze commandant is wel echt van de CRM."
Human performance	Leadership style	2	5, 6	Every watch officer has his own style of leadership and every situation demands a different style of leadership.	"Iedereen heeft zijn eigen stijl van wachtlopen…"
Human performance	Perception	2	3, 6	The perception of a situation is different between watch officers, and also between watch officers and CCO's for example.	"Natuurlijk kan het altijd wel, je merkt vanuit de commando centrale is de perceptie anders, ze kijken naar een scherm, zij zijn bezig met de oefening, navigatie doet er op dat moment niet of nauwelijks toe."

Human performance	Safety margin	2	3, 4	The watch officer sets an extra personal safety margin on top of the operational limitations.	"Ik voel me nu bijzonder comfortabel tijdens mijn wacht. Toen ik dat nog niet echt voelde toen was die veiligheidsmarge misschien nog wel groter. Maar ik blijf dat vasthouden. Ik ben daar wel vrij strikt in misschien." "We hebben overal checklisten voor, maar dan gaan we eens kijken, hoeveel is het zicht nu uiteindelijk en wordt het onder de twee mijl, dan gaan we echt de checklisten afwerken, extra veiligheid inbouwen, extra uitkijk boven, commandant inlichten, dat soort dingen."
Human performance	Sense of responsibility	2	3, 4	The sense of responsibility differs between persons. The watch officer has a high sense of responsibility.	"Qua veiligheid, de commandant is natuurlijk verantwoordelijk voor het schip. En de CCO's die willen heel veel qua oefeningen en wat dan ook. Maar ik heb nog steeds het idee, qua veiligheid dat ik heel hoog sta in die schaal."
Interests	Situation awareness as primary interest	2	3, 5	The watch officer considers SA to be his primary interest. The watch officer is aware of all relevant matters that affect the safety of the ship and its persons during his duty.	"Het belangrijkste is dat ik het plaatje helemaal helder heb."
Internal interests	Executive department	2	1	The executive department contains the daily general routine of the ship.	"Vandaag weer een mooie, op een geven moment dan wordt er gevraagd van mogen wij de bingo praaien. Ja, niet tijdens manoeuvreer oefening, maar wel als het weer wat rustiger is. Dat zijn wel dingen die als je die door laat gaan als officier van de wacht, dan heb je daar last van."
Internal interests	Passage prohibition	2	2, 6	Certain areas are out of bounds when it is unsafe to enter those areas. For example the vauxhall, during stormy weather.	"Maar uiteindelijk als ik een passageverbod op de bak afkondig, en er gaat toch iemand de bak op, dan houdt het toch redelijk op. Dan moet ik het zien."
Internal interests	Poor understanding by other departments	2	2	The watch officer (being part of the warfare department) often has to explain certain actions to the non-warfare departments onboard, because of poor understanding of the daily exercise schedule of the ship.	"En op juist een rustigere dag is er vrij vele onbegrip van de rest van het schip over het feit dat wij gewoon oefeningen aan het doen zijn. En dan komen ze op de raarste momenten, met de raarste vragen op momenten dat je er absoluut niet op zit te wachten."
Internal interests	Telephone exchange	2	2, 4	There are four telephones on the, which sometimes makes the bridge a telephone exchange.	"Af en toe is het echt de telefooncentrale bij ons. Je hebt vier telefoons, soms gaan ze alle vier tegelijk af." "Af en toe zijn we wel eens telefooncentrale de brug."
Learning & teaching	Coaching	2	1	The watch officer is sometimes coached by the CCO.	"Een CCO heeft een belangrijke rol hierin. Die zegt, oké, je gaat draaien, die kan zien wat de snelheid is, die voelt dat in de centrale en ziet dat op zijn scherm. Die kan zeggen, let op doe rustig aan."
Learning & teaching	Making mistakes when inexperienced is normal	2	2	More experienced colleagues consider the making of mistakes by colleague watch officers normal. Making mistakes is part of the learning process and helps building experience.	"Mensen vinden het normaal dat je fouten maakt, want ze hebben het allemaal doorgemaakt. En je merkt nu ook na deze reis, nu we een week of zeven acht op weg zijn, dat de fouten minder worden en dat je er beter in wordt. Dat het makkelijker gaat."
Learning & teaching	Supervision	2	2, 5	The watch officer is supervised during peak-periods by the CCO and/ or the CO.	"En dan wordt je weer bijgestuurd en een beetje gekneed, gevormd inderdaad."
Procedures	Maneuvering	2	2	The watch officer orders the helmsman to maneuver the ship.	"Wat ik uiteindelijk zelf kan beïnvloeden zijn de bewegingen van het schip. Eigenlijk de bewegingen van het schip."
Procedures	Standard Operating Procedures (SOP)	2	1, 6	Written procedures which contain the information how the procedure has to be executed.	"En toen werd ook nog eens niet de vaste procedure vastgehouden…"
Human performance	Assessing the situation	2	3, 5	The watch officer assesses the situation at hand.	"Dat is mij niet gebeurd, misschien deels omdat het mij niet overkomt, maar ik ben gewoon wat voorzichtiger met dat soort dingen. Ik probeer beter in te schatten. Ik probeer me niet te laten opjagen door tijdsdruk of dat soort dingen".
Procedures	Check of systems	2	1	The watch officer checks the systems on the bridge on a regular basis, depending on the determined fix interval.	"En je checkt al je systemen daarna, en dan weet je weer dat dat allemaal correct werkt en dan ga je waarschijnlijk…"
Human performance	Confusion of tongues	2	2	Confusion of tongues can result in confusing actions.	"En dat het uiteindelijk kwam door spraakverwarring. En niet door onwil of cowboy-gedrag zeg maar."
Human performance	Direct actions	2	2, 6	In certain situations there is no time to think and direct actions need to be taken in order to remain safe. When actions have been taken, key players need to be informed.	"Omdat wij gewoon eigenlijk aan het roer staan, moeten wij er ook voor zorgen als er iets noodzakelijks gebeurt er direct gehandeld wordt. Je kunt het niet eerst overleggen met hogerop wat te doen, dan is het al te laat."
Procedures	ORM	2	1	Operational Risk Management. The process of defining the risk versus the gain of the intended action.	"Alleen in relatie tot de taak die moet gebeuren, denk ik dat in het management team de taak voorop staat, en dat er dan gezegd wordt oké, hier knaagt het aan de veiligheid, we doen een ORM erop, en dan kijken we of we een beheersmaatregel erop kunnen toepassen, zoveel mogelijk om het te minimaliseren, het risico."
Human performance	Situation Awareness	2	1, 6	The watch officer is aware of all relevant matters that affect the safety of the ship and its crew during his duty.	"Dan verlies ik het overzicht."
Workload management	Creating time by decreasing speed	2	1, 5	By decreasing speed, the situation at hand develops slower and by having more time the watch officer is better able to manage multiple interests.	"En in de urgente veiligheidssituatie is dus een optie ook nog, wat je zelf zou kunnen doen is dus zorgen dat je relatieve snelheid ten opzichte van de zaken kleiner wordt. Dus vaart afnemen, is vaak een hele goede oplossing om tijd te creëren en duidelijkheid."
Team management	Creating time by team management	2	1, 3	Creating time offers the watch officer a better way of managing conflicting interests.	"Ik probeer taken af te splitsen. Het kan zijn aan uitkijken, als er een belangrijk stuk scheepvaart is, wat niet dringend is maar wel aandacht vereist, probeer ik daar een uitkijk op te zetten. Dan heb ik daarmee tijd gekocht."
External interests	External communication	1	1	The watch officer communicates with onshore traffic centers and other shipping in the vicinity by use of VHF.	"De verkeerscentrale waar je zaken mee doet, dus die je op de hoogte moet brengen van je aanwezigheid, dat is maar eenmalig vaak."
External interests	Other assets: giving directions to other assets	1	4	The watch officer directs other assets during exercises.	"Dan heb je natuurlijk je goede communicatie, die je met de CCO en de brug moet hebben om optimaal op te formeren, de-conflicteren, SOA nog strakker in de gaten houden, misschien andere eenheden aansturen."
External interests	Time of the day	1	2	Depending of the time of the day the watch officer is working during daylight or not.	"Wat er op mijn inwerkt? Wat er op mij inwerkt: is het donker, is het licht…"
External interests	VHF-radio	1	4	The VHF is used by the watch officer or yeoman to call other ships and traffic centers.	"Op een rustige wacht roep ik een schip zelf op. Maar als het een drukkere wacht wordt dan ga ik die seiner gebruiken, want daar hebben we hem voor."
Human performance	A busy duty cycle	1	4	A duty cycle that is considered to be busy by the watch officer.	"Een drukke wacht is meer als er oefeningen aan de hand zijn."
Human performance	Being directive	1	5	During peak-periods the watch officer manages people by being more directive.	"Het belangrijkste is dat ik het plaatje helemaal helder heb. Als je merkt dat je dat verliest dan stuur ik indien nodig de uitkijk altijd wat directiever aan."
Human performance	Caution	1	3	The measure of caution differs between people, between watch officers.	"...maar ik ben gewoon wat voorzichtiger met dat soort dingen."

Human performance	Challenges	1	4	The watch officer likes to be challenged during his duty cycle.	"Van leren wordt je beter, wordt je zeewachtstandaard-A je zeewachtstandaard-B en dan ga je weer een opleiding in, dan ga je weer leren, dan word je LTZ2OC, CCO, vlieger, zo kom je verder denk ik. Ik wil zelf ook uitgedaagd blijven."
Human performance	Comfort zone	1	3	The measure of comfort the watch officers experiences when working on the bridge.	"Ik voel me nu bijzonder comfortabel tijdens mijn wacht. Toen ik dat nog niet echt voelde toen was die veiligheidsmarge misschien nog wel groter. Maar ik blijf dat vasthouden. Ik ben daar wel vrij strikt in misschien."
Human performance	Duty cycle	1	1	The period that the watch officer is on duty on the bridge. In general two times 4 hours per day.	"Ik liep mijn wacht en meestal is dat op de marineschepen het vier acht schema, vier uur de wacht en acht uur af. In je af periode heb je voorbereidingen en je neventaken."
Human performance	Focus	1	1	The ability of the watch officer to pay enough attention to his primary interest at that time.	" Maar in principe draaien wij een oefening tegelijk op de brug naast veilig varen en als er een tweede komt of als iets tegelijk gestart wordt dan schakelen wij direct hulp in, zodat iemand anders die andere oefening opstart. Dan kan je niet genoeg focussen op een ding."
Human performance	Hierarchical pressure by the higher command	1	1	The CO has a higher rank than the watch officer that can be accompanied by the feeling of pressure, which can negatively influence the managing of the bridge by the watch officer, when the CO is present on the bridge.	"...mogelijk onder druk van een commandant die zegt: ik wil dat het allemaal zo flashy dashy mogelijk gaat…"
Human performance	Independent	1	2	Without getting help of colleague watch officers	"Gewoon de dingen die je eigenlijk zelfstandig doet boven of redelijk zelfstandig kan doen."
Human performance	Mindset	1	5	Every watch officer is doing his duty with a certain mindset.	"Dus tijdens de Weekly War, dan is iedereen in die mindset…"
Human performance	Motivation	1	3	The performance of people on the bridge is dependent of their motivation with regard to their job.	"Je personeel aansturen kost veel werk. En daarbij valt mij op dat ze hier niet zoveel weten, of dat het ze niet interesseert. Dat is een ding wat hier veel aandacht vereist."
Human performance	Overload	1	4	The watch officer is not able anymore to handle the situation at hand.	"Omdat je dan sneller in de overload kan raken. Want die ervaring spreekt toch voor een groot deel, maakt dat echt heel veel uit of jij een vliegrol kan combineren met een CASEX, en of dat jij dat nog nooit hebt gedaan, als jong wachtsoffcier. Ik denk dat het grote verschil zit hem in wat krijg je naast het veilig varen erbij."
Human performance	Personal sense of safety	1	4	When an interest conflicts with the sense of safety of the watch officer, the watch officer chooses for safety.	"De hoogste prio heeft altijd die veiligheid dus als er iets conflicteert met mijn gevoel van veiligheid, dan ga ik altijd van mijn eigen gevoel uit, en dan ga ik voor de veiligheid."
Human performance	Safety commitment	1	3	The measure of safety commitment differs between persons onboard.	"Op de brug voel ik mij soms op een ivoren toren zitten. Ik ben mij best wel bewust van mijn verantwoordelijkheden, de zaken die er gewoon spelen, als het goed is, de verschillende dingen die aan de gang zijn. Ik weet dat mijn personeel dat niet heeft. Ik weet dat als er een roerganger zit en het schip staat op de automaat, dan zit de roerganger in de stoel, achter zijn roer en die zit gewoon te zitten."
Human performance	Seasickness	1	5	When people on board get seasick, their performance deteriorates.	"Je kan natuurlijk soms last hebben van zeeziekte…"
Human performance	Time pressure	1	3	The watch officer experiences time pressure, for example because he has to be in time in the rendezvous point.	"Ik probeer me niet te laten opjagen door tijdsdruk of dat soort dingen. Dan heb ik echt zoiets van jullie komen er wel uit. We doen het rustig aan. Veiligheid eerst."
Interests	Secondary interest	1	3	All interests besides the primary interest.	"Veilige navigatie, dus oftewel nergens tegenaan varen, niet tegen een schip, niet tegen de grond, niet tegen weet ik het wat. Dat is mijn baan en alles wat er omheen komt is voor mij een rand zaak."
Interests	Shipping as primary interest	1	6	The watch officer considers shipping to be his primary interest.	"Het plaatje buiten is het belangrijkste, alle scheepvaart die om je heen zit."
Internal interests	Asking the watch officer for permission	1	6	The watch officer needs to be informed of factors that affect the safety of the ship and its crew. This results in the fact that people sometimes have to ask the watch officer permission to perform certain task.	"Dus je krijgt heel vaak telefoontjes met toestemming of mensen ergens mogen komen waar een passageverbod is."
Internal interests	Chitchat	1	3	People talking on the bridge about trivial matters.	"Dus vooral ook met mensen praten over koetjes en kalfjes en daarnaast komen de bullshit telefoontjes tussen door…"
Internal interests	Disturbing elements	1	2	Matters the watch officer has to deal with during his duty, which needs attention. However, these matters have nothing to do with the operational product.	"...andere storende elementen. Mensen die bellen, weet ik veel, ja oplopers. Alles wat niet rechtstreeks te maken heeft met je product, maar je je wel om moet bekommeren en niet kan negeren."
Internal interests	Draw attention	1	2	People drawing attention can distract the watch officer on the bridge.	"Ja, ze vragen allemaal aandacht. Al is het maar kort, ze vragen allemaal even aandacht."
Internal interests	Forgetting due to not seeing	1	3	The watch officer has to take into account among others interests that are not directly visible.	"Soms vergeet ik dat. Dat heeft vaak dus te maken met dingen die ik eigenlijk niet kan zien, waar men dan mee bezig is, maar waar ik toch een beetje rekening mee moet houden."
Internal interests	Machinery breakdown drills	1	2	Exercise with the technical department with regard to the propulsion and the steering installation of the ship.	"MK-nood procedures zijn gewoon onderdeel van je werk."
Internal interests	NAVTEX	1	6	The NAVTEX is a system used by the watch officer that offers him navigational information.	"Tevens doorloop je de NAVTEX, of je berichtjes binnen gekregen hebt, je AIS of daar nog berichtjes binnen zijn."
Internal interests	Piping	1	2	The watch officer pipes to inform the ship's crew via the broadcasting system.	"Als het echt nodig dan pak ik het praai-ijzer en dan praai ik de commandant op de brug, en dan is het voor iedereen wel duidelijk at er iets aan de hand is."
Internal interests	Technical department	1	6	The watch officer does a lot of cooperation with the technical department. The Technical Department manages amongst others the propulsion installation of the ship.	"Dat zijn inderdaad de communicatie met de TC bijvoorbeeld. Waarbij je rekening moet houden met bijvoorbeeld blowers wassen of machines die uit dienst zijn. Onderhoud dat ze gaan plegen. Daar heb ik mee te maken."
Internal interests	Weapon engineering department	1	2	When people need to work on the canon, they need to ask permission to the watch officer, because the ship's movement can have influence on the safety of the personnel working on the canon. The watch officer needs to be aware of their presence.	"...wat nou bijvoorbeeld regelmatig voor komt is dat we ergens heen varen in een transit en dat er in een keer mensen op het kanon zitten. WD-ers die daar gewoon aan het werk zijn. Daar hebben we gewoon afspraken over, van jongens, niet op het kanon. En als je op het kanon wil, dan bel je even en dan weet ik dat ik niet hard kan draaien."
Learning & teaching	Feedback from your team	1	5	The team of the watch officer gives feedback after certain events.	"Je weet zelf ook wel wanneer je een lekkere wacht draait en daar krijg je dan van de uitkijk of je team soms ook wel feedback op."
Learning & teaching	Teaching	1	5	The watch officer teaches his team, making use of his experience.	"Terwijl de laatste, dan merk je voor jezelf dat je echt de leiding hebt. Je kopt al die MK-noods weg, je stuurt je team aan en je kan ze wat leren."

Category	Code			Description	Quote
Learning & teaching	Training program	1	5	Every ship goes through a training period after having had a long maintenance period.	"In het opwerktraject doen we ook allemaal zo'n herhalingstest veilig varen. Dus we gaan allemaal de theorietest nog een keer maken, en de brugsimtest. Daar kun je ook voor zakken. Als je twee keer zakt, dan ben je zeewachtstandaard-A kwijt, de commandant kan altijd een zeewachtstandaard-A intrekken."
Learning & teaching	Transfer of knowledge	1	6	By learning on the job, knowledge is transferred between watch officers.	"En ik denk dat dat binnen dit bedrijf, binnen dit schip, ondanks dat mensen weggaan, toch altijd doorgegeven wordt en de bepaalde basis er altijd is."
Learning & teaching	Turnover	1	1	Navy personnel change jobs frequently (every 2 to 3 years).	"Ik denk, de cycle time van een wachtsoffcier is redelijk kort. In twee jaar gaat hij door naar een CCO-opleiding of navo-specialisatie. En dat is geboren uit tekorten in de 2OC functies. Personeel dat daar weggaat. Ik denk niet dat dat per definitie heel goed is."
Navigation	Radar	1	6	Radar offers the watch officer a means to detect other shipping. Radar provides a bearing and distance to other ships.	"Tevens ga je ook nog even langs de radar, daarin kijk je hoe het plaatje buiten ook inderdaad in je radar staat en die rekent voor je wat voor afstanden je langs elkaar vaart."
Organization	Authority	1	2	The power to control their actions and decisions to influence the possible outcome.	"Ik moet zorgen dat we op tijd komen waar we moeten zijn, maar ik heb niet de leiding over de oefeningen. Dus uiteindelijk zal ik gewoon uitvoeren van wat beneden gezegd wordt. Of van boven."
Organization	Bound by location	1	2	The watch officer is sometimes bound by the location on the bridge. For example during FLYEX, he is standing next to the VT for communication with the CCO and the FDO.	"Het is gewoon heel druk. Los van het feit dat je vaak met drukke dingen ook fysiek aan een plek gebonden bent. Ik kan bij heli operaties niet weg uit het hoekje bij die stop-and-go lights. Want daar heb ik mijn VT en ik die knop indruk."
Organization	Relieve duty	1	2	Taking over the duty from the preceding watch officer.	"Waar je een rustige wacht vaak wel je oefeningen binnen je wacht kan beginnen en eindigen, of ze zijn voor je wacht begonnen, maar je kan ze rustig overnemen."
Procedures	Checklist	1	2	The watch officer has to go through a checklist before the start of for example exercises. The checklist offers a framework of items that has to be in place before commencing the exercise.	"Die checklist is gewoon procedureel. Checklisten vertellen mij niet welke vliegkoersen ik moet varen. En ook niet met welke roer-hoek ik op dat moment naar vliegkoers moet draaien. Wanneer ik dat moet doen. En vertelt mij ook niet of ik wel of niet kan draaien als die heli ge-ranged wordt. En vertelt mij ook niet of ik noem het maar op. Dat soort afwegingen vertelt de checklist niet."
Procedures	Rules of the road	1	2	The rules of the road prescribe how ships have to behave when sailing in close vicinity of each other, in order to avoid collisions.	"...doen we dat met de verkeersstroom mee, moeten we raar gaan manoeuvreren, hebben we daar de ruimte voor of moet ik gaatjes zoeken."
External interests	Ever changing circumstances	1	1	There is always the risk of errors when working in ever changing circumstances.	"Maar waar je aan het werk bent, steeds met wisselende omstandigheden bezig bent, loop je het risico op fouten."
Organization	Less personnel due to automation	1	1	By automation, less personnel is onboard, which decreases redundancy when automation fails.	"Het risico van automatisering zie je weer mooi terug op de Holland, waarbij we meer, vanwege automatisering, minder personeel hebben."
External interests	Looking outside	1	1	The watch officer has to look outside to see what is happening in the direct environment of the ship.	"En je checkt al je systemen daarna, en dan weet je weer dat dat allemaal correct werkt en dan ga je waarschijnlijk, daarna hou je tijd over om naar buiten te kijken…"
Organization	Loosing the timeline due to automation	1	1	By introducing automation on the bridge, the watch officer tends to loose the structure that was automatically generated by the former navigation fix interval.	"...dat jij een soort van timeline hebt lopen en dat als je die timeline kwijt bent dan is het heel moeilijk om een volledige dutycycle op de brug te creëren."
Human performance	Luck	1	3	The watch officer assumes that luck might be part of successful operations.	"Ergens een gezonde dosis geluk misschien wel."
Learning & teaching	Monitoring the watch officer	1	1	The watch officer is monitored by colleagues, amongst others the other watch officers, the CCO and the CO.	"...maar de CCO werkt als een controlerende functie, en die kijkt ook naar het grote programma, waar hij uiteindelijk heen wil, en waar nodig stuurt hij de officier van de wacht bij, maar in principe kan de officier van de wacht dat zelf aan. Dus de officier van de wacht bepaalt, maar wordt wel geadviseerd en gemonitord."
Procedures	Operational limitations	1	3	Operational limitations, for example the pitch and roll limitations of the ship when operating helicopters.	"Sommigen zien het, er is bijvoorbeeld een limiet 15 graden, weet ik het wat, die stomme limiet daar kun je heus wel overheen, want daar is hij heus niet.. Daar ben ik het mee eens, maar toch heb ik zoiets van ik ga niet eens die 15, die wil ik geeneens aantikken voor mijzelf, om mijn eigen veiligheden in te bouwen. Dat verschilt per persoon. Daar ben ik mij heel erg van bewust."
Human performance	People's own responsibility	1	2	When people behave irresponsible, that is outside the watch officer's scope of responsibility.	"Uiteindelijk moeten mensen het toch zelf doen."
Learning & teaching	Recognize problems	1	6	The watch officer needs to recognize problems and to communicate the identified problem with the CCO for example.	"Wat wij dan doen heel vaak en wat wel enigszins van ons verwacht wordt is dat we het probleem erkennen of herkennen en dan doorgeven, want heel vaak worden die problemen niet herkent in de commandocentrale. Bijvoorbeeld SOA problemen om op tijd in het volgende rendez-vous te komen."
Human performance	Recognize your limitations	1	1	The watch officer, the more experience he has, needs to recognize his limitations and to request help when these limitations will be exceeded.	"En het commitment voor safety op de brug is meer inderdaad op het herkennen van je grenzen en wat doen we eigenlijk en wat kunnen we doen in relatie tot van wat is de impact op de veiligheid daarin."
Organization	Safety paradox	1	2	Safety during peacetime has the highest priority. However, the situation during wartime is inherently unsafe.	"Veiligheidsdenken, ja, voor oefenen, maar uiteindelijk zullen we ons in situaties gaan begeven waar het inherent niet veilig is. En dat is natuurlijk wel een heel raar concept."
Human performance	Split second decisions	1	1	The watch officer sometimes has to make split-second decisions.	"Omdat, dat gaat om een split-moment inschatting van de officier van de wacht die wel zijn instructies heeft hoe die ermee moet omgaan, maar dan mogelijk bezig is met andere zaken, mogelijk onder druk van een commandant die zegt: ik wil dat het allemaal zo flashy dashy mogelijk gaat, en zich dan niet bewust is van de hoeveelheid vaart die hij heeft, hoeveel power hij heeft, die hij met zijn roeren in het water zet waardoor je heel veel rol krijgt."
Human performance	Successful means guaranteeing safety	1	1	The watch officer considers himself being successful when safety is guaranteed.	"Omdat het werk is die veiligheid. Die zijn heel erg met elkaar verbonden. Dus ik ben niet succesvol in mijn werk als ik die veiligheid niet garandeer."
Team management	Team awareness	1	2	People of the team are aware of the experience, and therefore the limitations, of their colleague on the bridge.	"Ik denk, omdat iedereen hetzelfde proces heeft doorgemaakt, uiteindelijk iedereen zich heel bewust is van het feit wie er boven staat. En dat je dus ook vanuit je ondersteuning, dat je vanuit je mede wachtsoffciceren, sneller ondersteuning krijgt aangeboden. Dat ze sneller vragen of je wel happy bent. Dat de CCO vanuit de commandocentrale sneller zal vragen, meer uitleg zal geven bij een besluit, of directiever zal zijn: ik wil nu dat je die koers gaat."
Learning & teaching	Training	1	1	The watch officer is trained to be able to recognize when the primary interest of safe navigation is in danger and that he request help In such situations.	"Wij worden zo opgeleid dat wij zouden moeten kunnen herkennen als wij de primaire taak veilig varen niet meer kunnen volbrengen in combinatie met het oefenprogramma, dat wij zelf iemand erbij halen en het command informeren, zodat onze werkbelasting verlicht wordt om op het moment dat wij ondersteuning krijgen waardoor we de taak kunnen uitvoeren."
Human performance	Trespassing rules	1	2	Trespassing the rules in favor of safety of the ship and its crew.	"Maar als ik een regel moet overtreden om het schip veilig te houden, lachend. Navigatie is denk ik te breed. Het gaat echt om de veiligheid van het schip. Alle andere dingen, op tijd komen waar we moeten zijn, is ondergeschikt daaraan."

Procedures	When in doubt, call for help	1	5	The watch officer has to ask for help well in advance when in doubt.	"Voor mij zijn die orders altijd heel leidend. Bij twijfel moet je bellen."
Team management	Team effort	1	4	The output of the bridge is not only an effort of the watch officer. It is the effort of the team.	"We hebben de roerganger en de uitkijk. Die nemen als ze hun werk goed doen in ieder geval, je SA omhoog brengen die. Als zij goed hun werk doen dan heb jij goed in de gaten welke scheepvaart er van belang is voor jou. We hebben de seiner die de comms van je over zou kunnen nemen als je het te druk hebt. Je hebt echt wel je personeel op de brug nodig."
Working ahead	Schedule	1	2	The schedule for the ship on that day.	"Personeel, navigatie, programma en andere storende elementen. Mensen die bellen, weet ik veel, ja oplopers. Alles wat niet rechtsreeks te maken heeft met je product, maar je je wel om moet bekommeren en niet kan negeren."
Workload management	Special duty	1	2	Duties where the watch officer gets help of (a) colleague watch officer(s).	"En dan de bijzondere wachten zijn dan de havenaanlopen en ook nog RAS-en en de tactische serails zeg maar."
Workload management	AIS	1	6	AIS offers the watch officer information with regard to other shipping.	"Tevens doorloop je de NAVTEX, of je berichtjes binnen gekregen hebt, je AIS of daar nog berichtjes binnen zijn."
Workload management	Combat Management System (CMS)	1	6	The CMS offers the watch officer tactical information which he uses during his duty.	"Tevens gebruik ik nog het CMS, waarin we ons niet officieel navigeren, maar ook tactisch veel doen, bijvoorbeeld rendez-vous waar we naartoe moeten. Tracks staan erin."
Workload management	Combining safe navigation with an exercise	1	1	Combining the navigational process with one exercise.	"Een oefening is altijd goed te combineren met veilig varen. Twee oefeningen tegelijk, dan wordt het al complex en dan loop je al een groter risico."
Workload management	Combining two or more exercises increases risk	1	1	Combining more exercises simultaneously increases the risk of mishaps.	"Twee oefeningen tegelijk, dan wordt het al complex en dan loop je al een groter risico. Maar in principe draaien wij een oefening tegelijk op de brug naast veilig varen en als er een tweede komt of als iets tegelijk gestart wordt dan schakelen wij direct hulp in, zodat iemand anders die andere oefening opstart."
Workload management	Creating rest	1	2	The watch officer creates rest by dismissing people on the bridge not on duty and by being directive to the remaining team members on the bridge.	"De eerste uitweg is rust op de brug creëren. Als ik merk dat ik volloop, dan ga ik eerst om mij heenkijken. Oké, wie zijn hier die ik hier niet hoef te hebben. Welke informatie krijg ik waar ik niks aan heb."
Workload management	Last minute changes	1	2	The watch officer needs to be able to deal with last minute changes.	"De wacht op de brug zit inderdaad tjokvol met oefeningen, en wat daar dan bijkomt is dat je ervoor en daarna dingen moet gaan voorbereiden en dat plannen wijzigen op het laatste moment."
Workload management	Managing concurrent exercises by experience	1	1	The watch officer is able to manage concurrent exercises when he has more experience.	"En naarmate je meer ervaring opbouwt, in het begin heb je nog hulp nodig, als het complexe oefeningen zijn, om dat veilig varen te kunnen garanderen, maar in the end krijg je op een gegeven moment dusdanig, dan wordt je ervaren in je werk en dan kan je oefeningen tegelijk draaien met dat je veilig vaart."
Workload management	Managing multiple interests	1	2	The simultaneous occurrence of three interests at the same time, which conflict with each other	"Op een gegeven moment liepen we daarbij een vrachtschip op en het werd daarbij ook wat nauwer, we moesten door een soort chicane heen, en het werd nog nauwer en die heli moest oplanden."
Team management	The risk of a new team	1	1	Getting help from other colleagues is less obvious when new teams are put together. This improves significant by training.	"Ja, dat is denk ik echt het onderdeel van het goed runnen van een brug. En je ziet in een onervaren team, dat wil ik nog wel aanvullen, dat dat juist het lastigste is, dat dat ontbreekt wel eens. Gaat niet vanzelf. In FOST, of toen wij met Seatrain begonnen hier, dan heb je een nieuw team bij elkaar, dan is dat niet vanzelfsprekend. Daar zit natuurlijk groot risico."

Appendix C: Interests influencing the watch officer

Main interest	Specific interest		
External interests	External communication	FLYEX	Other assets: giving directions to other assets
	Ever changing circumstances	Looking outside	Time of the day
	External exercises	Meteorological conditions	VHF-radio
Human performance	A busy duty cycle	Fatigue	Perception
	Assessing the situation	Focus	Personal sense of safety
	Average duty cycle	Hierarchical pressure by the higher command	Recognize your limitations
	Being directive	Independent	Safety commitment
	Can-do mentality	Leadership style	Safety margin
	Caution	Limitations	Seasickness
	Challenges	Luck	Sense of responsibility
	Comfort zone	Mindfulness	Situation Awareness
	Confusion of tongues	Mindset	Split second decisions
	CRM	Motivation	Successful means guaranteeing safety
	Direct actions	Overload	Time pressure
	Duty cycle	People's own responsibility	Trespassing rules
Internal interests	Asking the watch officer for permission	Forgetting due to not seeing	Phone calls
	Chitchat	Internal exercises	Piping
	Communication	Machinery breakdown drills	Poor understanding by other departments
	Different departments	NAVTEX	Spectators on the bridge
	Disturbing elements	Oracle	Technical department
	Draw attention	Passage prohibition	Telephone exchange
	Executive department	People management	Weapon engineering department
Learning & teaching	Basic training at the Royal Netherlands Naval College	Learning	Teaching/coaching the second watch officer
	CCO	Making mistakes when inexperienced is normal	Training
	Coaching	Monitoring the watch officer	Training program
	De-briefing	Recognize problems	Transfer of knowledge
	Exercises	Supervision	Turnover
	Experience	Teaching	ZWST-A: certificate
	Feedback from your team		
Managing conflicting goals	Managing workload	Prioritizing	
Navigation	Fix interval	Radar	The navigation planning
	Navigation	Taking into account other shipping	
Organization	Authority	Loosing the timeline due to automation	Responsibility
	Bound by location	Quality assurance	Safety paradox
	Informing key players	Redundancy	Speak-up mentality
	Less personnel due to automation	Relieve duty	The commanding officer (CO)
Procedures	Checklist	ORM	Standard Operating Procedures (SOP)
	Check of systems	Rules of the road	The need to be informed
	Maneuvering	Standing orders	When in doubt, call for help
	Operational limitations		
Team management	Creating time by team management	Team effort	The risk of a new team
	Team awareness	Team management	
Working ahead	Planning ahead	Preparation of duty	Schedule
Workload management	AIS	Creating rest	Managing multiple interests
	Alarm generation	Creating time by decreasing speed	Sharing workload
	Combat Management System (CMS)	Division of responsibilities (DOR)	Supporting the watch officer by automation
	Combining different interests	Getting help from colleagues	Special duty
	Combining safe navigation with an exercise	Last minute changes	
	Combining two or more exercises increases risk	Managing concurrent exercises by experience	