This paper aims to formulate a strategy for maximizing work performance for seafarers under stress. This paper concerns itself chiefly with seafarers in the merchant navy; naval officers serving as part of the country’s defence force work under different conditions from that of the merchant service. Based on a preliminary study into the different kinds of existing job stressors, known stress factors and stress mitigation methods, this paper proposes a strategy for maximizing seafarer’s work performance, at the same time drawing a distinction between reducing stress and optimizing performance.

Submitted by: Lee Sin Wei, Crystal
Supervisor: Assoc Prof Poh Kim Leng
**TABLE OF CONTENTS**

1. Introduction .................................................................................................................................................. 3
2. Literature Review .......................................................................................................................................... 4
3. The concept of Stress .................................................................................................................................... 6
   3.1 Job Stressors ........................................................................................................................................... 7
   3.2 Stress Management Models: a short discussion ...................................................................................... 7
4. Alleviating Stress vs Maximising Performance - Coping with stress vs Dealing with stress .............. 10
5. Methods to Maximise Performance for the Merchant Navy ................................................................. 11
   5.1 The Merchant Navy ............................................................................................................................... 11
   5.1.1 Ranks and (Highlighted) Related Duties ....................................................................................... 15
   5.2 Methods ................................................................................................................................................ 16
   5.2.1 *Coping Inventory* ......................................................................................................................... 16
   5.2.2 *Personal Work Standard* ............................................................................................................. 16
   5.2.3 *Personal Resources* ...................................................................................................................... 17
   5.2.4 *Optimism* ....................................................................................................................................... 17
   5.2.5 *Organizational-based self-esteem* (Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2007) ........ 18
   5.3 Performance Measures ............................................................................................................................ 19
   5.4 Using the SDW ....................................................................................................................................... 20
   5.4.1 Checks and Balances ....................................................................................................................... 23
6. Conclusion .................................................................................................................................................... 25
7. Areas for Future Study ............................................................................................................................... 26
Works Cited ..................................................................................................................................................... 27
1. **INTRODUCTION**

Due to the isolated work environment aboard ships, it is of paramount importance for seamen to be in optimum condition at all times, such that they can respond to any emergencies on board; after all, the ship is their home. However, rules governing the way of life aboard merchant ships, such as work scheduling, are less stringent than those of naval vessels, resulting in a possible neglect of the welfare of merchant seamen. This may lead to decreased job satisfaction and mental and physical wellbeing, thus contributing to the onset of stress which further exacerbates the problem of poor performance of duties. This paper aims to find a model that would allow for the seamen’s optimum performance while under stress.

Stress is defined here as the psychological and physical state that is induced due to various factors, as discussed later in this paper. This state results in the person being unable to perform his duties with the usual diligence, accuracy and efficiency; in order words, the ‘stressed’ seafarer is unable to perform to his full, optimum potential.

We first identify through literature reviews and a survey of seamen in the merchant navy, the key factors that result in stress when on board. We then develop a model that reduces the incidence of stress occurring, thus indirectly reducing the instances of poor performance due to stress. As to the dealing with performance while under stress, we take into account the notion that stress may actually help certain kinds of people work better, thus being under stress actually results in optimum overall performance with respect to the ship. It must be mentioned now, though, that this paper is focused on benefiting the individual rather than the company. Optimum overall performance with respect to ship may be negative in relation to our study because of this, because the stress level of the individual concerned may be raised and is consequently detrimental to them.
2. **Literature Review**

There is little literature on combating stress for personnel at sea. However, there have been studies regarding the causes of stress for personnel at sea. Among these factors, sleep has been identified as having a “strong causal relationship [with]” performance (Miller & Firehammer, 2007). Studies conducted have shown that personnel with little sleep miss “subtle pattern changes” when undertaking vigilance tasks. In addition, temporary deprivation of sleep results in a degradation of human performance for at least three days after sleeping hours have returned to the normal 8 hours per night, *without the degradation of performance being noticed by the personnel themselves*. These two scenarios are dangerous on their own and when combined, it becomes extremely dangerous, particularly when sailing through busy channels and during storms and fogs or at night when visibility is extremely low. In particular, Miller cites critical levels of fatigue between 8% to 21%, driven primarily by personnel on the 4 hours on, 8 hours off schedule on merchant ships. Although 8 hours are the universally agreeable period of sleep, the seamen virtually never get to enjoy a full 8 hours of uninterrupted sleep due to the need to attend to other personal matters such as showers and phone calls home, and the cycle of day/night rotation upsets the circadian rhythm.

Food, or the quality of food, is another factor that contributes to the onset of stress in marine personnel. In a comparison of health-related behavior and stress at sea and ashore, seamen showed more frequent occurrences of and higher levels of stress at sea than ashore. This may be attributed to the disrupted sleep that they are able to get, and the lack of proper relaxation exercises due to space and time constraints. Poor health (relatively speaking) due to food of lower nutritional value than ashore coupled with the sleep deprivation frequently experienced by seafarers (Miller & Firehammer, 2007) results in an individual who is not performing at his optimum. In addition, he might not have the mental energy to cope with the demands of being away from home on the close confines of a ship, leading to high levels of stress. Monitoring the nutritional value of food served on board the different ships and voyages is recommended. Alcoholism is also a problem in the merchant navy, with alcohol a fast and easy way to escape the boredom of long journeys between ports. The periods between access to alcohol would result in extremely high stress levels for alcoholic seamen.

As promotions for seafarers are based on performance reports conducted by their superiors (eg captains or chief engineers), Implicit Stress Theory as postulated by Perrewe et al may hold the key to yet another reason for stress at sea. The Implicit Stress Theory predicts that *raters will judge individuals’ performance as lower if those individuals are perceived to be under stress.* (Perrewe et al, 1993) As such, seafarers are stressed by the idea that they must not appear to be stressed, resulting in a boomerang effect. However, what stressed individuals lack in performance, they make up for in perceived commitment, which is an asset today, as the marine sector faces a shortage of marine personnel. (Low, 2007) At the same time, these “committed personnel” are also at the highest risk of burnout (Perrewe
et al., 1993), which may lead to an overall shortened service time. One has to bear in mind though, that commitment and burnout are perceived by the rater and may not actually be experienced by the individual himself.
3. **THE CONCEPT OF STRESS**

Stress as a psychological factor has been studied at length by psychologists and organizational behavior practitioners. The type of stress discussed in this paper is slightly more complicated in that it does not deal solely with organizational stress (which may be alleviated automatically in a lesser or greater extent when the individual leaves the workplace) nor does it deal solely with psychological stress (because seafarers deal with stress within the framework of an organization: they are consistently within the organizer for extended periods of time). Although it may be argued that psychological stress is the all-encompassing term for stress that is experienced, the author would like to define here, that psychological stress as mentioned in this context, refers to the stress perceived or experienced by a person as a result of his personality and/or character; that is, what Kenny and Cooper (2003) term “personal trouble”.

It has been recommended that the idea of “organizational stress” be eradicated and replaced with “occupational stressors” due to the issue of “coping” with stress being different from the issue of “dealing” with stress. Before proposing the eradication of the idea of organizational stress, Kenny and Cooper propose in their paper, Occupational Stress and Management, the idea of occupational stress as being influenced by two factors: “personal trouble” and “public concern”. The former concerns itself with the personality of the individual, while the latter is related to the work characteristics. In this paper, we will continue using this concept to define the causes of stress in seafarers, and address the issue of work performance through these two factors.

In addition, there are various factors that have a significance difference for the merchant navy when we talk about organizational stress

**Differences between merchant navy stress and organizational stress**

- Organisation as family when aboard ship (when we discuss commitment, is it to the ship as a home or to the company as a home or to the paycheck as a home?)
- Work load requirements (work load for each officer/rating in the merchant navy is pre-determined and responsibility charts are well-delineated: in the event of mischance, blame can be dished out according to those charts, it is highly unlikely that work load requirements change)
- Working time (for each officer working time is also fixed based on number of watch hours. Although these may change due to unforeseen circumstances such as sickness or storm, there is little variation on the number of work hours)
- Management levels (merchant navy works on a highly bureaucratic, hierarchical and authoritarian system. Each ship’s crew answers to the captain of the vessel. There is little or no room for dissidence when the captain’s word is the last word. Compare this to where suggestions/complaints can be brought up to a level higher. On a ship this is not
immediately possible and one rarely sees the impact till the ship is brought to shore, which may be months later)

- Suggestion of 24 hour accessibility and info overload as a possible stress point: this is not particularly applicable as seafarers have all along have to deal with this issue
- Seafarers dun expect shore mgmt to make things better for them; they accept that this is a high-stress high-risk high-paying (solely monetary value) job, whereas normal org people have higher expectations of HR and mgmt to help alleviate this issue through “Staff welfare” services. Seafarers have little staff welfare

3.1 JOB STRESSORS
A questionnaire was conducted of 50 seafarers including both engineers and officers, from nationalities including India, Singapore and Burma. These three job stressors figured in the responses of 100% of the respondents, whether as primary or secondary stressors, namely:

- Performance Appraisals and Theory Examinations (Still a case of hierarchy and experience. Meritocracy plays a part but experience and superior recommendation still plays a larger part)
- Problems in the family, prolonged absence from home
- Friction between individual and other members of the crew

It is also proposed in this paper that there exist other stress-causing factors that have not been identified by the seafarers because they do not recognize them as such. These factors include lack of nutrition (good food), lack of sleep, extreme temperature and claustrophobia. Most seafarers get used to life on board ship, so seasickness, lack of sleep and claustrophobia gradually become part of their routine such that they do not identify them as stress-inducing factors, although they are constantly at the back of their mind.

Using the Parker and DeCotiis’ model (as discussed below), these three job stressors fall under the Career Development, Extraorganizational Issues and Relationship at Work. While their model included a factor “Corporate management out of touch”, the respondents to the survey indicated that they did not expect the shore management to find ways to eliminating job stress on board ship, because they felt that the job stress experienced on board was “part and parcel” of being a seafarer. At the same time, although they did not expect it, they suggested that the shore side management could organize more get together activities such as sporting activities perhaps in order to let them get to know their fellow colleagues better.

3.2 STRESS MANAGEMENT MODELS: A SHORT DISCUSSION
Various stress management models have been proposed: (what are the limitations of these models? Or discuss the limitations at the end of my final model? Think end of final model is better, because we can sum the variances)
- Commitment level as a buffer against stress
- Personal work stress decrease with higher perceived work standard
- BSCI stress mgmt instrument to help determine an individual’s performance and consequently the best kind of method to mitigate stress/ the best way to implement a work site stress mgmt programs
- Personal resources as a mediator of relationship between job demands and exhaustion and influence perceptions of job resources
- Efficacious or optimistic employees report lower levels of severe fatigue meaning that they might be resistant to adverse conditions //improve performance
- Mobilisation of job resources may be of value for employees to thrive (in conjunction with empowerment of employees’ personal resources //improve performance

Job Stressor Categories (Parker and Cotis, 2003)

- Aspects of Job
  - Autonomy
  - Stability
  - Pay-performance limitations
  - Task variety
  - Emphasis on achieving
  - Actual base salary
  - Hours worked per week

- Structure, Climate, Information Flow
  - Recognition of good performance
  - Fairness
  - Formalization
  - Centralization
  - Quality of decision making
  - Communication adequacy
  - Communication openness
  - Emphasis: profit vs people
  - Concern for individuals
  - Corporate management out of touch

- Career development
  - Training quality
  - Basis of promotions
  - Performance feedback
  - Emphasis on individual development

- Relationships at work
  - Trust
- Aspects of role
  o Innovativeness encouraged
  o Role conflict
  o Role ambiguity
  o Boss’s encouragement/support
  o Boss’s task orientation
  o Closeness of supervision
  o Tenure in job
  o Tenure in company
  o Organization level
  o Supply support

- Extraorganizational variables
  o Age
  o Sex
  o Number of dependants
  o Years of education

In this paper, we seek a solution to maximizing work performance while under stress because we acknowledge that stress is constantly in existence, although in varying levels, while at sea. At sea, it is important to perform well while under stress because performance is extremely important for the well-being of the entire crew and ship: the ship is your home and the crew your proxy family.
4. **Alleviating Stress vs Maximising Performance - Coping with Stress vs Dealing with Stress**

Kenny and Cooper in their paper *Occupational Stress and Management* (2003) highlight the difference between “coping with stress” and “dealing with stress”. With regards to “coping with stress”, the individual’s coping mechanism is closely tied to his personality. Because personality changes are hard to effect, the coping mechanism will be hard to change as well. They suggest instead, to shift the focus to mechanisms that help individuals deal with stress instead. Dealing with stress suggests harnessing personal resources to solve problems, while coping with stress in effect measures the reactivity of the individual when faced with the problem; solving the problem is not of primary concern when talking about coping, how well one lives with the problem is.

In the same way, alleviating stress and maximizing performance has the same difference. When one alleviates stress, the mental burden placed on the individual is reduced. He is able to live with the extra demands and/or changes in the environment without exhibiting signs of mental incapacity or abnormality. Whether the individual acknowledges and recognizes the presence of a stressor is not crucial. What is crucial is that the psychological burden placed on him by the stressor does not cause him to become mentally incapacitated. In contrast, maximizing performance under stress involves the individual being able to recognize the presence of a stressor, deal with the impact of the stressor such that he is able to recognize the stressor, yet not allow his performance to be overly affected by the presence of the stressor. Some of the methods discussed above address this issue of dealing with stress in addition to coping with it. While not all the methods are directly applicable to the merchant navy, just as not all the job stressor variables as defined by Parker and DeCotiis (1983) are directly applicable, the methods and variables provide a solid platform from which to develop performance maximization methods applicable to the merchant navy.
5. **METHODS TO MAXIMISE PERFORMANCE FOR THE MERCHANT NAVY**

Several ways of reducing stress have been proposed by researchers. These include among others the Brief Stress and Coping Inventory (BSCI) stress management instrument to help determine an individual’s performance and the best way to implement a work site stress management program.

Several factors have been targeted as the focus in stress management programs. These include personal work standards, commitment level, personal resources, optimism and job resources.

Using these factors as a basis, and including the Parker and DeCotiis model, the model proposed seeks to help determine the methods of minimizing stress in the merchant navy and consequently maximize the performance of the merchant navy when they are working under stress whether or not they are in stressful conditions.

5.1 **THE MERCHANT NAVY**

The merchant navy is unique in the sense that they are economically oriented: their sailing schedules, port stays and remuneration are based on their work performance, which in turn translates to the company’s profits and earnings. Unlike the defence navy, where high degrees of discipline are fostered due to the bureaucratic structure, pension scheme and the general discipline of a military force, the merchant navy lacks the military discipline that makes enforcing the bureaucratic structure and high discipline required of a seaman.

The modern seaman differs from the traditional seamen in that they do not receive payouts based on the amount of profit garnered on a particular trip. Instead, they receive fixed paychecks based on their rank, length of services, and other factors that the crewing department takes into account, much like the way the human resource department determines salaries and pay raises. Thus, work performance does not directly translate into higher profits. The link is vague and indirect. One can liken it to the scenario where the good is never acknowledged but the bad is broadcasted all over the world. Imagine a tanker who has made several voyages, carrying hundreds of thousands of tons of fuel over the several trips. No notice is paid to this tanker until it collides and the crew dies, or an oil spill occurs. This leads to caution on the part of the seamen for they do not wish to deal with accident reporting. However, is this resistance sufficient to spur them on to greater work performance?

Measuring work performance among the merchant navy is an extremely tedious task, because of the variety of ranks and relevant duties, in addition to there being different requirements for different kinds of ships, for example, special provisions are made for tankers as opposed to those for a container ship or passenger ship. Using the regulations and definitions as set out in the Standards of Training, Certification and Watchkeeping (STCW) provide a solution to this problem: work performance will be based on the requirements of the STCW for the particular position or duty. Optimising work performance, then, would mean achieving a level of
performance close to or exceeding that specified in the STCW. STCW requirements are the bare minimum for any ship that is sailing in international waters and are governed by the International Maritime Organisation (IMO). By achieving a performance level close to or exceeding that specified, the seaman would have exceeded the minimum expectations for safety on board merchant vessels and thus indirectly ensure that the cargo is delivered intact and in keeping with the deadline as much as possible, given that sometimes ships are given schedules that are impossible to meet unless the vessel travels at the speed of an aviation vessel.

Stress for merchant navy officers does not gain a new definition; stress still implies the psychological, physiological or physical elements that affect performance. While some people may feel that they “work better under stress” (stress taking on a positive, motivational role), this paper seeks to address the issues and concerns of those to whom stress is a negative, affective factor that causes disruption to their normal work, be it through psychological, physiological or physical means.

Causes of stress for the seamen are similar to those of land-bound workers, except with the added factor of home-sickness and worry when problems occur at home. The seamen have a much longer response time as compared to a land-bound worker because of the former’s relative distance from land: should the vessel be in the middle of a trade route, it will need to dock at a port before the seamen can catch a flight or other transportation modes back to their families. Non-stress-induced fatigue also affects the seamen, due to the way their job functions. While on a vessel seamen are at work 24 hours a day; should the vessel dock at a port and prepare for loading/unloading, several seamen may have to forfeit their sleep in order to oversee the port operations and ensure that they are aware of any emergency situations onboard.

Fatigue induces stress and stress induces fatigue. This appears to be a chicken and egg problem. The nature of the problem and the role and background of fatigue is explored in the IMO’s amendments. Readers interested in fatigue and its role on seamen may wish to consult the IMO amendment. Other factors causing stress are listed below and will be discussed individually.

Seamen are most affected by stress that are caused by psychological factors, not least because these are the factors that are least able to be resolved on board ship, whether internally by the seamen, or with external help from his crew members or the shore management.

At the top of the list of these psychological factors is the notification of problems or even emergencies at home. Reaction time for seamen to family emergencies are terrifyingly long, because of the time needed for the initial message to be reach the seaman, for the seaman to notify the company of his need to sign off from the vessel and for the vessel to reach a port of call such that he is able to make his way home from there, subject to flight/train availability. While these flight issues are usually outsourced to travel agents specializing in movement of merchant navy crew, thus reducing the need to jostle for tickets with the general public, the period after receipt of the message and prior to sign off is an extremely stressful period for the seamen. We call this period the “family emergency stress” period, occurring during the pre-signoff stage.
Seamen have to undergo constant performance evaluation by the captain of the ship. Coupled with the conflict and tension associated with long periods of confinement with the same group of people, this is another factor for stress. Promotion and the associated pay raise is gained not just through the recommendations of the executive members of the crew (Captain, Chief Mate) but also through competency training and grading conducted through maritime academies. While the worry of passing examinations may not be a huge weight on the sailor’s mind while at sea, the worry of not getting a good performance grade bears greatly on the sailor. We term this “grading stress”, which occurs throughout the entire period on board ship, but peaks at the initial sign-on period and the pre-signoff period.

Interpersonal relationships among the crew are a source of constant stress, particularly if the seaman is unable to get along with his crew members. There has been more than one case where the seaman has left the profession for good, signing off in the middle of a voyage because of his inability to continue working under the stress imposed upon him by uncooperative and (to him) unfriendly crew members. As the shipping network is closely connected, especially within the same company, negative interpersonal relationships tend to be viewed with more importance because negative feedback from one set of crew has the possibility of translating into negative reception by members of another crew on another vessel which the seamen has to join. We term this “peer stress”, occurring throughout the period at sea, peaking after a few weeks into the term, where enough time has passed for friendly/unfriendly relationships to develop within the crew.

A stress factor that is common to seamen and land-bound staff is the stress associated with entering a new working environment. For seamen, this occurs as often as every 6 months or less, where they sign off a vessel, take a vacation and sign onto another vessel. Although one might argue that one tanker is much the same as another tanker, we can liken this argument to one that says the finance department in company A is much the same as another finance department in company B. Each vessel, though of the same type, has its own quirks, and each captain has a different method of management. We term this “new environment stress”, occurring only during the initial weeks of joining ship.

Physiological factors causing stress are just as difficult to deal with as psychological factors because there is little or no way of improving environmental conditions to mitigate this form of stress: the crew of a container ship sailing through the waters near Alaska cannot simply turn off the refrigerant element of the gigantic freezer in which they find themselves. In the same way, the crew of ships sailing through the middle of an ocean on a hot, humid day can only have the airconditioner turned up to that level; they are still subject to the mercy of the sun overhead and the reflected heat from the ocean waters, while trapped in their standard uniforms.

1 Mani's case
Another instance of stress occurs during the loading/unloading of cargo at ports, where everyone is required to be present whether or not he has been on watch before the actual unloading period. This contributes to a lack of sleep and consequently fatigue.

There is no doubt other factors exist that contribute to the stress experienced by seamen. However, we deal only with the factors mentioned above when we attempt to optimise the work performance of seamen under this form of stress.

Understanding the role of job stress helps us identify the possible methods that can be used to optimise work performance. This understanding is summarised by Parker and DeCotiis’ Model of Job Stress. (Cooper & Kenny, 2003) Through Parker and DeCotiis’ analysis we are able to see a relationship between the stressor and the 2nd level outcome. In the same way, the Stress Distribution Wheel below attempts to let the reader see the relationship between the five key areas and the method selected to deal with the stress problem.

Stress sources can be differentiated between the physiological and psychological sources. In this paper, we concentrate on psycho and physiological methods of alleviating stress such that work performance can be optimized.

Understanding the different methods allow us to know how we will use it for each part, as well as their role in the Stress Distribution Wheel (SDW).

**Methods**

Coping Inventory

OBSE

Personal Resources

Personal Work Standards

**Performance Measures**

Engineering Watch

Bridge Watch

**Ranks & Related Duties**

Captain

Chief Engineer

Officers/Engineers

Cadets

Based on our knowledge of the duties of each rank, and the performance measures used for each rank we can determine the time period at which the stress is most likely to occur and thus decide...
upon the method used at that point in time to optimise the work performance. Once a pattern has been observed, the company may then choose to invest (and determine the amount of investment) in each method.

5.1.1 Ranks and (Highlighted) Related Duties

Captain

The Captain is in charge of everything associated with the running of the ship, and has the final say over all matters on board, including but not limited to crew timetable scheduling, vessel safety and environmental issues, law and order onboard and decisions on when/where/how and if to sail. Especially during emergencies, the STCW decrees that the decision of the Captain supersedes the decisions of all other stakeholders, including shipowners and charterers. Whether this decree is always followed is debatable.

Chief Engineer

The Chief Engineer is in charge of all the engines, but reports to the Captain, who makes the final decisions on issues regarding the engines, with input from the Chief Engineer. In particular, the Chief Engineer has to ensure that engine operations comply with regulations regarding emissions and environmental impact, at the same time operating with maximum efficiency. In the event of environmental guidelines being breached by the ship’s engines, the Chief Engineer and Captain will both be tried for this violation.

Deck Officers/Engineers

Deck Officers are in charge of the navigation and daily operations of the ship. In other words, they are in charge of everything except the engines and daily tasks such as cleaning and cooking. These tasks are usually performed by ratings (able seamen, including positions such as motorman for engine). Deck Officers are divided into senior and junior officers, senior officers comprising the Captain and Chief Officer, while junior officers being the 3rd Officer (Third mate) and 2nd Officer (Second mate).

The Chief Officer typically handles the administrative duties onboard before submitting the documents for approval to the Captain. These documents include the crew schedule which is drawn up by the C/O, as well as equipment requirements onboard ship, including entertainment equipment such as Xboxes, which are available on some ships.

Engineers

Senior Engineers are the Chief Engineer and 2nd Engineer, while the 3rd, 4th and 5th Engineers are the Junior Engineers. The engineers are responsible for inspection and maintenance of the engines such that the engines are running in optimum conditions at all times, subject to environmental regulations governing emissions from ship’s engines.
In the event of engine malfunctions, the engineers are to inform the C/E and Captain of the malfunctions and recommended action. Upon approval by the captain, the engineers may then proceed with the repair of the engines. For minor engine problems, this step may be skipped and the repairs may continue but all malfunctions and repairs have to be noted in the engine log book, similar to that of the watch log.

_Cadets (Deck and Engine)_

Cadets are onboard ship to gain sea hours and experience in preparation for their career as seamen. As such, they are exposed to a variety of tasks and have a varied job scope, depending on whether they are engine, deck or dual cadets\(^2\). Cadets typically experience higher stress levels due to the different tasks they have to undertake, ranging from the menial (cleaning up tanks on tankers) to the more ‘sophisticated’ (assisting in navigation/watchkeeping). If it is the cadet’s first time onboard, there is the added stress of homesickness and the arduous procedure of earning their sealegs. In addition, certain cadets may find the rituals associated with virgin equatorial or Mediterranean crossings extremely stressful.

5.2 METHODS

5.2.1 _Coping Inventory_

Using results drawn from the Brief Stress and Coping Inventory proposed by Rahe and Tolles (2002), the “Coping Inventory for Stressful Situations” allows us to classify the types of reaction to stress into task-oriented, emotion-oriented and avoidant coping methods. This allows us to determine the type of optimum performance that a seaman is able to deliver, thus assigning him to a position that is best suited for his stress coping mechanism, such that the methods used to optimise his performance will be more efficient, and over time, more effective.

5.2.2 _Personal Work Standard_

Hsieh has established in his paper “The Relationship between Employees’ Personal Work Standards and Perceived Work Stress” that

“[personal work standards of employees] was related to high work centrality, long hours worked per week, high salary, and high organizational level. Perceived work stress was related to high work centrality, long hours worked per week, and high salary.

The data in Table 2 indicate that when personal work standards were entered into the equation after the control variables, it contributed a significant portion of the variance in perceived work stress, \(F(1, 231) = 5.22, p < .01\), and the regression coefficient was negative, indicating that _perceived work stress tended to decrease with higher personal work standards._” (Hsieh, 2004)

\(^2\) Dual cadets: An initiative by AP Moller to train cadets in both engine and deck tasks, such as navigation.
This presents us with one method of increasing work performance through reducing stress: groom seamen to have high personal work standards such that they will perceive work stress to be less of a burden and more of a challenge. Of course, the subjectivity of work standards is a hot bed for conflicts, particularly after having been on the same vessel for more than 3 months with the same group of people. This is the cognitive dissonance Hsieh spoke about in his paper regarding the cooperation between people of different work standards. This dissonance is amplified by the stress of being in confined quarters with the same social circle for three to six months at a go. While allowing the reduction of work stress, we have increased the propensity of conflict among the crew.

5.2.3 PERSONAL RESOURCES

Xanthopoulou, Bakker, Demerouti and Schaufeli write that “job demands are the main predictors of negative job strain” and that personal resources, aspects of the self that are linked generally to resiliency and refer to individuals’ sense of their ability to control and impact upon their environment successfully (Hobfoll, Johnson, Ennis, & Jackson, 2003). We include three typical personal resources, namely, self-efficacy (Bandura, 1989), organizational-based self-esteem (Pierce, Gardner, Cummings, & Dunham, 1989), and optimism (Scheier & Carver, 1985), all of which have been recognized by Hobfoll (2002) as fundamental components of individual adaptability. 

Which gives us an idea of the relationship between job demands and job strain.

In this paper, we adopt the paper’s view of self-efficacy as the individuals’ perceptions of their ability to meet demands in a broad array of contexts.

5.2.4 OPTIMISM

Optimism refers to the “tendency to believe that one will generally experience good outcomes in life (Scheier & Carver, 1985), which increases the propensity to take action and deal with threats (Aspinwall & Taylor, 1997).”

Developing seamen’s personal resources or their perception of their personal resources increases the positivity with which they regard job demands. The more they feel that job demands are reasonable (due to an increase in resources that makes the job easier), the lesser they will feel job strain.
5.2.5 *Organizational-based self-esteem* (Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2007)

*Organizational-based self-esteem* (OBSE) is defined as

“... the degree to which organizational members believe that they can satisfy their needs by participating in roles within the context of an organization”

(Pierce et al., 1989, p. 625). 

Although OBSE features as part of personal resources, it is identified as a separate category here because of the different components of OBSE that is relevant to each particular rank. These components include

- (1) Resourceful work characteristics (such as influence, fairness and support)
- (2) Employee motivation
- (3) Employee attitudes (such as satisfaction, commitment)
- (4) Performance

The OBSE model expects that self-efficacious and/or optimistic employees will focus more on resources than on job demands and they will consequently experience lower levels of exhaustion and higher levels of work engagement. This higher level of work engagement will be a contributing factor to our perception of their job strain.

In addition, components (1) to (4) are issues we want to attack using an appropriate method. For example, if OBSE(1) is listed as a method to optimise work performance in the SDW, we would want to examine the individual’s influence on decision, the fairness with which he is treated and the support he receives from fellow crew.

This leads us to propose the method of enhancing the OBSE components relevant to the individual seaman. In this case, it would be to teach him how to increase his influence, fairness and support, although it is noted that the concept of influence is less relevant to seamen due to the strict hierarchy of authority that is maintained at all times.

**OBSE(1)**

*Resourceful work characteristics* help water down stress by giving the seaman the ability to delegate work in the form of seeking external help, or making changes to certain methods of doing work, even though he is not in a position of authority to do so. Having resourceful work characteristics would imply being able to garner support from fellow crew members for a proposition he has, or not receiving excessive negative treatment in the event of error.

**OBSE(2)**
**Employee motivation** is “the psychological feature that arouses [the employee] to action toward a desired goal”. (dictionary.com, 2007) It is about how willing the employee is to take actions to further his goals within the organisation, be it faster promotions, higher payscales or personal achievements in terms of efficiency and seamanship. Motivated employees typically experience less stress because they are able to see the light at the end of the tunnel and are willing to travel towards that light. Less motivated employees see every task as yet another dreary obstacle in their otherwise uneventful climb to their goals. This perspective leads them to experience stress because they do not have the willingness or energy to think up solutions to the problem at hand, or to complete their tasks effectively and efficiently. This may also lead to the conflict of personal work standards, as mentioned earlier, where seamen with higher work standards find fault with those with lower work standards.

**OBSE(3)**

**Employee attitudes towards work** are closely tied in to employee motivation: Motivated employees tend to look at work in a more positive light and consequently are more satisfied and committed to their work, either because they love it or because they see it as a stepping stone to their goals, with each stone crossed a milestone marking their achievements. Less motivated employees tend to be less satisfied with work and see stepping stones as obstacles to an easy upward promotion. Less satisfied and less committed employees would be the exact opposite. Commitment has been shown to be a stress buffer by Donald Parker (1983). Improvements in employee attitudes would have a positive effect on stress alleviation.

**OBSE(4)**

Performance, both actual and perceived, weighs heavily on the minds of all the crew. Perceived performance might be out of the control of the seaman, as this depends highly on the personal work standard of the external observer. However, performance that can be controlled by the individual seaman, will be governed to a great extent by OBSE(2), (3) and (4). Positive values for 2,3,4 will enhance the controllable section of performance of the seaman. Knowledge that performance can be controlled by the individual to a certain extent will allow the seaman a lesser degree of stress.

**5.3 Performance Measures**

The Standards of Training, Certification and Watchkeeping (STCW) Convention is a system that is governs seamen, in particular merchant seamen. It sets forth requirements pertaining to acceptable standards of training and certification required to be undertaken and held by the seamen in order for them to be able to assume positions and promotions within the seafaring hierarchy. It also sets out guidelines, as suggested by the International Maritime Organisation, for charterers and shipowners. The convention covers all aspects of seafaring life, including personnel safety and performance quality. It is these two aspects that allow us to determine the performance measures of seamen.
Bridge Watch

The STCW requires that a person reporting for duty be *fit* (author’s emphasis) for duty in terms of efficiency and effectiveness.

In addition, the officer in charge of a navigational watch must take into account limitations in the qualification and fitness of the other available watch members in the decision making process.

Individuals should also be assigned to locations where they can most effectively and efficiently perform their duties, including the possibility of re-allocation (of duties).

The author perceives “fit” as having a maximum of 0.08% blood alcohol level (BAC) during watch duty, with the last consumption of alcohol being more than at least 4 hours prior to the commencement of watch duty.

At the same time, the STCW states that “minimum periods of rest” as stipulated by the STCW does not imply that all excess times after the minimum rest periods should be “devoted to other duties, in particular keeping watch”.

The chief requirement of a watchman is the “effective utilization of the bridge”, which requires fitness and competency in watchkeeping.

As such, optimum work performance for a watchman can be taken to mean

(1) How effectively has the bridge been utilized in terms of
   a. Avoiding possible collisions and other accidents
   b. Navigational purposes

(2) How fit the seaman is when carrying out his watch duty such that
   a. He exhibits the skills necessary to
      i. Avoid possible collisions and other accidents
      ii. Navigate
      iii. Take into account the limitations and qualifications of other available watch members during the decision making process

With these assessments being made by the captain or other members of the crew who are familiar with the procedures and processes of a watch.

Engine Watch

Requirements for an engine watch follow those of a bridge watch, with particular emphasis on fitness for duty. First aid skills are highly emphasized in the hazardous engine room environment.

5.4 Using the SDW
This paper does not propose new methods to minimizing or eliminating stress to optimise work performance. Rather, it suggests, through the SDW, a method to determine the best existing method to choose to combat a particular problem.

The SDW is a wheel that is superimposed on each other, such that whenever the factors (rank and coping inventory types) are aligned according to the needle on the wheel, the proposed method according to the OBSE is highlighted. In addition, the user looks up the Primary Factors according to a table that comes with the wheel to determine any other additional methods that are necessary to be implemented.

The following assessments have to be made prior to utilization of the SDW.

1. **Individual Assessment**

   The seamen are assessed on their stress levels after each voyage for the initial purpose of determining their stress factors and periods. Assessments thereafter will be to monitor the success rate of the treatments that have been undergone.

2. **Points to note in individual assessment**
   a) The assessment is done in two phases: the individual assesses himself according to a stress factor checklist; any other officer who has worked with him assesses him according to the same checklist and any discrepancies are noted.
   b) These discrepancies are analysed by the Captain and a final decision made regarding the differences
   c) Final answers will be based on the same answers given by both in the stress factor checklist and the decisions made by the captain

3. **Factors to assess**
   a. Period of service before sign-on
   b. Particular periods of stress that have been observed
   c. Type of duty performed on that ship
   d. Any particular incidents/abnormalities on that voyage that is not directly related to the individual (eg massive storms)
   e. Reasons for particular stressful periods (from the point of view of both the individual and his external assessor)

3.1 Point (b) in particular is taken with reference to how well the individual has performed his duty according to those (1) stipulated in the STCW and (2) distilled from the STCW and placed in the SDW.

Periods of observed stress is equivalent to periods where the individual is not performing up to the standards expected of him by (1), (2) and the demands of his hiring company. In this case, we
operate under the assumption that any and all poor performance is due to stress and not due to factors such as inadequate training, since training is a prerequisite under the STCW.

4. **Determining methods**
   Using the points in (3) and (3.1), we align the wheel to the direction of the arrow to discover the OBSE methods. We also look under the “Primary Factors” table to determine other possible causes and methods.

5. **Methods**
   Having determined the ‘method’ or focal area, the crewing department of the main company can source for trainers and organizations specializing in motivational training with respect to the focal area and/or take steps to setup or implement tasks targeting the focal area.
   In the example below, the cadet is an emotionally-oriented person, thus we use OBSE methods 2, 3, 4 as primary methods, and look up other primary factors to determine the specific treatment.

![Stress Distribution Wheel](image)

### Table 1: Primary stress factors

<table>
<thead>
<tr>
<th>Factor</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family Emergency</td>
<td>-Coping Inventory</td>
</tr>
<tr>
<td></td>
<td>-Merchant Family Support Network</td>
</tr>
</tbody>
</table>
Quick Response Time of Shore Personnel to arrange for crew’s sign-off

<table>
<thead>
<tr>
<th>Appraisal</th>
<th>OBSE(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OBSE(3)</td>
</tr>
<tr>
<td></td>
<td>OBSE(4)</td>
</tr>
<tr>
<td></td>
<td>-Personal Work Standard Differences</td>
</tr>
</tbody>
</table>

| Peer Stress                | -On-shore seminars for team-bonding |
|----------------------------| -Minimise instances of same-ship scheduling of high-conflict persons |

| New Environment Stress     | -OBSE(2) |
|----------------------------| -OBSE(3) |
|                            | -use commitment to occupation to decrease stress level |
|                            | -use same-ship scheduling as far as possible |

| Fatigue                   | -Personal Resources |
|----------------------------| -Optimum scheduling methods |

| Climate                   | -Hot/Cold Air Conditioning |
|----------------------------| -Different uniforms for different climates |

### Table 2: Background stress factors

<table>
<thead>
<tr>
<th>Factor</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piracy</td>
<td>-Availability of Medication onboard</td>
</tr>
<tr>
<td>Bad Weather</td>
<td>-“Hope” (optimism) in the form of</td>
</tr>
<tr>
<td>Homesickness</td>
<td>(1)high salary (2)entertainment onboard (eg xbox, playstation etc)</td>
</tr>
<tr>
<td>Risk inherent in sailing</td>
<td></td>
</tr>
</tbody>
</table>

5.4.1 **Checks and Balances**
Having invested in the training methods according to the SDW, the company has to ensure that it reaps benefits. Continual assessments will allow them to see if the area has been targeted accurately and if the crew is handling stress better than before.

Of course, stress cannot be eliminated 100%; it can only be reduced to a minimum. Based on the quality standards set by the parent company, the individual may continue undergoing training to cope with stress until he reaches the company’s goals. Else, he may be taught the necessary skills to cope and left on his own to figure things out.
6. Conclusion

This study is limited in that no concrete methods have been proposed. Rather, what this study tries to do is to find a method that optimizes the investment on the appropriate stress coping mechanisms targeting specific areas instead of general training. Further study can be made into actual methods targeting seamen and their problem areas. At the same time, further studies can also be made to investigate the high rate of seamen leaving the sea for good and venturing onto land professions instead.
7. **Areas for Future Study**

This paper has concerned itself with determining the best investment options for minimizing stress and consequently maximizing work performance for the merchant navy such that the ship is at all times operating under conditions of safety and efficiency, which translates into cost savings and profit generation for the parent company. However, while performance maximization may arise through improvements to the psychological and general wellbeing of the seafarer, these improvements are not highly correlated to retention of seafarers in the profession. The high rates of seafarer exodus from the sea-going profession is a growing concern in the shipping industry. Although ships are getting more and more technologically sophisticated and the number of crew needed to man the ship may be consequently reduced, reduction in manpower would lead to greater stress levels on the remaining crew, despite the enhanced technology. This is due to the legal and operational responsibilities placed upon the crew. As ships get bigger, experienced crew will become a treasure companies want to lay their hands on. This group of experienced seafarers, however, seem to be more interested in coming back to shore, even in the face of rising salaries and growing recognition as a skilled workforce. How these seafarers can be retained is an area further studies into might prove interesting.
WORKS CITED


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