

The characteristics and value of tugboat training experience.

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Abstract

The subject matter of this thesis work focuses on the characteristics and value of tugboat training experience, and the impact of tug training experience on deck cadets and officers' performances during towage operations.

It was inspired by the fact that deck officers are contributing parties in towage operations and the part they play during these tug mishaps and accidents. Evidently, not much study has been finalized to determine all the factors behind this. However, several reports and findings point out the roles played by the bridge team and other non-tug operators during the accidents.

The thesis includes information specifically regarding the different range and purposes of the tug training experience and an examination of these differences. Also discussed is the correlation between the direct and indirect impact of situational awareness, and the presence of lack of tug operational knowledge being linked to the lack of situational awareness. Other areas covered were the opinions and suggestions of tugboat crews.

The opinions were based on the group the questionnaire targeted and the interviews with tugboat crew.

Language: English Key words: Tugs, towage, decision making, situation awareness, onboard training, deck, cadets, officers, accidents.

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1 INTRODUCTION

This chapter gives introductory information on the background, problem, limitations, delimitations, and objectives of the work. It also has information on the scope and significance of the study.

1.1 Background

There is no doubt that maritime and shipping organizations worldwide gives recognition to the critical role tugs play in the shipping industry. To put it comprehensively, tugs are mainly divided according to their application, utility, and operational limit, grouping them into three main categories; Seagoing tugs, Escort tugs, and Harbour tugs 'also termed' Conventional tugs.

Typically tugs are categorized according to their structural features, configuration or type of propulsion system required, the known main characteristic is that they have low aft decks. The conventional tugs still remain the oldest, most popular and largest number of tugs, and can be found all over the world. They are still relevant today for three main reasons for their usage, their multi-purpose ability, the efficiency of power expressed in the force of "bollard pull", and cost-effectiveness. (Radisic, 2012)

The number of risks tug get exposed to are quite similar, with regards to their common traits, 'the operations carried out' both in port and in the sea. Shipping needs to appreciate the emergency role of tugs. Editor Martyn Wingrove of Tug technology & business highlighted on the essence of salvage tugs in the shipping industry, the keeping of key waterways open after maritime accidents and ship blockages (Wingrove, 2018). In addition, the role they play in providing safe mooring, berthing operations and assistance to the shipping industry is quite vital.

However, one of the most deliberated issues surrounding tugs operations is the high rate of accidents and fatalities globally. In line with this, several reports have investigated, discussed, and highlighted on this issue. A number of factors are in the cause of these accidents. It was observed that 53% of all towage related claims were due to the primary cause, 'human factor', with the initial claim being attributable to poor maintenance, crew negligence, sub-standard navigation, as well as inadequate operational and safety procedures. It is hoped, therefore, that training will assist in the avoidance or reduction of these incidents. (shipownersclub, 2015). According to some findings, human error is said to

account for 75% of marine liability losses and remains the most important factor in marine accidents. (Frith, 2017; Veysey, 2013)

Furthermore, the maritime industries and regulatory bodies have continued to take measures and lay emphasis for improvements in this area. In a survey carried out by The Dutch Safety Board, to investigate what should be considered a safe speed and safe procedures for tug operations. Some of the pilots', remarks and suggestions made on the improvement in the safety of tug operations, recognized the significance of competency to be attributed to skills, great teamwork and experiential comprehensive training for tug captains, pilots, ship's master and crew involved in towage operations. (Hensen. Henk., 2013)

Considering the contributory factors to these accidents involving tugs, by relating to the execution of the whole operation, focusing on communication, experience, and qualifications. In conjunction with, focusing on the planning of the operation, risk management and the contributions of the different parties. It is strongly recommended that all parties involved in harbor towage operations pay the greatest attention to these essential aspects for safe towage operations and practice safe procedures for ship crews when securing tugs require attention. It should be noted that several pilots complained about lack of well-experienced crew members on board ships today. (Hensen. Henk., 2013) .

In recent years, the advancement in technology, introduction of larger vessels and other developments, for a competitive, sustainable and safe maritime sector has created a demand for officers with a set of skills that go beyond what machines are capable of. These are non-technical skills, also known as “soft skills”, such as the ability to manage yourself and others, work under pressure, demonstrate resilience in response to adversity. The growing importance of soft skill is about to cause a significant skills gap and will be associated with loss of productivity and profitability.

This is in line with the statement made by National Workboat Association (NWA) when addressing the skills gap to prevent further towage accidents. “The maritime sector must retain a strong focus on the development and implementation of best practice standards, and qualifications, for towage work across the board, in port, coastal or during ship-assist operations. Addressing the “skills gap” and ensuring that lessons learned are effectively transferred is the only way to reduce the risk of further fatal incidents. (Safety Report, n.d.)

In addition, this may also point out why in recent times, it happens that almost 80 percent of maritime accidents are based on human factors and human failures in managing different activities onboard ships, in line with the loss of situational awareness has been cited as the most common cause of accidents in the maritime industry. Although, current research has not proven beneficial in determining the factors that underpin situational awareness, in order to understand the impact of situational awareness on the towing vessel industry, a definition of human factors must first be given. Given those research findings in this field typically lead to more questions than answers, the study of human factors is a daunting task (Towns, Thesis, 2007). Situational awareness is the main attribute of all human decision making and performance and is a critical factor for human errors. (Mica, 2015)

Personally, as a deck student with a keen interest in tugboats. Having the opportunity to be a student cadet trainee onboard a tugboat, for a period of the sixty 60 days supervised onboard training. I became interested in the topic and especially the different effects it has on deck cadets or officers. I was interested in what studies, report and researches have recommended or implemented as measures for improvement in bringing these skill gaps, in the deck department. I wanted to explore the contributory factors, by understanding the relationship between the lack of experience and other human factors that caused or led to these accidents and the role training plays in this. Which drew further attention towards the need to understand tugboat training experience for deck cadets.?

1.2 Objective and research questions

The objectives of this study are to investigate and explore the characteristics and value of tugboat training experience. Consequently, identify and highlight the benefits and relevance of tugboat training experience for deck students, by focusing on the bridge in the skills gap and knowledge or experience to fill this, that can be acquired or developed during tugboat training. Will tug training experience improve the effectiveness and performance of the deck/bridge team during towage operations?

This raised questions to the subgoals which are as follows:

- » What is the common range of purposes and beliefs about tugboats training experience and tug operations knowledge?

- » Most importantly, would there have to be improvements in deck officers performances during tug operations, if they had tug training experience?

It is expected that the findings of this study will help highlight why tugboat training experience for deck trainees can be beneficial in bridging some the skills gap, not only safe tug operations but also as additional skills for competency or career development for deck crew. In view of this, the results pave the way of improving development in the training obligations, skills, and competencies as deck students through tugboat training experience. Also to help understand the important role tugboat knowledge and experience plays in the path of becoming well skilled and experienced, as fully fledged ship officers.

1.3 Limitations and delimitations

Usually, it is almost impossible for a study of this nature to be realized without difficulties or limitations. While there are a number of guidelines, regulations, and recommendations that focus mainly on tug masters, tug crew and pilots. The compulsions may not include non-tug operators or personnel, however, some ports implement codes of practices for all parties involved in towage operations in their seaport area. Furthermore, information collected surrounds mainly conventional tugs, amongst other tugs, and guidelines, code of practices of some ports.

In essence, this study relates directly to deck students or deck officers without tugboats training experience. However, current research has not proven beneficial in determining the many factors relating to tug accidents. As it remains unproven if practical tugboat training experience can improve a deck personnel's skills and competency, and prevent the skill gap during towage operations. In addition, the paper tried to slightly examine the possible effects and improvements situational awareness can have on performances.

Furthermore, the lack of a precise training plan and directives specifically for the supervised onboard tugboat training, with a major reason being due to the organized and strict working methods and manning requirements practiced on tugs, limiting the collection of more expressive practical details on this topic.

This paper will focus mainly on the conventional tugs regarded as "Harbour" tugs. Other tugs may be covered in a descriptive manner but not investigated further. The scope is limited to the deck related personnel in tug accidents and not procedures of arrival at the site or

leaving starting point. Due to the author's limited participation during the training regarding tug operational activities, little first-hand knowledge is provided throughout the thesis. Literature is used extensively and qualitative assessments have been made where deemed necessary.

2 Onboard training scope and the transfer of skills

This chapter will define the scope of the onboard training and the transfer and development of skill while training on different ships. It will also close the gap between compliance and competence during the process.

Deck cadets spend part of their cadetship as an apprentice on board. (STCW, Chapter II Regulation II/1). They are tasked with a variety of duties and tasks under the supervision of a training officer, and accomplishments are recorded and assessed towards respective certifications. These tasks mainly include seamanship and ship familiarization, on the knowledge that includes but limited to; security, safe working procedures, and proper operations on bridge navigations, communications equipment, and deck equipment. The relevant roles and responsibilities of the Cadet Officer are well defined.

A completion of this phase means the trainee should have acquired skills and some level of competence, through learning by observations and demonstrations of these duties. In essence, the cadets use the knowledge they have acquired in school, practically in the real future working environment. Consequently, task and duties performed vary depending on the ship, but the basic navigational and technical skills and duties required for certifications is stated in the onboard training book.

Deck Cadets can be thought of as apprentices are considered the lowest on most vessels but are a necessary and mandatory step towards achieving higher ranks as a ship officer. Deck Cadets learn the ins and outs of running a ship and all the proper processes and protocols involved. To become fully fledged ship officers, with expertise in the range of safety, practical, technical and management skills. However, expertise is required not only in deep sea waters with commercial shipping and fishing fleets but also in all sectors where people work on specialized vessels, such as tugs, workboats, large commercial yachts, Royal Navy ships or lifeboats. It is a career in which seafarers can create their own destiny. The industry is full of stories of people starting at the bottom and working their way to the top.

2.1 The Onboard training experiences

The scope of onboard training experience is to expand the knowledge and skills of the deck cadet in preparation for more relevant and superior position on ships. In addition, giving guidelines to the Cadet, Ship Training Officer and Master regarding the desired competencies. Consequently, the onboard training is structured in a way that it unites the shipping industry sectors, through apprenticeships and training frameworks to enhance knowledge transfer gained by working experience.

This is done by bringing together shipowners and managers, trade unions, and training institutions, to develop and approve training frameworks that meet regulatory and industry needs, in conjunction with government agencies to provide internationally required technical skills,

2.2 Onboard training, skills acquisition and transfer of skills.

The role and the risks and dangers involving the duties of the deckhand has changed little over the generations, their job being recognized as one demanding basic seamanship and boat handling skills of the highest order, often in the most trying of circumstances and conditions. Traditionally training has been largely hands-on with the irreplaceable practical knowledge of experienced crews being handed down to the next generation. (Barker, Peter, 2016).

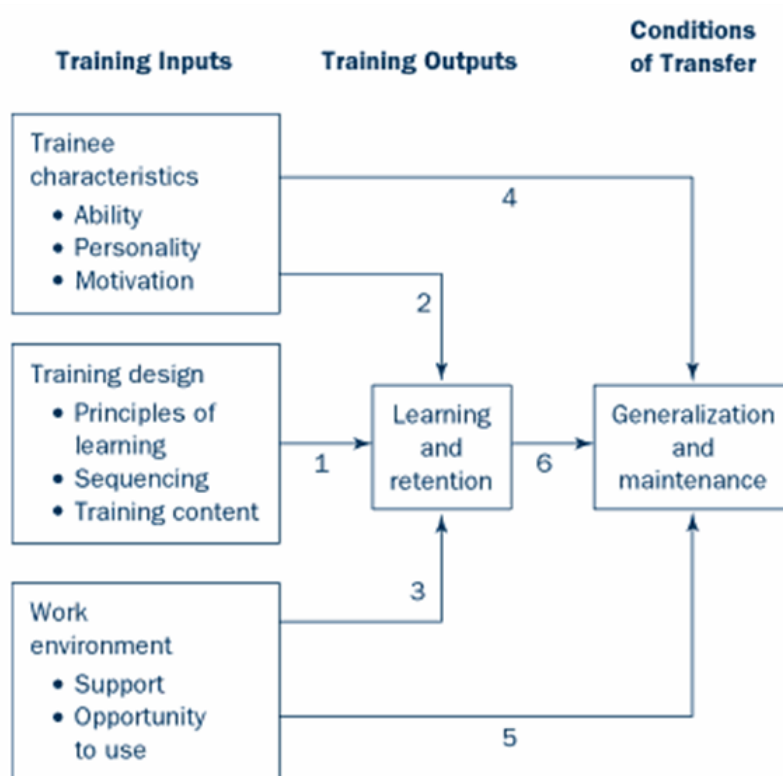
Indeed, there are excellent books on the theory and practice of seamanship (& on deck cadet training) but the practical experience gained as a cadet onboard ship is better than any bookish knowledge. It is therefore important that deck cadets have a general overview of the duties that are performed when on board ships. Of course, these are general guidelines and the jobs may vary from ship to ship. (Shilavadra, 2017). The flexibility of the onboard training enables a deck cadet to explore a different kind of ship experience for training. There are a number of skills and competencies to be acquired and developed during the training on a ship, even more, become useful on other ships, setting aside the basic and formal expectations; STCW, etc

2.2.1 Transfer of skills

WHAT IS TRANSFER OF LEARNING? Influence of previous experience on performing a skill in a new context or on learning a new skill. (Magill, 2007). Further explained, in

education Transfer of learning or transfer of knowledge refers to learning in one context and applying it to another, this means, the general ability to apply acquired knowledge and skills to new situations and encounters. “Transfer of training is of paramount concern for training researchers and practitioners. Despite research efforts, there is a growing concern over the “transfer problem.”

Baldwin and Ford’s Transfer of Training Model (1988) is based on the idea that the transfer of learning depends on training inputs that include trainee characteristics, training design, and work environment. However, an important point in the model is that the outcome of training is impacted by trainee characteristics and work environment in a direct manner, whereas the impact of training design depends on the levels of training outputs such as learning and retention.



(Baldwin, 1988))

However, there are three kinds of transfer: from prior knowledge to learning, from learning to new learning, and from learning to application” (Council, 2000)

The issue of transfer of learning is a central issue in both education and learning psychology. There is probably a subtle difference between transfer of learning (addressing theoretical knowledge) and transfer of knowledge (addressing the application of the knowledge).

Transfer of knowledge is very much related to the problem of knowledge integration, knowledge application and knowledge use in "the real life.

2.2.2 Skills gap

Work in the deck department involves the navigation, maneuvering and safe handling of the ship, communications between ship and shore, the handling and delivery of cargo, and the operation of all lifesaving devices. However, ship and vessels have a different purpose and operational requirements of vessels, limiting their needed skills to the ships environment and working procedures. The required tasks or responsibilities may change or differ, most of the time for compliance to manning of ships regulations. In essence, only the licensed and certified personnel, whose proficiencies have been assessed, determined and, through other methods training and hands-on experience, are qualified to perform tasks on these vessels. A practical example is a Tug', the manning of the towing vessel may be determined by an appropriate regulatory authority; however it is the responsibility of the owner/operator to ensure that the tug is manned with adequately certified and experienced. (shipownersclub, 2015).

The transfer of skills in the maritime sector can be further described by the work of the UK Merchant Navy Training Board (MNTB) which is supported by the Maritime Skills Alliance, which is to unite the industry sectors such as workboats, yachts, tugs and fishing vessels with shore-based infrastructure, to provide a comprehensive suite of maritime qualifications, apprenticeships and training frameworks. It is to ensure transferable skills can be adapted to meet industry needs and aims and provides incomparable unity across the entire sector. (Merchant Navy Training Board, 2015).

The UK Commission for Employment and Skills stated that 'skills shortage' refers to the situation where there are not sufficient appropriately trained and qualified people to be employed to fill the vacancies. However, the 'skills gap' exists when "members of the existing workforce in an organization are seen to have lower skills that are necessary to meet current business needs" ((Skills, 2010). The existence of skill gap is further described in UK Commission for Employment and Skills states that 'skills shortage' refers to the situation where there are not sufficient appropriately trained and qualified people to be employed to fill the vacancies. However, the 'skills gap' exists when "members of the existing workforce in an organization are seen to have lower skills that are necessary to meet current business needs" (Skills, 2010))

2.2.3 Skill acquisition

The primary aim onboard training remains to provide opportunities for world-class training. As well as teaching seafarers internationally required technical skills, with institutions focusing on management expertise, understanding complex regulatory regimes, and the safe and efficient operation of high-tech, high-value vessels. The safe and efficient operation of ships depends on the competence of the merchant ship officers who need to undergo diverse training in order to obtain the necessary knowledge and skills to perform shipboard tasks. In order to ensure the safe operation of ships and to harmonize the maritime education and training of the seafarers globally, the International Maritime Organisation (IMO) introduced the International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers (STCW), which stipulates the minimum standard of competence prescribed for the seafarer.

Briefly considering a work that looked into the determinants of knowledge gap, one of the issues stated was the limited duration of the training courses makes it unfeasible for the trainees to learn about a diversity of equipment. Making one of the causes of the gap in the area of the officers' knowledge. However, in order to partially bridge this gap, the officers advocated the idea of a 'segmented labor market' where the officers receive specialized training for specific types of ships or for working with a specific type of equipment. (Mazhari). .

In context, results from this paper may justify the existence of skill and knowledge transfer from ship to ship onboard training. Narrowing this down to the onboard training experience. Consequently, a deck officer can have a reasonable amount of sea-going experience, but the experience can be limited to a certain type of vessel. The undoubtful fact remains the certain type of vessels requires certain experience.

2.3 Impact of onboard training on the skills gap

As explained in (2.1), most of these responsibilities require separate manning requirements, which is underlined by specific skills and knowledge. However, with adequate practice and training, these skills and knowledge can be acquired. It is important to realize that, although being through the training on land, every vessel is different and equipped in various ways. During the familiarization, the most important pieces of information are given, but only personal training will provide the necessary skills. Drills and their different scenarios are a perfect opportunity of gaining and improving the knowledge and give the ability to find the

best solution in case of real emergency. With onboard training connected with a classroom education should provide a substantial amount of knowledge for future deck officers. In a situation when on board training's role is diminished just to the obligatory duty there is a danger of teaching and repeating of the bad habits.

2.3.1 Memories of Experience Influence Decision-Making

Most importantly, it may be relevant to point out that, not experiences, but memories of experience influence decision making. In regards to training experience, which revolves around sharing best practices and experiences about performing tasks effectively, and also understanding implications. Analyzing an incident that occurred or near-miss incidents, gives a clearer picture of how to make the right decisions and avoiding implications, it may well positively influence discretion in decision making.

Discretionary decisions can and do, lead to actions which are harmful to people or organizations. In order to alleviate the fears that are associated with these “decisions gone wrong,” many authors have looked not to abolish discretion but instead to confine it within pre-established limits. “Confining discretionary power means locating the boundaries of discretionary action and ensuring that discretion is exercised only within these limits” (Manley, 1977)

2.4 Skill acquisition as Career Strength

As earlier mentioned, one of the great attributes of gaining experience as a deck seafarer can be advised as gaining as much experience, technically and practically. One of the uniqueness of the job is the ability to work with different set of skills. Your diversity is exactly what the corporate world needs varied skill sets are sought after & highly desirable. Diversity allows you to solve complex problems with creatively, and you'll be able to relate to your team better.

Navigational officer Kyle Macleod reveals how he keeps on top of developing his knowledge and skills, both ashore and at sea. “As a junior officer, I've found that you never stop learning. New technologies are constantly evolving alongside traditional skills. A lot of the time you don't even notice that you're improving your competencies. It's not until you have a bit of experience that you can look back at yourself a year or two ago and realize how far you've come. Through reading and teaching from more experienced officers, as well as courses ashore, I keep on top of my professional development. It goes without saying that

you need to take advantage of every opportunity for training that presents itself. (MacLeod, 2016)

3 Tugs operations and training

As aforementioned, this chapter will generalize the ‘terms’ tug and its related aspects. It will briefly look into tug operations, the training methods, approaches and try to identify the importance of tug training for deck cadets and officers.

Seemingly, the significance and relevance of tugboats is often neglected or perhaps not thorough enough. In recent times tugs are the important representative of port infrastructure in harbors worldwide and it is almost irremovable part of the business at some port in international relations without their utilization (Ford, 2010). It is important to know that no tug operation is exactly the same, however, every tug operations must be planned and executed carefully in order to assure safety for personnel, equipment, and environment.

3.1 Tug operations

Tugs fall under the category of service ships, they are vessels designed for special services. The term tug is somewhat generic, it is the description for all manner of vessels that engage in tows. The inherent risks tugs are exposed to remain fundamentally alike, irrespective of the design or usage. Tugs are required to place themselves practically very close to moving objects and are frequently involved in working contact with barges and almost every ship or vessel. Clearly stating how almost unthinkable it would be not to run into them while working at sea.

Technically, the importance and usefulness of tugs go beyond assisting larger ships or floating objects, they are used for ice breaking, salvage, firefighting and emergency response or furthermore large buoys and seaway obstructions. However, their principal functions remain to provide propulsive power to other vessels, mostly for services in harbors and inland waters, for the maneuvering within the ports and on all seas, to assist with berthing, unberthing and general mooring operations for ships.

3.1.1 Tug training

For tug operations to be successful, it is important to ensure that proper manning is established with adequately certified and experienced personnel. Following accidents, it is

sometimes been found that the cause was due to unqualified personnel, in which case P&I insurance cover could be compromised. Highly specialized skills and knowledge are vital in tug operations, in order to enable them to handle the complexities of their operations.

Technically, the master ensures that inexperienced personnel must not be exposed without training and supervision to carry out high-risk tasks, such as hooking up or releasing the tow. For safe tug procedures, better training of tug masters, with focus on PEC holders with limited training and less experience in tug use. More training for deck crew on tug operations is important. (Hensen. Henk., 2013)

4 Tug training purpose, process, and outcomes

With bigger ships and newer technology being introduced into the shipping industry, the demands of more powerful and advanced tugboats keeps growing. “The particular reason behind this is the requirement for more power to handle bigger ships”. Tug is manned with adequately certified and experienced personnel for the voyage. Following an accident, it has sometimes been found that the cause was due to unqualified personnel. (shipownersclub, 2015)

Accordingly, with many ports implementing methods to reduce the high rate of harbor accident. There are various causes for marine accidents, however, approximately 80 to 90% of all accidents are caused by a mistake made by a person, namely human error. Most of these accidents were not caused by only one error, but they were caused by a series of errors. To reduce this percentage, several measures and approaches are taken to ensure safety, in order to prevent human errors and to improve team ability at the bridge and on deck. One particular approach is the introduction of tugboat as a training environment for deck students. Notwithstanding, the primary aim is in line with the amendments made in vessels qualified for training ships. With no obligations on the type or level of training expected, apart from the mandatory familiarization.

4.1 Training process

The tug training generally involves a systematic approach, followed by a sequence of activities and expertise to master, presently. For licensed tug operators and crew, it is an expected requirement to get certified through training.

The tug training experience is not always typed specific, Once employed, they must complete further company-specific training and meet higher standards that go beyond the “minimum competencies. (MacLeod, 2016). depending on the company rather generic because it covers basic towing knowledge areas, not in a particular structure. Trainee gets to get further experience through the simulations or vessels familiarization when joining the crew newly to enhance the already acquired knowledge. (MacLeod, 2016)

The process is based on setting high competency standards for deck personnel within their skill sets, to ensure that safe approaches are taken even in challenging situations to result in appropriate and safer outcomes.

4.2 Tug training experience for maritime students

Some maritime schools and shipping companies offer tug handling courses, which aims to provide tug handling skills to mariners who aim to become tug operators and masters. In some cases, is designed as an additional knowledge: include tugboats training in their programmes for deck personnel, either by simulation or hands-on experience.

The training is offered to nautical professionals through a number of methods, including apprenticeships; for masters, pilots and deck personnel, even more, those wishing to pursue a career as Tugboat Deck Officers. The aim is to get them exposed and enlightened with the knowledge and working procedures on tugs, also can be as an added skill for ship officers or aspiring tug operators.

It can be considered that to be successful in any area of expertise, one has to be able to improve and maintain, their skills and competence. And this can mainly be achieved through training and development. Training and development play an important role in the effectiveness of organizations and to the experiences of people in work. Training has implications for productivity, health and safety at work and development. (Shepherd.)

Traditionally, the primary goal for the training is to allow a combination of real-life conditions at sea and training, acquiring skills and knowledge in the process, under the supervision of qualified and experienced personnel for safer towage operations and knowledge.

4.3 Tug training experience skills outcomes

A few additional skills that can be learned or developed through the tug training experience are, but not limited to;

- Variety of duties of the tug mate basics, basic boat-handling skills.
- Tow and line handling.
- Correct and appropriate personal protection equipment (PPE).
- Bridge Resource Management for tug crews.
- Safety and emergency preparedness.
- Fire-fighting and controlling techniques.
- Ensure efficiency during a towing operation and adherence to the plan.
- Basic knowledge to execute the planning of towing operations.
- Acquire knowledge of decision-making strategies.
- Understand the strategies for towing of very large vessels.
- Understand distribution of towing forces on connecting point on board.
- Understand towing performed at nights and/or in reduced visibility.

Most importantly, teamwork and communication with all relevant parties (helicopter, VTS, casualty crew etc.) and various skills that may lead to competence assessment training for Tug Operators. However, it is important to know that

4.4 Identifying determinants of tug training experience

To be able to determine the tug training outcomes, it is important to understand What are the practical components? Why does the deck personnel need the training? Every training begins with the need analysis, and establishing a need analysis is and should always be the first step in the training process. (Infande, 2015)

There may be certain determinants that can influence a deck trainee's need for training. Categorically will be described as,

Academic(Knowledge)- To meet up with requirements forming part of maritime degree programmes, the supervised onboard training is an essential part of maritime studies. It is a practical based experience when deck officer cadets will work alongside qualified officers, learning and developing practical navigation and operation skills. The experience gained help put the trainee's academic theory into practice.

So as to be familiar with the job ethics in terms of regulations and compliance-related issues, also the procedures and best practices. The practical handbook is used by the trainee as a comprehensive guide to the major elements involved in onboard training and is designed to ensure an effective and dynamic learning environment. The whole process is assessed with possible remarks.

Skills- With developments in technology and new findings or methods to pathways for safer operations, a training needs analysis of skills may be crucial. By carrying out an evaluation of competency against the expectations of the industry. It is possible to Identify your strengths and weaknesses, along with any gaps in your knowledge or skills that need addressing.

Continuous training in different environments helps enhance competence, by the learning of newer skills or developing in the expertise of learned skills. This type of need covers not only practical skills to do the job but also soft skills like communication, teamwork, Sometimes it covers new or unfamiliar technologies.

Abilities- Do every deck officer have the ability to solve and manage risk? Are they able to manage themselves and situations and possibly make appropriate decisions and produce adequate solutions? The more independent a deck officer would be after studies, the more the need to be empowered, more productive and invest in their future. Evaluating personal ability to make decisions and become more action-oriented will only help develop into fully fledged and effective officers.

Competency with the STCW standards, is only an achievement to the minimum entry requirements, prior to deployment onboard a vessel or wanting employment, there may be the need to possess additional training and meet higher standards that go beyond the "minimum competencies" Many ship owners ask for more than just the IMO-defined minimum competencies in their deck officers. Instead, they require them to display greater proficiency above and beyond this, before they are promoted to the next level. Some ship

owners/ managers define extra competencies related to their business, for example, special operations or commercial knowledge.

4.5 Hands-on tug training experience

Although, some ports have guidelines or code of practices, that ensures operational safety issues for the attention of all those concerned, mainly Pilots, Masters of vessels being assisted, their bridge teams and mooring parties. The master of an assisted barge, ship, or other floating objects that require the use of tugs, is expected to have established adequate manning for the operations. The vessels mooring crew should be experienced and prior to the operation be briefed on the procedure for making the tug fast. (Forth)

Despite being adequately manned with the competent and experienced crew, in terms of certification. One will still wonder, how these mishaps or accidents still occur? What is the causal factor? In some accident cases, the factors of these accidents were connected to the tug crew. Despite some of the crew being experienced with sea experiences on different vessels, and even more experience as an officers-in-charge of mooring. An example cited from a final report stated; The Chief Officer being an experienced officer like the Master, was expected to have sufficient knowledge to realize the danger of using equipment not designed for its intended purpose. It indicated the lack of safety awareness onboard in general and was considered as the primary causal factor to the accident. (Bureau, 2017)

However, similarly on assisted ships or even on barges, specifically during mooring or towing operations. Lack of experience in towage operations of some of the bridge crew raised concern. Although several maritime schools and training organizations provide courses to help enhance safe operation of Emergency Towing Vessels (ETVs) by improving the bridge teams' ability to carry out emergency towing safely and efficiently. (Arnskov)

In addition, to what many studies found to be lack of experience or poor training as an element in towage operations. It is important to know that these elements can be linked to situational awareness and the presence of skill gap in towage operations.

Further explained. An example is; an escort tugboat routinely comes to the aid of a vessel navigating in confined waters or narrow seaports. There are special escort tugs required for this operation, it should be noted that many ports sometimes use conventional tugs for escorting vessels, although considering that they may not be as efficient as typical escort

tugs. however, the bridge team is expected to use their local knowledge and their coordination with tugs, linesmen, or even during pilotage.

These operations are delicate and inherently risky. The accidents that occur during escort operations and harbor maneuvering are not always caused by faults in the relationship between Master-Pilot exchange itself. Which happens to be one component of the Pilotage operation. There are other factors to consider, such as inadequate planning, poor attitude, (multi-tasking)multiple demands on the individuals, inadequate infrastructure (planning in ports), actual or imagined time constraints, the role of the VTS, technical failure and lack of contingency plans. (Academy, 2013)

In addition to the recommendations for Maritime Academic Institutions to undertake a comprehensive detailed study of harbor towage operations safety risk. This may help to monitor risks to safety and assist in developing solutions. In addition to safe speed and safe procedures, Henson, Merkelbach and van Wijnen (2013) identified the importance of ‘comprehensive training underpinned by experience, for tug masters, pilots and ship’s captains, ensuring optimum team working between all those involved in safe harbor towage operations’.

5 Methods of training

Different methods and approaches are used for teaching and training maritime students, with new technologies entering ships, ports and maritime organizations, and this brings new life into a well-established industry. But as these new technologies are taking over old systems, the importance of seafarer training rises (Lili, 2018)

The two common methods used for the training are; hands-on (supervised onboard training) and simulator-based training. While many maritime schools use the combination of both to deliver their training, the onboard training, the goal is targeted at developing the best understanding of different concepts, theoretically or practically.

5.1 Impacts of the tug training methods and the expected outcomes

Maritime training methods combine theoretical and practical knowledge’s in almost 80% of the mandatory learning curricula. In many cases, the practical applications are more

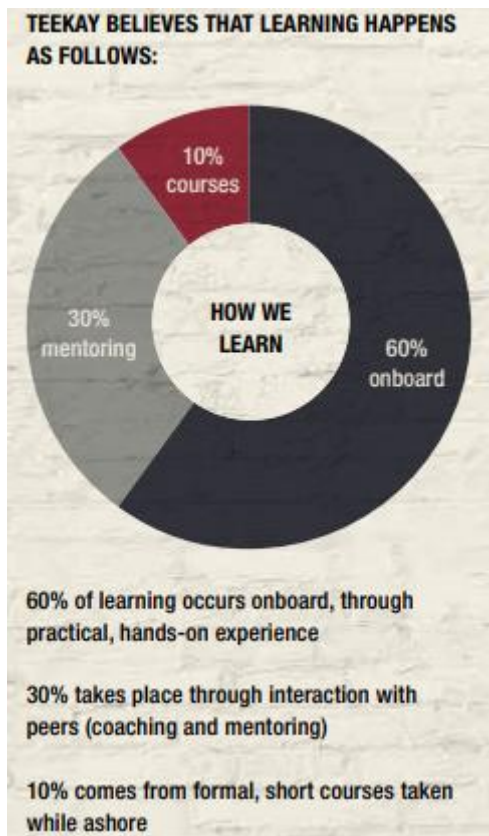
advanced than theoretical support. In order to cover this inconvenience is necessary to keep theoretical knowledge's updated to the level of actual practical techniques used in applications and meet onboard the ships by the students, future officers. (Radu Hanzu-Pazara)

The simulator provides a safe and controlled environment that enables the proper evaluation of performance against fixed settings. The introduction of simulator training was intended for navigation skills training such as passage planning and the master/pilot relationship. In recent times, simulators are used in several parts of the maritime industry, from offshore operation training on vessels and oil rigs, involving bridge operations, cargo handling, engine control, crane operations, towing and anchor handling. (Sellberg, 2016)

A 360-Control facility in the Netherlands has a number of advanced simulators to facilitate tug training, and specialize in training and assessments for azimuth stern drive (ASD) and azimuth tractor drive (ATD) tugs, they believe simulator training can help ensure crew are fully trained in all types of technology and situations, to meet future requirements.

However, with these modern training techniques gaining worldwide popularity in the achievement of future maritime officers competencies and professional skills, the importance of the conventional training methods cannot be sidelined. The practical aspects such as chart working, line handling and other seamanship duties need practical techniques.

TEEKAY' One of the largest one of the largest shipowners in the world gave a description of what is believed to proper learning, identifying a high percentage of learning to be gained through onboard training.



(MacLeod, 2016)

5.2 Decision making and situational awareness

By considering, unforeseen circumstances in maritime operations. Situation awareness involves building awareness in an area and associating information with objects in that area. If an incident happens, all information is available and decisions can be taken to cope with it. However, situation awareness applies to several domains, and the characteristics that these domains have in common are:

- The high diversity of information,
- A large amount of information, and
- Real-time streaming (high flow rate) of information.

The complexity of the information stream is further increased with the availability of more information sources to be considered. Also, criticality associated with this. A poor decision because of bad situation awareness may result in a catastrophic impact. Building and having up-to-date situation awareness where there is a complex information stream is almost impossible to do for decision makers without the help of real-life experience. (Glandrup, 2017)

5.2.1 Improving situational awareness through tug training experience.

If an emergency towing operation is not properly trained and prepared for the outcome can end up being even worse than the ship incident. Clearly stating, the majority of these accidents occur due to lack of situational awareness. Particularly, in safety areas, including but not limited to the mooring, line handling, and lookout. However, quality in the safety context is having the ability to reflect on your own operations and procedures, and being open to assessment by others. Nautical safety is not a project with an ending, it is a continuous process which involves many human factors. Learning and being aware are key elements in reducing risk. (René, 2016)

When mistakes occur, in situations where, despite a genuine attempt to follow due procedures, an error of judgment leads to an inappropriate rule being applied or a step in a procedure being done out of sequence. There is the possibility to reduce such errors by improving the training and the quality of procedural documentation. As aforementioned, competency may not be fully achieved without mastery, and situational awareness may not be achievable without experience. Both experience and competencies can be called tools to improve situational awareness. The term prior knowledge can be understood in a broad sense not limited by the local professional knowledge of the navigation area. It is, in principle, determined by the experience and educational level of an individual. From here, it is not a giant leap to make the claim that situational awareness varies with, and is completely dependent on, the goals for any given job.

5.2.2 The impacts of tug training methods on situational awareness

To determine the impact of tugboat training for deck cadet students and officers alike. The importance of hands-on training has to be further elaborated. The need to examine the impact of training on the ability of a deck personnel to make the right decisions in dangerous situations. It draws on previous studies which have shown that experts are able to manage complex situations in an acceptable way.

In an analysis, observations revealed that students on simulators have revealed that many of them are unable to manage such situations or even to recall their main features. It is, therefore, necessary to identify new training tools that will give trainees the capacity to assess a situation quickly and accurately and to perform satisfactory actions. Exercises were designed to evaluate the impact of such tools on the decision-making process of trainees. The impact of the type of navigation experienced by trainees during their on-the-job training

was also evaluated. Results showed that decision-making exercises did tend to improve the trainees' capacity to analyze a complex situation; however, they did not have a clear impact on the maneuver performed. On the contrary, there was an obvious difference between the trainees who experienced complex avoidance situations during their on-the-job training period and those who did not. At a time where ship-owners are looking to reduce the length of the "on-the-job" training period, these results point to its vital importance.

Similarly, Cor de Rigger, a senior instructor at explains the benefits of simulator training. One of the benefits of simulators is that it is fast and measurable. "The primary goal for training, in general, is to enhance the skills and competencies of the trainee. He suggested that conventional training techniques no longer fits well in the digital age, by pointing out the time-consuming nature. He further agreed that the continued value and importance of conventional training. However, the preferred and prescribed method used is to have the simulator training prior to the hands-on training.

Maritime professionals often accept the idea of simulators in training, yet their main concern is the challenge that may be faced when newer technologies are introduced to replace old traditions. Some of the main concerns are the upgrades of the IMO and STCW conventions and the practical impact it will have on training. To assure proper safety conducts of the future mariners, the conventions stress that simulators should be used for training and certification of proficiency and non-technical skills.

5.2.3 In the moment and hands-on experience

The impact of supervised onboard training methods on competency can be clearly proven and known, while simulator training might be effective in the use of development and improvements of these technologies, the results may not be fully studied. Knowledge and skills can be gained both ashore and aboard, but the experience is a special need that can only be achieved through on the job training, especially for mariners. The training onboard especially with the assistance of modern technology is an ideal vehicle for enhancing seafarers knowledge and skills

As aforementioned, competency may not be fully achieved without mastery, and situational awareness may not be achievable without experience. Both experience and competencies can be called tools to improve situational awareness. The term prior knowledge can be understood in a broad sense not limited by the local professional knowledge of the navigation area. It is, in principle, determined by the experience and educational level of an individual.

From here, it is not a giant leap to make the claim that situational awareness varies with, and is completely dependent on, the goals for any given job

An operator must also have knowledge of the process in order to make the right decisions and actions. When a situation appears that needs interaction, the basic understanding of the current situation ought to be equal, however that may not be the case. Making a decision based on different premises can cause critical consequences and even result in catastrophic outcomes. Be it by an individual or as a team. [Team Situation Awareness in Practice Stine Nicolaysen Raaen

Most people can gain insights from their personal experiences, and while formal training sessions are certainly necessary, it may be good to consider capitalizing on “teachable moments” when appropriate. Training methods should consider providing in-the-moment learning, especially after a potentially life-threatening incident occurs. It would enhance situational awareness and guide decision making. Situation awareness involves building awareness in an area and associating information with objects in that area. If an incident happens, all information is available and decisions can be taken to cope with it.

In most cases, hands-on application training may require more resources from company management, a committed investment to improve employees' safety knowledge through tangible exercises will far outweigh the additional spend. Through these sessions, the trainees could immerse themselves in the physical practice of a new process or equipment. This method is extremely valuable, as it provides a window into behaviors that can help evaluate workers' level of understanding prior to real-site work.

Analyzing nearly 40 years' worth of research, a 2011 study published in the Journal of Applied Psychology found that in jobs where workers are placed in high-risk, hazardous environments, hands-on training proved to be the most effective at improving safe work behavior. For companies dedicated to a stronger safety culture, educating onsite workers with the skills and confidence on how to avoid potential risks while using equipment is a crucial piece of the puzzle. (<https://www.ishn.com/articles/103076-in-the-moment-training>)

6 Tugs accidents, towage operations; Reports, and findings

In many investigations carried out, it was found that the primary cause of many marine accidents was an error of omission on the part of the deck officer that was either undetected or not acted upon in an emergent manner by others on the ship before it gets late. Such human errors are greatly influenced by weaknesses in traditional ship-bridge organization and management.

6.1 Tug accident cases study

6.1.1 Tug capsizes during container ship maneuvers

Tugboat Domingue was connected to CMA CGM Simba's port quarter to help pull the vessel's stern off the berth. During this maneuver, the heavy tidal conditions caused CMA CGM Simba to move towards an outlying mooring dolphin. In an attempt to avoid striking the dolphin, CMA CGM Simba's master briefly maneuvered his vessel ahead, during which time Dingue girted and capsized. One of the conclusions

The Dutch Safety Board recently investigated an accident involving the harbor tug Fairplay 22 at Hook of Holland, the Netherlands. The accident took place during stormy weather on the 11th November 2010. While the tug was trying to make a towline connection at the bow of the ferry Stena Britannica, it got trapped under the bow and capsized. Unfortunately, the captain and engineer drowned. Following the investigations cases, a few causes were found, which led to the conduction of a survey to carry out a report on safe procedures. Approximately 160 pilots, tug masters and ship captains contributed by responding to the questionnaires.

In the section reporting on safe procedures for securing tugs. Although half of the pilots and all ship captains acknowledge having safe procedures for securing tugs. It was to be noted that several pilots complained about lack of well-experienced crew members present on ships today. All ship captains confirmed to have instructed their officers to keep an eye on the tugs in both insight and when not visible from the bridge. Accordingly, most pilots do see it necessary to inform the captain to keep an eye on the tugs when securing even if they might not be visible from the bridge since it should be standard procedure. They expect the ship's crew to already be aware. (Hensen. Henk., 2013)

The U.K.'s Marine Accident Investigation Branch has issued its report on an incident which, Maltese flag bulk carrier Amber made contact with moored craft and grounded on the south shore of the River Thames shortly after departing from Tilbury power station. The MAIB investigation found that the accident was caused by the bridge team's loss of situational awareness as the vessel left the berth in restricted visibility. (Marine Accident Investigation Branch, 2012)

6.1.2 Mumbai high north platform disaster

in July 2005, A demonstration in dramatic fashion of the catastrophic potential of collisions between attendant vessels and offshore facilities was made by the Mumbai High North accident. A multipurpose support vessel lost control and hit several marine risers at the Mumbai High North offshore complex off the west coast of India. The collision caused a gas leak that resulted in a serious fire, and parts of the complex collapsed after approximately two hours. Of the 384 persons who were on board that day, 362 were rescued, and 22 died (Daley, 2013)

A study was carried out to understand the human factors and processes that contributed to the reported collisions on the Norwegian continental shelf to prevent similar events in the future. The analysis was based on the assumption that to be effective, bridge crews on attendant vessels must act decisively during stressful, high-risk situations. The analysis also assumed that situation awareness (SA) is a prerequisite for quick and good decisions (Endsley, 1995b). According to Endsley (2012, p. 13), SA can be described as 'being aware of what is happening around you and understanding what that information means to you now and in the future'

6.2 Findings

It has been observed as a common knowledge that a majority of accidents were actually caused by human factors or human errors. Moreover, also pointed out was that no matter how sophisticated the navigational aids and safety devices are onboard ships, and how far mathematically planned, computerized and automated the voyages are, human fallibility always exists and remains as the prime cause of accidents in navigable waters (IMO, 20008)

A study that reported on the critical analysis of harbor towage operations risks to safety. Stated in the Expert Interview Account, Five Experts were interviewed. Interviewees had between 27 and 52 years employment experience in maritime operations; roles performed

included as Tug Master, Ship Master, Harbour Master, Pilot, Superintendent, Regulatory Surveyor, Class Surveyor, and Marine Consultant.

The experts identified several critical factors that lead to accidents involving tugboats and ships, amongst these factors. The need for improved training was cited as a risk factor. This element related to other Risk Factors including Following Operational Procedures, Tow Planning, Tug Handling, and Communications; additional linked codings' included personal qualities and the importance of team working & judgment. Code Sample statements Training "a Voith Schneider captain is not an ASD tug captain and vice-versa ..." "lack of thought by [the assisted] vessel's bridge team was a problem.

6.2.1 The loss of situational awareness.

Conclusively, the major factors behind accidents onboard can be agreed to be caused by Human errors are; Up to 96% of the casualties onboard ship results from ergonomically inefficiencies (Rothblum, 2000). However, with proper safety training and human alertness, an average of 80% of all marine incidents could be prevented. Loss of situational awareness has been cited as the most common cause of accidents in the maritime industry. However, current research has not proven beneficial in determining the factors that underpin situational awareness (Towns, Situational awareness in the marine towing industry, 2007).

Apart from human error involvement in various safety-critical industries' accidents, other factors such as safety culture and safety climate are involved. (Wang, 2013) identifies the importance of human error but stresses focusing on the prerequisite of unsafe behavior, unsafe supervision, and organizational problems. Occasionally, many of the surveys are used mainly to collect the experience and opinions of maritime professionals, and some of these articles further provide expert advice to inform policymakers in the industry (e.g. (Barsan E. , 2004); (Barsan E. & -P., 2007) Their main contribution informs an "evidence-based practice" rather than empirical results which may not give accurate analysis for recommendations.

The principal drivers behind the improvements in accident occurrence are the policies and guidelines of regulatory bodies by improving the safety of the traffic system, with enhancement of navigation aids, ship specifications and mandating training requirements. With this, the ISM code, ILO code of practice, have made improvements in the reduction of the accident rates. However, Since MET institutions train their students for one of the most safety-critical industries in the world, there is a need for empirical studies that explore the

use of simulator-based training and assessment further to lay the foundation for an evidence-based educational practice.

Further stressed on by European Tugowners Associations (2011) was safety culture and human factor in tug operating companies, highlighted on was the casual attitude of company staff and tug crew due to lack of enforcement legislation for safety management system as they fall below 500 GT for many international conventions.

7 Research methods

This chapter will cover the detailed explanation of methodology that is being used to complete this paper. Consequently, the results were analyzed and a critical examination was carried out.

The research method used was a mixed method approach. A qualitative phenomenological research was used to provide quantitative insight to gather responses based on a questionnaire with easy to answer questions, so that data would be easy to analyze and collect. Finally, a qualitative method was used to gauge the influences and challenges to be able to reflect on any other issues not mentioned in the quantitative portion.

The target group was specifically the deck cadet students of Novia Uas. Consequently, a phenomenological approach was used for gathering contextual descriptions of the information from the tugboat crew, as an open-ended inquiry using active experience, through an oral interview.

7.1 The Interview

The interview with tugboat crew was in a form of joint discussion, and collective suggestions and contributions to the questions I asked. The questions were based on safe working procedures and the challenges faced during towage, escort or assist operations, mainly the involvements of other contributory parties during towage operations. In addition to the basic and most common factors that come to play during these operations, I wanted to understand what tugboat operators could describe as the challenges in the job, and other mentions and recommendations.

7.2 ISO PUKKI (School audited Tug ship)

ISO PUKKI. This tugboat was built in 1968 by ASI VERKSTADS - AMAL, in SWEDEN and is currently sailing under the flag of Finland.

Info

<u>BHP</u>	2000
<u>Bollard pull</u>	20 tons
<u>Speed</u>	12,5 knots
<u>Callsign</u>	OGVG
<u>IMO</u>	6818863
<u>Classification Agency</u>	Finnish Transport Safety

Navigation and communication equipment

<u>Radars</u>	Decca Bridge Master E
<u>Navigator</u>	DGPS navigator Philips
<u>Sat. compass</u>	Furuno
<u>Chart plotter</u>	Transas Tsunamis Pro
<u>Auto Pilot</u>	Furuno FAP - 330
<u>Radio station</u>	GMDSS Coastal

Dimensions

<u>LOA</u>	30,50 m
<u>Breadth moduled</u>	9,03 m
<u>Draft to the</u>	4,60 m
<u>GT</u>	264
<u>NT</u>	88

Deck layout

<u>Towing hook</u>	Mampaey
<u>Towing winch</u>	Lidan 15 ton
<u>Towing wire</u>	500 m dia 36 mm

Propulsion system

<u>Main engine</u>	2 x Wärtsilä 814 TK
<u>Propeller type and dia</u>	fixed 2300 mm
<u>Total power</u>	2000 bhp diesel electric

Tank capacities

<u>Gas oil</u>	50 m3
<u>Freshwater</u>	12 m3
<u>Ballast water</u>	72 m3

Auxiliaries

2 x Scania DS 11

-

Bowthruster

Brunvoll 360 bhp

(Alfons Hakans)

7.2.1 Iso Pukki Tugboat Crew

The crew is manning the two tugboats (Iso Pukki/ Fart) in the Turku port that carry out the harbor duties. The crew includes; Two captains, two engineers, two deck-hands (Able seamen), and an apprentice. In addition cadets and other trainees(officers) join the crew quite regularly at different times around the year.

The captain has long years (20-25 year)of experience as harbor masters, while the crew as well, have been together for almost a decade, excluding the apprentice. The tugs offer a 24 hours service and work in two weeks on, two weeks off rotation, with only one Captain on duty in charge of the tugs at a time. Although, emergency situations could change this.

7.2.2 Having cadets/trainees onboard

The crew welcomes the idea of cadets joining the crew every now and then. Trainees(cadets and officer) and apprentices are onboard for different training reasons, but commonly for the basic tug/ship familiarization and training to complete the requirement for sea days records. To our advantage, it helps a lot during the busy periods and gives the opportunity to share our knowledge and meet new people. So far our record has been positive, with no accidents or errors from the temporary members during their stay. We like to have more cadets and possibly officers as apprentices in the nearest future.

Further indicated, was that tugboat crew work in a synchronizing method, and follow a strict, precise working practice and manning establishment. However, it often gets quite busy aboard the tug, it may happen that a crew member is lacking, there is a possibility that someone else will have to take that part of the load. Where the trainees are given more responsibilities within their area of expertise or expected knowledge. Sometimes a trainee job may include assisting in engine work or work ashore.

However, it is a basic rule to view a new and temporary member as a novice. So the master ensures proper and fresh familiarization for all joining members. This ensures the trainees are able to acquire or develop different knowledge and skills effectively, assuring safety all through the training period.

7.2.3 Traffic in the shipping lanes, establishing a safe towage operation

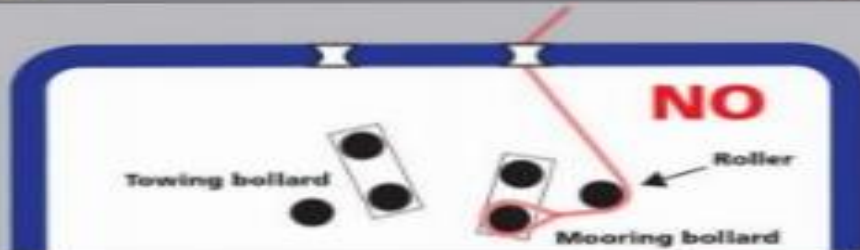
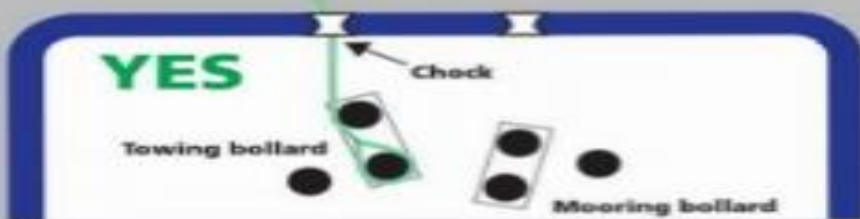
Is traffic in the shipping lanes ever an issue how do you establish a safe operation? Sometimes like every other vessel Tugs get encounters with, sailboats or pleasure boaters, but along the Turku archipelago route traffic is not necessarily the problem. However, in rough weathers extra caution is taken.

To establish a safe operation, the tugs abide by codes of practice that ensures safety all times. Organizational command lines are established and responsibilities and duties are clearly defined before a new towage commence. The master and the crew ensure that inexperienced personnel must not be exposed without training and supervision to carry out high-risk tasks, such as hooking up or releasing the tow.

Traditional for safe harbor towage, the tug's company, Alfons Håkans has provided a safe towage manual that guides their crew for effective and safe operations. Safe towage is based on clear communications. The method used by Alfons Håkans is described below.

SAFE HARBOUR TOWAGE

Pre-plan the towage in cooperation with the Tug Master before connecting the towline and communicate the strength (SWL) of the bollard and rope lead to the Tug Master.



1a Speed through water

Reduce ship's speed to max 6 knots when making fast to the forward tug.

SAFE TOWAGE IS BASED ON CLEAR COMMUNICATION

2 Connecting tow line

Connecting the forward tug: Send heaving line from the ship's shoulder. The tug stays behind the bow wave.

Connecting the forward tug: Send heaving line from the ship's shoulder. The tug stays behind the bow wave.

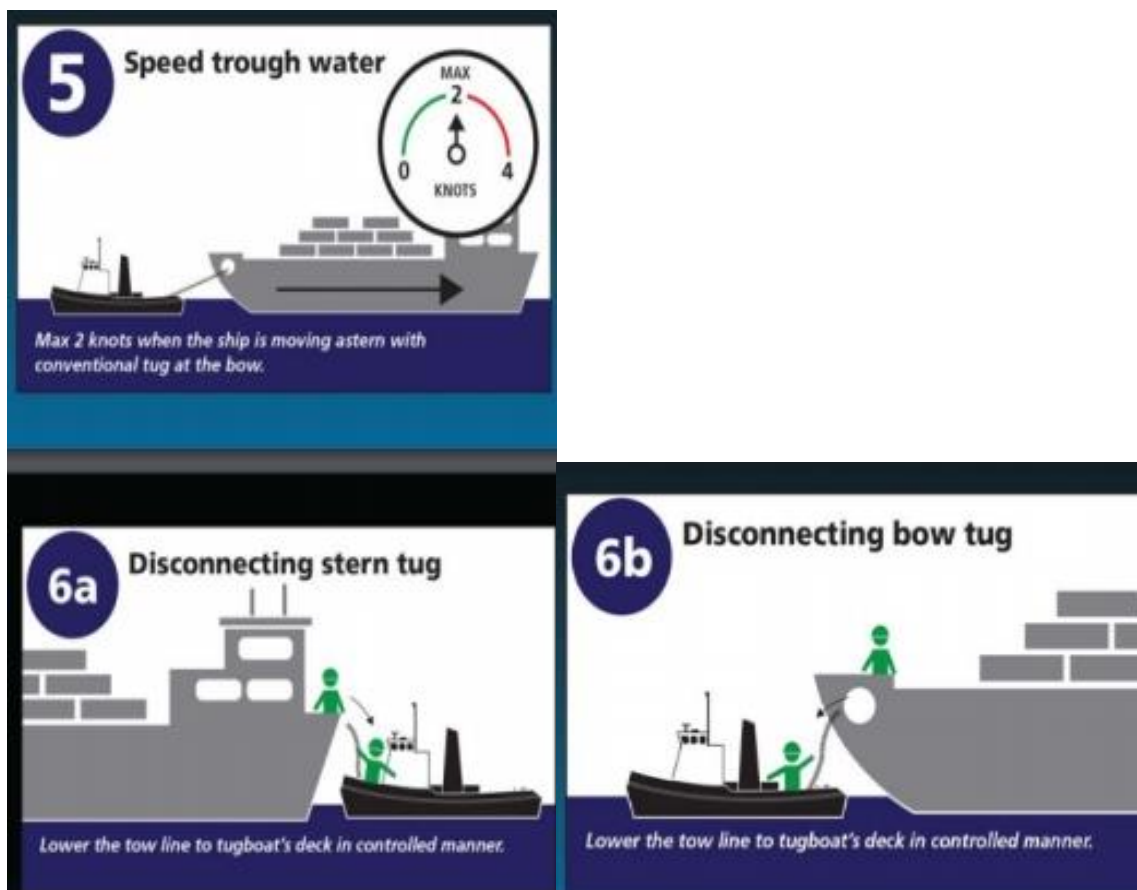
3 Communication

Pilot or Ship's captain instructs how and where to make fast. Crew confirms to tug captain that the towing line has been made fast.

4 Directions & Power

Towing directions: Use ship like a clock face or use cardinal points (N, E, S, W). Towing power: use 0 - 100 %

Towing directions: Use ship like a clock face or use cardinal points (N, E, S, W). Towing power: use 0 - 100 %



Credits. (Hakans)

7.2.4 Challenging operations and difficulties one may experience on the job

Aside from weather which is a challenging factor when at sea, Most of the crew agreed that working with barges have proven to be quite a challenge for the crew. Tugs are built with the capability to handle the barges without assistance from other boats, by maneuvering alongside the barge, with the lines tied up to a forward corner of the barge, using this method the tug is able to guide the barge to the dock as a single unit.

Some of these difficulties occur when the personnel supplied by barge operators are part-time, or contracted in and therefore possibly inexperienced and poorly trained with the method used by the crew, any wrong actions made can have an impact on the safety of an operation. Extra hands and expertise are sometimes needed when working with barges.

Also during ship assist, berthing and other operations with unknown crew or vessels, it is often tricky and difficult to determine their level of knowledge or expertise. Most

expectations rely on the master to have adequately manned bridge system. however this not always the case, so typically every operation is treated with extreme importance and the most expected from these crew is usually experience in safe mooring procedures.

During the winter months, our tugs are actively involved in the important task of ice-breaking, these operations are also considered strenuous and the crew might have to work unusual hours. The cold weather, the obstructions from accumulated snow, slipperiness and difficult ice conditions, especially with ice compression. Vessels are occasionally unable to follow the icebreaker with their own propulsion power, so they have to be towed by the icebreaker.

The operations require skill and can be quite risky, especially when high forces act in the towing line and also there is a risk of collision. However, relatively little is known about the forces acting during the notch towing operations, so the tasks are quite challenging and need extra hands and extreme measures. Consequently, captains on the ship which traffic the Baltic area during the winter must be constantly prepared for the occurrence of icing on their ships in severe weather conditions.

7.2.5 Steering of the tug

Does the captain alone steer the tug always and does the cadet have this benefit? Although the captain takes the wheel all the time through operations, however, sometimes, depending on the landing, the captain can also be on the tow/barge. The officer who also has steering experience could be in the wheelhouse, despite that the captain is not in the wheelhouse at this moments, he still gives the order on how the tug is steered, by a constant and effective radio watch.

However, when conventional tugs are connected at the stern of the vessel being assisted, it will have to work in the traditional way, which requires a lot of skill and experience from the tug Master. However, it is possible for the Captain to allow a cadet practice, during non-operational times.

7.2.6 Additional skills trainees can learn or develop, through the tug training experience

Trainees don't have any tug license yet and have no experience on a tug, but the training experience can be seen as a gateway for those interested into the towing industry and additional knowledge in tug operations. The training is highly flexible and training is for

both new and experienced crews with special emphasis on but not limited to safe towage and emergency practice. Depending on the motivation of the trainee, aside for his basic seamanship and navigational knowledge to be acquired. Development toward expertise is solely their decision. The participation of the trainee in all activities is encouraged. You don't absorb these skills by just stepping on a tug and spending sixty days on the tug. By observations, participation, and learning by seeing, doing, and then performing them competently and safely.

After training, the trainees are expected to have better knowledge of lines handling, teamwork and

8 The questionnaire

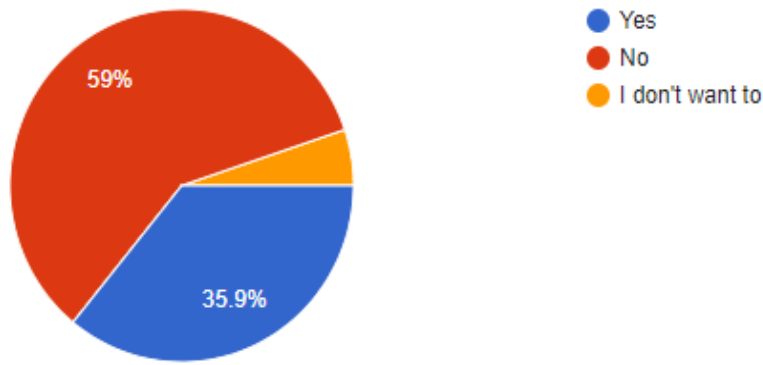
The questionnaire was presented using google forms and sent out through the school email system, with a brief explanation and with questions structured for deck students. The general questions were made to study the participants perspective on tugboats training experience and their notion of its relevance.

8.1 Results and interpretation

The number of answers gathered was 39, and the questionnaire was available through the summer of 2017. The interpretation is done by analyzing the questionnaire one at a time.

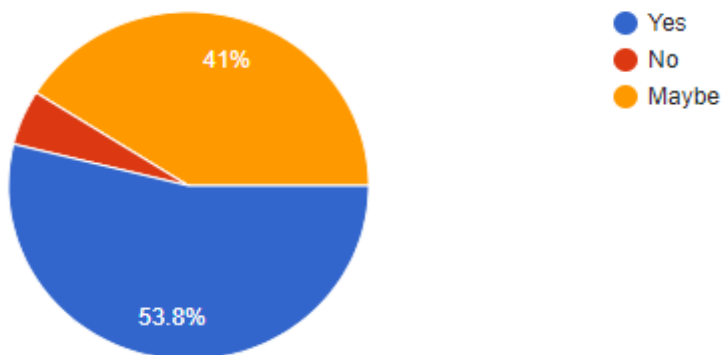
8.1.1 Onboard tug training experience

The participants were asked if they have ever been onboard a tug. Most participants have never had tug training experience, with 59%, 35.9% have been onboard a tug before and 5.1% do not even consider it.



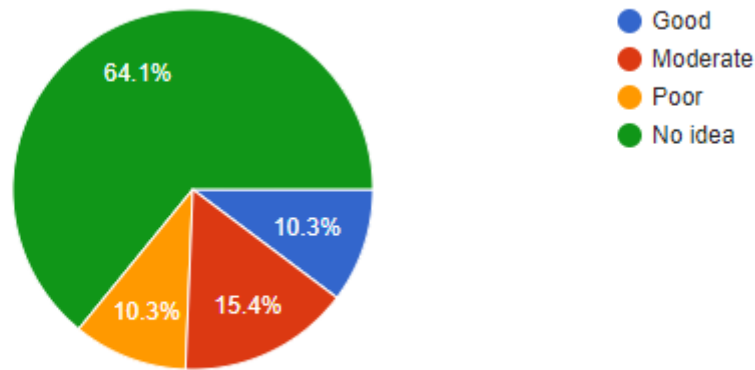
8.1.2 Onboard training on tugboats is important for aspiring officers.

To the question. Do you agree, Onboard training on tugboats is important for aspiring officers? Interestingly, 53.8% of the participants agreed that tug training experience is important for aspiring officers, 41% were indecisive and 5.1% found it unnecessary.



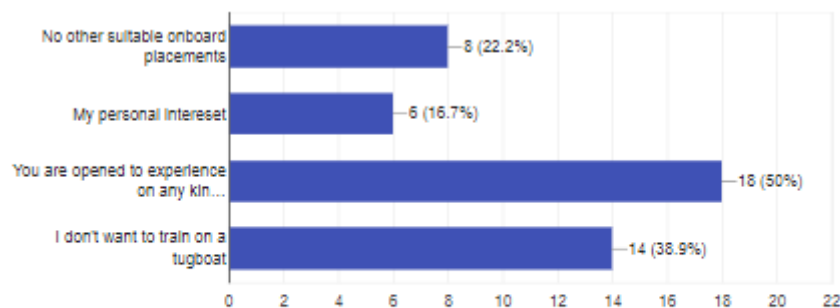
8.1.3 If you have been onboard a tugboat, rate the training experience.

64.1% of the participants could not rate the tugboat experience, 15.4% found it moderate enough, 10.3% termed it as poor, and 10.3% rated it good.



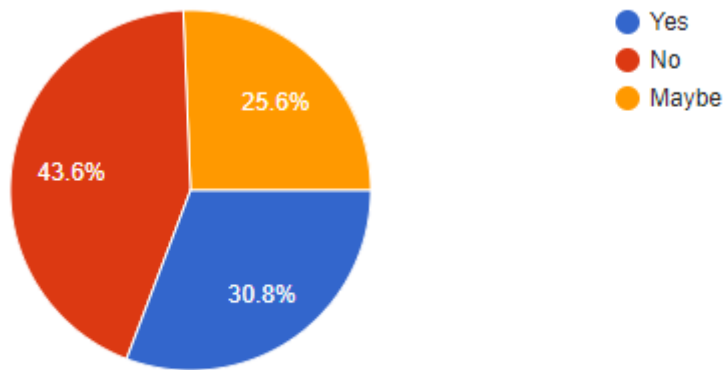
8.1.4 Choosing onboard training on a tugboat

When asked why would you choose onboard training on a tugboat? Half of the participants 50% are opened to experience on any kind of ship, 38.9% do not consider tug training experience, 16.7% had a personal interest in onboard training on tugs, and 22.2% made the tug training choice due to no other vessel options to suit them at that moment.



8.1.5 The onboard training with tugboats should be compulsory for students.

When asked if it can be agreed that The onboard training with tugboats should be compulsory for students. Most of the participants '43.6%', are not in support of tug training experience as a mandatory task for students, 30.8% of the participants agreed to make it a compulsory part of their training, while 25.6% were not certain.



9 Analysis

In this chapter, an analysis of the responses from the questionnaire will be executed, in more details. Further, in the following chapter, a critical examination will be conducted and to determine if there is a need to carry out new studies based on this.

The research question stated;

”Will tug training experience improve the effectiveness and performance of deck/bridge team during towage operations? ” And the subgoals were;

- » What are the common ranges of purposes and beliefs about tugboats training experience and tug operations knowledge?
- » Most importantly, would improvements have been made, in deck officers performances during tug operations, if they had tug training experience?

Furthermore, the critical examination will try to determine the reliability and validity, of the research questions and subgoals.

9.1 Findings

The total number of response was 39. The opinions of 2 participants were omitted because they are not interested in tugboat training experience, and their responses to the other questions could not be fully concluded.

To be able to give a more descriptive detail of the remainder 37 responses. The analysis focuses on two groups of participants. Hereinafter

- » The inexperienced (Never had tugboat training experience),
- » The experienced (Have tugboat training experience)

The different answers gave the opportunity to compare the range and purposes among deck cadet students.

9.1.1 The Inexperienced

The result indicated, 59% of the participants, had never been through tugboat training experience. However, 15 of this 23 participants believed tugboat training experience is important for aspiring officers, while the remainder 8 were indecisive of this. Consequently, they are not able to rate the tugboat training since they have not had an experience yet. While 5 participants indicated they can choose to train onboard a tug, as a personal interest, 3 would make this choice out of no other training ship option available, 3 are opened to experience on any kind of vessel. And 9 of them have no interest in tug training experience. 3 of the participants gave no response to this. In addition to this, 10 participants agreed that tugboat training should be compulsory for students, 5 were indecisive about this and 8 were not interested in the suggestion.

9.1.2 The experienced

The results indicated 35.9% of the participants have been through tug training experience. Of these 14 participants, the results indicated 6 of them considered tugboat training experience as an important experience for the aspiring officer., whilst 6 participants were indecisive about this, 2 considered it unimportant. Furthermore, 4 of this participants rated tug training experienced as poor, 4 of them rated it has been good, and 5 thought it has been moderate, However, one participant chose no idea. 7 participants were opened to idea of training experience from any kind of ship, 5 would make this choice out of no suitable option, and 2 won't want to train with a tugboat. Furthermore, 8 participants were negative about the idea of the onbaord training experience as a mandatory option for deck cadets students, 4 were indecisive, and 2 agreed to this.

10 Critical examination

One of the main challenges with this paper was the gathering of enough responses. Unfortunately, only 39 responses were gathered. This is due to a low number of deck students that showed interest in tug training experience.

While it may be difficult to determine the actual reasons for the different opinions. The responses from the inexperienced participants, concerning the importance of tug training experience for aspiring officers and as a mandatory option for deck students, indicates that some of these participants may be unfamiliar with tugboat operation and is unlikely for them to understand if it is important to them as deck cadet or officers. It is not evident that they may not be totally negative about gaining this experience, and their show of unconcern might be linked to a lack of enlightenment or career projections. This is in line with the remarks on lack of well-experienced crew members present on ships today. (René, 2016).

However, on the other hand, the response of the experienced officer on this may show that they understand the importance of the experience as aspiring or deck officers, but there is still the existence of skill gap. A typical example will be been tasked with responsibilities during towage operations in unexpected situations, and having little or no knowledge of the dangers and safety procedures to execute it smoothly. He may need to rely on his basic knowledge, which may not be enough.

Furthermore, the different opinions about the rating of their tugboat training experience cannot be fully determined but may be subjected to two major reasons and realization. Firstly, the expectation of the trainee from the training experience might go beyond basic or conventional knowledge of seamanship, which is the base of tug technical skills. Rather, their interest may include expecting duties in specific navigational duties, such as steering, chart work and bridge watch including radio communications. This may include their motivation or approach towards tug training experience. However, not totally underlining this as the main influence, but highlighting on the presence of unguided decision making.

Secondly, if put logically, 'different working environment, different working atmosphere', different ships, different rules. Some ships may be more accommodating and exciting in their method of work, approaches, and teaching, while some might be strict, unmotivating and precise. This clearly will give a reason for different opinions. In addition to this, the strict and organized method of work on tugboats, and no precise training plan may be a factor in determinants of the training performance or outcome.

11 Conclusion

Without laboring the point, it can be seen from the study and findings in this paper that there is a proper need for a review of the onboard training on tugs for cadets and students. Findings in some of the accident reports stated that the Deck crew involved had less than one year of experience, and also incurred the highest fatality rate relative to all other age and experience.

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categories. Simultaneously, ”the fatalities are strongly correlated by age, experience level, crew position and crew-member activity at the time of fatality” (Coast Guard-AWO, 2012).

A number of recent National Transportation Safety Board (NTSB) investigations also found that the primary cause of many marine accidents was an error of omission on the part of the deck officer that was either undetected or not articulated by others on the ship until it was too late. Such human errors are exacerbated by weaknesses in traditional ship-bridge organization and management. For groundings, statistics suggest that as many as 71 percents are caused by bridge management error ((Marine Board, 1996)

While it is important to take note that, the training experience or skills that can be acquired may vary due to the kind of tug or amount of time spent onboard. A common trait present in the tug crew was that they all worked their way from the position of junior officer, and apprentices through years of experience and training, to become fully fledged and licensed tug operators. An example of skills transfer in the maritime industry can be pointed from part of the crew and other tug operators I talked with. They had worked for several years onboard fishing vessels and barges and gained a lot of skills which later became handy. One main skill similarity observed, was that line handling and emergency skills learned and acquired while working in these sectors greatly contributed to developing their tug operating skills.

However, positive feedback was given on cadets performance during tugboat training experience with the tugboat crew, Cadets have been able to properly demonstrate tasks and duties given to them. We have not encountered any problems so far. (Iso Pukki, 2017) . In addition, further words of advice and encouragement were dished out. ” cadets should adopt the baby steps method, towards gaining their officer license. They should arm themselves

with as many skills and knowledge from opportunities and resources made available to them. This is the best path to professionalism. (Iso Pukki, 2017).

The experience, mastery, or skill sets, can only be gained by spending a substantial amount of time on deck, along with a lot of practical experience to understand the activities carried out on the deck. This is to have a knowledge of technical know-how on the deck, and errors that can take place, even more, to know how to deal with it from the bridge. Hands-on training will enhance their knowledge and skills in safe tug maneuvering under normal as well as extreme operations. Training a cadet during their sea time is important but having real-life simulators ashore could also assist in enhancing the knowledge.

12.1 Further studies

The major challenge with this paper was the minimal amount of response gathered. Only 39 responses could be collected, while the questionnaire was available for the summer of 2017 through spring 2018. The main reason is the focus group of deck officers students of Novia Uas is quite small, in order to get a more accurate result it would have been necessary to gather more data.

I believe that in the future, a study should be conducted in order to get a good picture of issues that are surrounding towage operations. The study and review of tugboat training experience and influences it has on situation awareness during towage operations. With regards to this, a few of these issues highlighted from works studied “4.1 Why hands-on tug training experience?” will be a good starter for future study. It may be possible to investigate how to create more approach and raise more awareness on the importance of tug operational knowledge for deck officers, despite the inclusion as a training ship, and to make cadets more motivated and enlightened to train with tugs. The feasibility of a “tug training course” as a mandatory option for deck students could also be studied. Responses from the survey indicate some of the deck cadets or officers somewhat see this training experience as important.

However, not totally underlining situational awareness as the main factor of skill gap, but highlighting on the presence of unguided decision making. An examination of both human and organizational factors which influence discretion may be needed. Enhanced and well-structured training may make way for more awareness of the human factors involving indiscretion. This research may focus on the organizational dynamics which also result in the use of discretion.

Conclusively, I would recommend a course or review of tugboat training, with the studies examined and analysis conducted, it clearly shows there may be an increase in understanding and approach if this is a course as part of their study program.

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Survey for Bachelor Thesis

Onboard Training On Tugboats

*Required

1. Have you ever being onboard a tug?

Mark only one oval.

- Yes
 No
 I don't want to

2. Onboard training on tugboats is important for aspiring officers. Do you agree?

Mark only one oval.

- Yes
 No
 Maybe

3. If you have been onboard a tugboat, rate the training experience. *

Mark only one oval.

- Good
 Moderate
 Poor
 No idea

4. Why would you choose onboard training on a tugboat?

Tick all that apply.

- No other suitable onboard placements
 My personal interest
 You are opened to experience on any kind of vessel
 I don't want to train on a tugboat

5. The onboard training with tugboats should be compulsory for students. Do you agree? *

Mark only one oval.

- Yes
 No
 Maybe