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MAY – 2022

Performance, Outcomes and Results

The Maritime Education and Training (MET) Network with NGO Status at IMO

GlobalMET NEWSLETTER

An IMO meeting in progress. *(Source: IMO)*

Inside this Issue

Articles in this newsletter represent the views of the authors. They need not reflect the views or policies of their employers or GlobalMET.

Editor: **Sriram Rajagopal**
Hong Kong

GlobalMET
Maritime Education & Training

To promote, develop and support in the spirit of cooperation, the common interests of its members in all matters concerning the development and quality of maritime education and training.

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Editorial

Capt. Sriram Rajagopal

Dear Readers,

Welcome to the May 2022 edition of the GlobalMET newsletter.

In this newsletter, we inform our members and readers of the various events that have occurred during the last few weeks involving GlobalMET and discussions at the IMO related to training. We also present information on a maritime casualty of much importance, namely the 2015 sinking of the US flagged cargo ship *"El Faro"* and new publications in the maritime sector.

On board training and Sea time issues

In this article, we dwell in detail on the issues related to On Board Training (OBT), Training Ashore (TAS), sea time and other issues related to maritime training. The article describes various approaches that have been taken by different states, their pros and cons, issues that were discussed in the IMO correspondence group on maritime training which GlobalMET is part of, and proposed solutions.

The Demise of EL FARO – A Wake up call for the World Merchant Marine

El Faro's investigation revealed various lacunae in the company's SMS, hidden schedule based pressures on the Master, limitations of current weather information and weather routing services and issues faced on old ships. *El Faro* was a 1975 built US flagged ship, making her nearly forty years old when she sank off the Caribbean on 1st October 2015, on her regular voyage from Florida to Puerto Rico. In this article, titled "The demise of El Faro – for the world merchant marine", Mr. C. Maheshwar discusses the findings that were unveiled by the official investigation. To this, he adds some interesting observations and comments, based on his rich experience at sea and in teaching. We are sure they will be of special interest to all readers, and especially to ex seafarers.

New publication – INTERTANKO Practical guidance on loading limits for gas carriers

In this article, we give a glimpse to readers of the INTERTANKO publication "*Practical Guidance on Loading Limits for Gas Carriers*." Though just 23 pages long, the book contains a wealth of information that will be of much use to our members involved in Gas carrier related courses.

Updates on current status of participation in IMO working groups

In order to keep our members and readers up to date, we have, in this newsletter, compiled information on the various IMO groups that GlobalMET is currently involved it. Members are encouraged to send to us any views that they would like to put forth at these forums.

We hope you will enjoy this selection of articles. Please do give us your feedback at sriram.rajagopal@globalmet.org

Happy Reading.

Capt. Sriram Rajagopal
Editor, GlobalMET Newsletter
Head of Outreach Activities (GlobalMET).

Upcoming IMO Meetings – 2022

The Editorial Team, GlobalMET Newsletter. *Source: IMO.*

Members please note: There are no IMO meetings currently scheduled for the month of August 2022. HTW 8 was held from 7 to 11 February 2022 and GlobalMET represented its members in it.

Forthcoming meetings

June	
78th session/06 – 10 June	**Marine Environment Protection Committee (MEPC)**
9th session/21 – 30 June	**Sub-Committee on Safety of Navigation, Communication and Search and Rescue (NCSR)**
July	
127th session/11 – 15 July	**IMO Council**
8th session/25 – 29 July	**Sub-Committee on Implementation of IMO Instruments (III)**
September	
8th session/19 – 23 September	**Sub-Committee on Carriage of Cargoes and Containers (CCC)**
October	
LC 44/LP 17th session/ 03 – 07 October	**Consultative Meetings of Contracting Parties (London Convention 1972) and Meetings of Contracting Parties (London Protocol 1996)**
72nd session/17 – 21 October	**Technical Cooperation Committee (TC)**
November	
106th session/02 – 11 November	**Maritime Safety Committee (MSC)**
128th session/28 November – 02 December	**IMO Council**
December	
79th session/12 – 16 December	**Marine Environment Protection Committee (MEPC)**

Inputs for IMO SSE LSA CG

GlobalMET has been included in the IMO Correspondence Group on Life Saving Appliances (LSA). Do you have any comments or suggestions regarding the current regulations regarding LSA?

If yes, then we eagerly solicit your feedback.

Please send your comments and suggestions to Capt. Sriram Rajagopal (Head of Global Outreach Activities, GlobalMET) and the Secretariat at the following email addresses, and we will get back to you.

Email: rajagopals@angloeastern.com and sriram.rajagopal@globalmet.org

Email: Secretariat@globalmet.org

On board training and Sea time issues – IMO Correspondence Group on Maritime Training

Capt. Sriram Rajagopal

1. Introduction

Maritime training is naturally a topic close to the heart for all of us at GlobalMET. Based on discussions at HTW 7 last year and HTW 8 this year, a Correspondence Group (CG) has been formed at the IMO. GlobalMET has been accepted into this group and will contribute to the constructive discussion that will be held in this group. Also known as the "Correspondence Group on Maritime Training", the group will discuss various aspects related to both, shore based training as well as on board training, and will consider proposals that have been submitted to HTW regarding this topic.

In this article, we update our members and readers with some of the topics under consideration at the CG as well as the challenges related to the subject of maritime training, and some potential solutions. We will especially focus in this article on issues and proposals related to "On Board Training" (OBT), sea time requirements for Cadets, and berths for cadets on ships (sometimes referred to as "cadet berths").

Members are encouraged to send their comments and inputs to Capt. Sriram Rajagopal (rajagopals@angloeastern.com and sriram.rajagopal@globalmet.org) and Capt. Vinayak Mohla, both of who are representing GlobalMET in this CG.

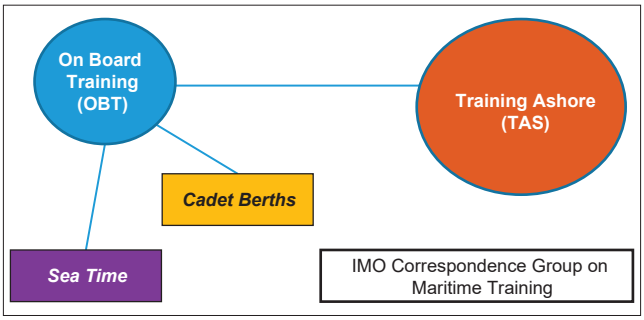

Figure 1 – Topics of focus in this article.
Source: Sriram Rajagopal, 2022

HTW	The Sub-Committee on Human Element, Training and Watchkeeping (IMO)
CG	Correspondence Group
OBT	On Board Training
TAS	Training Ashore
STO	Shipboard Training Officer
CTO	Company Training Officer
TRB	Training Record Book

Table 1: Abbreviations used.
Source: Compiled from IMO documents.

HTW 7	20 to 24 February 2021
HTW 8	7 to 11 February 2022

Table 2: Dates of 7th and 8th session of IMO's Sub-Committee on Human Element, Training and Watchkeeping (HTW 7 and HTW 8).
Source: IMO.

2. "On Board Training" and "Training Ashore"

Like most vocational learning, maritime training takes place both, ashore, as well as 'on the field', namely on ships. "Training Ashore" (TAS), also referred to as "Shore based training" helps seafarers learn the theory behind tasks performed on ships – learning that is best done in a classroom. Thereafter, seafarers go on board and learn how things are 'actually done on ships', namely the practical aspects of this learning. When done in a systematic manner, this "On Board Training" (OBT) helps the seafarer or Officer Cadet understand the 'how' and 'why' of various tasks, and helps her/him gain the skills essential to becoming a good, skilled seafarer and officer.

From an STCW and pedagogical perspective, shore based training addresses the "knowledge" aspects of learning, while the seafarer gains "skills" on board the ship by actually performing various tasks. The understanding aspect takes place both, ashore and on board.

Neither of them is a standalone, nor can one replace the other. Both TAS and OBT have their due merits, and one needs a healthy balance of the two, often in rotation.

	Learning Criteria			
	Aspect and location	***Knowledge***	***Understanding***	***Skills***
TAS	**Training Ashore →**	High focus	Moderate focus	Low focus
OBT	**On Board Training →**	Moderate focus	High focus	High focus

Table correlating TAS (Training ashore) and OBT (On board training) with STCW learning criteria of K, U and S (Knowledge, understanding and skills). *Source: Sriram Rajagopal, 2022*

Note: In this article, we have used the word 'cadet' to describe the budding deck officer, the budding Engineer, or the officer cadet who has joined the merchant navy, and is undergoing TAS and OBT in anticipation of passing their competency exams (mostly Second Mates examinations) and becoming an officer (normally Third officer).

2.1 Different countries, Different systems:

Different countries have developed different systems to achieve the above goals. STCW tells us *what* should be achieved, but gives flag states considerable leeway on *how* they decide to achieve it.

For example, in India, there are two generally used streams for deck officers. One stream involves TAS for one continuous year at a maritime training academy, followed by 24 months on ship (OBT), typically on two to three ships. It is only after this that the cadet is allowed to sit for her Second Mates competency exams. This is the more popular method and involves a reasonably rigorous entrance test for training academies and culminating in an extremely difficult competency exams including written and oral exams. Another stream which involves an even more difficult and competitive selection exam involves TAS ashore for two to three years, followed by 12 months of sea time.

Figure 2 – The Trainee Cadet Officers needs both, TAS (Training ashore) and OBT (On board training) to become a good knowledgeable and skilled officer. *Source: Sriram Rajagopal, 2022*

In the Philippines on the other hand, most entrants to seafaring undergo a four year Bachelors of Science program in either Marine Transportation (BSMT) or Marine Engineering (BSME). Youngsters aiming to work on deck join the former, and those aiming to work in the engine room join the latter. This is followed by mandatory sea time of 12 to 24 months, after which the cadet appears for a series of government administered objective type tests. Successful completion of the latter and the required sea time gives them their first certificate of competency. However, thereafter they need to find employment as officers. Those who are not able to find employment as officers often join companies and ships as deck or engine crew/ratings.

In the UK, a completely different system is used. This involves splitting up the cadet's journey into different "phases" of one to six months ashore (TAS) and on board a ship as a trainee officer cadet (OBT).

All of the above comply with the requirements of STCW, which requires a certain number of months ashore covering a range of topics (TAS), followed by a certain number of months on ship (sea time) involving a structured training program. Three documents constitute evidence of the latter. These are the sea time certificate, a letter or certificate of watch keeping and a training record book (TRB).

3. Benefits of TAS and OBT – an Example

Both, TAS and OBT are needed for a person to gain a complete understanding of shipboard operations, practical work on board and the practical use of various types of equipment. Let us see how this is accomplished, with a few practical examples.

The example of Cargo Work

A budding officer can, and in fact does learn cargo work in the classroom of a nautical college and training center. However, it is only when she or he boards a ship, participates in cargo watches, assists the chief officer in the planning and execution of cargo work that she/he truly understand the various aspects of the task. A seemingly procedural standard task becomes varied, complicated, with the chief, second and third officer finding ways to address the issues that they face. This imbricates into the cadet's knowledge of hatch cover operation, safety (while walking on deck during cargo watches), communication (while using the walkie talkie), ISPS code (while keeping gangway watches), inter personal relations (while working with varied people, personalities and nationalities on board). The cadet also learns the practical aspects of, dare we say 'dealing' with stevedores of various nationalities.

The budding officer quickly realizes that no two cargo operations are the same, even on the same ship. In a few months, the cadet learns quickly and becomes well versed with that ship's operations. She/he gains a level of confidence far higher than what they had in their training academy or nautical college.

The cadet officer then goes on the next ship, and realizes that every port, cargo and ship is unique. The learning process begins anew, albeit at a higher level. At the end of this ship, the cadet is armed with even more practical knowledge and experience. All that she learnt in her class room settings comes alive in the real world. She will use all of these learnings in her future roles as a third officer, second officer, chief officer and finally, as Master.

4. The dilemma of maritime institutes and cadets – "berths for cadets"

A major dilemma that maritime institutes and cadets face is that of berths on board. Most ship owners want good well trained and qualified officers. However, there is a reluctance among them to have cadets on board (referred to in the industry as "berths for cadets").

A survey by the author of the crew lists of 127 randomly selected ships revealed that only 26 ships had a deck cadet and 11 of them had an engine cadet on board. Only 3 ships had both – an engine and deck cadet. Additionally, 8 ships had a 'deck trainee seaman', who was collecting sea time in order to get qualified as an 'Ordinary Seaman".

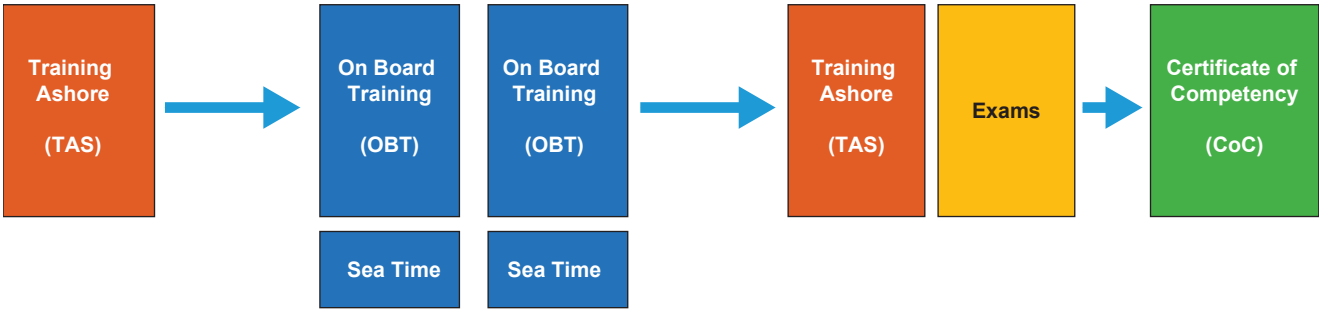

Figure 3 – An example of Training Ashore (TAS) and On Board training (OBT) in four phases. *Source: Sriram Rajagopal, 2022*

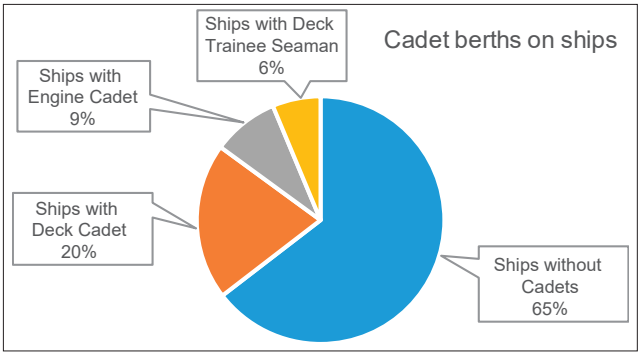

Figure 4 – Ships with cadets from a random sample of 127 ships. There is a need for more cadet berths on ships.
Source: Sriram Rajagopal, 2022

This is not an entirely new issue. It has been a long standing problem in the maritime sector for many decades. However, its impact has become direr over the last two decades, due to the growth in the number of maritime institutes. This leaves many cadets who have completed their TAS without a ship for many months or even years.

For the MET (maritime education and training) provider, this creates a dilemma. Naturally, all MET providers – be they maritime institutes or cadet training academies – would like their cadets to be on board a ship as soon as possible. They understand the worries that cadets face while waiting for their ship, as they are directly in contact with these cadets. However, placement on ships is often beyond their control. Cadet berths depend entirely on the ship owner. While many ship managers try to convince ship owners to place cadets, they might have limited say ultimately in the matter.

Maritime institutes that are connected with or have formal written agreements with ship management companies and ship owners face this issue to a far lesser extent, though cadets here too face the natural apprehension that one faces when they have to wait for many months before they learn of their first shipboard deployment. However, maritime education and training (MET) institutes that do not have such agreements for all the cadets that they train face this problem to a far greater extent. From a maritime institute's point of view, it is impossible for them to place all the cadets who pass out of their premises, if owners are unwilling to take them on board. On the one hand, they need to attract potential students to their courses. This is often done by painting a bright future for cadets who join the merchant marine. On the other, once the cadet completes his training, there is little that the institute itself can do except for the above. Rarely do people highlight the uncertainty that the cadet will face after passing out. This leaves both, the MET provider and the cadet in an uncomfortable situation.

From the cadet's point of view, she/he is rarely informed sufficiently of this aspect, namely the 'ship hunting' that they might be required to do, after passing out of the MET institute. This might often have to be done mostly on their own. In the Philippines, discussions with MET providers suggests that only 2 out of every 10 pass outs from the Bachelor of Science in Marine Transportation program are able to secure a berth on board, complete their sea time and obtain a certificate of competency. The rest either join ships as deck crew, or worse, quit the sector after a fruitless search for employment. Discussions with cadets and officers from other maritime manpower providing nations suggest that after they complete their one year pre-sea training, many of their cadets too can end up spending 1-2 years applying on their own to various shipping companies. One can only imagine the apprehensiveness and uncertainty that cadets go through during this pensive period.

5. Some potential solutions

The CG discussed potential solutions to the above issue.

Some of these are presented below:

5.1 Maximize "Cadet berths" on ships

The best (ideal?) solution to the above issue would be for every ship to carry at least one cadet on board. After all, having a cadet on board is an excellent investment for the ship owner and ship manager. Better her training on board, better she will be as an officer. Cadets are excellent, high performing, quality working members of the ship. They are versatile, perform a variety of jobs on the bridge, deck, CCR and ECR that few other crew can perform. They learn quickly and have high drives.

This would mean 98,400 cadet berths, based on the current fleet of 98,400 SOLAS class cargo ships that are sailing worldwide as per UNCTAD (2021). An excellent measure to solve the problem. One wonders why ship owners are reluctant to do this.

Another method that has been used by the United Kingdom is that of the government sponsoring cadets, either directly or

through one of the merchant navy training boards. The company that employs the cadets on board receives benefits in terms of a lower tonnage tax that they need to pay the government. This method is effective and yields immediate results. One limitation of this method is that it may not be feasible for countries that do not have a large number of ship owners. This, unfortunately, is the case for most of the largest maritime manpower providing nations of the world, especially the Philippines and the Indian subcontinent.

5.2 Reducing sea time requirements for cadets?

One suggestions that has been placed at the IMO (HTW 7/10/1) is that of reducing the sea time requirement from the current 12 months (for cadets who wish to give their first competency exam). On the one hand, this can alleviate the above problem. On the other however, it can negatively impact on board training time and quality. We asked trainers ashore and officers on ships their opinions on this. Most of them felt that any such measure would result in a dilution of practical knowledge and skills.

5.3 The use of simulators in lieu of sea time?

Some entities have suggested the use of simulators in lieu of at least some of the sea time requirements. This could on one hand appear to solve some of the above issues. However, there are three issues with this. Firstly, the amount that one learns by being and working on board a ship is far greater in variety and quantity, as compared to what one can learn in a bridge simulator. After all, when on board, the cadet spends time on all parts of the ship and not just the bridge. This includes the bridge, mooring stations, on deck and in cargo operations, not to mention the vast human interactions with multiple nationalities – a skill that he will use much when he becomes an officer, given the global nature of the industry. Simulators can only simulate a few of these tasks and environments. Secondly, even for bridge watches, substituting navigation related bridge sea time with simulator time would mean spending eight hours a day for months in a simulator to achieve some amount of equivalency. Thirdly, the cost for this would increase the cost of training dramatically, as simulators are expensive for MET to install and operate. This would increase the financial burden on cadets who have not even started to earn money. And we have not even discussed the incomplete nature of such training, and its impact on the future officer's knowledge and skills.

6. Work load on the Shipboard Training Officer (STO)

A justified observation made to the Correspondence Group (HTW/7/10/2) was that of workloads on Shipboard Training Officers (STOs). As it is, the deck officer and engineer of today labors under extremely high workloads. This leaves them little time for them to carry out training of cadets. On most ships, the STO is the Chief Officer for Deck cadets, a person who already is one of the most overloaded officers on board. For engine cadets, the STO tends to be the Second Engineer. Any measures introduced for improving on board training should not increase the workload on the STO.

Four solutions to this issue were discussed in the Correspondence Group:

Proposed solutions to improve OBT and alleviate burden:

Solution 1

Carry out OBT as part of the ships general routine. For example, if the day's work involves greasing on deck, ask the Cadet Officer to participate in it. He learns about grease nipples, pneumatic grease guns, trouble shooting them, various deck equipment and their parts like blocks, sheaves, gangway greasing points, winches and their operation, etc. merely by participating in the actual task. He learns far more within a day than he could if he were asked to read a book on this subject. Thereafter, the STO can ask him what he learnt, and explain certain other aspects that may not have been apparent to him.

Solution 2

Compile and publish practical guidelines on methods that the STOs can use to achieve high quality OBT without overloading them with work. Examples such as the above could be given in these guidelines.

Solution 3

Increase the number of CTOs (Company training officers) ashore, so that they can alleviate the STO's training work burden. This could also provide good reason for sailing officers to engage in a useful activity ashore during their vacations, or as a full time occupation. The CTOs can stay in continuous touch with the cadets on board, perhaps on a weekly manner, monitoring their

Review group for revised model course 1.32 on Operational use of integrated bridge systems including integrated navigational systems

GlobalMET has been included as a participant in the IMO HTW review group for revised model course 1.32 on Operational use of integrated bridge systems including integrated navigational systems.

Do you have any comments regarding this model course / any amendments that you would like to suggest?

If yes, please send them to Capt. Vinayak Mohla and Capt. Sriram Rajagopal at the below email addresses, with a cc to the Secretariat.

Email: mohlav@angloeastern.com

Email: sriram.rajagopal@globalmet.org

Email: Secretariat@globalmet.org

training on board and providing them with answers to questions and queries that they have. The CTO will not replace the STO. The CTO will merely augment the STO.

Solution 4

Reduce the number of tasks in the TRB. Reduce its prescriptive nature. Give more independence to the STO to decide tasks, such that they merge with solution #1 above. If electronic TRBs help in making the above convenient for the cadet and STO, then it might be useful for administrations to allow them, as many electronic TRBs can have videos incorporated which help the cadet learn better.

The CG will continue its deliberations and discussions over the next few months and submit its findings to the IMO Maritime Safety Committee for its consideration.

7. Conclusions

There is a need to improve the quality of training ashore and on board training. This should be done without increasing the work load of the STO. The issue of insufficient cadet berths too needs to be addressed urgently. It would be useful for the IMO to ask administrations to provide incentives for ship owners to keep cadets on their ships, in the interest of the future of the maritime sector. Any measures in this direction would go a long way towards addressing the current issues of maritime institutes and cadets. It would also help address the larger issue of addressing manpower shortages and competence levels of officers.

There is a need for a reduction in the size of TRBs and to increase their practical component. Some amount of flexibility is needed, giving the STO leeway in deciding the tasks that can be taught in lien with the work being carried out on that ship. More support and guidance needs to be given to STOs by providing them with training ashore on who they can best conduct OBT without increasing their workload. There is a need to make this shore based training mandatory for STOs. Publishing a practical set of "Guidelines for the STO", by the IMO, would be a welcome constructive step in this direction. It might also be a good idea to reinforce the requirement to carry out OBT in a structured manner as a mandatory requirement under STCW.

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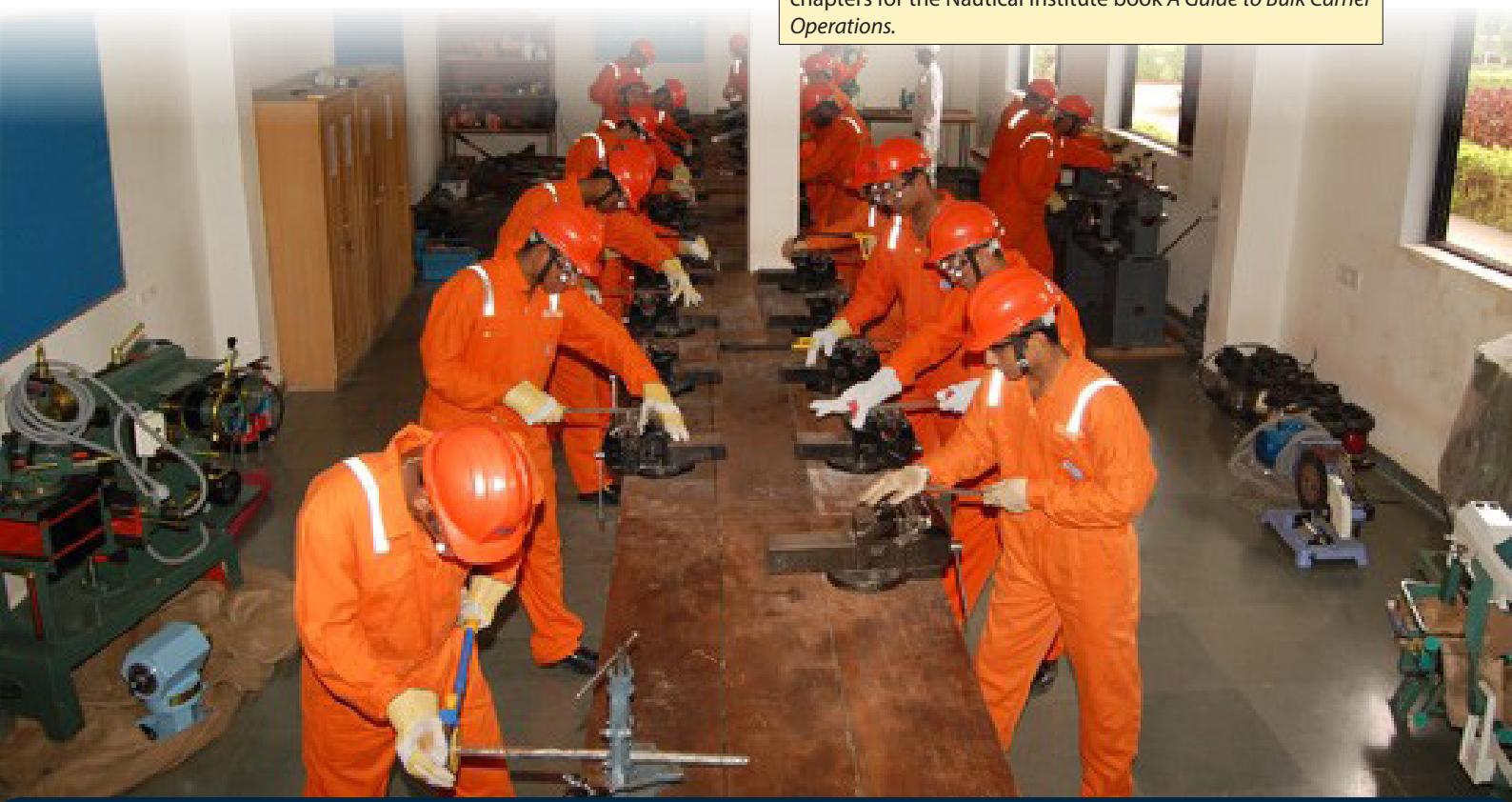
About the author

Capt Sriram Rajagopal is a maritime expert with more than 30 years of experience in the maritime sector. He sailed on a variety of ships in Barber Ship Management for nearly two decades. He thereafter worked ashore in a variety of roles including as a Trainer, QHSE Superintendent, Shipyard Supervisor, Researcher and Lecturer for Anglo Eastern Ship Management, the Sustainable Shipping Initiative (UK) and Southampton Solent University.

He holds an MSc in International Maritime Policy from the University of Greenwich (London). He is the author of a number of books and articles, and has co-authored four chapters for the Nautical Institute book *A Guide to Bulk Carrier Operations.*



The Demise of EL FARO – A Wake up call for the World Merchant Marine

C. Maheshwar

1. Introduction

On Thursday, 1 October 2015, at about 0730 hrs local time, the 737 feet (224.6 meters) long ro-ro cargo ship ***El Faro*** sank about 35 nautical miles north of Crooked Island, Bahamas. The vessel had navigated close to the eye of Category 3 tropical storm, later upgraded to **Hurricane Joaquin**. Ironically, El Faro is Spanish for lighthouse.

During her fateful voyage, *El Faro* was laden with 391 containers on her deck, and a cargo of 294 trailers and cars below deck. She took in water in hold No. 3 through one of the scuttles[1] and developed a list of 15 degrees. Soon, her main propulsion failed and the vessel sank along with 28 American crew members and 5 Polish workers who were on board preparing the engine room for a retrofit. Her wreck was found at a depth of 15,000 feet after a month-long search.

In this article, using the official NTSB report as the basis, we examine the circumstances in which the vessel sank and the probable causes. To these, the author has added some personal comments and observations based on his own experience of sailing on ships. We have especially focused on the engineering aspects.

2. El Faro's last voyage

The 600FEU capacity vessel had sailed out at 8:15 pm (2015 hrs) on 29 September from Jacksonville. She was bound for San Juan, Puerto Rico, a 1300 mile voyage. The route was a well-travelled one that *El Faro* regularly ran. This route serves as a lifeline between US and Puerto Rico.

Eventually, sailing near full speed throughout the day, *El Faro* became trapped between the path of the storm — which kept shifting toward it — and the Bahamas to the ship's west. With the benefit of hindsight, one could say that *El Faro* did have a chance to slip westward at 5 p.m. on that fateful day, through the gap in the Bahama Islands known colloquially as "Hole in the Wall," taking it farther from the storm. But it sped right past it. After that, it was on a "collision course" with the storm.

Figure 1 – *El Faro* *(Source: NTSB)*

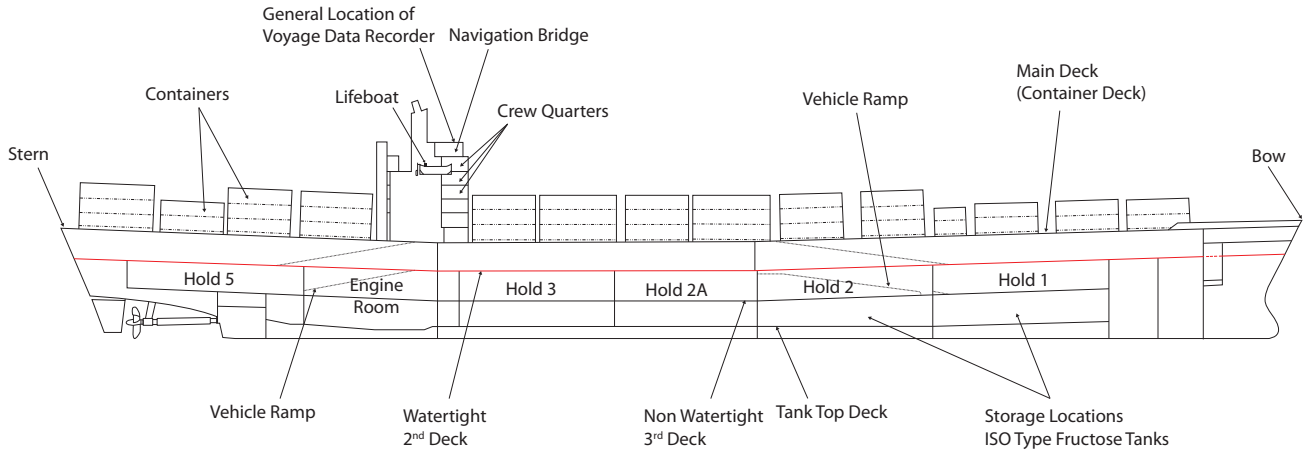


Figure 2 – Layout of *El Faro* *(Source: NTSB)*

[1] The NTSB report uses the word 'scuttles' to describe what seafarers conventionally call 'booby hatches'. These are often shown in ships plans as 'raised watertight hatches'.

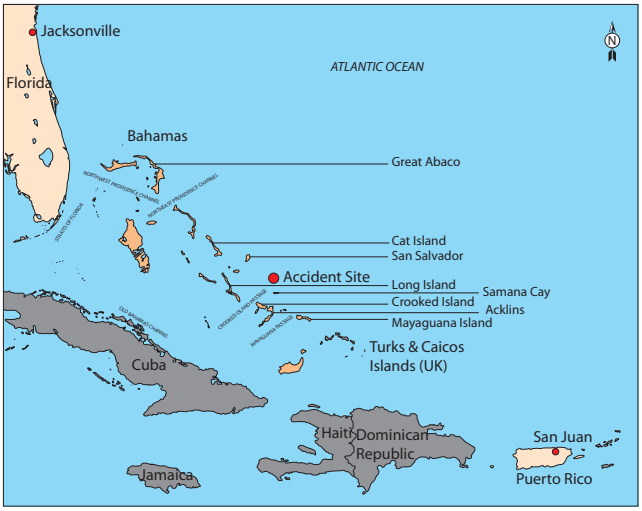


Figure 3 – Location of accident, and the Converging paths of *El Faro* and Tropical storm/later Hurricane "Joaquin" *(Source: NTSB)*

El Faro had two bright orange open lifeboats of 43 persons capacity and 5 life rafts, each capable of holding 17 people. The crew found it impossible to launch any of these. With winds more than 120 mph, seas of 50 feet and higher, it was perilous to go on deck. During the final fateful hours, visibility was near zero. The port side lifeboat had a diesel engine for propulsion and the starboard life boat was propelled by means of Fleming gear.

Figure 4 – Open Lifeboat of *El Yunque* sister ship of *El Faro*. *(Source: NTSB)*

Figure 5 – Wheelhouse of *El Faro* *(Source: NTSB)*

El Faro was classed as a vehicle carrier by ABS with restricted deck loading and reduced scantlings based on corrosion control. Her ABS class survey and statutory surveys were completed in February 2015, annual Coast Guard Inspection in March 2015 and another survey was carried out in June 2015. Lifeboat drills were conducted on a weekly basis. Records indicate that the ship met the required stability criteria before sailing.

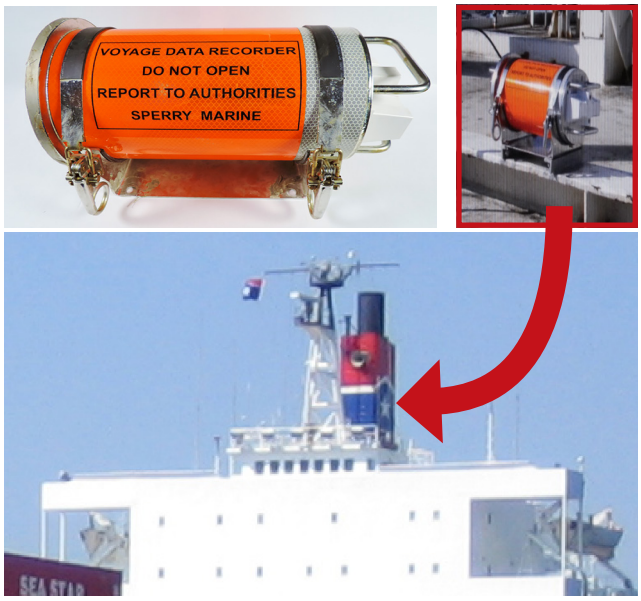


Figure 6 – S-VDR of *El Faro* *(Source: NTSB)*

3. Probable causes as per the NTSB report

The NTSB report identified the following 11 safety issues and made recommendations to the Coast Guard; the Federal Communications Commission; the National Oceanic and Atmospheric Administration; the International Association of Classification Societies (IACS); the American Bureau of Shipping (ABS); Furuno Electric Company, Ltd.; and the ship's owners and operators TOTE Services, Inc.

These issues were:

- The Captain's actions
- Use of noncurrent weather information
- Late decision to muster the crew
- Ineffective bridge resource management
- Inadequate company oversight
- Company's safety management system
- Flooding in cargo holds
- Loss of propulsion
- Downflooding through ventilation closures
- Need for damage control plan
- Lack of appropriate survival craft.

The above are well enumerated in the official report. However, there appear to be many other factors of interest as well which we list and explain in the next section.

4. Other issues

We find 19 other issues that the NTSB report directly or indirectly alludes to, which we found of interest. To each, we offer our personal comments and suggestions. In the author's opinion, all of these, when combined, appear to have played a role and contributed to the sinking of *El Faro*:

1. **Age of the ship**: *El Faro* was built in 1975, making her a 40 year old ship when she was sailing her weekly shuttle service from Jacksonville to San Juan. 40 years is too long a period for survivability of a ship for ocean going purpose, however well it may have been maintained. Some of the ex-crew members who were subsequently interviewed had called it a "rust bucket", with drainage issues, frequent water leakage into the cook's cabin and that the ship was covered in rust and the deck was filled with holes.

2. **Lengthening of the ship**: In 1993, the length of the ship was extended from the original 217 m to 241 m; an extra length of 27 m was added at the mid body, perhaps for commercial reasons. The stability and structural factors must have been definitely been considered, as the ship ran without any reported structural or stability issues for the next 22 years. However, it cannot be totally eliminated, because a retrofitted structure is never as strong as the original one. Cases have occurred in the past five decades of ships that were lengthened, but later developed structural problems in the region of lengthening. A prominent such case is that of *MSC Carla* which broke into two parts off Azores in 1997 in a storm.

3. **Structural Changes**: As can be expected for a ship of her age, *El Faro* had substantial corrosion that was repaired by 2011. Steel was added to the ship to repair the corrosion, though the amount was insignificant. In 2005-06, the ship was converted from work in Alaska to its last duty on the Jacksonville to Puerto Rico route which increased the permissible draft of the ship by two feet. 100-ton fructose tanks were welded to the deck in 2014. This information was not made known to ABS, the classification society, nor was information given to them about any of the other ongoing works. It is a standard practice that no structural change should take place on the ship without the class approval. This was obviously not practiced in this case.

4. **Large Ro-Ro decks and free surface effect**: *El Faro* had vehicle extry/exit doors at the sides of the hull rather than at the bow or the stern. In other words, she only had side ramps. During extreme weather with 30- 40 foot waves, sea water can pour through an improperly secured or damaged loading door. In 1987, a passenger ro-ro ferry *Herald of Free Enterprise* capsized in 90 seconds when a bow door was left open, not long after leaving the dock with a loss of 193 passengers and crew members. In 1994, the passenger ro-ro *Estonia* capsized and sank with more than 900 lives lost when the bow door was torn off by heavy seas. In 2004, the ro-ro car carrier *Baltic Ace* capsized and sank in 15 minutes following a collision with a container ship in the North Sea with five crew members killed and six were missing and presumed dead. In 2006, a fire broke out on the Egyptian ro-ro passenger ferry A*l Salam Boccaccio 98*. Water that had been used for firefighting water collected on the vehicle deck, causing the ship to capsize and sink with the loss of over 1,000 lives. Furthermore, on El Faro, one of the deck scuttles (booby hatches), leading to cargo hold 3 appears to have led to water flooding into the cargo hold, resulting in large free surface moments and reducing the ship's stability.

5. **Open Lifeboats**: As per SOLAS, all ships built after 1986 should have enclosed lifeboats, *El Faro* was built in 1975, thus open lifeboats were permitted on it. Unfortunately, open lifeboats offer little protection in heavy seas. The port side lifeboat had a diesel engine for propulsion and the starboard life boat was propelled by means of Fleming gear. Sailing in rough weather, expecting to survive in such lifeboats is, in the opinion of the author, an open invitation to disaster.

6. **Earlier Reported Problems with Lifeboat Lowering Mechanism**: It was reported that in earlier instances, problems were faced during lowering of EL FARO's lifeboats. Crew had to spend extra time to straighten kinks and lifeboats would lower slowly in relatively calm waters and at the berth. This could have led to problems, given that the ship staff would be attempting on that fateful day to lower the lifeboats in exceptionally heavy weather, with waves washing all over and the ship rolling and pitching violently.

7. **Double Skin versus single skin**: *El Faro* was a single-hulled vessel. A double hull may have made it safer in some ways.

8. **Earlier Loading Issues**: As per interviews that were conducted with ex crew, *El Faro* had experienced cargo related issues earlier. For example, it had developed 3 ½ and 4 degrees lists on certain occasions during cargo operations. Loading had to be stopped and list corrected before loading was restarted. Though the vessel did have heeling tanks for correcting list during cargo operations (referred on *El Faro* as 'ramp tanks'), ro-ro ships do occasionally have list-related issues, especially if the cargo weight and rate of cargo work are faster than the pumping rate of the heeling pump.

9. **Main propulsion**: The main propulsion of *El Faro* was through a single shaft double expansion compound steam turbine. SOLAS requires that all shipboard machinery should be fully functional even at a static heel of 15 degrees or a dynamic heel of 22.5 degrees. However, in practice, when a ship heels over, she loses suction from vital tanks necessary for the safe operation of the main engine. Interconnected alarms and trips can, in such cases, result in main engine stoppage. The NTSB report suggests that *El Faro's* propulsion failure occurred because the ship listed. When the ship listed, the propulsion turbines' lub oil pumps lost suction because of the excessive list. The turbines tripped due to low lub oil pressure.

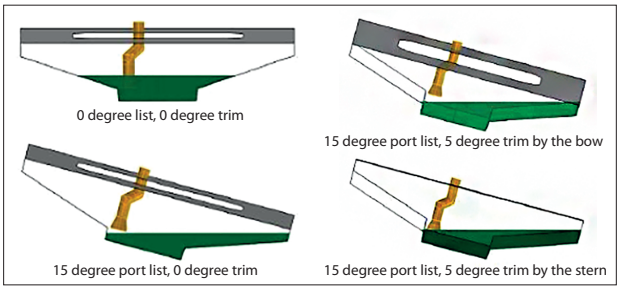


Figure 7 – *EL FARO's* main engine lub oil sump and off-centre aft oil suction bellmouth *(Source: NTSB)*

10. **Power Generation**: In *El Faro*, power was generated through two steam turbine driven alternators. It may be the same condition as for the man propulsion turbines. It is unclear whether these two power generation steam turbines were functional when she listed to 15 degrees and more. *El Faro* did not have a backup diesel generator which could take up the sea going electrical load in case there was a problem with the boilers.

11. **Derated Boilers**: *El Faro* had two Watertube Boilers of 27690 square metres of total heating surface with a maximum working pressure of 1200 psi. The ABS Surveyor who surveyed *El Faro* had permitted the hydrostatic pressure test the on economizer of 800 psi, whereas the maximum working pressure was 1200 psi and USCG standard was 1.5 times the maximum working pressure i.e., 1800 psi in this case. The justification given at that time was the age of the vessel and the long service of the boilers. The overall condition of the boilers appears to have been, in the eyes of some of the crew and the author, rather unsatisfactory. In many ways, *El Faro* was running on derated boilers.

12. **Earlier Incidents**: On April 12, 2011, *El Faro* reported a temporary loss of power when the generator breaker for the main buss tripped offline. Engineers determined that the cause was due to the severing of the terminal end of a wire within the exciter. It was successfully repaired.

    In the same year, on August 11, 2011, *El Faro* lost forward momentum at Sparrows Point outside Baltimore. The cause was suspected to be a bottom suction, hitting a channel obstruction or shoaling. No evidence of grounding was found during a dive survey.

    Earlier, in December 1984, the vessel touched bottom while maneuvering at Jacksonville and all blades of the propeller were heavily damaged. The vessel was repaired and returned to service.

13. **Container weights**: On container ships, there is always a possibility that the weight of some/many containers may not have been correctly declared. This could have reduced the stability parameters. So called 'bogie weights' have been a long standing issue in the container industry. From 1 July 2016, SOLAS requires that correct declaration of container weights is mandatory before a container is loaded onto a ship. Wrong declaration of container weights is treated now an a punishable offense. Other ships which have suffered due to this reason include *MSC Napoli, Deneb, MOL Comfort, Rena, Limari, Husky Racer, P&O Nedlloyd Genoa and P&O Nedlloyd Barcelona*. However, anecdotal evidence from seafarers on container ships, as well as practitioners from the container industry suggests that this issue continues to exist across the world. It was reported that *El Faro* met stability criteria when it left Jacksonville for the fateful voyage. However, stability calculations are made based on the declared weights.

14. **Carriage of Cars and Trucks**: During rough weather conditions, it is common for the securing arrangements of ro-ro cargo, cars and trucks to get loose. This can result in cargo shift, upsetting the ship's stability. It had happened with *Herald of Free Enterprise, Hoegh Osaka* and many other ferries and car carriers. The company's procedures called for some cargo on the ship to be "double lashed" regardless of the weather expected to be encountered during the voyage. It was reported that prior to *El Faro's* departure on the accident voyage, the cargo was secured in accordance with those (double lashed) procedures.

15. **Deviation from the Charted Passage Plan**: The vessel had deviated from the originally charted passage plan which would have taken them a little more into the sea rather than being close to the land. There was no reliable information about the storm for the Captain. Instead, he was receiving contradictory information from different sources. This ultimately placed the vessel within the eyewall of Hurricane Joaquin, where winds in excess of 80 kn (150 km/h; 92 mph) and waves of 20 to 30 ft (6 to 9 m) battered the ship. On the day of sailing out of Jacksonville, when the pilot asked the Captain what they planned to do about the tropical storm that had just developed, he replied that they "planned to sail below it" and that it would not be an issue.

    On the night prior to sailing, when the Captain had dinner with the TOTE engineer, they had discussed among many other things, the tropical storm, but neither had considered it to be an issue, as it was normal to have storms in that region at that time of the year. One could argue that the Master was justified in his subsequent deviation of the ship - as the tropical storm got escalated to hurricane and he had to keep the ship as far away from the eye as possible. It appears that in the bargain, the ship got sandwiched between land and the hurricane, leaving them with no place to go. As it is, the route between Jacksonville and San Juan is a straight route, and the low pressure was on the ship's route. To deviate, the ship would have had to sail at right angles to her indicated course, and stay away for days, till the storm's path became clearer.

    VDR transcripts also indicate that the ship's schedule was often mentioned by the Master and officers. This self-assumed commercial pressure resulted in their perceived need to stick to the vessel's schedule. *El Faro* was on a fixed Jacksonville – San Juan run. She made one scheduled round trip a week between these two ports, leaving Jacksonville every Tuesday, docking in San Juan on Friday, and arriving back in Jacksonville on Monday. The unstated as well as stated pressure on Officers on such shuttle- services often stresses 'maintaining the schedule' and thus incentivizes risk taking.

16. **Decision to sail under such rough weather conditions**: In hind sight, it appears that the Master could have delayed the departure by a day in view of the tropical storm (later upgraded to hurricane) crossing his way. But ships do not stop sailing because of weather. Ships are designed to sail through rough weather as well. Professional pride prevents senior and experienced Captains from delaying a ship's schedule. This has been a recurrent theme for more than a century. That is what prevented Captain Smith of the *Titanic* from slowing down for ice bergs. The Master of *El Faro* had attended the Maine Maritime Academy, gone out to sea as

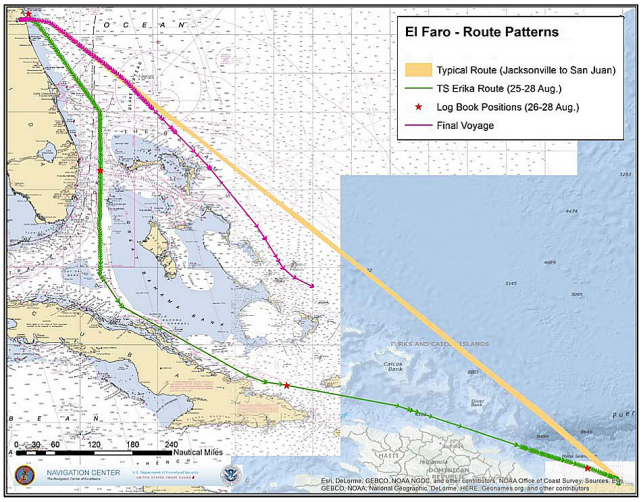


Figure 8 – Alternate route via Old Bahama Channel (green) from Jacksonville to San Juan, compared with normal route (orange) and *El Faro's* route on accident voyage (purple) *(Source: NTSB)*

a teenager, had 10 years' experience as Captain and 3 years with the owner/operator TOTE. He was reported to be a very squared-away sailor, meticulous with details, very prudent. He took his job seriously. (*Editor's note:* Notably though, on a previous voyage in August 2015, *El Faro had* deviated from her track considerably by using the route via Old Bahama Channel, to avoid Tropical Storm Erika. In fact, during this fateful voyage too, the Captain had discussed with TOTE and subsequently with the 2nd Officer that they would most probably use the longer Southern route to return to Jacksonville, in order to avoid the rough seas resulting from Joaquim (NTSB, p.26-28).)

17. **Un-updated Storm Tracking Data**: At a certain stage of investigation, it became known that the vessel did not have an updated weather report. The weather routing computer program, a proprietary software called "Bon Voyage System" had developed a problem on 30th September and did not send updated storm data to the ship. The vessel was working on the basis of storm data which was updated 10 hours before.

18. **El Faro's S-VDR**: *El Faro* was not fitted with a VDR – rather, she was fitted with a Simplified Voyage Data Recorder (S-VDR) which was not designed to float free of the vessel. Simplified VDRs are targeted at the retrofit market (cargo ships built prior to 2002). Simplified VDRs record bridge audio and basic parametric data, but are generally not required to record more extensive parameters such as engine, steering, alarm, or wind data. Inside this fixed capsule, a 12 hour duration of data is recorded. This data includes audio from microphones on the bridge, Very High Frequency (VHF) radio communications, images captured from an onboard radar every 15 seconds, and Automatic Identification System (AIS) traffic broadcasts data (if not possible to record radar). Lastly, other vessel data is recorded, which includes date, time, GPS position, speed, and heading. The fixed capsule is certified to remain functional upto a depth 6,000 meters (about 20,000 feet). In the case of *El Faro*, the S-VDR was mounted on the antenna mast support structure above the bridge of the vessel. *El Faro's* S-VDR was finally found in May 2016. The analyzed data and audio files only brought out the agony that transpired amongst the ship's team during the occurrence of the sequence of events that led to *El Faro's* sinking.

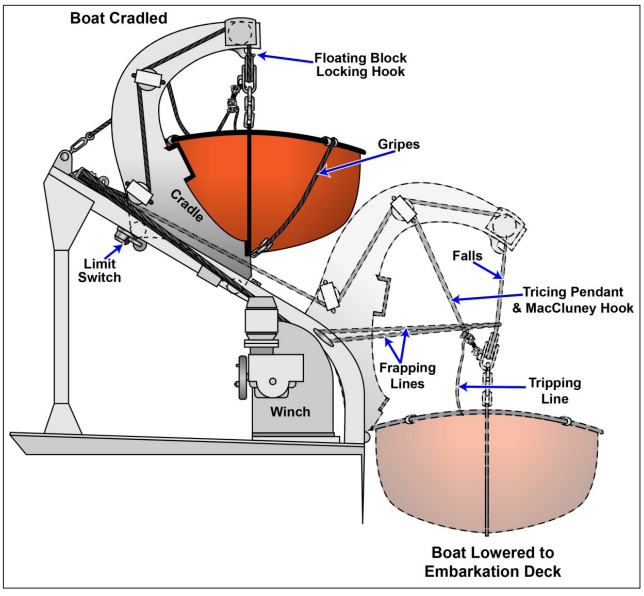


Figure 9 – Lifeboat Lowering Mechanism of *El Faro*
(Source: NTSB)

19. **Loss of Propulsion** was probably the proverbial last straw on the camel's back, and proved to be the nemesis of *El Faro*.

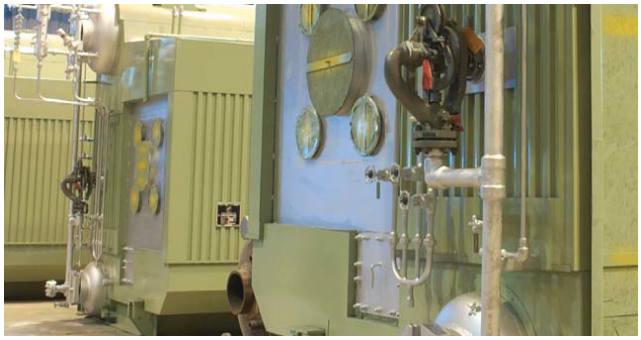


Figure 10 – Boilers of *El Faro* *(Source: NTSB)*

Figure 11 – Top Portion (Safety Valve) of Boiler of *El Faro*
(Source: NTSB)

As can be expected of such an old ship, *El Faro*'s machinery was not a stranger to problems. In 2010, one of her boilers suffered a failure because of a rupture of super-heater tubes. It was subsequently repaired. In 2011, the ship lost her propulsion when a generator breaker tripped. It was subsequently repaired.

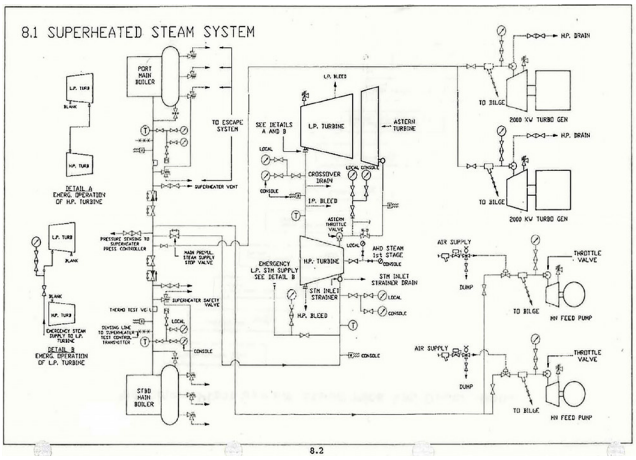


Figure 12 – Steam System of *El Faro* *(Source: NTSB)*

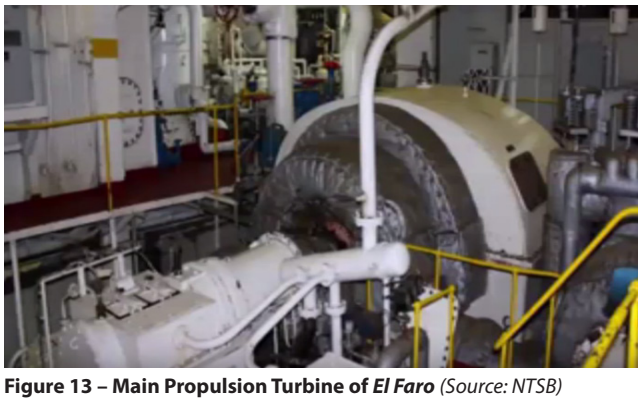


Figure 13 – Main Propulsion Turbine of *El Faro* *(Source: NTSB)*

Figure 14 – Power Generation Turbines of *El Faro* *(Source: NTSB)*

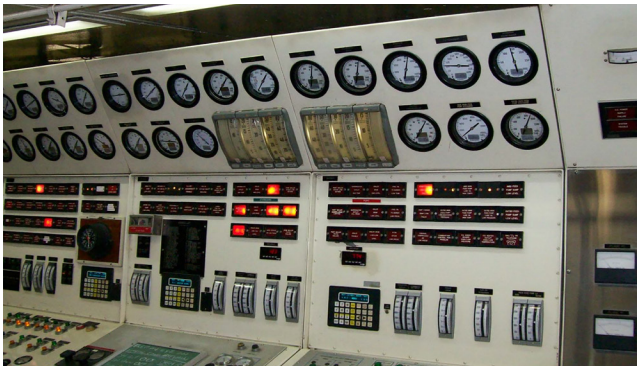


Figure 15 – Engine Control Room Panel of *El Faro* *(Source: NTSB)*

As per SOLAS, all shipboard machinery should be fully functional even at a static heel of 15 degrees or a dynamic heel of 22.5 degrees. Steam turbines are generally considered to be a reliable piece of equipment. The major reasons for tripping of Steam Turbines could be overspeed, lub oil failure or loss of steam pressure. Loss of steam pressure from the boilers can cause loss of vacuum in the condenser and also speed reduction and stoppage of propulsion.

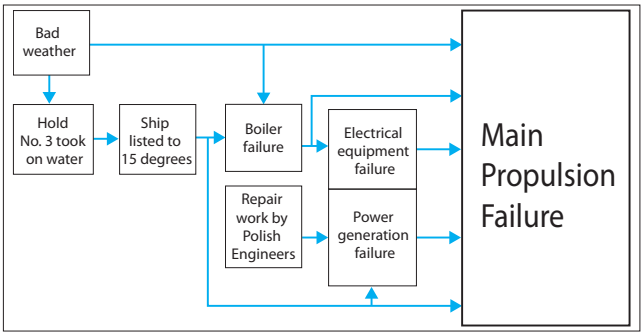


Figure 16 – Possible Causes of Main Propulsion Failure
(Source: the author)

5. Suggestions for the future

The NTSB report made a number of suggestions and recommendations. In addition, from a seafarer's perspective, based on the above, the author proposes some suggestions of his own:

1. Retire all ships above 30 years of age – they are simply not safe, especially to sail in seas of more than force six winds and rough weather. They are not economical, neither are they environmentally friendly.
2. Use these ships as a shore based training establishment – Instead of sailing, old ships can be used instead as shore based training establishments for training newcomers to sea. This will give them a realistic training atmosphere – far more realistic than a concrete 'ship-in-campus'. They do not have to sail. They can be stationary, bottom fixed water surrounded structures with all the equipment and machinery kept intact and perhaps in working condition.
3. This might be controversial, but I would suggest that flag states bring down the maximum sailing age of personnel to 50 years for commercial vessels for all ranks including for Captain and Chief Engineer. Instead, help the seniors get involved in training. Offer them salaries as trainers that are the same as what they last drew as officers and engineers at sea. This will, on the one hand, give a realistic incentive for experienced officers and engineers to come ashore and teach. The newer generation will only benefit from such a cross over. On the other hand, it will open up promotion possibilities for existing officers and will rejuvenate training.
4. Let the vessel inspections, audits and investigations be carried out by neutral third party consultants and investigators. Classification societies and flag state authorities currently have a strong commercial incentive to *not* prevent a ship from sailing, irrespective of any issues that the surveyor might detect. This results in what in the financial world is referred to as a 'moral hazard'. This naturally results in self-censorship.

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> "The wind and the waves are always on the side of the ablest navigator."
>
> *–Edmund Gibbon*

New publication - INTERTANKO Practical Guidance on Loading Limits for Gas Carriers

The Editorial Team, GlobalMET Newsletter

In February 2022, INTERTANKO published a new guidance document *Practical Guidance on Loading Limits for Gas Carriers*.

The book is just 23 pages, and gives guidance and explanation on Chapter 15 of the IGC code. It has been written with the most common cargoes for gas carriers in mind, namely LPG, LNG, Butadiene and Ammonia. It contains useful worked out examples and case studies. Loading limit curves are explained for various loading temperatures.

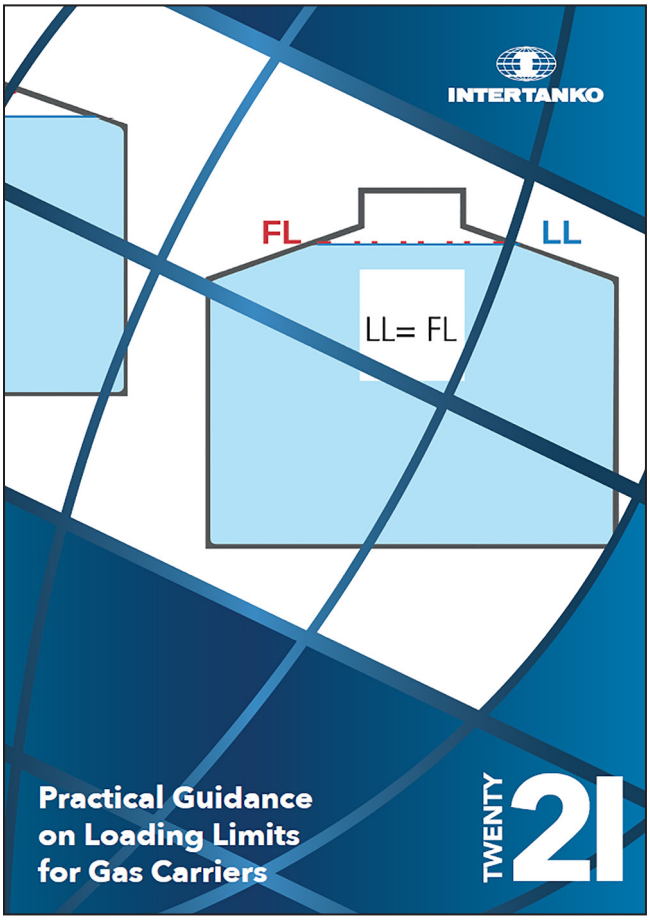
Main contents:

- Loading limits – general explanation
- Loading limits for a ship with vapour pressure/temperature control
- Ships with vapour pressure/temperature control built before 1 July 2016
- Ships with vapour pressure/temperature control built after 1 July 2016
- Loading limits for a ship without vapour pressure temperature control
- Information to be provided to the Master as per IGC Code.

This guidance document does not cover uncommon tank types and unusual cargoes (for example; Chlorine) which may have their own specific regulations in respect of loading.

In any case, this is a good book for faculty involved in gas carrier related courses for deck officers as well as students and seafarers involved in gar carrier operations.

Members conducting gas carrier courses might find it useful to add this book and its contents to their course content.



IMO Correspondence Group on Maritime Training

GlobalMET has been included as a participant in the IMO HTW Correspondence Group (CG) on Maritime Training. The CG will deliberate on various aspects related to maritime training including On Board Training (OBT), Training Ashore (TAS), Training Record Book (TRB), Sea Time requirements and Online education and training.

This is a good opportunity for members to place their view points and inputs at the IMO, and help shape upcoming training related regulations and guidelines. The discussions will take place in phases all through 2022.

We look forward to hearing from you.

Please send any inputs that you might have to Capt. Sriram Rajagopal (Head of Global Outreach Activities, GlobalMET) and Capt. Vinayak Mohla, keeping the Secretariat copied, and we will get back to you.

Email: rajagopals@angloeastern.com , sriram.rajagopal@globalmet.org and mohlav@angloeastern.com

Request for Feedback from Members

Do you have any comments regarding the articles in this newsletter, the GlobalMET website or GlobalMET's activities?

If yes, then we eagerly solicit your feedback.

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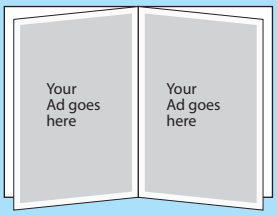

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The IMO HTW 8 Sub-Committee has selected Capt. Vinayak Mohla (representing GlobalMET) as review group Coordinator for revised model course 1.35 on Liquefied Petroleum Gas (LPG) tanker cargo and ballast handling simulator.

If you have any comments regarding this course, please do send them to Capt. Mohla at the below email address, with a cc to the Secretariat.

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