Yacht Owner's Manual

Yacht Owner's Manual Blue Marlin 12mR

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BACHELOR'S THESIS

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Abstract

12mR class sailing yacht from 1937, Blue Marlin, was re-launched after its restoration completed in 2014. The captain, electrician and the boat builder started inventorying, labeling and creating user guides for the vessel. During the writing process, a transition to a more comprehensive owner's manual was deemed necessary by the captain who was foreseeing a problem with information distribution as the experts who had built the vessel were not the same people who supplied parts or sailed the vessel.

I was asked to write the manual as I was getting more involved with the vessels operations after its re-launch. I wanted to examine, how the project spiral design method works for designing and constructing a manual? I set two sub-questions for this research task. 1. How to delimitate contents for a manual in the spiral design process? 2. How to address the topic of user-friendliness in the spiral design process? I followed Barry Boehm's (2000) software Spiral Design to guide my work and the International Electrotechnical Commission's 82079-1 (2012) along with David McMurrey's Power tools for technical communication (2017) to provide general principles and detailed requirements for the design and formulation of the manual. While writing the manual in accordance to the spiral design models steps, I used one on one conversations, phone calls, text messages, e-mails and documents to gather data, which I used to answer the research questions and to write the manual.

Key findings; Succesfull seafaring demands instructions. The quality and understandability of instructions enables operations to be executed to the principles and objectives of those instructions. A manual that contains these procedures is in an important position in regards to safety and proper executions of operations carried out at sea.

Language: English Key Words: Yacht Owner's Manual, Safety, Education, Maintenance

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1 Introduction

Blue Marlin is a yacht designed by Charles E. Nicholson, constructed and launched by the Camper and Nicholson Company in Gosport, UK in 1937. Blue Marlin is one of the nineteen, 12mR yachts that the company produced throughout the years. The vessel was originally ordered by Lady Marion B. Carstairs, a citizen of Bermuda, but sold on during its building process to C.E.A. Hartridge. He had been fascinated by the 12mR's after his first chartering of Iyruna in 1935.

As the boat was launched in 1937 it was in the use of the Hartridge family for a year prior to being sold to the world-famous aviation industrialist T.O.M Sopwith who raced the boat. The boat passed down through several British owners before it was sold to Italian owners in 1951. In November 2006, Henrik Andersin became the new owner of the vessel and moved the yacht to Kotka, Finland for renovation. The ship was re-launched in July 2014.

(Fox, 1949)

Since its' re-launch, in July 2014, Blue Marlin has participated in the following events;

Viaporin tuoppi 2014

Kiel Classic 2015

Dyvig Tune Up regatta 2015

Robbe & Berking cup 2015

KDY 150 Years Jubilee - Wessel & Vett Meter Yacht Cup/Baltic 12mR Championships 2016

(INTERNATIONAL 12 METRE ASSOCIATION, 2019) (BM team, 2019)

1.1 Starting point for this thesis

Initially, the need for a user manual was realized by the captain who was foreseeing a problem with information distribution. The experts who had built the vessel were not the same people who supplied parts or sailed the vessel. It was becoming clear that people sailing the vessel may not know what was installed on the vessel or where different parts were located. In addition, they might not know about the parts which might need replacement. This knowledge was important for people who were working as crew. Knowledge about the legislation affecting the vessels class rating, as well as its certification as both a pleasure- and rental craft perspectives, was also needed. From the perspective of a captain, knowledge about the vessel's particulars, vessel safety information and legislation affecting the vessel and any operations that the vessel and it's crew undergo are impervious, as the captain is ultimately responsible for the vessel's and its crew's safety along with the safety of the environment (Finnish Maritime Law 15.7.1994/674., Chapter 6). It was understood that not only the crew but also the captain would benefit from a manual. The captain of the vessel approached me with the topic of writing a comprehensive manual for the vessel. I soon realized that maritime law, vessel class legislation, vessel operation, and maintenance, as well as the use of Blue Marlin as a schooling ship, would form the foundation for the thesis and that my work would require reflecting these topics in relation to the manual.

1.1.1 Law, legislation, and classification

According to Investopedia (n.d), Maritime law, also known as admiralty law, is a body of laws, conventions, and treaties that govern private maritime business and other nautical matters, such as shipping or offenses occurring on open water. Maritime law also relates to registration, license, and inspection procedures for ships and shipping contracts, insurance and carriage of goods and passengers. (Investopedia, n.d.) In all, the maritime law is a huge body of laws and for the purpose of Blue Marlin's yacht owners manual, it was considered applicable for the reader to understand the legislation and the requirements set upon the vessel, in relation to the vessels pleasure craft, rental craft,

and 12mR class type certification. (Traficom, 2014, 2015; World Sailing Class Association, 2018).

1.1.2 Vessel operation

Operating a vessel is about being in charge or having an essential role in the handling of a vessel while underway. This may include navigation or direct controlling of the vessels propulsion system for the individual operator. A similar definition is presented by NOAA in their Fisheries Glossary (National Oceanic and Atmosphric Administration, 2006). Operation in relation to a manual means: Understanding how to execute operations on board by following guidelines written and illustrated in a manual. By doing so being mindful of correct execution methods, safety and of good seamanship all along the process.

1.1.3 Maintenance

Maintenance is about performing activities required to conserve as nearly, and as long, as possible the original condition of an asset while compensating for normal wear and tear (BusinessDictionary, n.d.). For a vessel that means checking of functions, servicing, repairing or replacing necessary equipment in order to keep the vessel sailing as long as possible. For example, checking battery charging equipment regularly, so that there is usable power for the equipment onboard, or servicing winches in order to trim sails or mooring lines, or repairing/replacing broken deck hardware so that the vessel can perform as per it's design and purpose. Maintenance in relation to the manual means: Understanding that in order to keep the vessel in peak performance for extended periods of time, vessel-related operations need to be carried out in accordance with their guidelines, hardware needs to be operated and maintained in accordance to their own guidelines and to fix any issues that a person operating the vessel might encounter as soon as applicable. (Finnish Ministry of Traffic, 2019)

1.1.4 Safety

According to BusinessDictionary (n.d.), safety is relative freedom from danger, risk, threat or loss to personnel and/or property. In seafaring, there are three topics of safety that concern of any and all seafarers, crew safety, the safety of the vessel and cargo and the safety of the environment. Safety in relation to a manual means: Understanding what safety-related items are found on board and how are they used. Also understanding how vessel safety has been taken into consideration during the building phase of the vessel in order to satisfy the regulations applicable to the vessels safety regulations. (Traficom, Vuokraveneiden laitteet ja varusteet, 2014; Huviveneiden turvallisuus ja päästövaatimukset, 2015; IMO, SOLAS, 2018)

1.1.5 Education

To practice the art of seafaring, one must learn not only the practices, skills, values, beliefs, and habits of the art but must also understand how to facilitate learning in both a school and a ship environment. (Oxforddictionaries, n.d.) For the purpose of hands-on training in the art of seafaring, school ships are audited to provide a platform for the practical learning of the necessary skills, practices, and habits that go with this trade. A year after Blue Marlin's re-launch, it was audited as a schooling ship by the personnel of Aboamare's Maritime school. This added to the need to have a comprehensive and well-organized manual on board to help with the familiarization and hands-on guidance with the operating features of the vessel. Education in relation to a manual means: Bringing the reader to abstract the concepts of the manual that relate to the vessel as a whole. These abstracts being the vessel's history, particulars, safety and operation guidelines that are relevant in order to familiarize with the vessel and master seafaring with it. (Aboamare, Sopimus auditoidun koululaivan käytöstä, 2015)

In all, there are many points of view that are related to writing a manual, which has also has been the case in this thesis. In writing the manual I had to take into consideration all of these points of view in order to write a comprehensive manual.

1.2 Previous research

I searched for previous research on the yacht owner's manuals with the keywords of legislation, safety, operation, maintenance, and education from Google Scholar, but no studies showed up. I conclude that this topic has not been studied by academic researchers before. However, Jelmer Wijma (2019), Linda & Steve Dashew (1997), Andy du Port (2015) and Kemp Dixon (1878) have written works that share features of this manual and the viewpoints behind it and IEC (2012) and David McMurrey (2017) have written general rules for manual/user guide writing.

1.2.1 Structure and content of the manual

Wijma Marine consultants, Yacht Owner's manual

Jelmer Wijma through his business, Wijma Marine consultants, has created an owner's manual software that is an electronic yacht owner's manual template for the purpose of CE certification of a vessel. The software is designed to a form that may also be directly printed as soon as the vessel particulars have been written into the manual. In relation to Blue Marlin's yacht owner manual, this work gives an idea on topics to be covered as well as an idea for the structure of the manual. From the point of information organizing and presentation in the context of a manual, this work shows how the headings are organized and how charts, pictures, and text can support each other in creating a comprehensible yacht owner's manual.

Linda & Steve Dashew Offshore Cruising Encyclopedia, second edition

As the name suggests, this work is an encyclopedia for offshore cruising and in so covers a vast amount of information in relation to seafaring and the lifestyle of offshore cruising. This book serves as an educational tool that voices out things to consider when first joining or further deepening your relation to the offshore cruising lifestyle and the

art of seafaring. What the Blue Marlin's owner's manual gains from this work is the structuring of it. Also helping to understand what is relevant to write in this manual and where to direct for other sources of information.

Andy du Port's, THE YACHT OWNER'S MANUAL

This manual is meant for a person looking to buy a boat and to serve as an introductory for the art of sailing for people previously unfamiliar with it. Thus this work contains general information about its topics and not vessel specific which is the purpose of Blue Marlin's Yacht owner manual.

Kemp Dixon's, "A manual of yacht and boat sailing"

The connection of Blue Marlin's yacht owners manual and Kemp Dixon's "A manual of yacht and boat sailing" is understanding the abstract of vessel behavior according to its construction and design.

Kemp Dixon describes how a manual connects abstracts to practice in his introduction;
"The Art of Yacht and Boat Sailing cannot be acquired by the mere study of books which treat of the subject, but precise instruction will always be of value to those who have had no early experience of the sport, or who were not "to the manner born." Yacht sailing, like many other arts, is governed by certain scientific principles, easily determinable in theory, although hidden in practice...However, the object in view is not to instruct sailing masters in the scientific principles which govern their art but to give such instruction and knowledge of the practice of that art as may be of service to the purely uninitiated novice. This knowledge can be most readily imparted if a clear understanding is first arrived at of the principles and properties which scientific research has determined to govern the performances of sailing vessels. With this purpose in view, will be given, in as succinct form as may be compatible with clearness, a statement of those principles and

properties before the general subject of the management of a vessel when under sail is entered upon. The exact application of principles or the determination of properties referred to would be beyond the scope of this work, and can be acquired from some modern work on naval architecture, such as "Yacht Designing." (Kemp, 1878, p. 1)

In all, all of these works helped me to structure my manual and to delimitate topics relevant for my work, but these works are publications of general knowledge and not specifically aimed at the vessel which I write my manual about. My goal is to write a vessel-specific owner's manual where the abstracts support the safety, legislation, education, maintenance, and operations related to this vessel while guiding to other sources of more general information if the reader is in need to deepen their knowledge in one specific topic.

1.2.2 User Experience & User Interphace

UI (User Interface) and UX (User Experience) are two design disciplines that are intimately related to one another, but different in their design approach.

The international standard on ergonomics of human-system interaction, ISO 9241-210, defines UX, or user experience as "a person's perceptions and responses that result from the use or anticipated use of a product, system or service" (2010) According to the ISO definition, user experience includes all the users' emotions, beliefs, preferences, perceptions, physical and psychological responses, behaviors and accomplishments that occur before, during and after use. The ISO also list three factors that influence user experience: system, user and the context of use.

In UI, the ISO 9241-11 definition of usability is: "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use." (2018) According to the International Design foundation (2019), a usable interface has three main outcomes;

1. It should be easy for the user to become familiar with and competent in using the user interface during the first contact with the product.

2. It should be easy for users to achieve their objective by using the product
3. It should be easy to recall the user interface and how to use it on subsequent visits

1.2.3 IEC 82079-1:2012

International Electrotechnical Commission or IEC for short is the leading global organization that publishes consensus-based International Standards and manages conformity assessment systems for electric and electronic products, systems and services, collectively known as electrotechnology.

The relevance of this work in relation to mine is best described in its "Scope";

"This part of IEC 82079 provides general principles and detailed requirements for the design and formulation of all types of instructions for use that will be necessary or helpful for users of products of all kinds, ranging from a tin of paint to large or highly complex products, such as large industrial machinery, turnkey based plants or buildings.

This part is intended for all parties involved in the preparation of instructions for use, for example:

- Suppliers, technical writers, technical illustrators, software designers, translators or other people engaged in the work of conceiving and drafting such instructions for use;

This part of IEC 82079 does not specify a fixed amount of documentation that has to be delivered with a product. This is obviously not possible because this part is applicable to all kinds of products. The amount of documentation required, will depend on the nature of the product, its complexity and the skills of the intended users." (ISO, 2012)

1.2.4 Power tools for technical communication

Similar to the IEC 82079, David McMurrey's (2017) work covers general principles and detailed requirements for design and formulation of user guides. Topics including, styles

& formats and user guide components, but also giving general guidance on the production process of a user guide.

In all, in my writing work of Blue Marlin's Yacht Owner's Manual, I have incorporated to my best ability the principles of UX and UI. Thought has been put into content strategy, information architecture, interaction design, accessibility, and visual design both by me and professionals in the design UX and UI design. The IEC 82079-1 (2012) and David McMurrey's (2017) works helped to scope out topics of concern and guide in the process of incorporating them into my work.

1.3 Writing the manual

After the initial problem of information distribution was foreseen, the captain and the electrician started writing visual user guides to help them and the people involved with the sailing of the vessel, in the vessels maintenance and operation in a hands-on way. So, the initial visual user guides written by the captain and the electrician started out as a set of slides with pictures and text. The slides indicated installation locations, such as batteries, switches, vents, pumps, etc. and gave visual guidance in the basic operations of them.

When I received the user guides they seemed convoluted in their information flow and display of guidance. They were lacking structure and flow of thought. This did not make them easy for a reader to understand or use. I consider this a flaw because a user guide has to be easily understood and the information easily mediated to the reader. These are aspects of user-friendliness which I chose to aim at in my work. I speculated that these problems were due to the user guides having been written as notes by their writers, not so much aimed to informative for other readers. So from now on in this study user-friendliness is defined as; informative and clear communication of technical information.

I decided, for the sake of added manual topics and content as well as being a more comprehensible document, to transform this work from a user guide to a manual. To support this transition I reflected on the definition of both a manual and a user guide. As there is considerable overlap with both, and to determine those subtle differences "StackExchange" (2012) describes that;

> "Manual refers specifically to a reference document which provides detailed information about operation and maintenance of a product. Manufacturers will often provide an official manual for a product to provide assistance to its owners or users: cars, for example, usually come with an *owner's manual*, machinery with an *operator's manual*, and official documentation for Unix programs with *manual pages*." (StackExchange, 2012)

Whereas;

> "Guide is a more generic term. Whereas *manual* implies a written document, one that could be a booklet for a video game or a large book for a complex product such as a car, a guide can be just a card, or in another medium altogether such as a video. It may be a detailed reference, but it can also indicate a very simple overview or instructions for a small subset of features." (StackExchange, 2012)

For me a task like this sounded interesting and would definitely serve the purpose of getting properly acquainted with the vessel and its properties as my involvement with the vessel was continuously increasing at the time and I needed a topic for my thesis.

The nature of manual writing is that of a project, which by Copur Zeynep (2015) is defined as;

"A the process and the facility of planning, organizing, coordinating, and controlling the resources to accomplish specific goals. The process takes a transportation improvement from concept through construction. It has six phases; initiation, definition, design, development, implementation and follow-up phases"

By this definition and due to the nature of this kind of project work where, while writing the foundations of a manual are reconstructed, the content of it expanded and it's visual presentation continuously improved upon, the time, recourses and written product need to be managed. In order to select my approach in writing this manual, I chose to delimitate a single applied framework to guide my work from start to finish. For this, I chose the "Project spiral development" (Boehm, 2000) to guide my writing. Out of all the methods for project developments, I chose the spiral, because, at the initial stage of writing, the content/need of this manual was not clearly determined and that significant changes were expected to happen during the writing process. Also, this enabled me to have feedback with concrete work in my hands in a dynamic way all the time.

As the foundation for my project management was set, the following step was to manage the manual itself. For the manual to be balanced and clear in being comprehensive in its abstracts and also practical in its guidance, the manual is delimitated to it's chosen topics; the vessel class related legislation, vessel particulars, and safety. For the informativeness and structure of the manual itself, I utilized the educational elements and framework guidance of David McMUrrey's (2017) "Power tools for technical communication" and the general guidance of IEC's 82079-1(2012) as well as having back and forth conversation with Timo Riihimäki (Riikinkukko, 2019), a graphics- and user experience designer and media technical professional during the writing process of the manual.

1.4 Research questions

The restoration of Blue Marlin is complete, and the task is now to keep the vessel performing at its best for as long as applicable. In order to do so, proper management and execution of the vessel's and its crew's safety, inventory, maintenance and education on the updates in installations onboard must be implemented. For a person to sail, perform maintenance or educate themselves on the installations of the vessel without the need to consult multiple electronic or printed sources, or a person directly for that matter, they could consult a reference work providing summaries of knowledge on these topics, a manual so to speak.

It is due to me being involved in the process of constructing and optimizing those management tools to ease the vessels maintenance and information distribution tasks, that I set my research task to be to find out how the project spiral design method would work for designing and constructing a manual? This task I explore with the following two research questions:

1. How to delimitate contents for a manual in a spiral design process?

2. How to address the topic of user-friendliness in a spiral design process?

2 Research material, methods, and procedures

My research methods are qualitative (Denzin & Lincoln, 2000). My study is a case study as I focus on one case and I do not seek for generalizations. I gathered the data by one on one conversations, phone calls, text messages, e-mails, and documents, which I used to answer the research questions and to write the manual. My research subjects were the vessel's owner, the captain, the electrician, the boat building manager, a graphics- and user experience designer, technical documents and articles related to Blue Marlin. The data was gathered between September 2018 and May 2019

2.1 Spiral development

When I started writing the manual l needed a model that guides and organizes the steps of my work, a design model. I started from a source that I was familiar with due to the nature of my education, naval projects and designs.

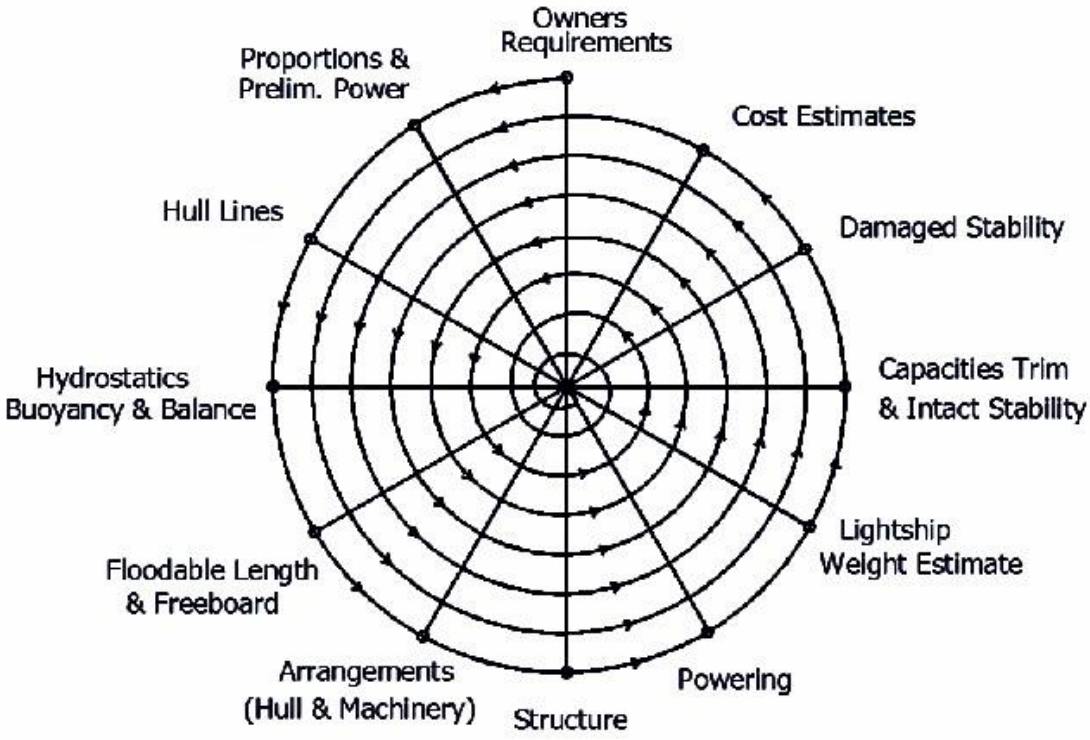


Figure 1. Ship design spiral (Naval-Architechture, 2014)

After looking at the ship design spiral, I concluded that this concept works only in its spiral projection, as the same topics revolve one after another as the project progresses. This led me to search for a project design spiral that would grow from its original source as it progresses.

In my search for such a project development spiral, I found, two candidates for the basis of my project work. Action research (1944) which is the work of Kurt Lewis and spiral development for software engineering by Barry Boehm (2000). Action research (1944) seeks transformative change through the simultaneous process of taking action and doing research, which are linked together by critical reflection. Kurt Lewin, stated in his 1946 paper "Action Research and Minority Problems" he described action research as "a comparative research on the conditions and effects of various forms of social action and research leading to social action" that uses "a spiral of steps, each of which is composed of a circle of planning, action and fact-finding about the result of the action". (Smith, 2001)

“Spiral development is a family of software development processes characterized by repeatedly iterating a set of elemental development processes and managing risk, so it is actively being reduced.” (Boehm, 2000). To explain iteration I quote the Interaction Design Foundation’s definition of it; “Iteration is a mathematical concept which means doing the same thing over and over again in order to refine the result.” (Smashing Magazine, 2016)

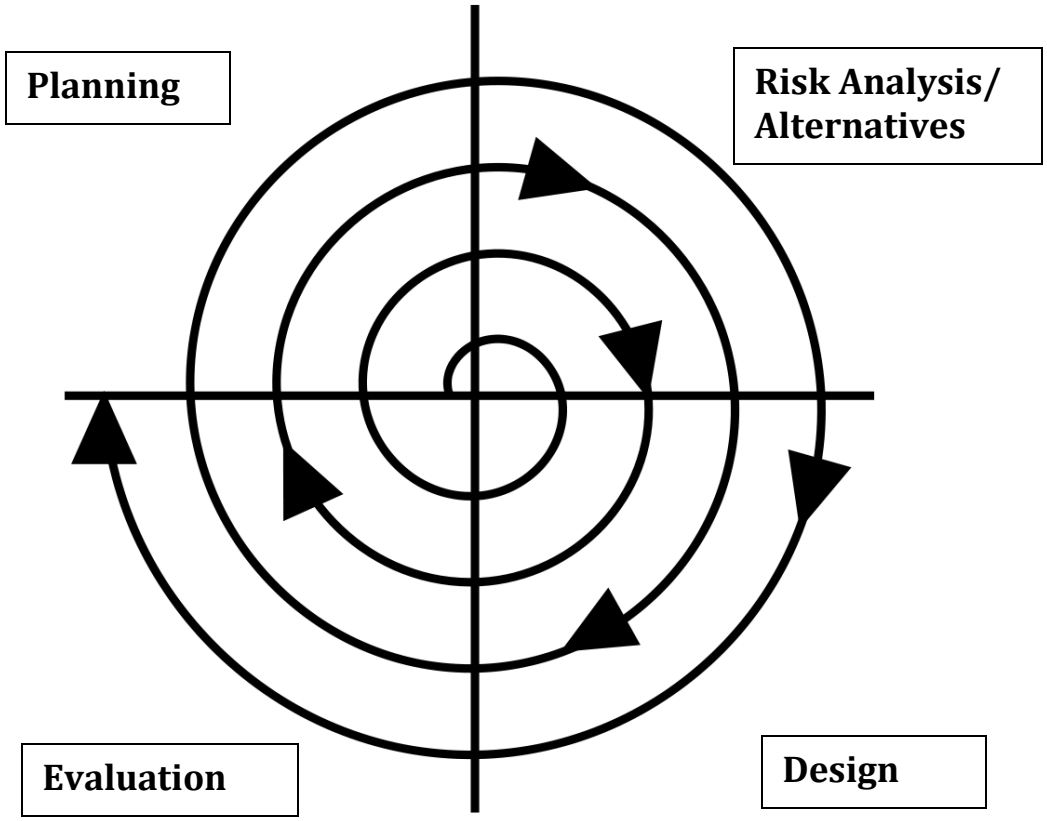


Figure 2. A simplified illustration of Boehm's spiral design (Hans Winter, 2019)

As seen in the illustration, the Spiral development model has four main phases.

I. Planning, in the planning phase objectives and requirements, are set and gathered

II. Risk Analysis, the risk and alternative solution will be identified and a prototype will be produced

III. Design, a product and the testing of that product will happen here

IV. Evaluating, the output of that project so far is evaluated and the next "generation" will be planned

The process cycles these four phases until it reaches the desired outcome or a product for release. The advantages of this design model are:

I. Risk reduction, the extensive risk analysis reduces the risk of the project to fail

II. Functionality may be added in later phases, because of the iterative nature of the process

III. An actual product is being put together early in the life cycle, thus in every iteration, there is a product to show, discuss and reflect upon. This also gives an early feedback loop between the developer and the end user.

The disadvantages of this design model are:

I. The complexity compared to other development models

II. The success of the project highly depends on the risk analysis

III. Risk analysis requires expertise in the subject

In the next section, I describe how these cycles appeared in my work and how I was able to benefit from the advantages.

2.2 Procedures

In this section, I explain how the work was designed according to the iterating a set of elemental development processes of the design spiral in order to achieve the desired product, the manual. It took three cycles to complete the writing process of the manual. I provide examples of data gathering methods associated with each cycle and phase to support the explanation of the writing process.

2.2.1 Cycle 1

Planning

The first objectives were to determine the manual's scope and the requirements it needs to serve.

Examples 1 and 2 are examples of one on one conversations in September 2018 regarding the scope and requirements set on the manual;

Example 1

> "From a Captains point of view, what are the topics that should be covered with this manual?" - Hans Winter
>
> "Topics that should be covered: All electrical systems, plumbing, heating, cooling, thru hulls for every place where there is a chance for water to enter the vessel, pumps, radio, navigation, sails, rig, maintenance." - BM Captain, Winter

To my question about the topics, the manual should cover, the captain was of the opinion that safety (thru hulls), maintenance (electrical systems, heating, cooling, pumps, radio, sails, rig and maintenance guides) and operation (navigation) should be included. I follow the definition of safety, maintenance, and operation described in Chapter 1.

Example 2

> "From a Captains point of view, what would be the most user-friendly and informative way to present this manual?" – Hans Winter
>
> " A powerpoint version would be useful for its ability to add bullets and pictures when needed."-BM Captain, Winter

To my question about the user-friendliness, the captain was of the opinion that the work should be continued to be written on its file form of the time for the benefits of easy editing.

Risk Analysis/Alternatives

The next phase was to determine the ways to properly implement the set scope and think of alternative methods of approach. The risk here was the possibility of leaving some fundamental information out from the manual due to lack of experience with the vessel and writing about abstracts necessary for a yacht owners manual. The plan to manage this risk was to keep in touch with the experts as much as applicable and periodically have them check the work for its validity.

In the topic of alternatives, there was discussion of writing the manual in another file form if it could prove more visually dynamic and better engaging the reader on the important points being written and illustrated, in other words, more user-friendly. Examples of more dynamic and lively text and image combinations were pop up sidebars, animations and action buttons linking information between the e-library and the manual.

Design

I continued writing the user guide in powerpoint and exploring other potential file forms while doing so. At this stage, I started taking references from other user guides and manuals related to yachting and seafaring in order to conclude on an order in which to write the contents of the manual. While reflecting on the structure of Andy du Port's The Yacht Owner's Manual (Port, 2015) I started taking more pictures of items and installations, such as pumps, batteries, hose and pipe connections in order to add relevant content to the user guide.

As the logic of the existing user guides structure was difficult to interpret at first glance and having no table of contents yet or indexing in the works, that was the first issue in regards to information management that I started working on.

Evaluation

I evaluated the work in one on one conversations with the captain. We focused on what worked and what needed improvement. At the end of this first cycle, I decided after confirming the idea with the captain to transform this user guide into a more comprehensive manual. What drove me to make this decision/suggestion was the fact that, knowledge about the legislation affecting the vessels class rating, as well as its certification as both a pleasure- and rental craft perspectives, was not conveyed to the reader, nor was the information easily found online as Trafi (Finnish Transport and Safety Agency) was undergoing changes in its organization from Trafi to Traficom (Finnish Transport and Communications Agency). Thus I made the decision to add the legislation and class certification-related information to the manual, as the legislation and class certification -related documents were already stored in the captain's archives of vessel-related information.

The more I went through the existing user guides, the more I realized that there was very little if any introduction or bridging of the topics already written about, and the abstracts that the user manuals contents fell under were also not clearly conveyed.

In all, the topics and abstracts of the user guides needed to be elaborated and expanded, other file forms needed to be explored in hopes of gaining more advantages in user-friendliness and a more effective feedback system needed to be created in order to get valid and quick responses to the progress in the manual writing.

2.2.2 Cycle 2

Planning

In order to elaborate and expand the topics and abstracts, I decided to look for more reference in manuals and user guides. Looking into Wijma Marine Consultants, Yacht Owner’s manual (2019), Linda & Steve Dashew Offshore Cruising Encyclopedia, second

edition (1997) and Kemp Dixon's work I found structures to reflect on and in so, to guide my work. As per the evaluation of the work written thus far, I concluded that topics and content needed to be added. To add to the clarity and user-friendliness of the manual, I decided that to test that would better angeled pictures with higher image quality add to the user-friendliness of the manual.

Legislation, the addition of this chapter would have both an informative and educational value. It would explain the legislation behind the certification and classification of the vessel and shed light on some of the construction and gear investment decisions done on the vessel. Such as stairway step heights in regards to safety as well as safety railing and its effect on the vessels classification and therefore the operating zone of it. Safety, this chapter should get inventory lists and continuity in its chapters, so that one topic leads to another with logic and consistency. From the perspective of maintenance, and user-friendliness it would be beneficial to manage to link the manuals of each individual item to the Blue Marlin yacht owner's manual. Last but not least, I started planning to change from powerpoint to Microsoft Word in order to write the base of the manual for an interactive PDF and add dynamic and interactive visual elements to the manual to further engage and activate the user of the manual.

Example 3 is from an e-mail exchange with the graphics- and user experience designer, Timo Riihimäki in November 2018:

Example 3

> "From a media technician's point of view, what is the most user-friendly and informative way to build this manual?" – Hans Winter
>
> "There are three (3) things to consider in a manual like this one.
>
> User friendliness; This will determine the visualization of the work and the elements that make the information more easily understandable already from the initial reading.
>
> Informativeness; Stringing the information is key. Thus, the information needed should be behind simple and easily adaptable search functions in order to minimize steps in between in search of a specific piece of information. Also, the consistency in the chapter construction adds to the educational aspect of this manual, when it is used for such a purpose.

> Malleability; This manual is part of an ongoing and ever-changing project. Parts and installations may change on the vessel in time, which brings the need to make possible additions and changes to the manual over time. This sets a demand that the manual should be accessible and adjustable on all computing platforms at any given time." – Timo Riihimäki

To my question about user-friendliness, Timo Riihimäki was of the opinion that user-friendliness is linked with the user experience, which in his line of work refers to a person's emotions and attitudes towards using a particular product, system or service. Visualization, meaning; colors, text and picture style, and the order of text and picture presentation. Informativeness meaning the ease of access and the linking of information. Malleability meaning the ability for the manual to be shaped or extended with ease.

The international standard on ergonomics of human-system interaction, ISO 9241-210, defines user experience as "a person's perceptions and responses that result from the use or anticipated use of a product, system or service". (ISO, 2010)

Risk Analysis/Alternatives

Looking further in the pros and cons of the interactive PDF, it seems that the pros are the interactive elements, such as; animations, visual clarity, and extra dimensions. The major cons are that updates would either have to be run through a person that had the know-how and the right program to edit the file or all the people would have to undergo training and purchase licenses in order to edit the future versions of the work. The risk of leaving some fundamental information out from the manual due to lack of experience with the vessel and writing about abstracts necessary for a yacht owners manual still remains.

Design

The pros of an interactive PDF were alluring and I made the decision to start writing the manual in Microsoft Word. The idea here was to write the manual with a program that had the ability to be worked upon on all computing platforms and all the necessary tools for organizing the manual into the desired order. After this, the word file would be converted to an interactive PDF and together with the graphics- and user experience designer finalized to a publishable final product.

At this stage the chapters were as follows; Introduction, Design category & certification, Vessel particulars, Safety, Vessel operations, and Vessel handling. This being the result of structure comparison between other the other manual read.

To add to the informativeness of the manual, I thought of starting the process of downloading all of the user manuals into an e-library for quick access that didn't require internet access. The e-library contained 3 folders, engines, electronics, and hardware. All of the manuals that were downloaded were categorized into these three folders with no further labeling.

In order to add to the user-friendliness, I wanted to make the manual more dynamic and add visual elements conveying information, other than text, so I started adding more pictures and drawings of the vessel into the manual.

Example 4 is a drawing added to the manual in order to get a comprehensive picture of the deck arrangement. Having a general layout combined with specific pictures makes the reader understand the concept and practice of the demonstrated item. In order to use such a drawing in the manual, permission is required from the owner of the drawing. In this case, the drawing is co-owned by the designer, David Pedrick, and the vessel's owner, Henrik Andersin, and permission from one of them gives me the right to use the drawing as a reference.

Example 4

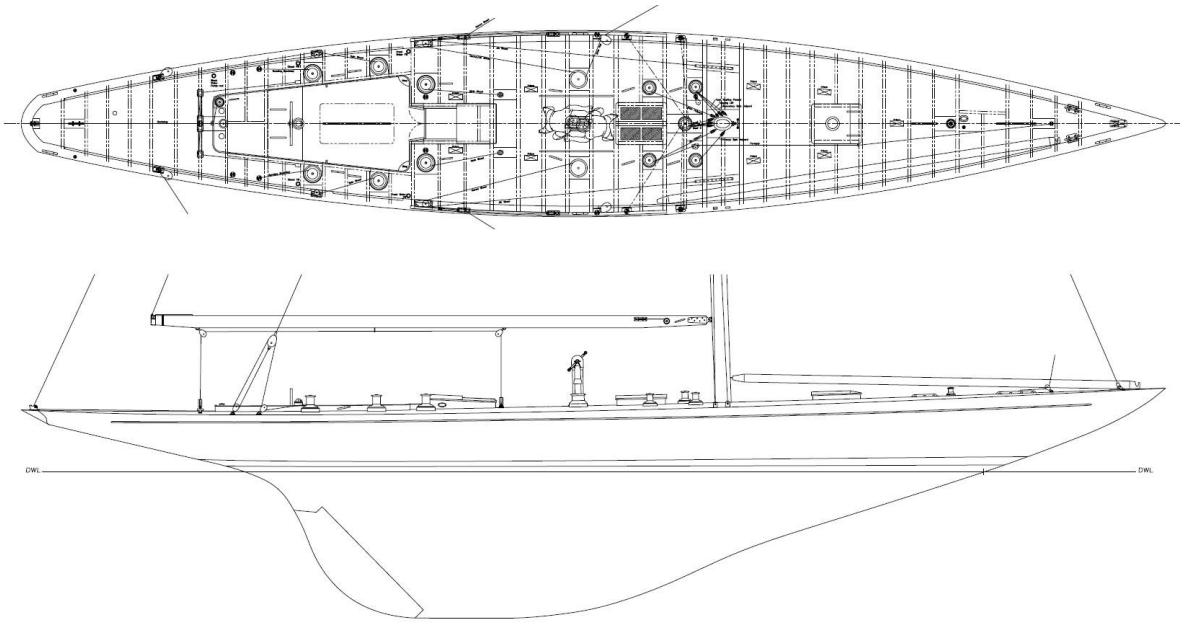


Figure 3. Deck Hardware Arrangement plan (Pedrick, 2015)

Example 5 is a picture used in conjunction with the drawing to explain the deck hardware in order to get a more comprehensive understanding of the vessel's deck hardware.

Example 5

➢ Harken 24V electric winch with deck imbedded push button. 2 Winches for the main sheet in front of the cockpit and 2 for the Genoa mid cockpit. ➢ The winches are 2-speed winches. ➢ There is currently only 1 operation speed set which is the "low" speed.	

Figure 4. Harken 24V electric winch instruction from BM manual (Hans Winter, 2018)

Evaluation

After a few times of forwarding a version of the manual still in progress, individually to the captain and graphics- and user experience designer for feedback and comments, I came to realize that this limits my ability to work parts of the manual at the same time while I'm waiting for a response from one of these individuals. To eliminate this stage of time delay, I eventually uploaded the manual to Google Drive and shared the latest version of the file with all of the research subjects (vessel's owner, the captain, the electrician, the boat building manager, a graphics- and user experience designer). People that didn't have a Google account were given a link to access the file.

While working with the material already at hand, I found it hard to interpret some of the pictures previously taken for the purpose of the user guide. The images were blurry and the perspective from which they were taken from was not always easy to interpret. I deducted that the quality and informativeness of the pictures needed to be improved.

While thinking about the structure of the manual and the bridging of the topics into one, whole, easily comprehended work, I decided that the current "Chapter 5. Vessel Operations" needed to be removed, as the way it was currently gathered and written didn't fit with the rest of the manual. Parts of the content of the chapter were left into the manual to later serve in the "Vessel particular sub-chapters" and the rest was either removed or formed into checklists and guidelines which were added as separate files to the manuals e-library.

The contents of the e-library continued to grow, and in the context of user-friendliness, an idea had now arisen that hyperlinks could be created between the manual, the e-library and possible web-based sources (providing that internet access with the used device was possible). This linking of information would definitely prove as an efficient way to bridge important knowledge together and would definitely improve user-friendliness if constructed well within the interactive PDF file form.

2.2.3 Cycle 3

Planning

In spite of the benefits of visual elements with the interactive PDF, the following cons bring me to the decision that I will continue writing the manual in Microsoft Word due to its benefits.

The cons of the interactive PDF are; that in order to create an interactive PDF, I will need to purchase the Adobe Indesign program, learn how to create these file types and having learned the skill, be the only one from the Blue Marlin team updating the document. The updating of the file could be outsourced to an entity with this program and the skills to write the document, but then all updates will be run through this third party with a cost. Also, interactive PDF relies heavily on the Flash Player (a multimedia software platform used, for example, animations), which is no longer bundled with Adobe Reader/Acrobat. Not to mention that most smartphones and tablets don't support Flash, and Adobe has announced Flash's end of life for 2020. Moreover, several interactive capabilities from InDesign—animation and multi-state objects—have never been supported by PDF, so you won't see them working when you export.

The pros of Microsoft Word as the file format choice are; having the ability to access and update the manual from any computing device, not needing internet access to read the document, have the file size still relatively small considering the content, having the basic tools for picture and text editing, have the majority of computing devices the programs that can run the file type and having the skill to use the program to write and edit the document. And that goes for all the people using the manual and possibly editing it as well.

Making the decision to structure the manual in the following chapter order:

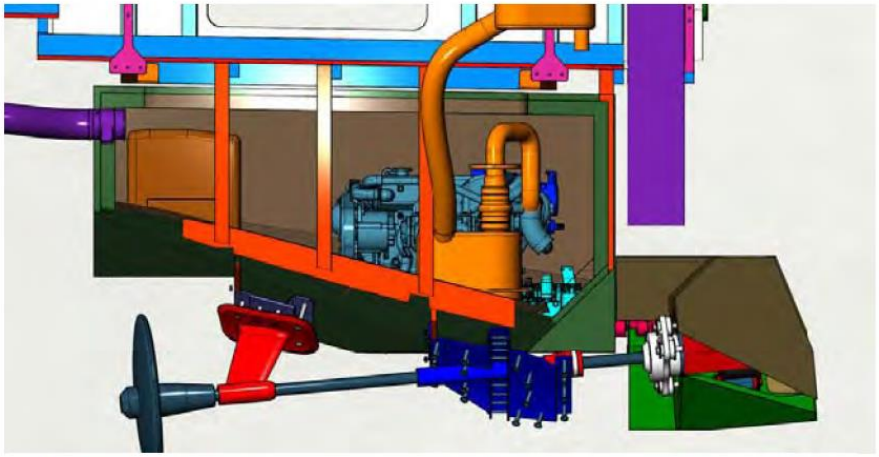
1. Introduction
2. Design category and Certification (Traficom certification and class rules)

3. Vessel Particulars (Rig, boom, spinnaker pole, sails, navigational equipment, engines, deck hardware, and tanks & pumps)
4. Safety (Fire Fighting equipment, Vessel Life-saving equipment, Bildge and bailing)
5. Updates from last revision
6. Updates to come

Additions to the contents of the manual are going to be the “Vessel steering mechanisms” and “Vessel Handling”. These chapters will add to the understanding of basic the factors affecting the vessels behavior and in doing so, adding to the educational value of the manual.

Example 6 is an example from the document “Restoring BLUE MARLIN, a 1937 Nicholson Twelve” (Pedrick & Savolainen, 2014) which I used for reference during the writing of the manual. This example is used in the manual to indicate the engine, drive belt, propeller shaft, and propeller locations as a part of the vessels steering mechanisms.

Example 6



75) Propulsion system arrangement with exposed shaft and relatively large exhaust system components. The water-lift silencer is inside the engine compartment. The water-drop separator is outboard of the cockpit. A bronze shaft log foundation spans several planks and frames. The bolt pattern was designed to original plank positions long before the hull was re-planked. (Pedrick Yacht Designs)

Figure 5. an example of a document type reference for the manual. (PYD)

Risk Analysis/Alternatives

I came to realize that trying to take into consideration on all the principles, details, and variables in order to create instructive technical writing like the manual, I needed something more than just the influence of other manuals. I needed a guide to aid my design and formulation of this manual. It was after I had conducted some research on the topic and not finding much on google scholar with the keywords; manual writing instructions, that I contacted a friend, that works in software development, in UI or User Interphase to be precise. He guided me in the direction of IEC documents and David McMurrey's (2000) work on instructions for manual writing.

Design

Example 7 is a phone call from me to the captain of Blue Marlin February 2019

Example 7

> "Hi, how are you doing?" - Hans Winter
>
> "I'm good and you?"- BM Captain
>
> "Good, good. I called because I have a question about the measurement certificate for Blue Marlin, more specifically about adding it to the manual or not." - Hans Winter
>
> "Ok. I think it should be apart of the manual." - BM Captain
>
> "Ok, that was the thing, I wasn't sure whether it was something that we can have on a document that is available for people that are not crew or directly involved with the vessel."- Hans Winter
>
> "Yes, they changed that this year so that all of the measurement certificates are publicly available from all the vessels that have this class rating. They should have the measurement certificates on display on the international 12mR website." - BM Captain
>
> "Oh, all right. So what's your take on that? Is that good or bad?" – Hans Winter
>
> "I think it's very good. It gives clarity on the topic for the sake of everyone involved in sailing and racing vessels of this class." – BM Captain

To my question about the change in regulating, the availability of private boat measurement results, and the relevance of having the information on display for people in general, the captain was of the opinion that it is for the benefit of the 12mR class in general, but it would also be good to have that information available for people working on the boat, as the measurement certificate holds all the basic measurements and information of the vessel.

Example 8 is an example of the numerous messages sent and received within the target group. after the document was shared with the research subject group. This message is from March 2019.

Example 8

> ”Thoughts and comments on the current version of the manual.” – Hans Winter
>
> “I have read the manual and its looking good. A few details were insufficient or changed… 3.7.1 Upgraded to Zeus3, change from ECDIS to MFD chartplotter, 3.8 Jet thruster batteries 2*3 optima yellowtop batteries 24 Volts.” – Vessel electrician.

To my request of thoughts and comments, the vessel electrician found the structure of the electroncis and navigation sections to be in order. Changes in technical instruments or systems specifications that I may have not been aware of, due to recent changes in these subjects onboard.

Due to examples like these, I changed some of the content and structure of my work, but the major additions were the following; Vessel Safety card, Vessel classification/rating measurements, steering gear related pictures, and sail plan and deck plan drawings

Evaluation

The writing of this thesis serves as analytic work to the progress of the writing of the manual. Reflecting on the work in a scientific mindset will improve the quality of the content and the user-friendliness of the manual in its future versions.

In all, the manual is now at its production stage where it is considered satisfactory for use. It is now released as version 1.0 for use of the research subjects as well as my self.

The vessel will undergo major upgrades and changes, of which some are now listed at the end of the manual. For the manual to serve its purpose, it will be updated and changed along with the updates and changes done to the vessel.

3 Results

The Spiral Design (Boehm, 2000) guided my work as planned and works of IEC (2012) and David McMurrey (2017) provided the general principles and detailed requirements for the design and formulation of the manual. The cycles and phases of the spiral design helped me to produce a document in the early stages of this process. I was able to further develop the pre-manual document into a manual through the writing process.

3.1 How to delimitate contents for the manual?

The feedback from the manual users during the spiral development process helped me to delimitate the contents of the manual.

Legislation

In the beginning, this subject was not covered in the user guides. It was during the evaluation phase of the first cycle that a chapter of legislation and class rules was brought up for discussion. During the second cycle a chapter that covered both the class rule and the actual CE certificate of the vessel was added. This was to explain the logic behind the vessels class design and the criteria for its CE certification for pleasure craft purposes. The Traficom rules, their criteria and the 12mR class certificate were added to the manual during the third cycle as a result of feedback and request from the main users. The idea was to elaborate the criteria for the vessels classification in both pleasure craft and rental craft, also to connect the reasoning behind the safety installations related to the classification rules, such as guard rails.

Vessel operation

Instructing and having a user understanding how to execute operations on board by following written and illustrated guidelines was the original task that the user guides written by the captain and electrician tried to tackle. Instructing on the operation of the vessel and its systems remained a fundamental theme throughout the writing process of the manual. It was during the second cycle's design phase that I discovered it better to display the object of operation in the manual and to link that object to its own user/installation manual for more detailed instructions. This idea was supported by the captain with the statement that; "It's much more efficient to have the object on display in the manual and the very informative user manual behind a link, so that the knowledge of interest is easily found and not lost in an overwhelming amount of information that the manual contains. This also makes the manual a lighter read, and less of a chore than it is a pleasure to scroll through."

Maintenance

In the beginning of the writing process I thought of writing a separate maintenance chapter for all of the vessels components, as well as explaining the periodical and seasonal maintenance tasks for the vessels structure. It was during the transition from a user guide to a comprehencive manual in the second cycle that I decided to drop the maintenance chapter out. The reasoning behind this was the fact that the seasonal and periodical maintenance was only done by the professional carpenters and boat builders of the Red Sky company and they had their own schedules and work lists planned, making this chapter practically useless to the manual. Also, instead of writing the maintenance instruction for all the vessel's components into the manual, I found that most of the user manuals of the components had maintenance instructions in them, so it would be best to simply link the information to the manual and not do the extra work of writing the same instructions twice. Thus, all of the maintenance related information is behind links and found in the product user manual in the final version of the manual.

Safety

Safety, and how it relates to all the vessels topics has been a fundamental topic in the manual since the beginning. In the user guides written by the captain and electrician most of the guides and instructions were related to safe and correct operation of devices or understanding how a construction may affect the vessel's and crew's safety. A good example that has remained almost unchanged throughout the writing process is the display of through hulls in the manual. It is common that wooden boats built with this style of framing and planking suffer from breaches of hull integrity simply due to the natural behaviour of wood as a construction material while being under the external influences such as weather and climate. Thus the emphasis in understanding the most likely places for hull breaches and how to fix them has remained a constant point of interest and education in the manual. The chapters where firefighting and life saving equipment were listed and displayed were added in the second cycle of the writing process. The Blue Marlin's safety card was added in the third cycle. All of these additions were the result of consultation and approving discussion with the vessel captain.

Education

Education is the core of the manual. Already in the beginning, the answer to the foreseen problem with information distribution was the writing of educational and informative works. Education shows in; the structuring of the manual, guiding the reader from one topic to an other while describing the content and its purpose along the way , and in the validity of the information displayed which was obtained the combined efforts of all the professionals contributing their knowledge to the work.

To support the conveying of information, and thus the learning experience, the UX and UI disciplines with their topics are implemented in the work. such as information architecture, optimisation of the user interphase, visual design, functionality in the manual design etc.

In all, feedback and reflecting on other works were key elements to determine the delimitation of the manual's contents. What greatly increased the value of feedback in

the delimitation process was the uploading of the work to Google Drive and making it open for discussion and feedback by many sources. The result was a tighter feedback loop which gave me the ability to react to any feedback while still working on other parts of the manual simultaneously.

3.2 How to address the topic of user-friendliness in a spiral design process?

User-friendliness and the need for it derived from my first glances at the user guides written by the captain and electrician. The works were partly lacking bridning from one topic to an other, lacked guiding structure and in parts the visual appeal to actually read through the guides.

Through the short comings of the user guides, my definition for user-friendliness was created. For a manual to be user friendly;

1. It should be easy for the user to become familiar with and competent in using the user interface during the first contact with the manual.
2. It should be easy for users to achieve their objective by using the manual
3. It should be easy to recall the user interface and how to use it on subsequent visits

Through the writing process, my idea of user-friendliness was supported and further guided by Timo Riihimäki, a user experience designer. He for example brought up the importance proper designing work in elements of visual presentation to further enhance user-friendliness of the manual. Visual presentation being for example; font design, colors, illustration placement, and construction of the informatio linking methods. The idea to focus on user friendliness was supported by the unanimous agreement of the user group members with the simple statement, “This looks good, continue doing this.”

4 Conclusions

Succesfull seafaring demands instructions. The quality and understandability of instructions enables operations to be executed to those principles and objectives of the instructions. A manual that contains these procedures is in an important position in regards to safety and proper executions of operations carried out at sea. The writing of a manual is not only a laborious task, but a creative process aswell. In this case study, I conclude that a creative process may be guided by spiral design into a multi-dimensional product, such as a manual.

For me personally, the writing of the manual gave me the insight for project designing, and the writing of technical information in an instructive way,

The writing of this thesis has given me the opportunity to independently demonstrate my ability to formulate a topic related to my education, select relevant literature, process data, conduct analyses, apply methodologies, make critical assessments and present answers to questions raised by my problem statement.

For Blue Marlin, it means two things. Firstly, the people involved in the vessels operations and maintenance now have a tool to reflect upon. That tool covers legislation, vessel operations, maintenance, safety, and education. Secondly, it indicates that there are people willing to create not only for the sake of individual benefit but for a unified cause, which is the vessel, Blue Marlin.

People aiming to create projects by a design and informative writing in general, in the context of Maritime Management may benefit from the tools that I have used to create this project and this manual my self. In all, I hope this thesis and the manual to serve as guides and sources of information to be reflected on in the process of creation.

Follow up questions

What is the most effective project design approach to manual writing?

Can the design spiral be implemented in project design related to Maritime Management?

Should project design and management be educated in the studies of Maritime Management?

Are user experience and user interphase disciplines effectively exersized in the Maritime Management field of study?

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Appendix, Blue Marlin Owner's manual for 12mR Yacht

BLUE MARLIN

OWNER'S MANUAL FOR 12mR YACHT

DESIGN BY CAMPER AND NICOLSON EST. 1937, REBUILT 2015

Contents

Revision number: 1.0

Date of effect: 28.5.2019

DISCLAIMER AND ACKNOWLEDGEMENTS

This manual is a continuously improving product, the main users retain the right to make changes to the manual at any time, which may not be reflected in this version. Please contact any of the main users if in need of further assistance.

This product is for reference only, thus leaving the sole responsibility of safe working practice of any given action at any given time up to the reader/user.

THE AUTHOR AND ALL MAIN USERS DISCLAIM ALL LIABILITY FOR ANY USE OF THIS PRODUCT IN A WAY THAT MAY CAUSE ACCIDENTS, DAMAGE OR THAT MAY VIOLATE THE LAW.

Each version of this manual will have a unique revision number. Staring at 1.0, 1.1, 1.2…. and continuing as 1.9, 2.0, 2.1… The revision number will be at the beginning of this page and the content added/ changed for that revision will be written on the last page of this manual. Also, if know in advance, the updates to come will be written at the end of this document.

Drawings used in the manual are by the kind permission of the vessel's owner, Henrik Andersin. Photography by author, unless otherwise mentioned.

Descriptive item pictures are owned by the producing companies and are used for reference only in this document.

Cover photograph by Leo Skogström.

Consultancy in legal matters, such as vessel certification was given by Anton Salokoski, Salokoski Naval Architecture Consulting.

Electrical drawings are by the courtesy of both the Boat Yard Manager, Boat Builder and Boat Designer Allan Savolainen and the vessels designated electrician, Robert Nyberg

1. Introduction

Blue Marlin, a yacht designed by Charles E. Nicholson, constructed and launched by the Camper and Nicholson Company in Gosport, UK in 1937. Blue Marlin is one of the nineteen, 12mR yachts that the company produced throughout the years. The vessel was originally ordered by Lady Marion B. Carstairs, a citizen of Bermuda, but sold on during its building process to C.E.A. Hartridge. He had been fascinated by the 12mR's after his first chartering of *Iyruna* in 1935. As the boat was launched in 1937 it was in the use of the Hartridge family for a year prior to being sold to the world-famous aviation industrialist T.O.M Sopwith who raced the boat. The boat passed down through several British owners before it was sold to Italian owners in 1951. In November 2006, Henrik Andersin became the new owner of the vessel and moved the yacht to Kotka, Finland for renovation. The ship was re-launched in July 2014.

The objective of this manual is to serve as a reference guide and a tool for the project's key personnel, future students & sailors and part suppliers for the vessel.

2. Design category & Certification

2.1 Traficom pleasure craft certification

Blue Marlin is CE certified with an ID number: **BE O6O9A491G414**

CE certification indicates that the manufacturer(s) claim compliance with relevant EU legislation in health, safety, and environmental protection standards applicable to the vessel. The vessels CE certificate is found later in this chapter.

Blue Marlin has been CE certified to design category A, which requires the high guard-lines to be installed. The craft can be used in category C conditions without the high guard-rails but for daytime navigation only (i.e. not during the night).

The stairway step minimum height in category A is 30cm and 15cm in category C. Half of this height is to be a fixed structure and the rest of the height may be of a mobile structure. The mobile structure must be secured to the vessel, however (I.E hinges or rails).

Definitions of design categories A and C are given below.

A recreational craft given design category A is considered to be designed for winds that may exceed wind force 8 (Beaufort scale, 17.2 to 20.7 m/s) and significant wave height of 4 m and above but excluding abnormal conditions, such as storm, violent storm, hurricane, tornado and extreme sea conditions or rogue waves. Such conditions may be encountered on extended voyages, for example across oceans, or inshore when unsheltered from the wind and waves for several hundred nautical miles.

A watercraft given design category C is considered to be designed for a wind force up to 6 (Beaufort scale, 10.8 to 13.8 m/s) and significant wave height up to 2 m. Such conditions may be encountered in exposed inland waters, in estuaries, and in coastal waters in moderate weather conditions.

The significant wave height is the mean height of the highest one-third of the waves, which approximately corresponds to the wave height estimated by an experienced observer. Some waves will be double this height.

2.1.1 Traficom Rental craft certification

Blue Marlin TRAFI ID **382360**

Besides being a pleasure craft, Blue Marlin is also a rental craft and thus fall under the rental craft legislation that further specifies general safety and its implementation on board the vessel.

Blue Marlin is a **Rental craft class III**

The vessel is certified to carry 16 people, out of which 12 at maximum may be passengers (in accordance per the vessels class rating). This has also been taken into account in regards to the lifesaving appliances on board (life rafts and complimentary life vests are fitted in the vessel for all crew and passengers.

Definition of rental craft classification below.

1) class I: domestic traffic area I;
2) class II: domestic traffic area II;
3) class III: domestic traffic area III;
4) class IV: traffic outside domestic traffic areas. Class IV is divided into the following traffic areas: Baltic traffic, local traffic, European traffic and long-haul traffic.

In order to certify a CE-classified pleasure craft as a rental craft, one must comply with the pleasure craft directive annex IA-section 1 classification categories as follows:

1) design class A can be inspected for classes I, II, III and IV;
2) design class B can be inspected for classes I, II, III and IV for the Baltic traffic area and local traffic area;
3) design class C can be inspected for classes I, II and III;
4) design class D can be inspected for a class I.

To access the traffic area border information and the legislation for area definitions, follow this link:
Material to support the yacht owner's manual\Legislation\KotimaanliikenteenMaarays.pdf

INTERNATIONAL MARINE CERTIFICATION INSTITUTE
International Non-Profit Association

Rue Abbé Cuypers 3 / B-1040 Bruxelles / Belgique / Fon +32 2 741 6836 / Fax +32 2 741 2418
www.imci.org / info@imci.org

POST CONSTRUCTION ASSESSMENT

Report of Conformity

BLUE MARLIN

This is to confirm that the product specified below has been assessed with respect to the conformity procedure described in Art. 8 cl. 1 of Council Directive 94/25/EC on Recreational Craft as amended by Directive 2003/44/EC and found to ensure equivalent conformity with all applicable requirements of the Directive.

Responsible Person/Organisation	**Red Sky Oy**
Original boat model	**12 METRE CLASS**
Boat type	**Sail**
Original manufacturer	**Camper & Nicholsons, Ltd.**
Length of hull [m]	**21,44**
Beam of hull (Craft) [m]	**3,61**
Light Craft Condition Mass [kg]	**30000**
Engine type	**Yanmar 4JH4-HTE**
Maximum rated engine power [kW]	**82**
Boat design category	**A**
Number of persons recommended	**17**
Maximum recommended load [kg]	**1925**
Original Craft Identification Number	**none**
Craft Identification Number (CIN)	**BE-O6O9A491G414**
Report of Conformity	**BPCFIREDS001**

The responsible person/organisation who places the product on the market and/or puts it into service shall draw up a Declaration of Conformity according to Annex XV of the Directive and affix or cause to be affixed to the product a Builders Plate according to Annex I clause 2.2. of the Directive.
The Builders Plate shall include the words "Post Construction Certificate" and the CE-mark shall be accompanied by the distinguishing number of this Notified Body.

INTERNATIONAL MARINE CERTIFICATION INSTITUTE IMCI BRUSSELS

Dr. Ing. Ulrich Heinemann (Managing Director)
for EU - Notified Body : 0609
2016-12-28

References to relevant standards given within the PCA Report, which is legal part of this assessment

BELAC
NBN ISO/CEI 17065 accredited organisation - Certificate No 228-PROD

2.2 Classification rule for 12mR's and Blue Marlin

The 12 Metre class is a rating class for racing sailboats that are designed to the International rule. It enables fair competition between boats that rate in the class whilst retaining the freedom to experiment with the details of their designs. The latest rule for the class is the 1956 rule combined with the Third rating rule used since 1933.

The current rule revision is the one of (November 1, 2018)

The vessel's rating is achieved by the following formula:

$$\text{Rating} = \frac{L + 2d - F + \sqrt{S}}{2.37}$$

L = length (metres) d = girth difference (metres)
F = freeboard (metres) S = sail area (square metres)

*Blue Marlin holds a current rating of **11.997**, All ratings at 12.000 or less are considered valid.*

The annual revisions are published on the official 12mR site:

http://www.12mrclass.com/about-us/class-rules/

And the latest revision is found here:
Material to support the yacht owner's manual\12mR rules\12M-Class-Rule-2018-WS-ApprovedforPublication.pdf

12

INTERNATIONAL TWELVE METRE CLASS

Yacht's Name	*BLUE MARLIN*
National letters and Sail Number	*FIN-1* **Club** NJK Helsinki
Designer	*Charles Nicholson*
Builder	*Camper & Nicholsons* **Building Year** *1937*
Owner	*Henrik Andersin*
Owner's Address	*Bredavagen 36, 02700, Grankulla, Finland*
Lloyds R class certificate (Number or Date)	Lloyds

APPENDIX E RATING CERTIFICATE

This yacht has been measured by measurer(s) appointed by the International Twelve Metre Association and has been found to rate not more than 12.000 metres.

This certificate is dated	13-May-15
Measurer	N.Sironi
Valid until	13 May-17
Supersedes	

Signature

ITMA Technical Director

Signature

I T M A 12 World INTERNATIONAL TWELVE METRE ASSOCIATION

Stamp of Authority of the International Twelve Metre Association

Yacht's name : BLUE MARLIN	FIN-1	13-May-15

RATING CALCULATION

OVERALL LENGTH					**21.546**
Overhang Forward to L1				2.503	
Overhang Aft to L1				3.262	
Total Overhang (Subtract)				5.765	
MEASURED LENGTH (L1 L1)					**15.781**
Girth at Bow				1.607	
Twice vertical Height at Bow (Subtract)				1.200	
O at Bow				0.407	
Add 1 1/2 O at Bow (min 0.540 m)				**0.611**	
Girth at Stern				3.059	
Twice vertical Height at Stern (Subtract)				1.634	
O at Stern				1.425	
Add 1/3 O at Stern (min 0.400 m)				**0.475**	
Add any penalty (Beam)				**0.000**	
Sum of Length and Girth Corrections					**16.867**
Age Date and Allowance	1937	Allowance	0.9589		
CORRECT LENGTH L					**16.173**
Skin d to d1 Port					
Chain d to d1 Port					
d Port				0.005	
Skin d to d1 Starboard					
Chain d to d1 Starboard					
d Starboard				0.005	
Add d				0.010	
Add GIRTH 2 d					**0.020**
Mean Freeboard Bow O		Actual	1.308	1.308	
Mean Freeboard Midship d		Actual	1.034	1.034	
Mean Freeboard Stern O		Actual	0.997	0.997	
Sum of Freeboards				3.339	
Subtract FREEBOARD, F				See Notes	**1.113**
Add SAIL AREAS (Square root)					**13.353**
TOTAL OF MEASUREMENTS					**28.433**
PENALTY (Draught)				0.000	
RATING					**11.997**

Date and place of Measurement	**13-May-15**	KOTKA		
Measurer's Name(s)	**N.Sironi**		Signature	Nicola Sironi

Yacht's name : BLUE MARLIN	*FIN-1*	*13-May-15*

PENALTIES

Overhang Forward to L	3.013	
Overhang Aft to L	3.968	
Subtract from overall length	6.981	
Difference of imersion from salt to fresh water		
WATERLINE LENGTH		**14.565**
Minimum Displacement for Zero Penalty [m3]	28.737	
Minimum Weight for Zero Penalty [ton] (Water of sg 1.025)	29.455	
WEIGHT [ton] Additional weight	30430	Append E Cert
Equivalent LWL (for Displ. < min.)		
Difference		
DISPLACEMENT PENALTY (add to L)		Append E Cert
DRAUGHT (actual)	2.822	
Max. Draught for Zero Penalty	2.830	
Difference (if positive)		
DRAUGHT PENALTY (add to Rating)		**0.000**
BEAM (Min)	3.600	
Max Beam at 1/3 of Midship Freeboard	3.620	
Difference (if positive)	-0.020	
BEAM PENALTY (add to L)		**0.000**
Tumblehome Max. (2 x 2% of Extr. Beam)	0.145	
Extreme Beam	3.620	
Beam at deck	3.498	
Difference (if positive)	0.122	
TUMBLEHOME PENALTY (add to Rating)		**0.000**

Date and place of Measurement	**13 May-15**	KOTKA	
Measurer's Name(s)	**N.Sironi**	Signature	Nicola Sironi

Yacht's name : BLUE MARLIN	FIN-1	13-May-15

SAIL PLAN

Max Height of Sail Plan =	25.000	J=	7.290	I =	18.750
Boom Height =	1.520	A=	23.480	B=	10.350
Rated Mainsail Area	121.509	Spi boom=	7.700	√S=	13.353
Rated Foretriangle Area	61.359	Propeller allowance			0.975
TOTAL RATED SAIL AREA	182.868	Corrected sail area			178.297

SAIL LIMITS

Mainsail max girth:	1/2 height (68%)	7.038	3/4 height (41%)	4.244
Genoa:	max. foot length (J + 4.8m)	12.090		
Spinnaker:	1/2 foot max breadth (125% J)	9.625	max. luff length=	18.716

Spar Measurement

MAST (material)	Wood	Mast Weight	630	CG pos.	9.510
	Deck	Half-Height	Jib-Halyard	Head	
Mast dimensions [mm]	340x255	340x255	276x217	177x162	
Sections area [cm^2]	709	709	482	235	

Engine/Propeller Installation

Engine and propeller weight	450 kg	Propeller diameter =	24in
Minimum boat speed with engine	8.5kts	Propeller position =	15.150
Engine model and power	Yanmar 4JH4-HTE 105 HP		

Flotation

	Internal Ballast	weight	dist.from stem	
1	in chain locker fwd	400kg	3.5	
2	around bow thruster	123kg	4.9	
3	around water heater	101kg	6.3	
4	under fwd sole	95kg	6.1	Total lead int.ballast 700kg
5	bow thruster with batteries	230kg	5	
6	Li-Ion services and engine batteries	170kg	14.4	
7	anchor chain+rope in fwd locker	30m+100m	3.5	

Measurer's Notes

1	Measured according to 1934 Rule
2	Internal ballast+chain+batteries+tanks+engine+heaters+head etc on board as detailed above
3	Certificate assumes engine and prop are fitted whilst racing
4	Certificate based on repeated floats in Kotka in fresh water, adjusted to standard SG=1.025

Date and place of Measurement	13-May-15	
Measurer's Name(s)	N.Sironi	Signature Nicola Si

3. Vessel Particulars

This chapter gives an overall look of the fundamental elements unique to this vessel.

3.1 Vessel building/restoration company

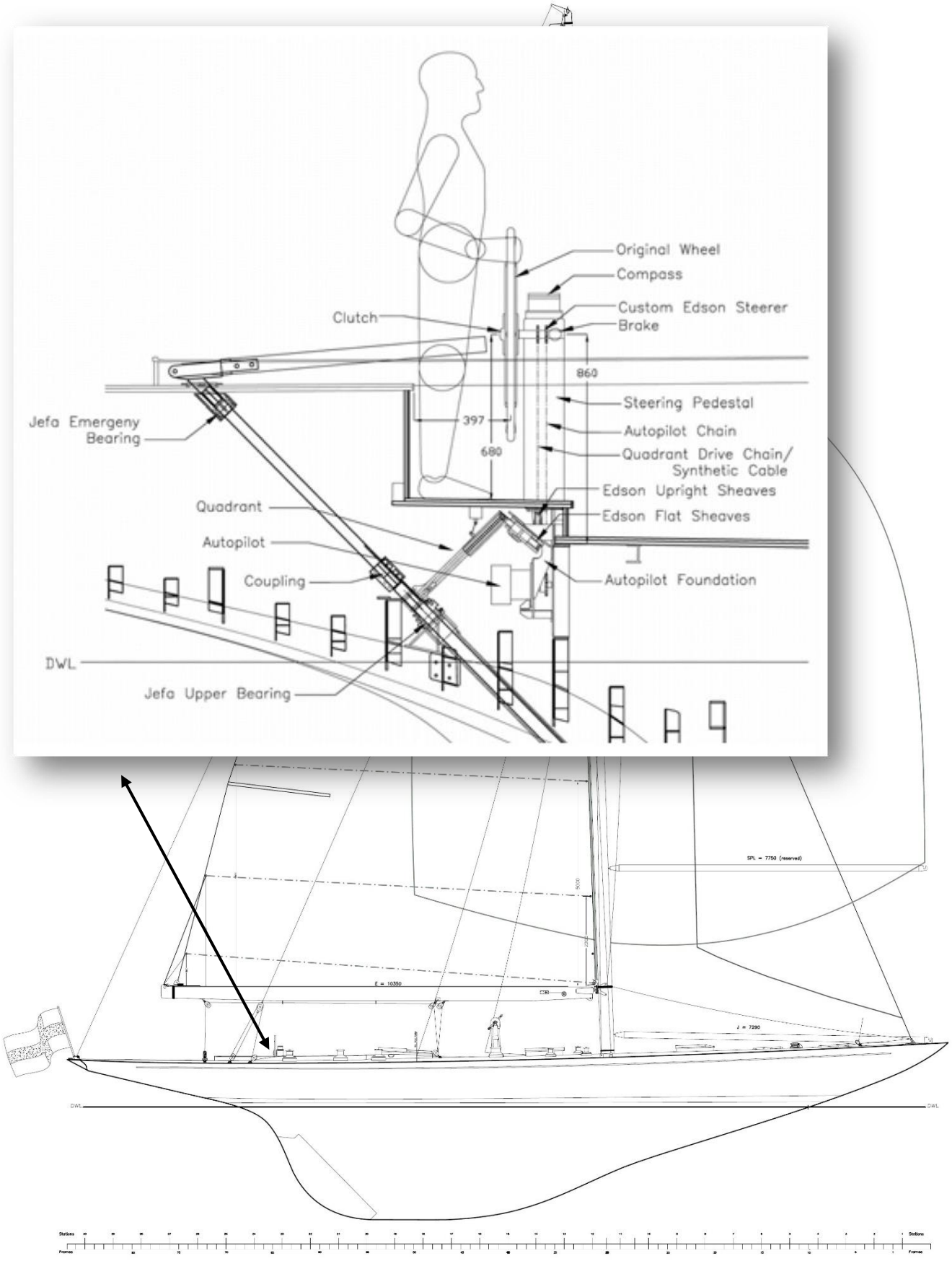
Red Sky/ Kotkan puuvenekeskus

Address: Tornatorintie 15, 48100 Kotka, Finland

Ship Name:	Blue Marlin
Vessel call sign:	OH 4154
Flag:	Finland
Ship Yard/Home Port:	Red Sky, Puuvenekeskus, Kotka
Year of original built:	1936
Year of Renovation completed:	2015
LOA:	21,5m
Breath:	3,48m
Draft:	2,74m
Height (Air Draft):	28m *(for bridge clearance)*
Displacement Light:	28 100kg
Displacement Sailing:	30 200kg
Ballast Keel:	14 360kg
Inside Ballast:	520kg
Tonnage:	30,5GT
Sail Number:	FIN 1*
Hull Number:	K17
Hull construction:	Honduras Mahogany hull with bronze strengthened framing and a lead keel

*Blue Marlin is the first of its class to be registered in Finland. Thus, it has been given the sail number ***FIN 1***. Suomen Purjehdus ja Veneily Ry (SPV), the Finnish branch of the World Sailing association is responsible for issuing the registration number.

3.2 Vessel steering mechanisms (PYD)



3.2.1 Vessel steering mechanisms, continued

The steering overview on the previous page shows the arrangement of components necessary for the steering of the vessel. The binnacle that houses the compass on top and the drive chains inside is made of stainless steel. The frame is directly bolted into the bronze structure under the sole that carries steering the cables and the autopilot.

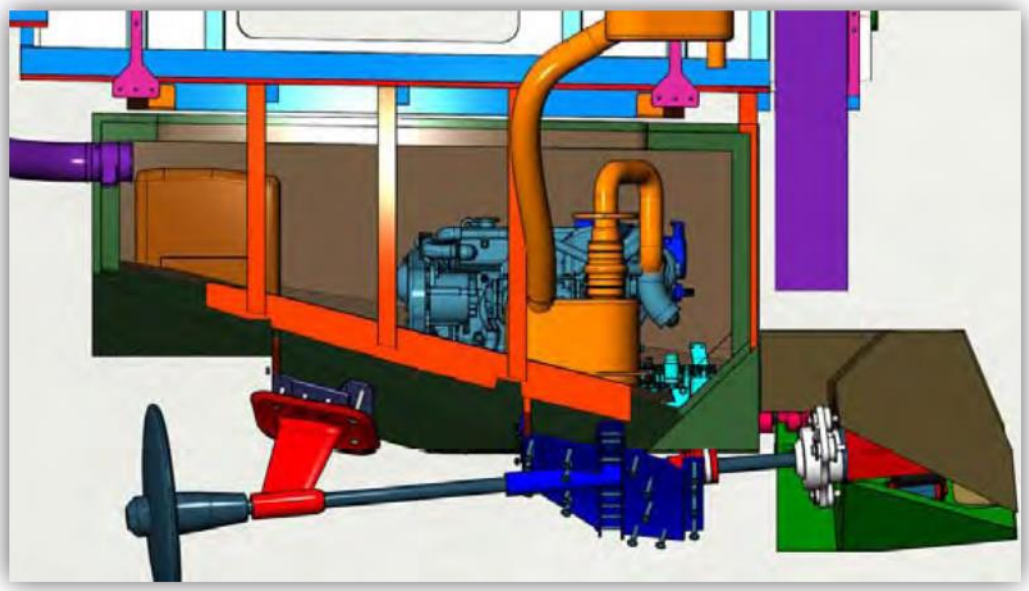
The Binnacle (PYD)

Quadrant, autopilot and steering sheaves (PYD)

All the steering input components are attached to a bronze beam as shown.

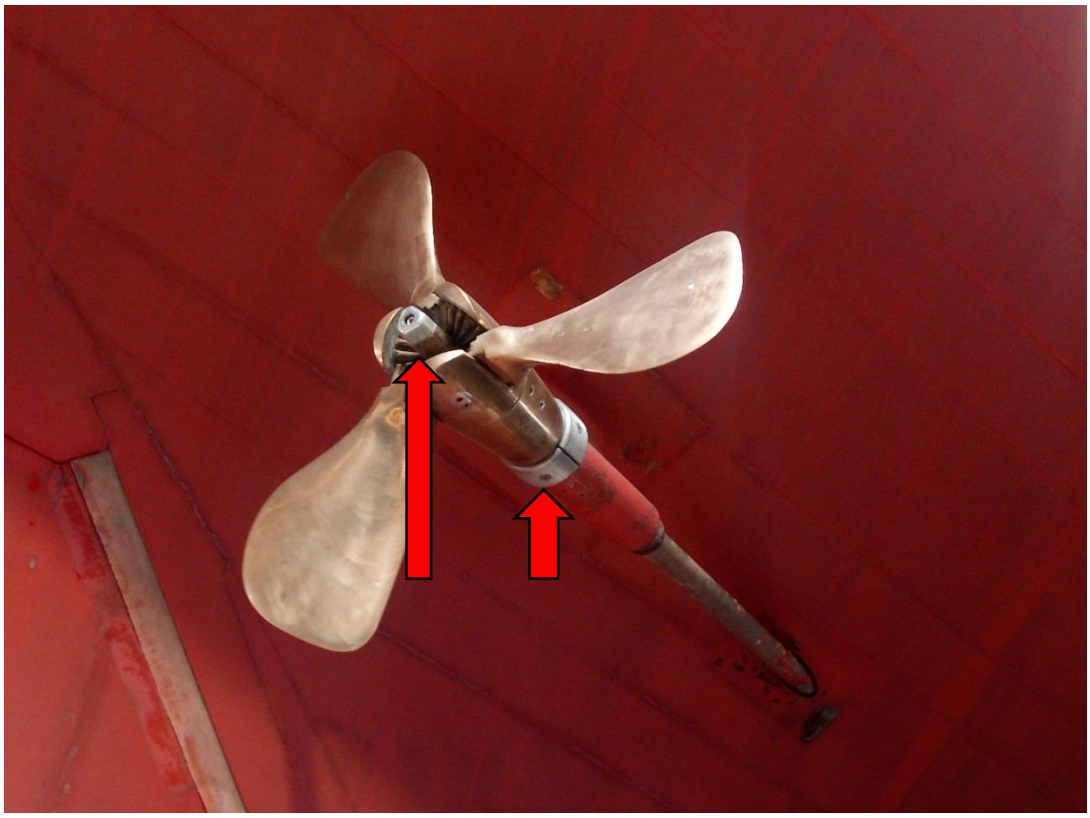
The steering head/wheel includes a clutch and a wheel brake mechanism that allows the wheel to be safely disengaged and locked whenever the autopilot is engaged.

When the autopilot is activated the *Jefa* rotary autopilot activates the drive train and cables to the quadrant by clutched components in the steering head.



Propulsion system arrangement with the exposed shaft. (PYD)

The propeller shaft is supported by a single-arm bracket. Between the shaft and the bracket is a rubber that is connected 3x 2mm Allen screws.

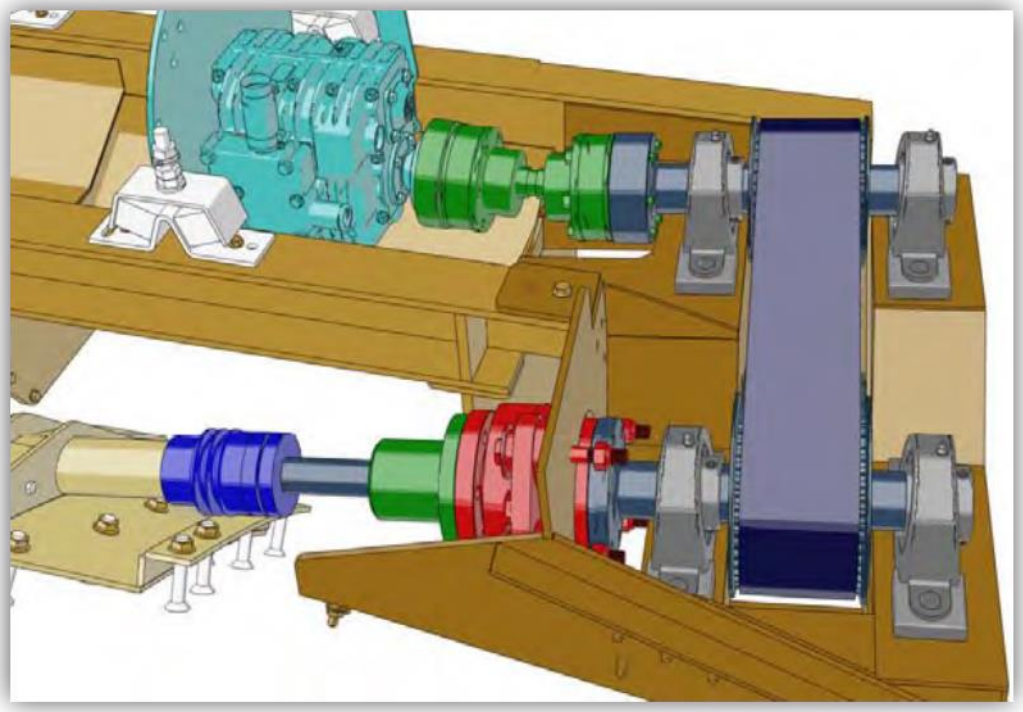


Propeller shaft and end piece zinc's

3-blade Gori folding propeller with “overdrive” function.

The Yanmar main engine on Blue Marlin was chosen for its advantage in carrying a relatively large propeller. The 3 bladed Gori propeller has a 600mm (24”) diameter and delivers increased thrust at both low RPMs and adverse weather conditions. The propeller also has an overdrive function. To learn more about that, follow this Youtube link:

https://www.youtube.com/watch?v=JaoffXjM_nQ



Gearbox and drivetrain setup (PYD)

The custom drive train provides lateral offset and a change in the shaft angle. After the engine, there is an Aquadrive (CV) constant velocity joint, an offset drive with Gates belt and Klee cogs, an Aquadrive vibration-dampened thrust bearing, and a Packless Sealing Systems bellows shaft seal.

3.3 Vessel handling

The ability to steer is the single most important factor in handling the vessel.

The components affecting the handling and maneuvering characteristics of the vessel are:

1. Hull Shape

The traditional full keel, with a deep “wineglass” hull, allows for straight line tracking and gentle motion. An element not related to vessel handling but is a consequence of the hull construction is deep and ample interior volume for the vessel.

2. Wind area

The wind area of the vessel is the hull that is directly influenced by the wind. All parts of the vessel that are in direct contact with the wind act as a sail and will affect the vessels movement accordingly.

3. Rig and Sail set up

Blue Marlins sloop design, with its paucity of spars and control lines, imparts less aerodynamic drag compared to other keelboat rig designs. Compared to other rigs, a sloop tends to perform very well when sailing close hauled (sails tightly trimmed) to windward and generally offer a sound overall compromise of abilities on all points of sail. The difficulty of the vessel’s sloop design is reefing the sails with increasing wind.

4. Installed engines

The main engine is connected to the propeller shaft and gives the ability for forward and aft motion for the vessel. The bow thruster gives the ability to rotate the bow, increasingly so when maneuvering with slower speed with the vessel.

3.4 Rig, Main Sail Boom & Spinnaker Pole

Here, basic part dimensions and construction materials are given for the Rig, main sail boom and the spinnaker pole. For more specific information on these items, consult the vessels drawings here:

Cruising mast drawings

Cruising boom drawings

3.4.1 Cruising rig

Main mast weight:
- 630kg

Main mast height:
- Mast foot to Dec k= 2.092m
- Deck-Top = 24.56m

2x Wooden spreaders
The cruising rig and its Jumper strut/Spreader are constructed of Alaskan Sitka Spruce.

3.4.2 Cruising main sail boom

Main boom weight:
- 358kg

Main sail boom length
- 10,35m

The Boom tapered at both the fore and aft end
The main sail boom box section is constructed of Sitka Spruce.

3.4.3 Spinnaker pole

Spinnaker pole weight:
- 30kg

The spinnaker pole is constructed of high-strength carbon fiber.
- Length: 7,70m
- Outer diameter on inboard end 135 mm, tapered at the outboard end to 108 mm
- Wall thickness 3,25 mm

The spinnaker pole has Tylaska pole ends: Interpid II and CR4 Stubbie combined with a "Bayonet" on a Harken track inboard end to attach the pole to the spinnaker pole rail.
The spinnaker pole is locked in place on the deck with an angled controller bar for the aft end and a cage to lock onto for the bow end.

3.4.4 Cordage for rigging and sails

Rigging comprises the system of ropes, cables, and chains, which support a sailing vessel or sailing vessels masts.

Rigging is divided into two classes:

- *Standing*, which supports the mast (shrouds and stays)
- *Running*, which controls the orientation of the sails and their degree of reefing. (halyards, braces, sheets, and vangs)

To access Blue Marlin's rigging cordage and shackle inventory, click here.

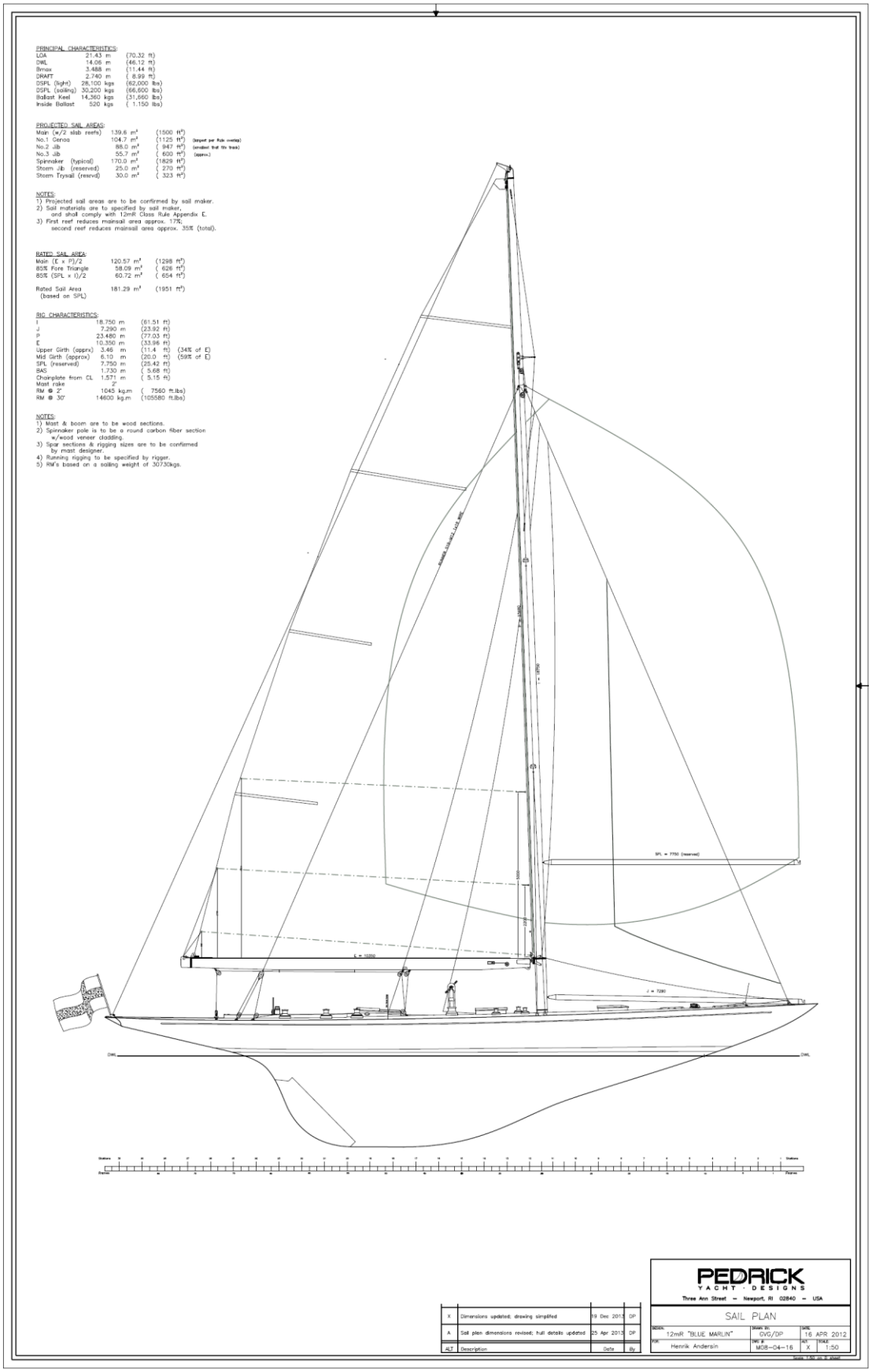
3.4.5 Cruising Standing rigging:

Item	QTY.	Total Pin to pin length/mm	Material
V1 (with cover)	2	7442	Nitronic 50 Coil - 0048
D1 (with cover)	2	7212	Nitronic 50 Coil - 0040
V2/ D3 (spr. bend)	2	11960	Nitronic 50 Coil - 0040
D2	2	6067	Nitronic 50 Coil - 0015
Jumpers	2	9667	Nitronic 50 Coil - 0010
Jumper bracing stay	1	1418	WIRE
Check stay	2	26000	8mm Dynema
Racing Forestay	1	20053	Nitronic 50 Coil - 0030
Cruising Forestay	1	20053	Wire, compatible with Reckmann furling 2000 system
Running backstays	2	20698	Kevlar (15T)
Masttop backstay	1	28130	Kevlar (3T)

To access the Ocean Yacht systems Rigging catalog for item references, click here.

To access the Rackmann operational manual, click here.

3.5 Blue Marlin sail plan (PYD)



3.6 Sails

Sails are the main source of propulsion power for this vessel. The vessel has separate sails for both cruising and racing.

Sail relevant terminology:

TWS = True Wind Speed
TWA = True Wind Angle
Penlam TF2 = Double sided taffeta*
% = Percent of "J"**
Penlam = Pentex laminate***

*Taffeta is a crisp, smooth, plain woven fabric made of silk, cuprammonium rayons, acetate or polyester
** "**J**" is the base of the foretriangle measured along the deck from the headstay to the mast.
*** **Lamination** is the technique/process of manufacturing a material in multiple layers so that the composite material achieves improved strength, stability, appearance or other properties from the use of differing materials. A laminate is a permanently assembled object by heat, pressure, or adhesives.

3.6.1 Racing sails

Type	Area m2	Notes
Mainsail, Penlam TF2	137,84	1 reef, flattener reef, 2 full battens
Genoa, Heavy, Penlam TF2	95.89	14-20kn TWS
Genoa, Medium, Penlam TF2	107,13	9-15kn TWS
Genoa, Light, Pentex Laminate	114,26	4-9kn TWS
Spinnaker S 1,5, Superkote 75	N/A	Light, Blue, 5-11 TWS
Spinnaker S 2, SL90 Nylon	N/A	Medium, Red, 10-20 TWS
Spinnaker SL90 Nylon	N/A	Heavy, Yellow, 15-25 TWS
Stay Sail	N/A	Converted 6mR Rolling Genoa

3.6.2 Cruising Sails:

Type	Area m2	Notes
Main, Penlam TF2	127,00	2 reefs, flattener reef, 2 full battens
Furling Jib, Penlam TF2	58,9	15-22kn TWS, UV cover
Furling Genoa, Penlam TF2	97,00 (140%)	6-15kn TWS, UV cover

Asymetrical Spinnaker, Norlon 150	N/A	TWA 110-165 Snuffer (spinnaker sock)

3.7 Navigational equipment

The main method of navigation on Blue Marlin is as per good seamanship, audio/visual navigation supported by official paper charts. The chart navigation is supported by electronic instruments consisting of measurement instruments, radar, and plotters. All Blue Marlin's electronic navigation components are connected via an NMEA 2000 network*.

*NMEA 2000, (standardized as IEC 61162-1), is a plug-and-play communications standard used for connecting marine sensors and display units within ships and boats. Communication runs at 250 kilobits-per-second and allows any sensor to talk to any display unit or other device compatible with NMEA 2000 protocols.

To access Blue Marlins NMEA 2000 Network drawing, click here.

3.7.1 B&G H5000 Integrated navigation system

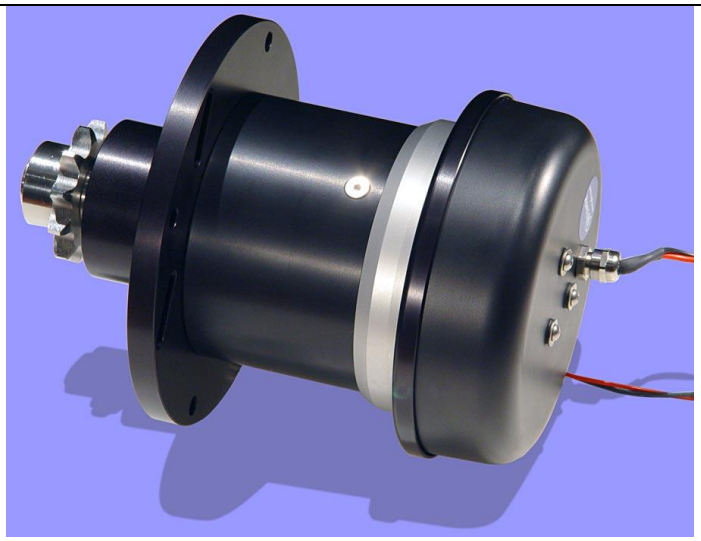
An INS or integrated navigation system is a series of interconnected and closely grouped screens and modules allowing centralized access to navigational, propulsion, control and monitoring information. The aim of INS is to increase safe and efficient vessel management by its qualified personnel. All components of this INS are a part of the B&G H5000 system communicating via NMEA 2000 network.

(Top screen MFD (Multifunction Display)-plotter, bottom right instrument screen, bottom center autopilot, bottom center with yellow labels automated horn program switches, bottom left VHF/AIS)

**By pressing CTRL+TEXT you can open the items own operator's manual/data sheet.*

H5000 Integrated navigation system on NMEA 2000 network	
➢ B&G H5000 instrument system ➢ All the following CPU's, displays, instruments are mentioned in the H5000 manual	
➢ H5000 "Performance" Central Processor Unit-CPU	
➢ B&G H5000 pilot computer	

➢ B&G instrument graphic display	
➢ H5000 Pilot controller ➢ WR10 Wireless autopilot controller and BT-1 base station	
➢ B&G Precision-9 compass	

➢ Jefa autopilot electric motor Sprocket drive unit 300 Nm 24V	
➢ B&G RF25N Rudder feedback unit	
➢ B&G WIFI-1 ➢ This Wi-Fi gateway allows for remote access to the vessels B&G network data	

➢ B&G Zelus³ 12" touch screen MFD chart-plotter ➢ 1x at the helming station ➢ 1x below deck on the navigation station	
➢ B&G Broadband 3G/4G Radar	
➢ B&G ZG100 GPS antenna	
➢ B&G Loadcell ➢ DLA1 Digital Loadcell amplifier and a Stowe Dataline GX display	

➢ AIRMAR DT800 Smart DEPTH/TEMP. Sonar	
➢ AIRMAR ST850 Smart Speed & Temp.	
➢ B&G 213 Masthead Unit, electronic wind direction and force indicator	
➢ SIMRAD RS90 VHF/AIS Radio	

Navigational instruments (non NNMEA 2000)	
➢ Icom IC-M23 GMDSS VHF-Radio telephones (3x)	
➢ SK-615 X – Heritage Skylight Binnacle Compass ➢ For Installation, Compensation and maintenance, click here	
➢ WEMPE Nautic series, Porthole clock, brass 120mmØ ➢ WEMPE Nautic series, Barometer, brass 120mmØ hpa/mmHG	

➢ WINDEX XL wind direction indicator	
➢ Kahlenberg S-330 air horn ➢ Kahlberg P449-25 Air compressor	 
➢ Kahlberg V-149-K Solenoid valve kit ➢ Kahlberg M-485A Horn Controller	 

3.8 Electrical system

There are two ways to supply power to the electrical systems of the vessel, shore power and batteries. All electrical systems on-board draw their power from the Mastevolt 24V/320Ah Lo-ion batteries with the exceptions of the Webasto AC and the Holland Marine bow jet thruster. The AC works only while connected to shore power and the bow thruster has its own 24V battery source from which it draws power.

The Li-ion 24V/320Ah Mastervolt service batteries may be charged by either running the main engine or by connecting a shore power cable to the foremost shore power connection in the cockpit. The level of charge in the Mastervolt batteries may be observed from the Mastervolt's monitoring and control panel that is located on the inboard side of the user panel.

The 12V Optima Red main engine battery is charged by running the main engine.

The 24V Optima Yellow bow jet thruster batteries are charged by connecting shore power to the aft-most Mastervolt power socket in the cockpit.

There are three different voltage current that are used on-board the vessel:

The 24V DC system;

- The main DC circuit (pumps, webasto heater, fireboy, electric winch motors, and windlass)
- Navigational electronics (certain systems connected to the NMEA 2000 network)
- The Fireboy CO_2 system
- The Masterbus system (Battery monitoring system)

The 12V DC system;

- The 12V DC service system (alarms and parts of the NMEA 2000 connected navigational electronics)

The 230V AC system;

- The 230V domestic power system (power sockets for electronics, kitchen appliances, and hot water heater)

Power source	Picture	Location
➢ Mastervolt Service batteries ➢ 2x Li-ion 24V/320Ah		Electric compartment behind the electric board
➢ Yanmar engine start battery ➢ 1x 12V, Optima Red 50Ah		Cockpit port side, behind the AC unit
➢ Jet Thruster batteries ➢ 2*3x 24V, Optima Yellow 75Ah		Bow, aft of anchor chain box.
➢ Mastervolt Shore power cables, 3 x 2,5 mm2 ➢ 2x20m 230V for 16 A inlets ➢ 2x CEE plug with current indicators ➢ Stainless steel inlet 16A		Cockpit aft STBD side

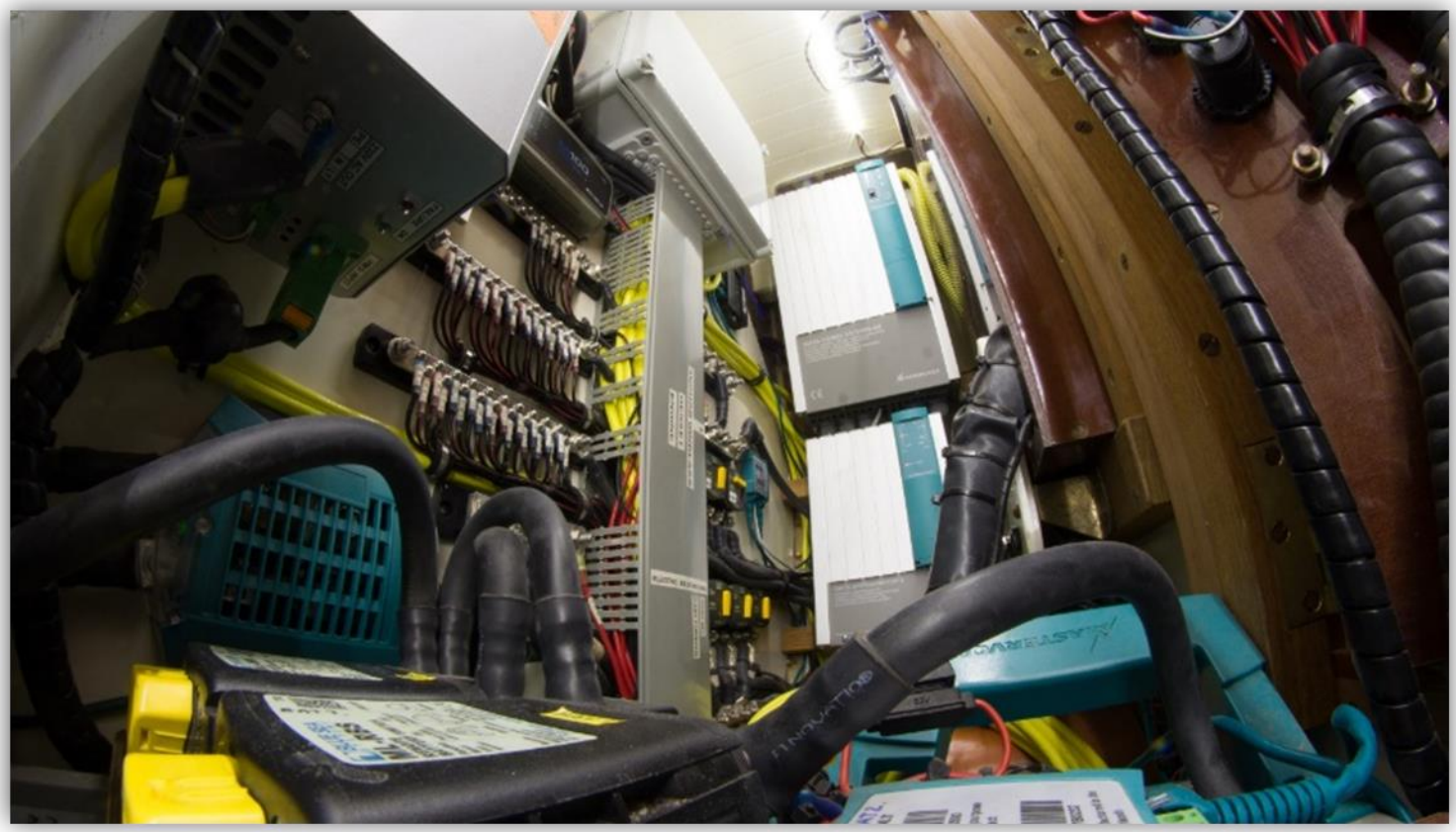
User panel	Electric board
	

On the user panel you will find:

- Light switches for internal and navigational lights
- Yanmar main engine panel
- Webasto heater and AC panels
- Bilge, black water tank and engine fuel filter alarm loud speakers
- Fusion radio/stereo
- Fuel & fresh water gauges.
- Hand held VHF charger
- USB charger ports

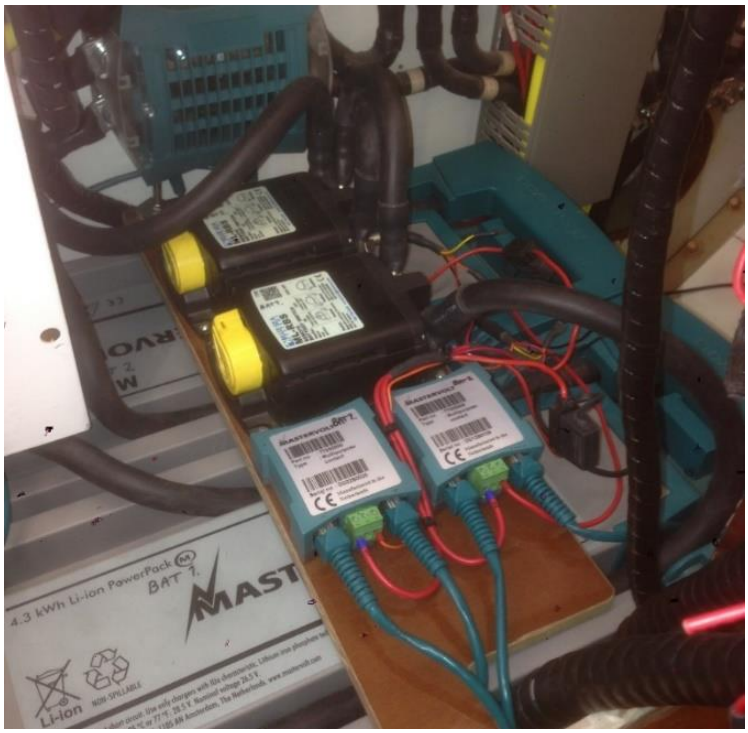
On the electric board you will find:

- Automatic fuses aka. “breakers”
- Main switches for the main engine and service



Electrical compartment, behind user panel and electric board

Mastervolt battery breakers



- The batteries are located on top of the batteries in the electric compartment.

Main Fuses

- Upper row, two left most breakers
- To turn on the main engine, the red main switch must be turned “on” after the fuses are connected
- The upper most right and all the lower row fuses are for the electric winches and the windlass

3.9 Engines:

In addition to sail power Blue Marlin is installed with the following engines for propulsion power.

3.9.1 Yanmar, 4JH4-THE series

The main engine of the vessel is an 80,9kW/110hp, Diesel powered Yanmar 4JH4-THE. The main engine is installed in a separate engine room below the cockpit floor.

*To access the Yanmar 4JH4-THE series operation manual click the text on the left side table

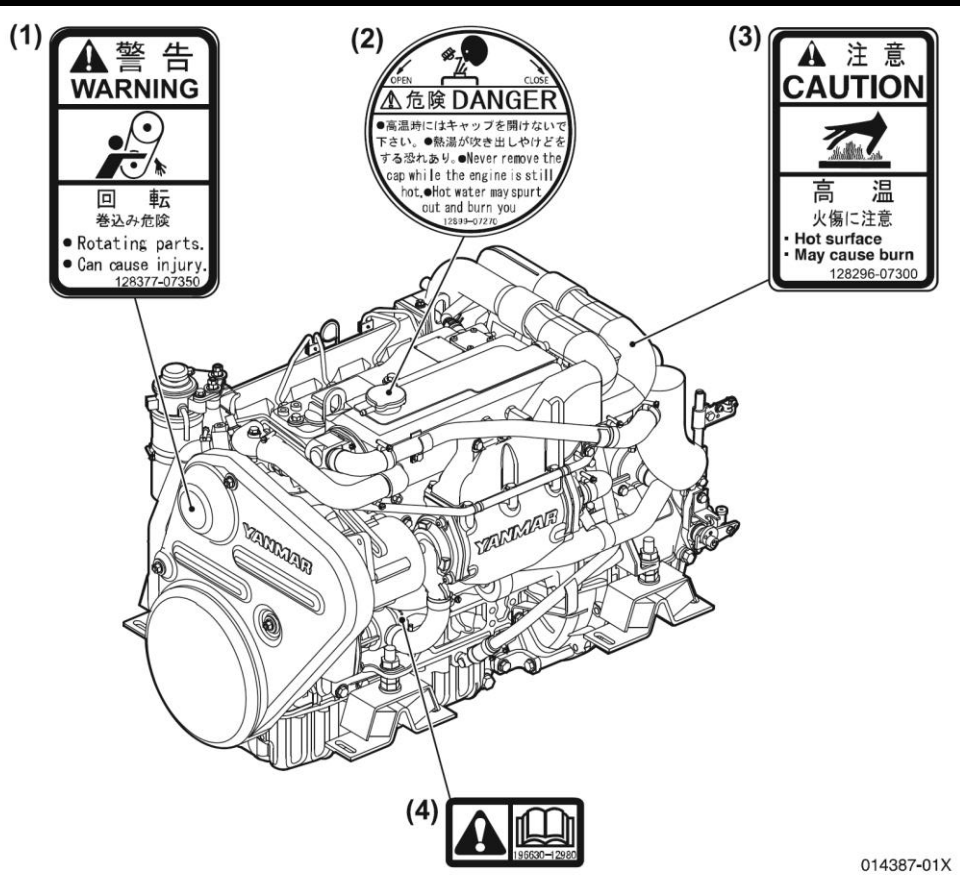
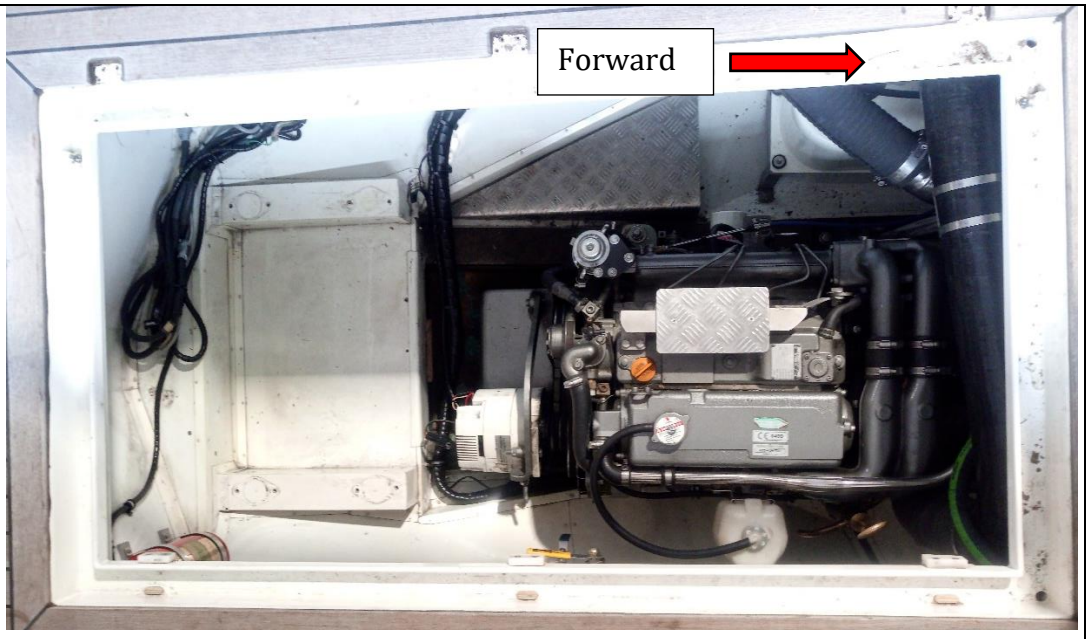
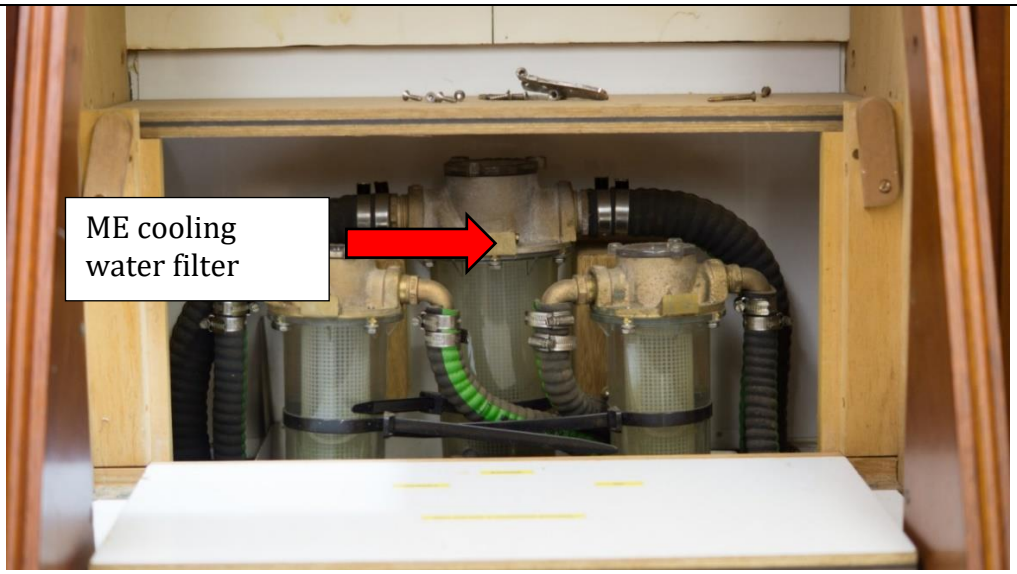
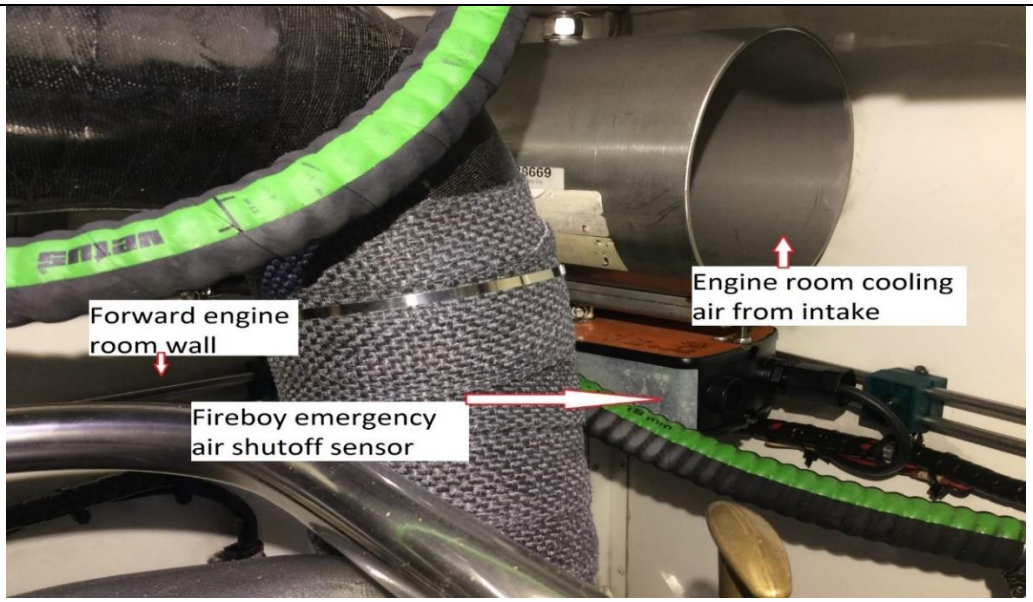
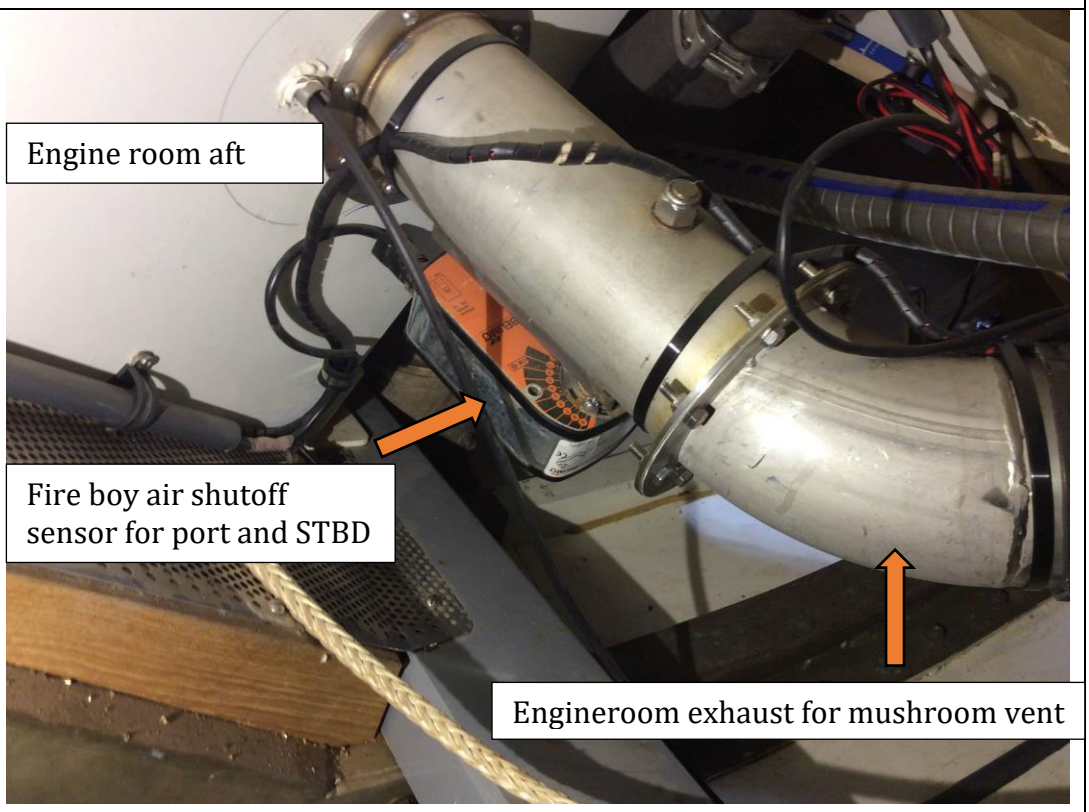
Yanmar 4JH4-THE	
➢ Yanmar 4JH4-THE series main engine	

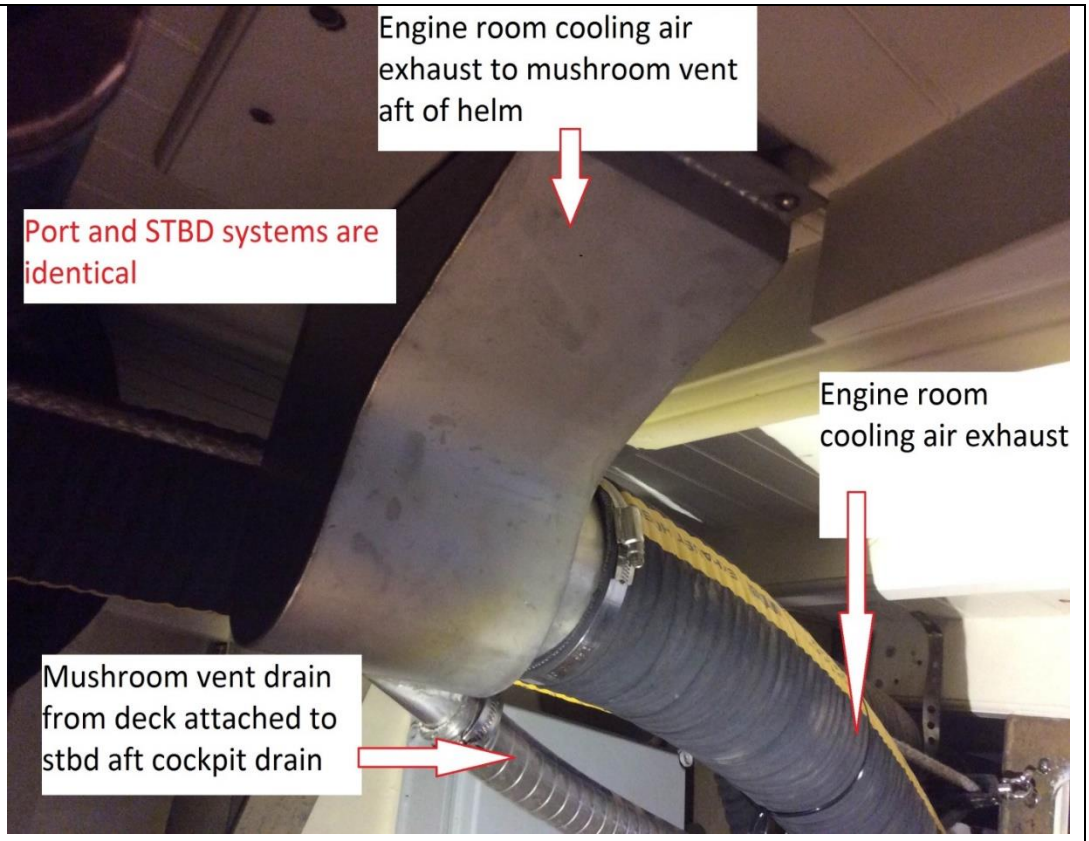
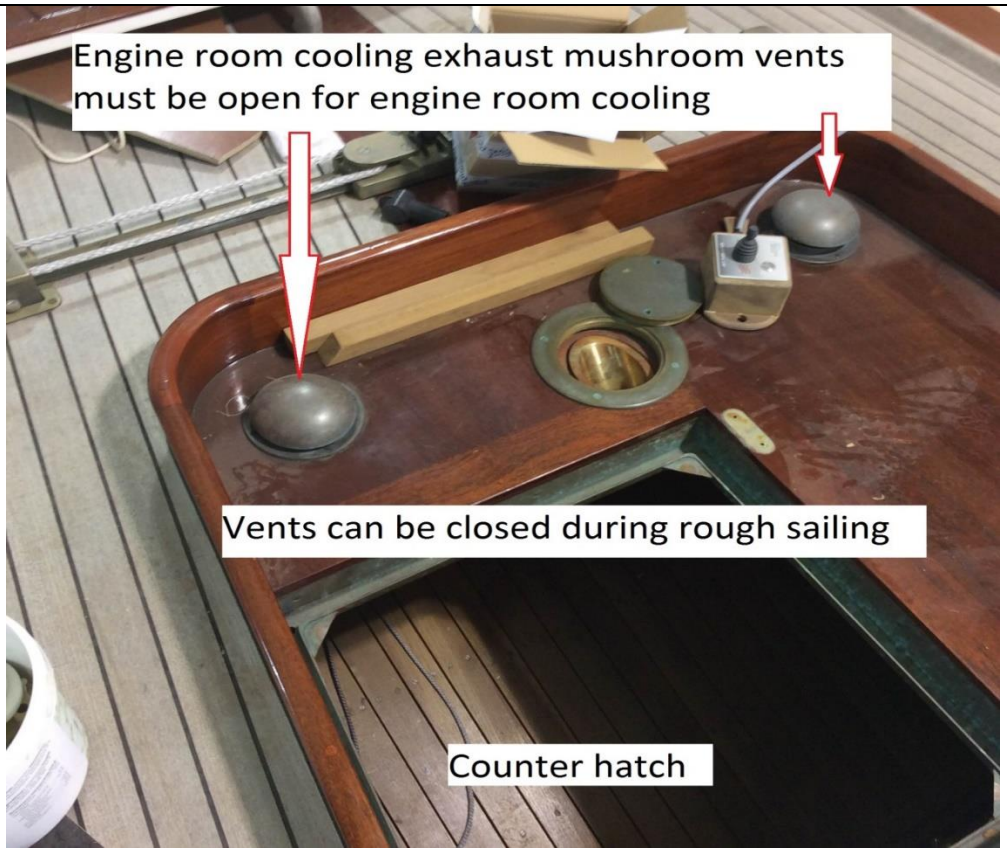
Figure 4

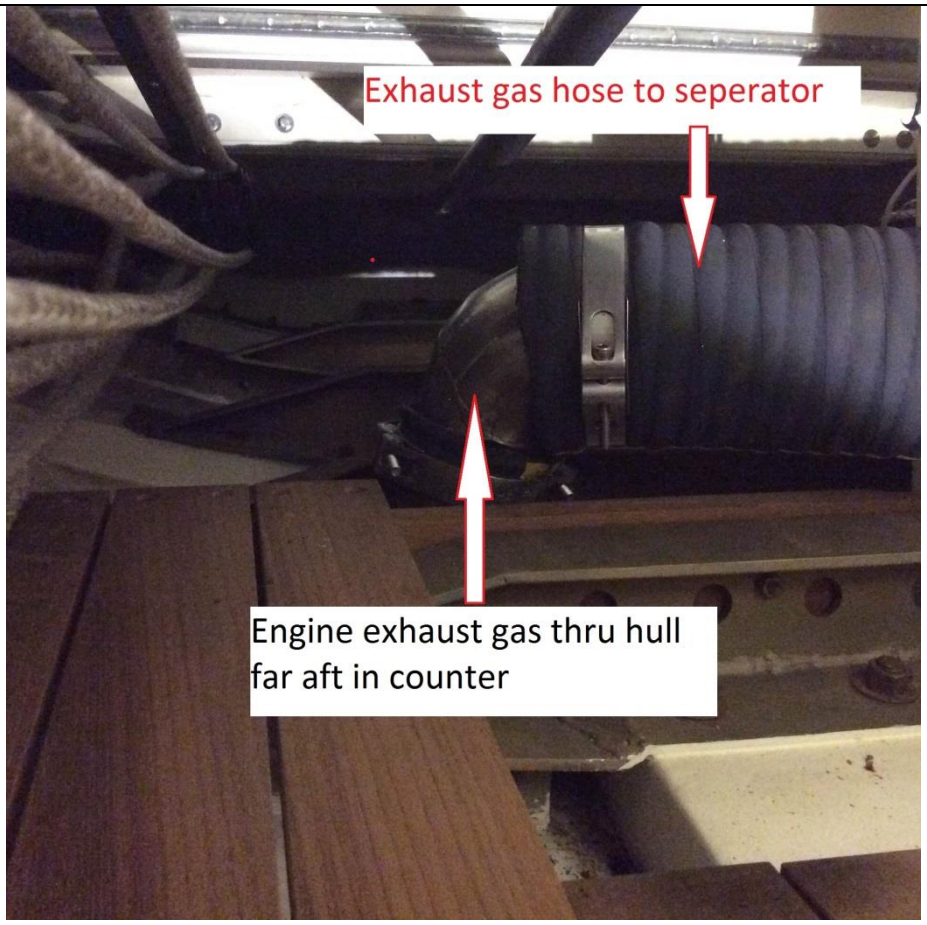
➢ The engine room holds the main engine ➢ The engine is cooled by air intake and exhaust ➢ The floor door is opened by twisting and lifting 3 locks	
➢ Fuel/Water separators are found on the STBD side wall next to the main engine.	

➢ The Main Engine salt water cooling filter is located directly behind the staircase. ➢	
➢ There are intake grilles connected to hoses alongside the companionway	

➢ Stainless steel pipes bring air into and send air out of the engine room ➢ There is a fireboy sensor on each stainless pipe to close air flow down to the engine room in case of fire	
➢ Engine room STBD side exhaust and Fireboy shutoff sensor	

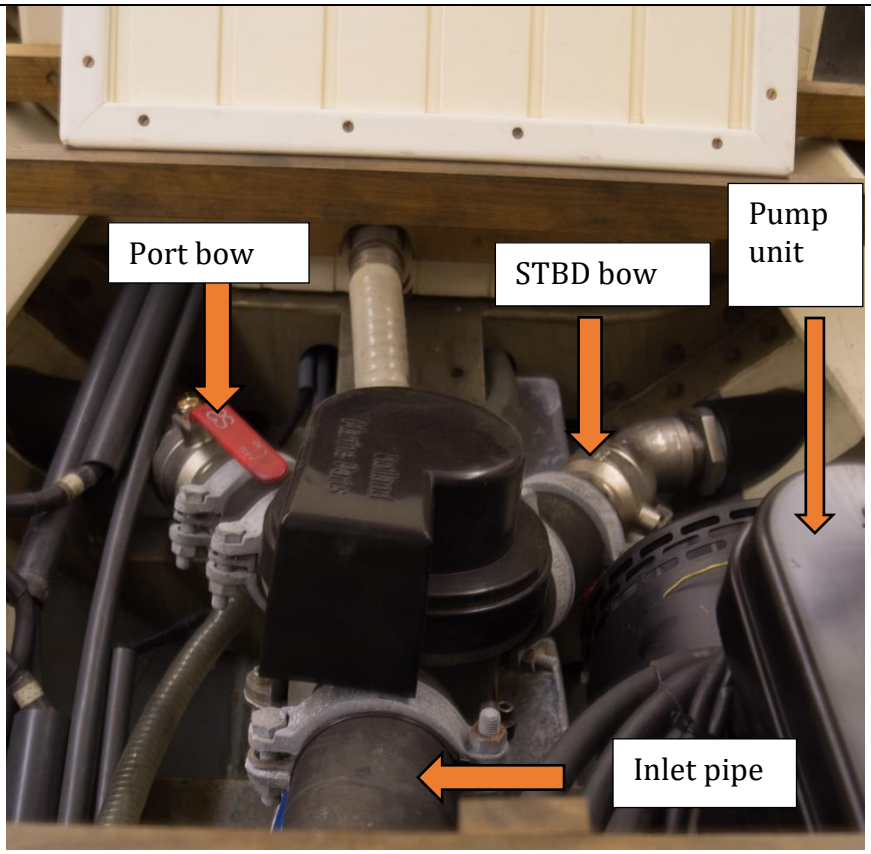
- A “Rule 240-24V 100mm (4") In-line blower”, is installed in both port and STBD exhaust hoses. They are activated by a thermostat in the engine room
- Picture from STBD side hose

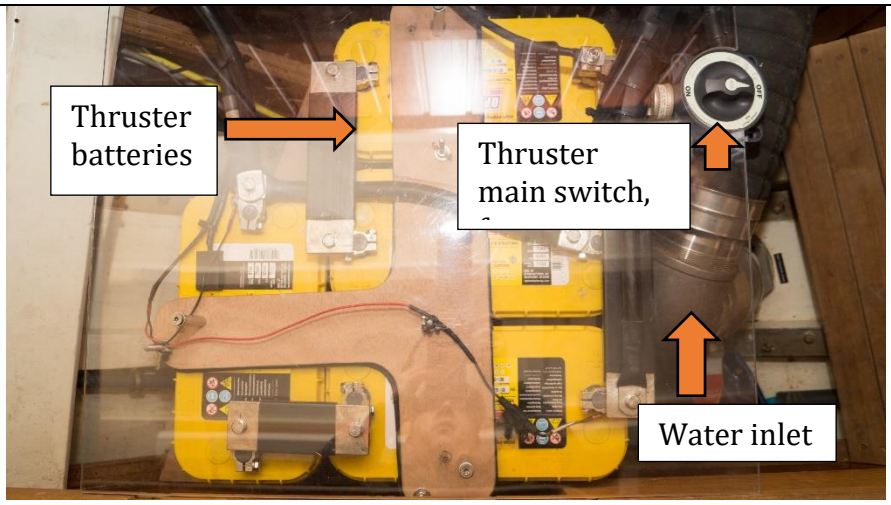
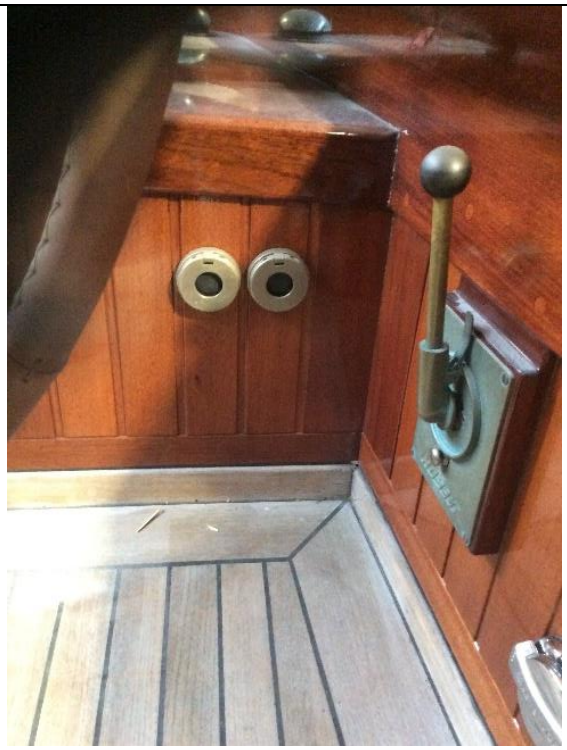
➢ Exhaust mushroom vents below deck	
➢ Exhaust mushroom vents	

➢ Engine exhaust through hull	

3.9.2 JT-90 Holland Marine Parts, Bow Jet thruster

The vessel is fitted with a 15,5kW bow tunnel thruster operating on a 24V electrical system.

JT-90 Jet thruster	
➢ JT-90 pump unit	
➢ The bow jet thruster system is located in the forward cabin	

➢ The jet thruster has 6x 12V batteries. ➢ 4 batteries fore and 2 batteries aft of the forward counter floor. ➢ 2x main electrical switches. 1 aft of the bulkhead, 1 forward of the bulkhead.	
➢ The jet thruster has a control panel located at the port side foot compartment of the helms man	

3.10 Deck hardware

Items of this chapter are meant to handle ropes and shackles along with their fastening. The operations that these items cover are i.e. mooring, sail-and anchor handling.

List of Harken deck hardware, rails and tracs etc.
List of Ording deck hardware, chocks, blocs etc.

The various wooden open based cleats on-board were created by Red Sky.

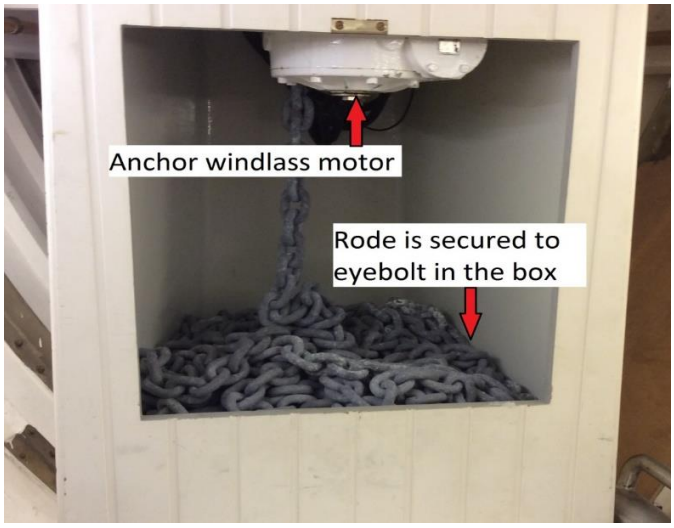
3.10.1 Anchor Windlass

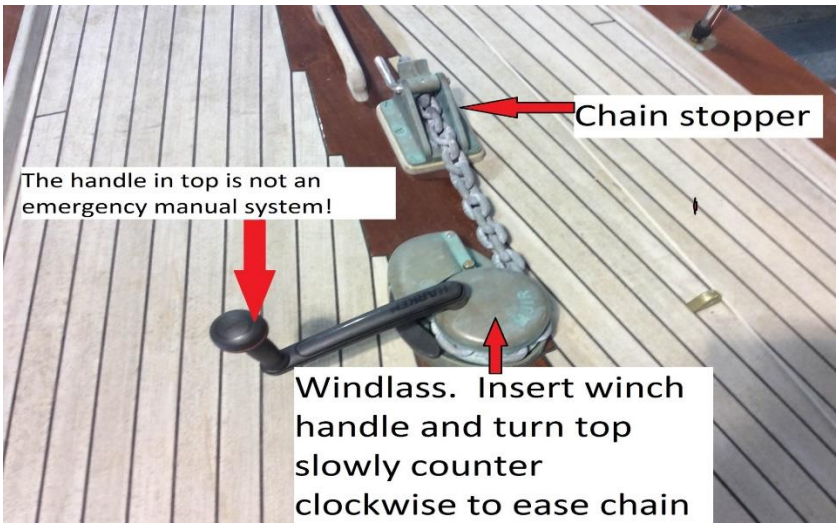
For 10 Practical tips for using a windlass, click this text.

Muir VR4000 Vertical (Polished Bronze)

- 24V DC 2000w Electric Motor
- Coupled To 90 Deg Worm Drive Gearbox
- Rope/Gypsy to suit DIN766 13mm Short Link Chain & 19mm, 3 Strand Rope

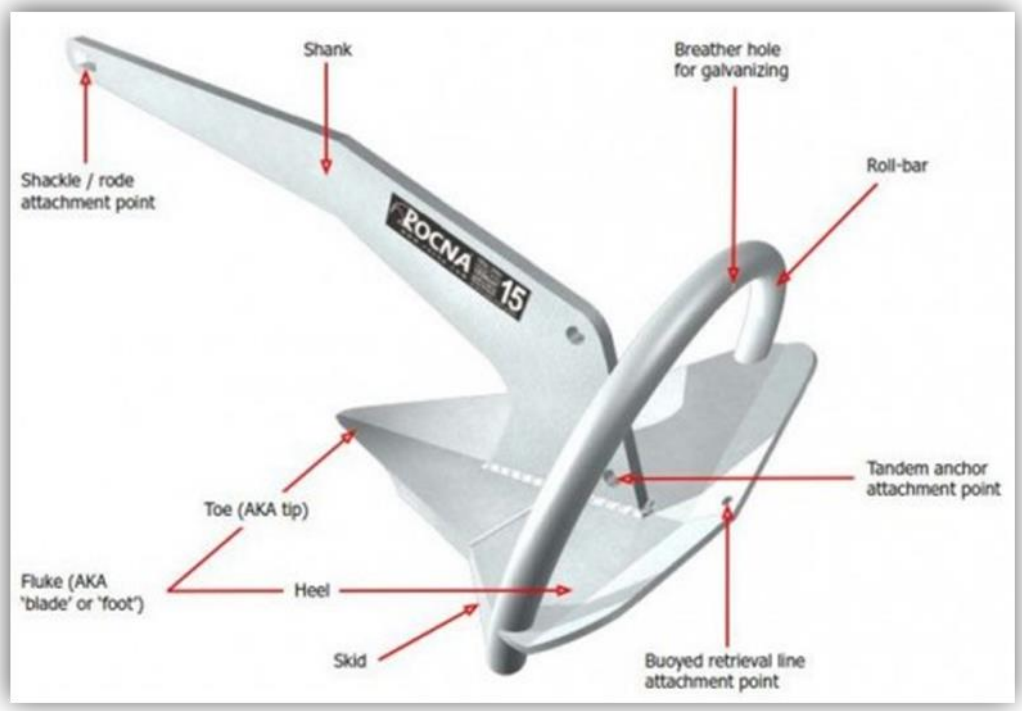
The Windlass is accompanied by a Polished Bronze chain stopper to fit 13mm chain and a hand-controlled pendant.





3.10.2 Anchors

- ***Rocna Spade 55kg***. Main anchor.
- The main/cruising anchor is connected with 1 shackle ***(28m)*** of 13mm DIN 766 chain and 100m of 20mm three strand nylon rope in the bow and anchor box.



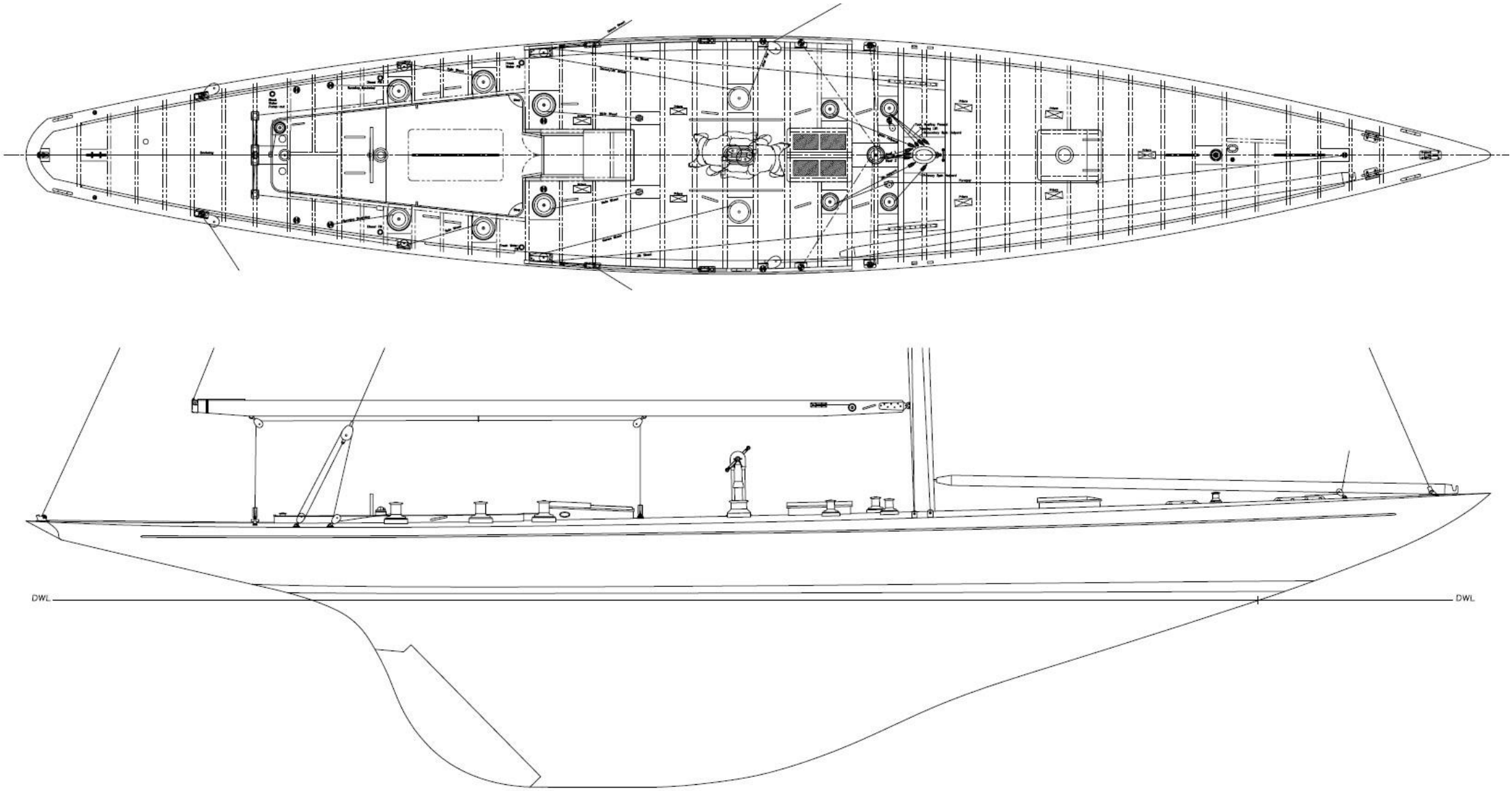
Rocna anchor illustration with components named

- ***Lewmar DTX 20kg***. Class legal race anchor.
- The race anchor is connected with 10m of 10mm short link steel chain shackled to the anchor and 90m of 16mm diameter nylon rope; all of which is located within 3m of the MGS (midship girth station) and carried there while racing.

3.10.3 Mooring ropes

Variable lengths of double braid 22mm Polyester rope.

3.10.4 Deck hardware arrangement plan (PYD)



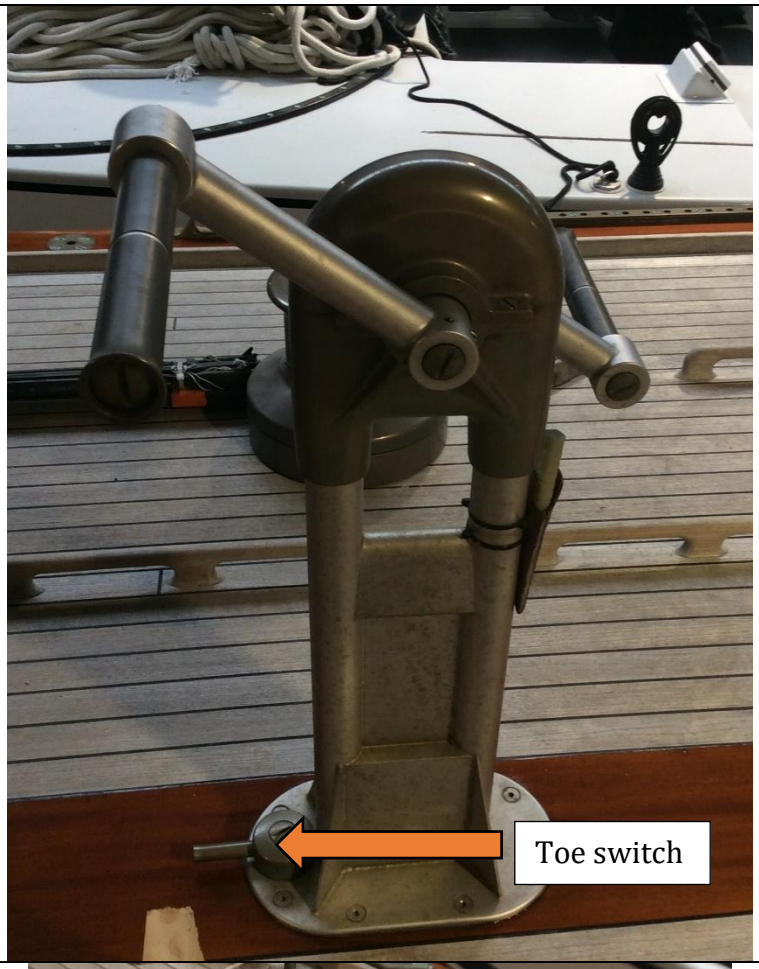
3.10.5 Winches

The vessel is equipped with fully customized Harken/PYD bronze winches. There are two kinds of winches on board, 2 speed and 3 speed.

Winch Qty.	Description
4	74,2 PT BBB ELECTRIC 24V ORIZZONTALI
2	74.2 PT BBB
5	48.2 PT BBB
2	8 PT BBB
2	990,3 PT BBB
1	Blue Marlin custom Pedestal
4	Blue Marlin KIT W74.2 ST EL/HY
2	Blue Marlin KIT W74.2 ST

To access the Harken handbook for the Blue Marlin winches, click this text.

- These are the small "48.2 PT BBB" mast base winches.
- These winches are all 2 speed winches
- All these winches are operated by individual winch handles from the winch top
- All winches have a corresponding cleat for tying off ropes.

➢ Pedestal winch grinder ➢ The pedestal connects to two axels below deck to both Port and STBD side winches. ➢ The connecting gear is operated by the switch at the base of the mill. aka. “toe switch”.	
➢ Pedestal winch ➢ Both Port and STBD side winch have the additional option to be operated by a single winch handle from the winch top. ➢ The winches have 3 gears aka. “3 speed” that are reset from the two top buttons on top of the winch.	

➢ Harken 24V electric winch with deck imbedded push button. 2 Winches for the main sheet in front of the cockpit and 2 for the Genoa mid cockpit. ➢ The winches are 2-speed winches. ➢ There is currently only 1 operation speed set which is the “low” speed.	
➢ Electric motor for electric main winches, found below the deck.	

3.11 Tanks & Pumps

All tanks are custom made to fit their space. The tank manufacturer is TEK TANK of UK. Each tank has its own vent and monitor/gauge. All circuits for both tank monitors and pumps related can be found on the circuit breaker board on the port side aft near the stair case.

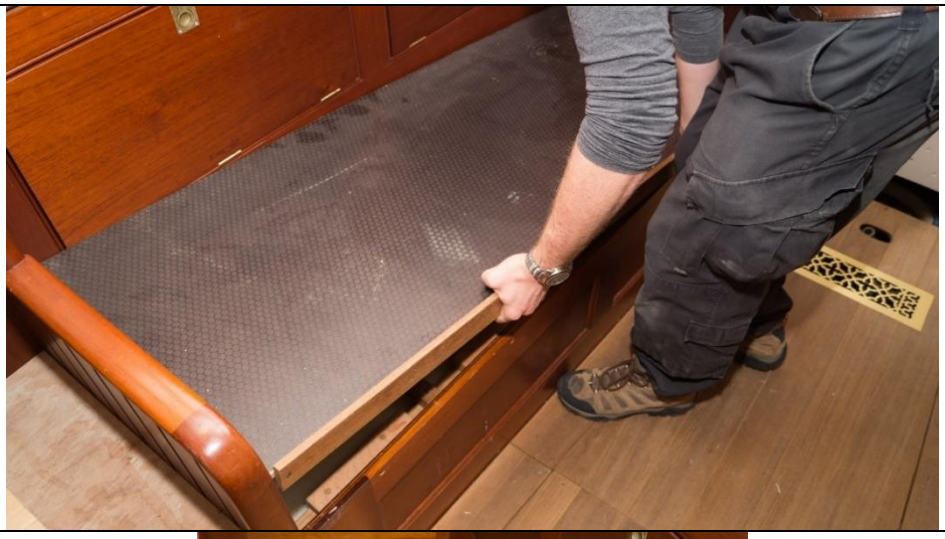
Tank	Tank capacity (L)	Tank location	Tank filling point	Tank emptying point	Tank vent location
Fuel tank (day)	117	STBD side, forward of life raft compartment	N/A	N/A	N/A
Fuel tank STBD	117	Below aft most STBD lower bunk	STBD side mid-deck	N/A	STBD side genoa winch
Fuel tank PORT	128	Below Aft most Port lower bunk	Port side mid-deck	N/A	Port side genoa winch
Fresh water STBD	193	Below center STBD side bunk	STBD side mid-deck	WC tap, shower head, Kitchen Tap	N/A
Fresh water PORT	193	Below center Port side bunk	Port side mid-deck	WC tap, shower head, Kitchen Tap	N/A
Grey water tank	8	Under kitchen floor	Sink + Toilet floor + refrigerators	N/A	N/A
Black water tank	358	Mid-ship below floor boards	N/A	STBD side behind manual fuel transfer pump and deck	STBD aft quarter near the rudder shaft

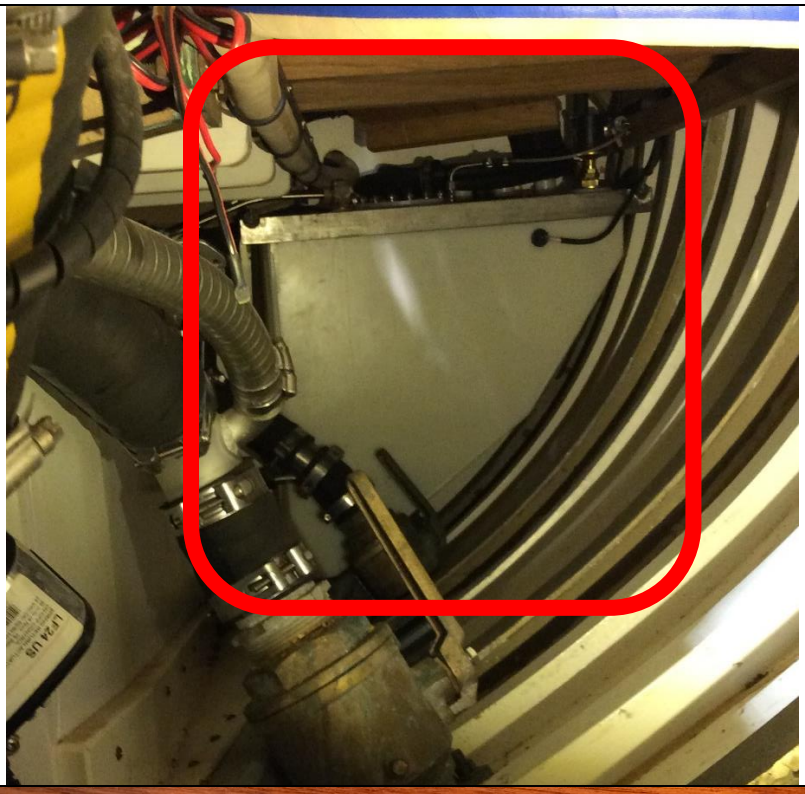
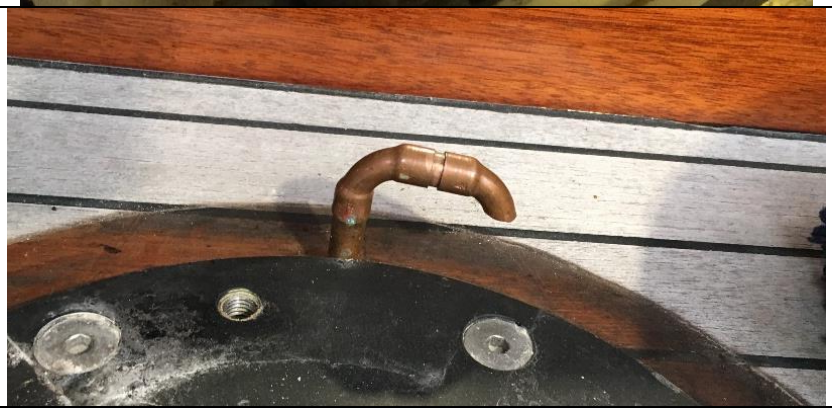
Pump	Flow rate L/min	Pump Location
Whale universal water pressure pump (FW)	12	Mid-ship below floor boards, fore of BW tank
Electric bilge pump, Whale 320 Gulper	15,5	Drying locker STBD side, near the stair case
Johnson L4000, Emergency bilge pump	252	Located under the center main cabin floor boards, forward of the BW tank.
Manual bilge pump, EDSON	N/A	Located below stair case floor board.
JOHNSON L650 UC-850 GPH, Anchor wash box pump	61	Forward cabin, aft of anchor chain locker
Marco DP12/E Anchor wash pump	15	Forward cabin, anchor chain locker with hose and nozzle in the deck FWD hatch
Grey water out pump, Whale 320 Gulper	15,5	Next to grey water tank
JABSCO 18590, Macerator pump	47	Below staircase floor boards
JABSCO VR050, Electrical diesel transfer pump	50	Dry locker STBD side
Manual diesel transfer pump	N/A	Main cabin, STBD side aft next to the stair case.
IWAKI MD-20 A/C sea water cooling pump	15	Behind stairs next to drive train configuration

*By pressing CTRL+TEXT you can open the items own operator's manual/data sheet.

3.11.1 Fuel tanks & pumps

Blue Marlins fuel tanks hold the Diesel reserved for the main engine. The combined capacity of the 3 fuel tanks of the vessel is 362 liters. The custom made *Tek Tank's* plastic fuel tanks are made of high strength, high density polyethylene (HDPE). The two major advantages of these tanks are their resistance to corrosion and their weight efficiency.

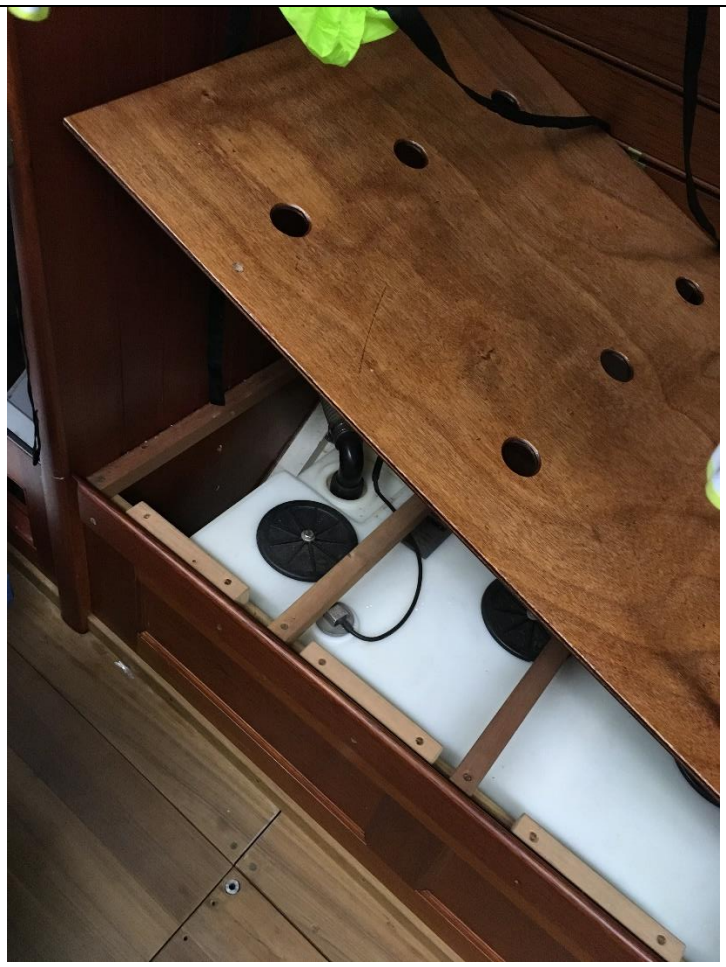
➢ To Access the fuel tanks, the boards must be removed. ➢ The picture is of the Starboard side fuel tank.	
➢ The Starboard and Port side tanks are supported by a wooden frame screwed to the lower side bunks.	

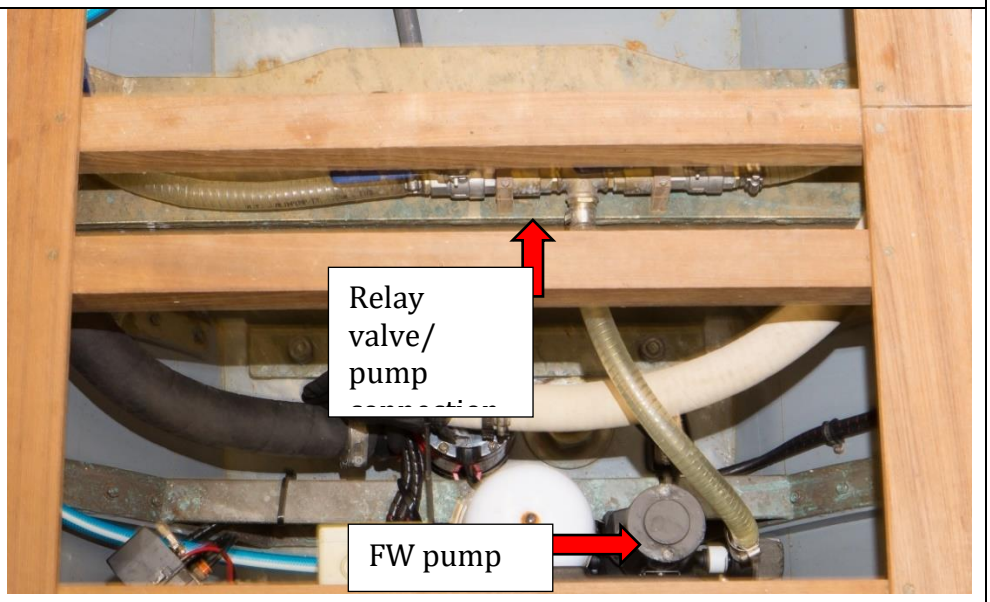
➢ Day tank, located below and forward of STBD side life raft compartment	
➢ Fuel tank Vents inside the two genoa sheet winches	

➢ The fuel tank selector valve is located next to the stair case on the Starboard side.	
➢ The manual fuel transfer pump is located in the main cabin, STBD side aft next to the stair case and below the navigation station.	

3.11.2 Fresh water tanks & pumps

The vessels fresh water is also stored in custom made high strength, high density polyethylene (HDPE) plastic tanks. Benefitting from the same corrosion resistant and weight efficient properties as the vessels fuel tanks.

➢ The water tanks are located in the middle of the main cabin, under the lower bunk boards. ➢ The bunk boards are screwed down and must be removed to give access to the tanks.	

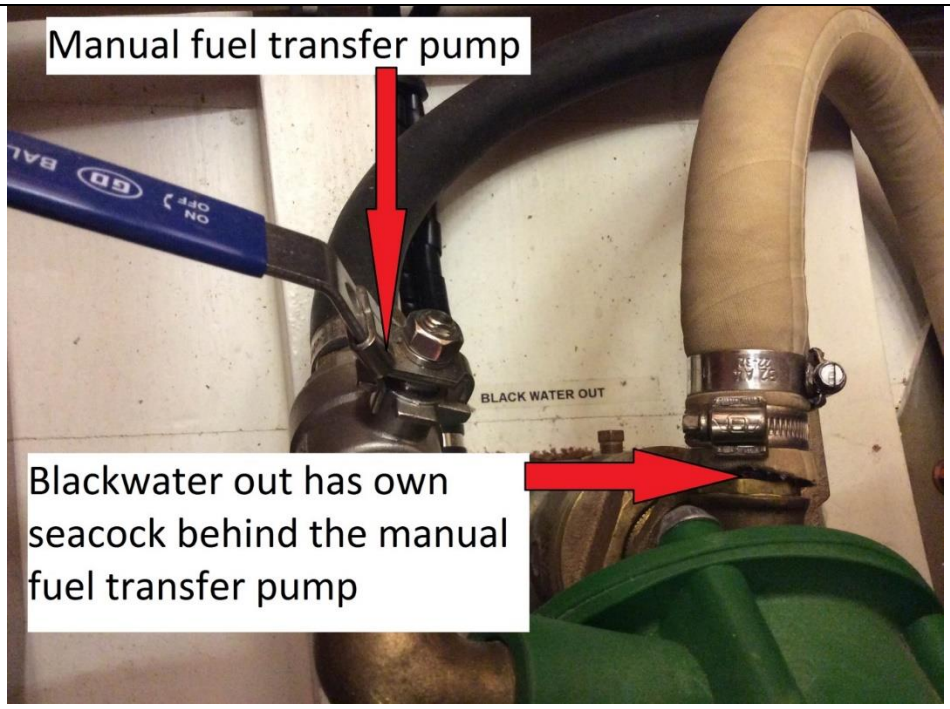
➢ The FW tanks are held in place with a frame.	
➢ The two FW tanks are connected via a relay valve.	

➢ Whale Universal Fresh Water pump	
➢ Isotemp hot water heater. ➢ Located in the bow compartment under the STBD bunk	

3.11.3 Black Water tank & pumps

Black water is the waste water from the vessel's toilet. The black water tank is a high strength, high density polyethylene (HDPE) plastic tank custom made for the vessel by Tek Tank. The system houses a macerator pump that grinds human waste to a slurry, which can then be moved by pumping.

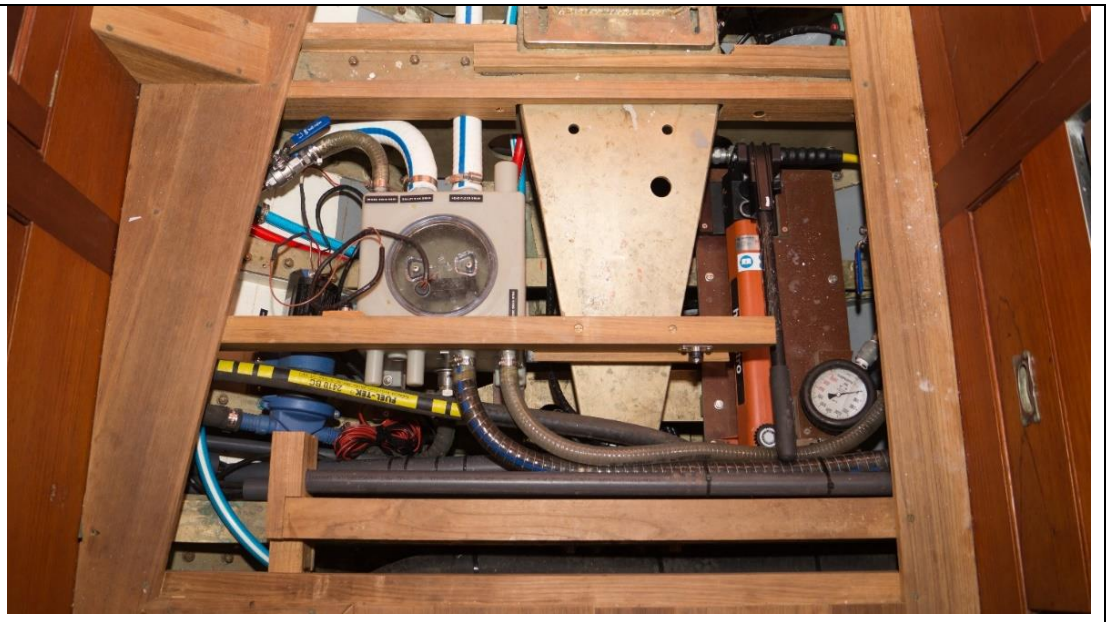
➢ BW tank located under the central floor boards.	
➢ JABSCO 18590 macerator pump.	

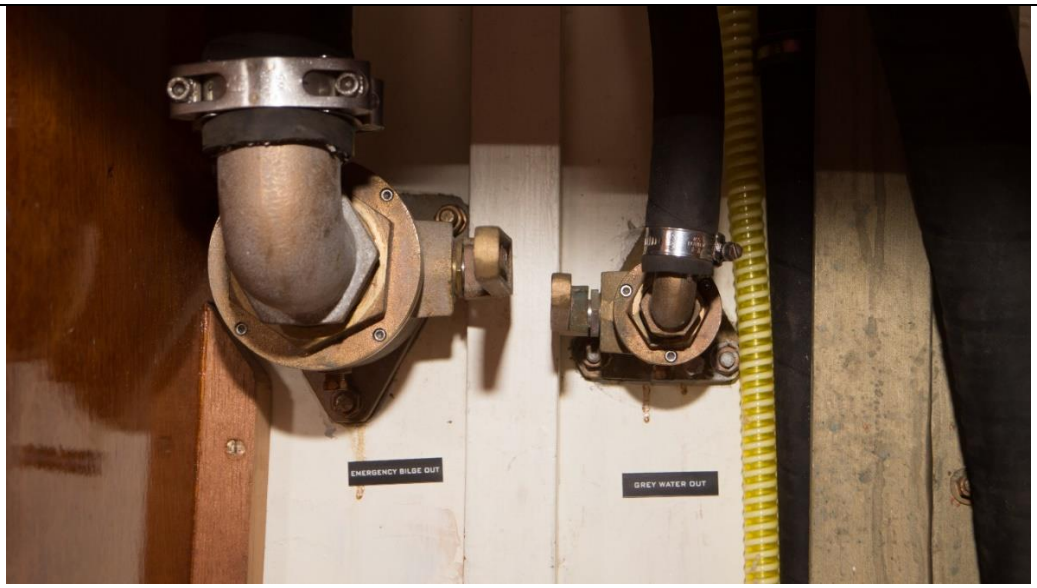
➢ BW discharge point behind manual fuel transfer pump. (Bronze lever behind pump)	
➢ BW tank vent STBD side aft quarter.	

3.11.4 Grey Water tank & pumps

The vessels grey water is handled through *Tek Tank's* "8 Liter Whale Grey Waste Tank." The necessary toilet and galley sink, shower floor and refrigerator connections are connected to the tank and other connections are intentionally left closed. The grey water tank holds a filter and the necessary integrated sensors for automated pump control.

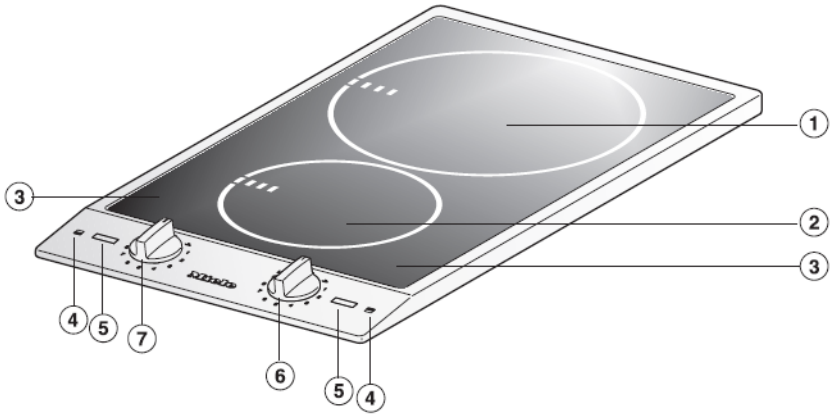
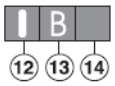
- The grey water tank and pump are located next to the mast base.
- The connection order from front, left rotating clock wise:
- STBD Fridge
- Kitchen sink drain
- Head floor drain
- Port Fridge
- Head sink/mushroom deck vents
- Pump out connection

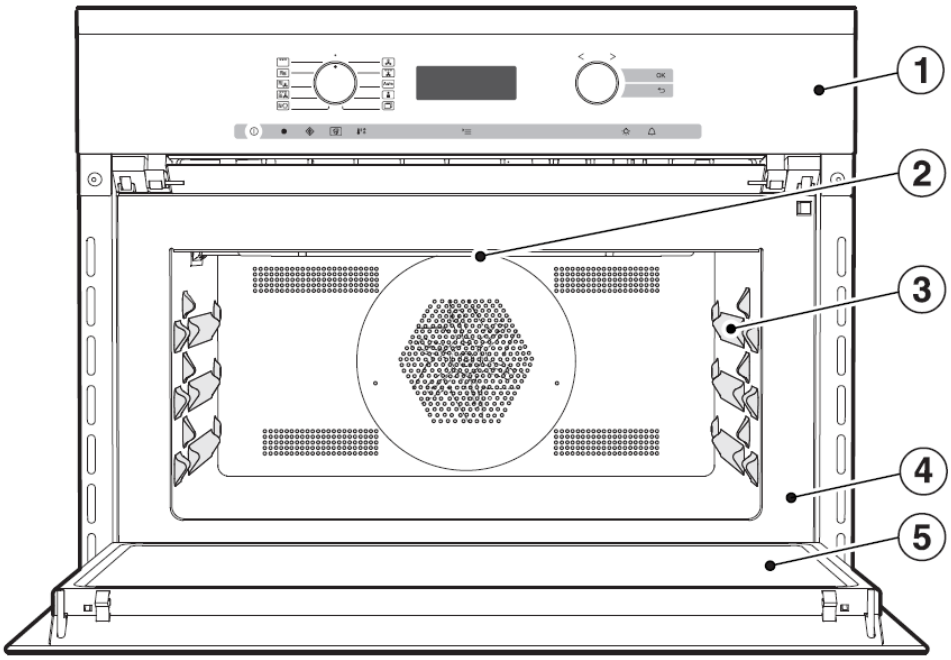


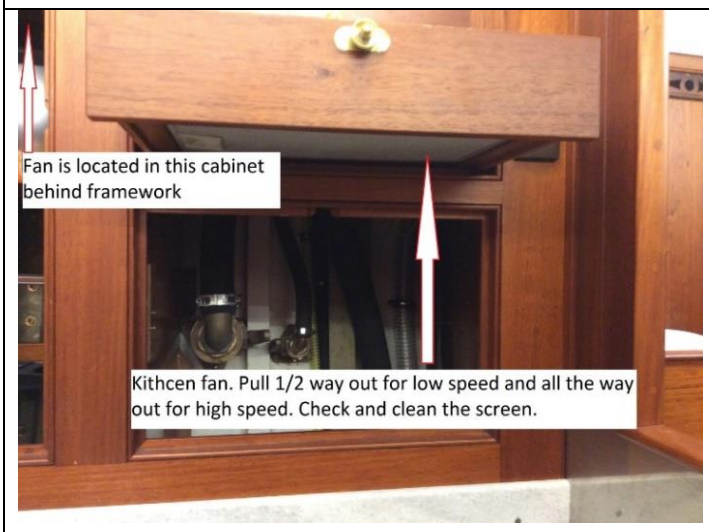
➢ The grey water discharge point is behind the kitchen cabinets on the STBD side.	
➢ There is a separate valve at the bulkhead for the discharge.	

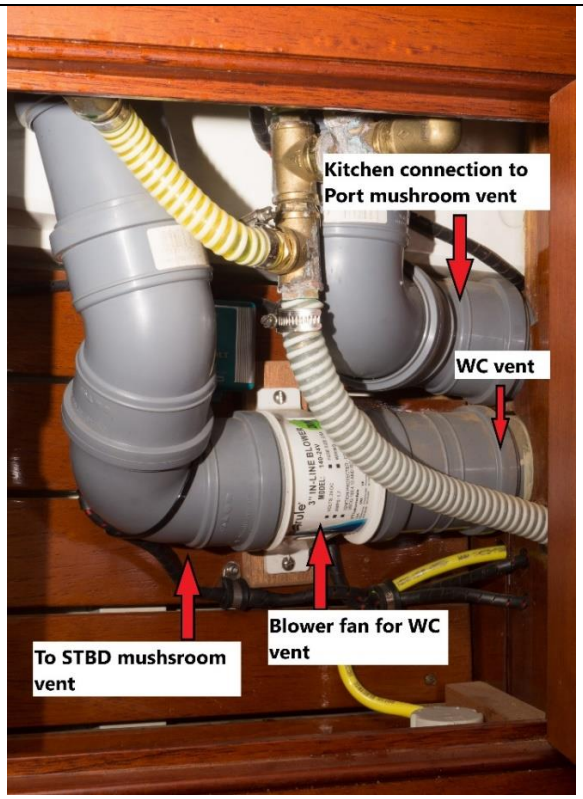
3.12 Galley

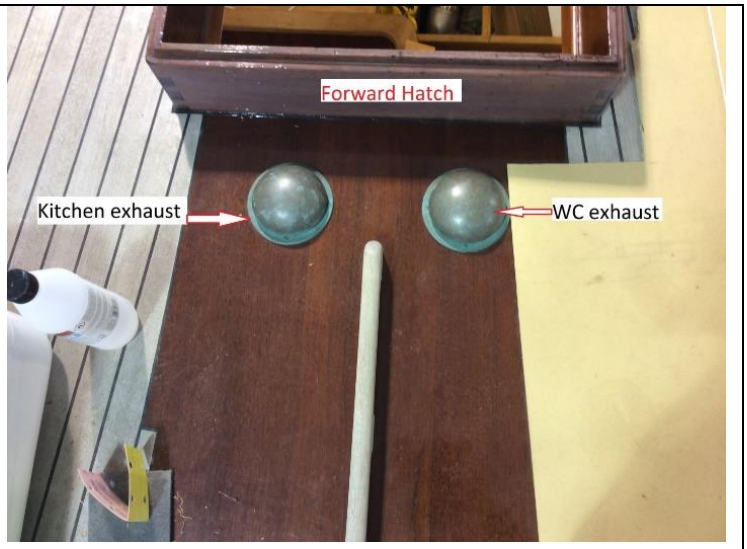
On-board Blue Marlin, there is an open galley with a sink providing hot and cold water, fridge boxes to both port and STBD side and a gimballed induction stove/oven/microwave combination on the STBD side. The galley is located below deck, midship, around the mast base.

Miele Kitchen Appliances	
➢ Ceramic combiset with induction, CS 1212 ➢ The coock top has been fitted with custom made guard rails and pot holders that may be srewd onto them	 ①Burner with double booster (BI/II) ②Burner with single booster (BI) ③Display ④ Cooking zone indicators ⑤Indicators Control knobs for the burners: ⑥ rear ⑦ front **Indicators**  ⑫ On/Off indicator ⑬ Booster indicator ⑭ "Residual Heat" indicator

➢ Miele H6400 BM Speed Oven ➢ The oven is gimballed and thus has the ability to move with the vessel or be locked into place	 ① Controls ② Grill element ③ 3 shelf levels for the glass tray and rack ④ Front frame with data plate ⑤ Door
➢ Isotherm 24V BL40 refrigerators ➢ 2x units ➢ 1 on port side ➢ 1 on STBD side of the galley	

Kitchen and WC fans	
Kitchen fan	**WC fan**
➢ Both Kitchen and WC have separate exhaust systems ➢ The Kitchen fan is started by pulling the compartment over the stove open. Short pull for low speed fan, long pull for high speed fan. ➢ The Kitchen fan is located behind the kitchen cabinet	➢ Both Kitchen and WC have separate exhaust systems ➢ The exhaust inlet for the WC is left of the WC mirror ➢ The WC fan is located in the forward cabin
	



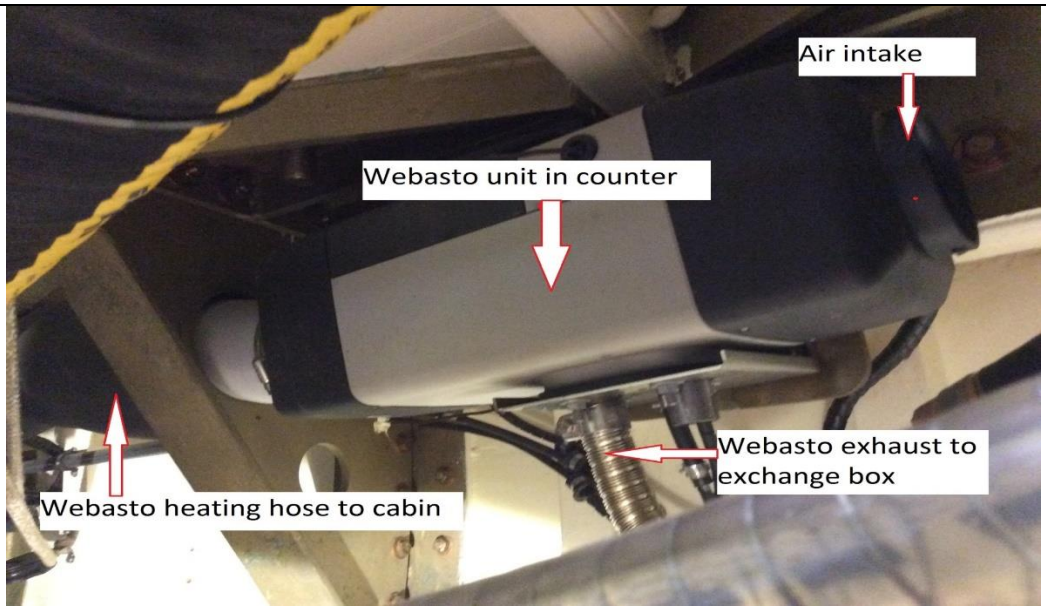
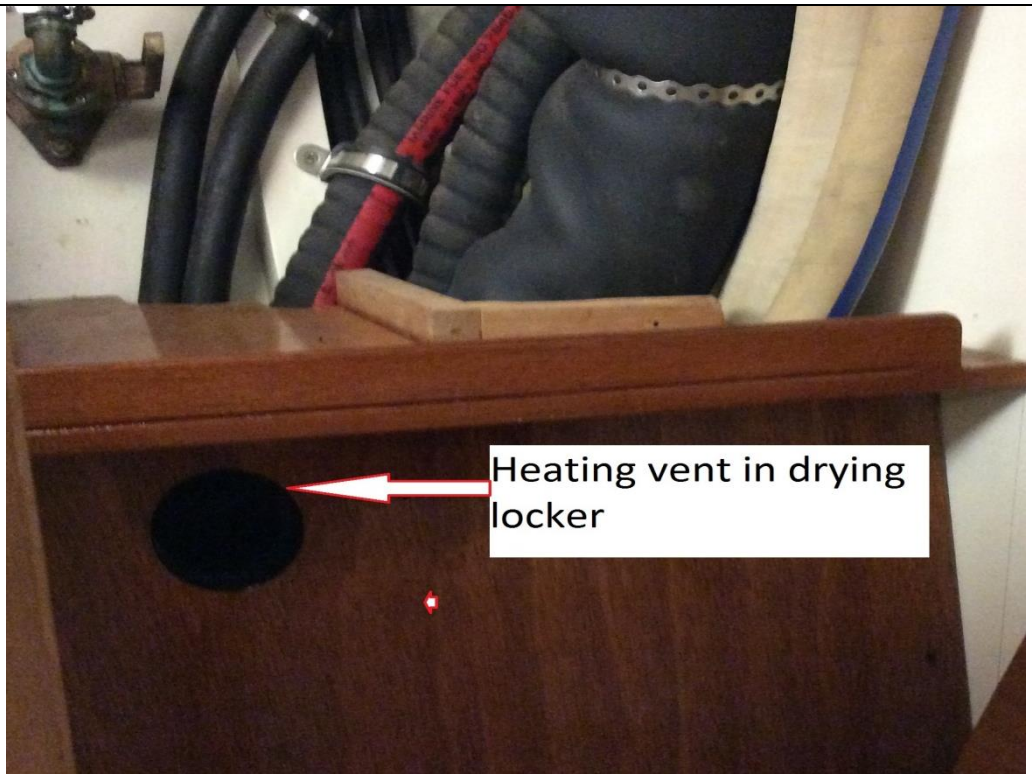


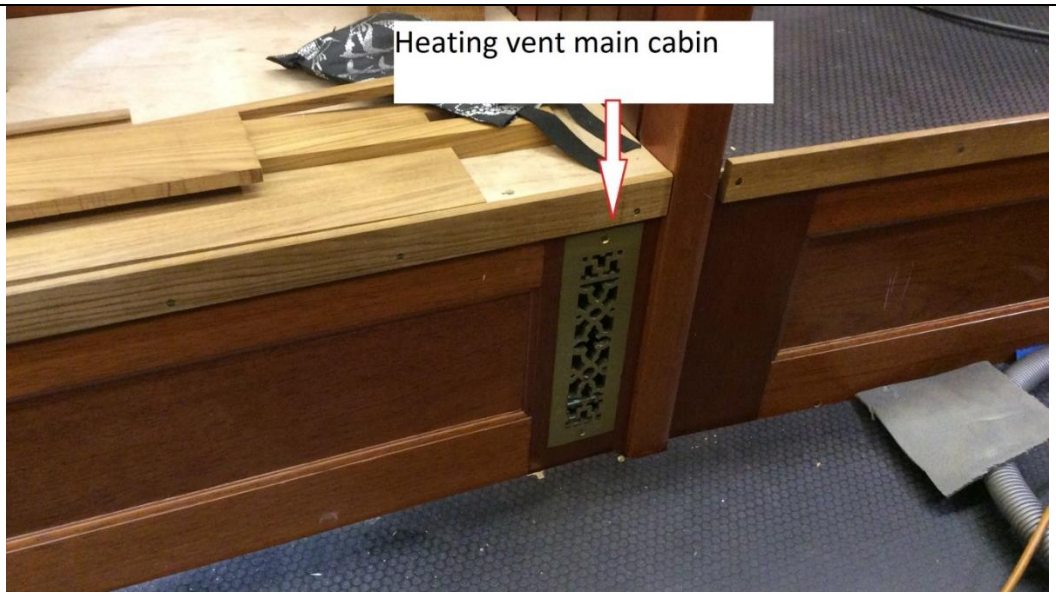
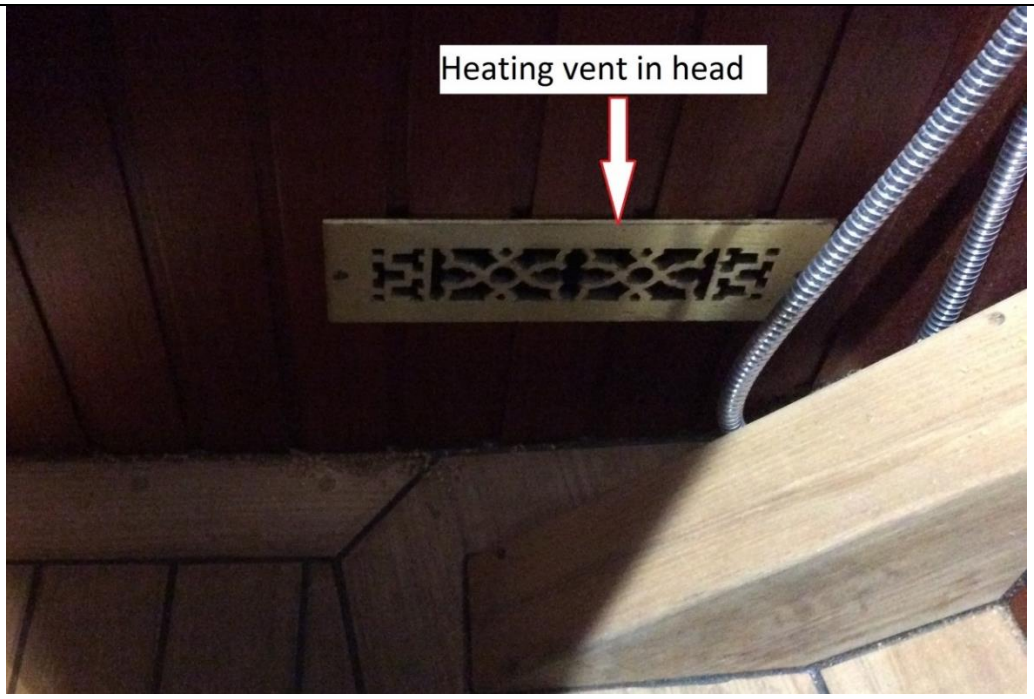
3.13 Webasto

Cabin heating is supplied by a diesel-fired Webasto hot air heater.

3.13.1 Webasto

- The Webasto digital display is located on the "User panel" next the electric board. The panel has temperature and fan speed control.
- The Webasto has its own circuit breaker

➢ The unit takes air in through the open end. ➢ Warm air is blown out thru the forward end. ➢ The warm air goes forward thru a large insulated hose to the hanging locker, main cabin, head and forward cabin in that order.	
➢ Heating vent in drying locker STBD side bulk head	

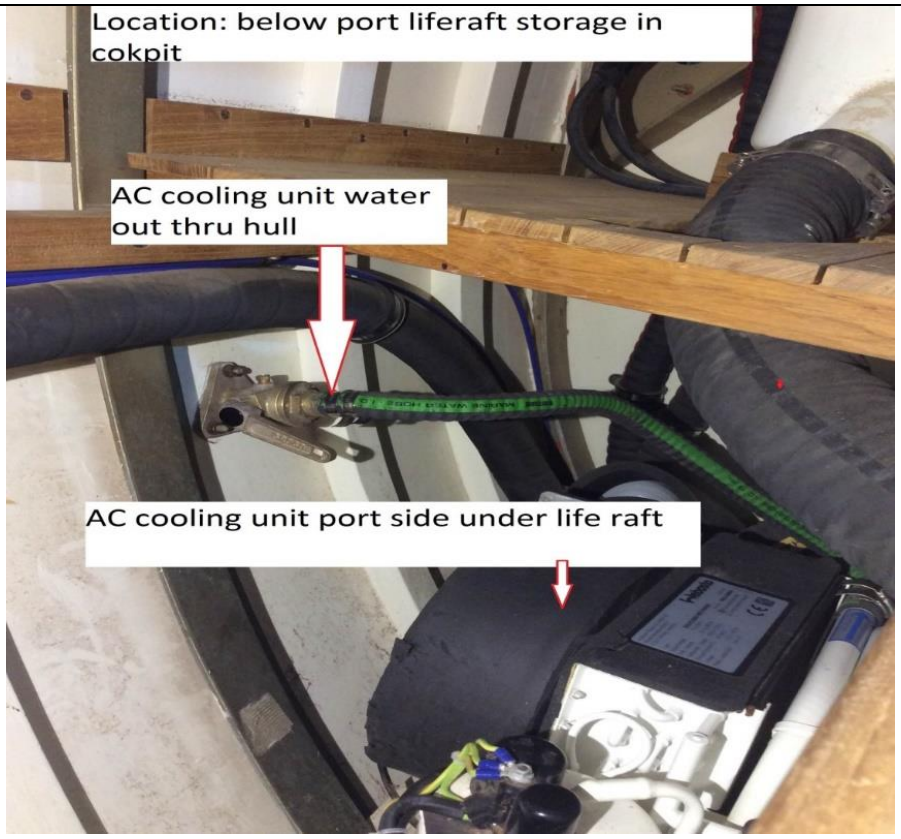
➢ Heating vent, mid main cabin STBD side	
➢ Heating vent in the forward bulk head in the head at floor level	

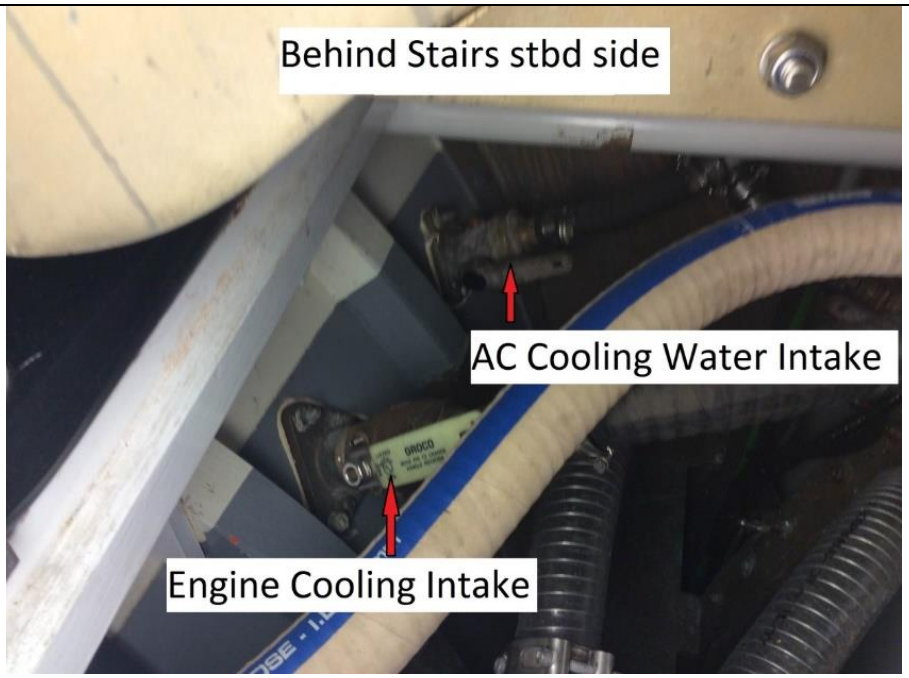
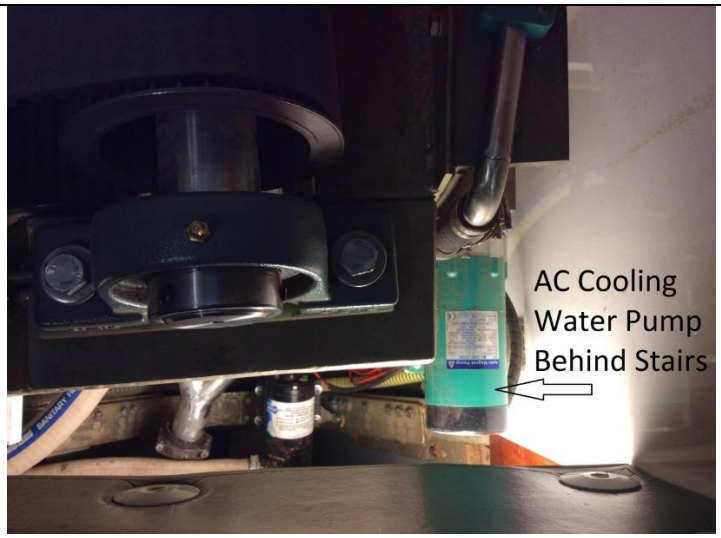
➢ Heating vent at floor level in the forward cabin	

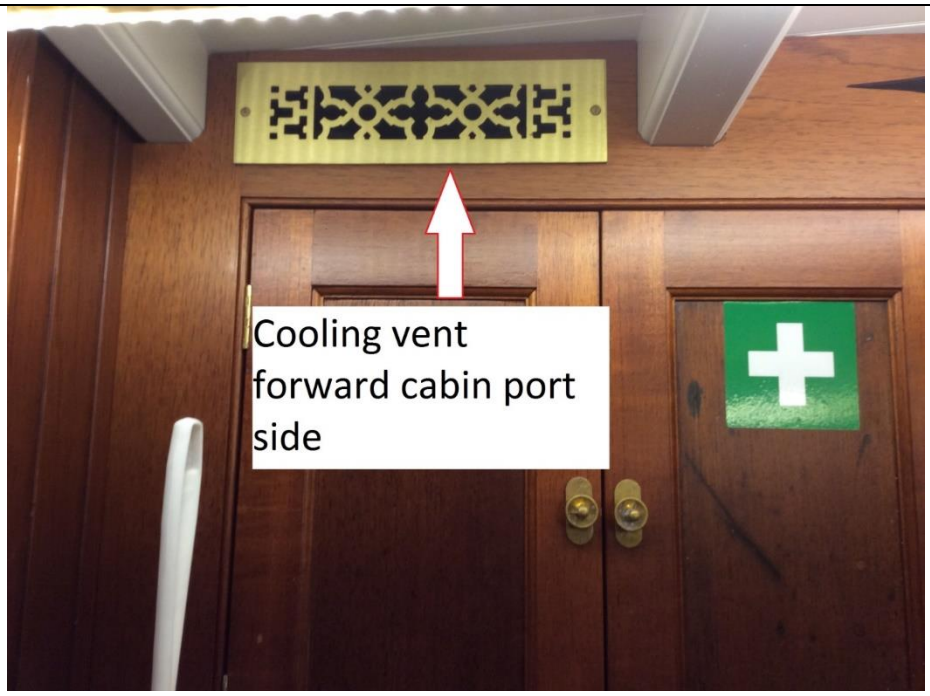
3.13.2 Webasto Blue Cool AC

Blue Cool S-series Air Conditioner is used to air-condition Blue Marlin.

To access Blue Cool S-series manual, click here

<table>
<tr><th colspan="2">Webasto Blue Cool AC</th></tr>
<tr><td>➢ The Webasto AC digital display is located on the “User panel” next the electric board.
➢ The AC has its own circuit breaker
➢ Can be used with (aft preferably) shore power</td><td>  </td></tr>
<tr><td>➢ The main AC unit is located under port life raft</td><td> 
</td></tr>
</table>

➢ The system takes in sea water at the thru hull ➢ Pumps cool water into system ➢ Discharges water at the waterline (you should always see water coming out when the unit is on) ➢ Pumps cool air thru a hose to vents on the port side	
➢ AC Cooling water pump ➢ This is a bird eye picture next to drivetrain system behind stairs	

➢ 2 cooling vents are located on the Port side of the vessel in both the main cabin and the forward cabin	
➢ Forward cabin	

3.14 Bathroom/head

The head flushes with sea water using a manual hand pump on side the bowl. The electric macerator pump is used to empty the black water tank. To comply with strict no-discharge laws in the Gulf of Finland and the Baltic Sea, a 360 l black water tank has been provided under the sole. There is a deck fitting for pumping out the black water. The fitting is located near the STBD shrouds.

A shower head is also located in the bathroom and it is connected to the fresh water system accessing both hot and cold water.

3.15 Radio & sound system

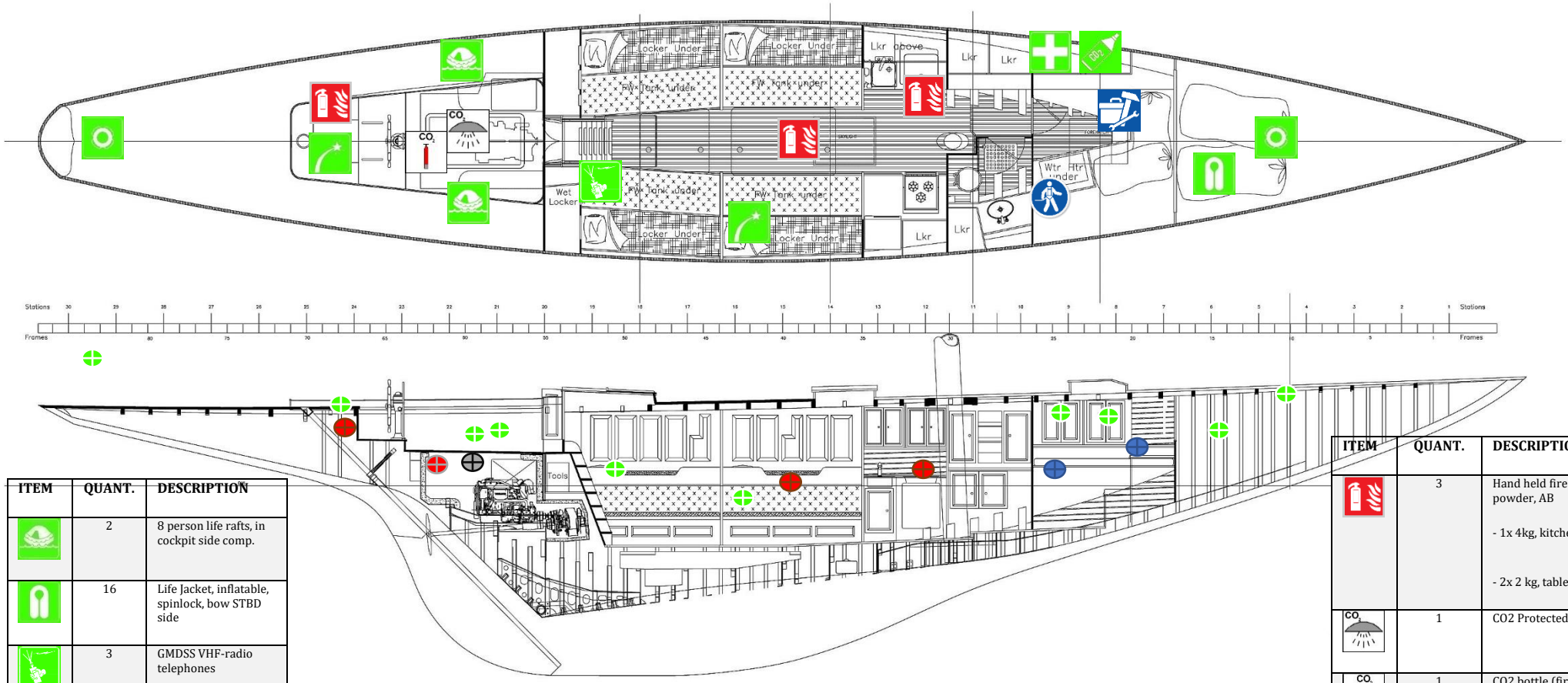
Blue Marlin has a compact marine stereo system, the Fusion, MS-RA205 with 6” 2-way speakers. The unit is mounted on the top right section of the controll panel next to the stair case and the speakers on both sides of the interior hull where the walls meet the cealing. The Radio/stereo system is connected to the NMEA 2000 network and has a variety of source options. (AM/FM, USB, Bluetooth, AUX, iPod, iPohone etc.)

To access the Fusion MS-RA205 manual, click here.

4. Safety

The ship complies with all the sections of the 1686/2009 23§ 1st moment set by *The Finnish Transport Safety Agency*, *Traficom.*

4.1 Blue Marlin Safety Card (PYD drawing)



ITEM	QUANT.	DESCRIPTION
	2	8 person life rafts, in cockpit side comp.
	16	Life Jacket, inflatable, spinlock, bow STBD side
	3	GMDSS VHF-radio telephones
	2	Life rings
	1	Medical Cabinet: - 1x First aid kit - 16x Thermal blankets
	2	Pyrotechnics (3x hand flares, 3x parachute flares, 1x smoke)
	10	Life jacket, CO2 rearm kit

ITEM	QUANT.	DESCRIPTION
	3	Hand held fire extinguishers, powder, AB - 1x 4kg, kitchen door inside - 2x 2 kg, table, in counter
	1	CO2 Protected compartment
	1	CO2 bottle (fire boy)
	16	Safety Tethers, STBD upper side cabinet
	1	Toolkit: - 1x Bosun's chair - 1x Bowman harness - Snap shackle spikes - Hydraulic rod cutter - Various size wooden plugs - 1x Rubber hammer

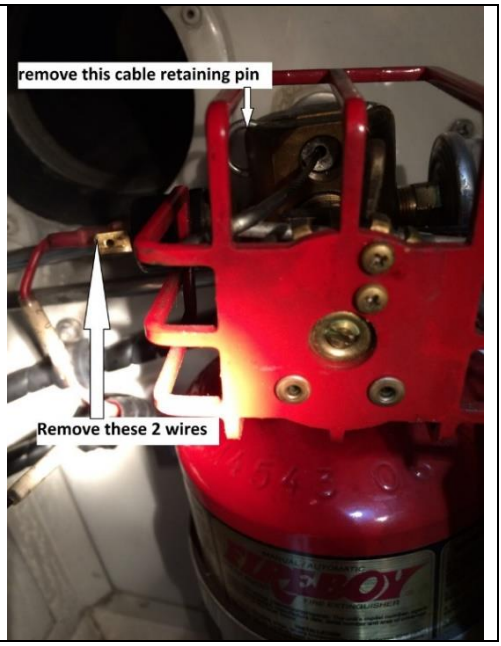
4.2 Firefighting equipment

When sailing, the vessel is equipped with the following equipment as per *Traficom* standards:

Equipment	Quantity	Type
Hand-held fire extinguishers	3	-1x 4kg dry powder (A/B) -2x 2kg dry powder
Fixed inert gas system for engine room	1	CO2

The Manual / Automatic Discharge Fixed Clean Agent Fire Extinguisher (MA for short) that is a pre-engineered engine room flooding system that automatically releases when reaching a temperature of 79°C or is manually released from the pin under the helmsman's seat.

- The Fireboy CO^2 canister is located in the engine room, on the aft bulkhead



4.3 Ship lifesaving equipment

When sailing, the vessel is equipped with the following equipment as per *Trafi* standards:

Equipment	Quantity	Type
8-person life raft	2	
Life ring	2	2x SOLAS taped 1x with life line 1x with self-lighting light
Medical kit	1	
GMDSS hand held VHF	3	ICOM, IC-M23, Float'n Flash
Life Jackets	16	Inflatable
Thermal Blankets	16	
Ship Pyrotechnics		
Hand held flares	3	Icaros
Parachute flares	3	Icaros
Orange smoke	1	3 min. smoke
Life Raft pyrotechnics		
Hand held flares	3	Icaros
Parachute flares	3	Icaros
Orange smoke	1	3 min. smoke

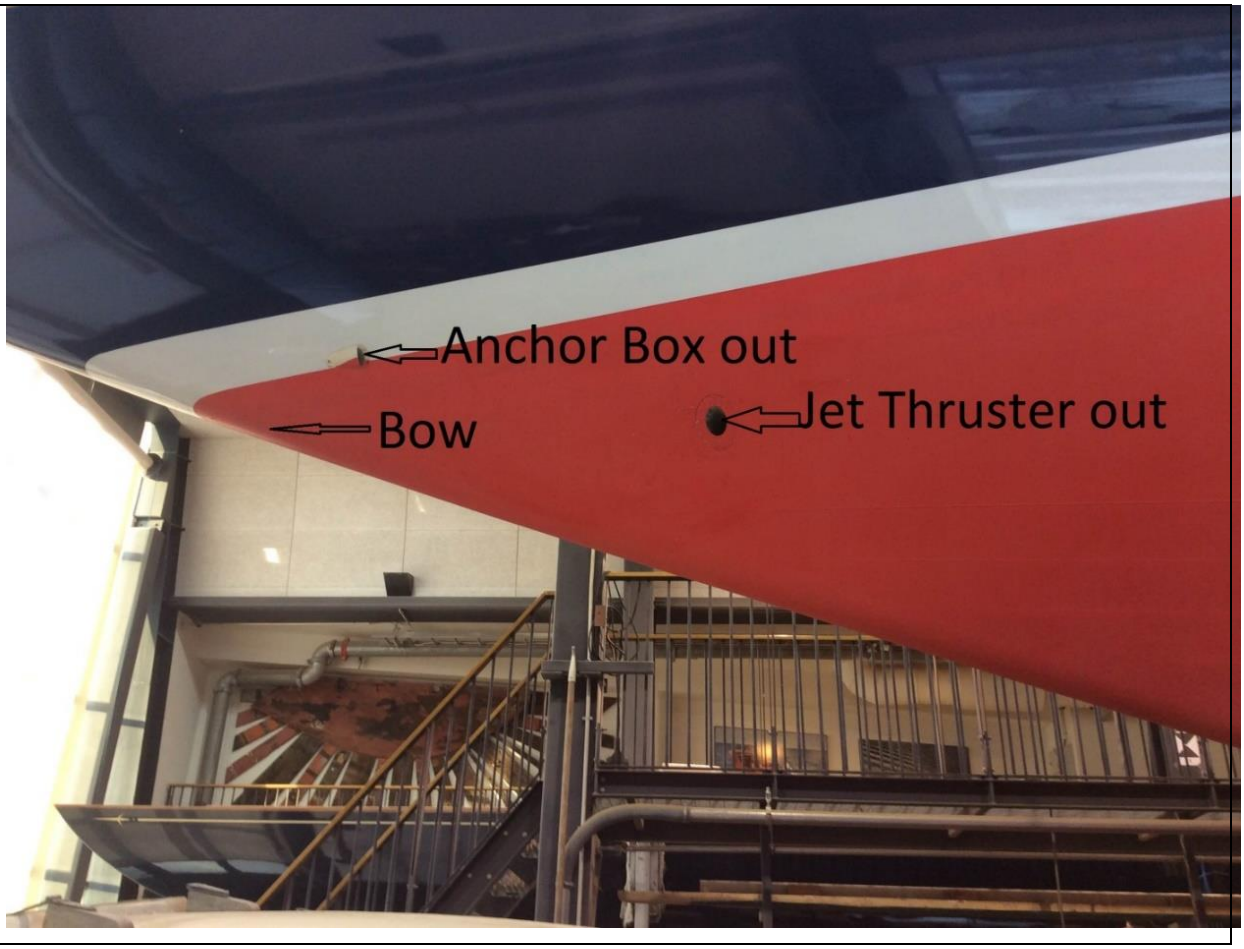
4.4 Safety-related items

These are items related directly to safety on board the vessel but are not in the category of direct lifesaving. For a specific inventory list of these items related to the boat, consult the Blue Marlin safety item inventory here:

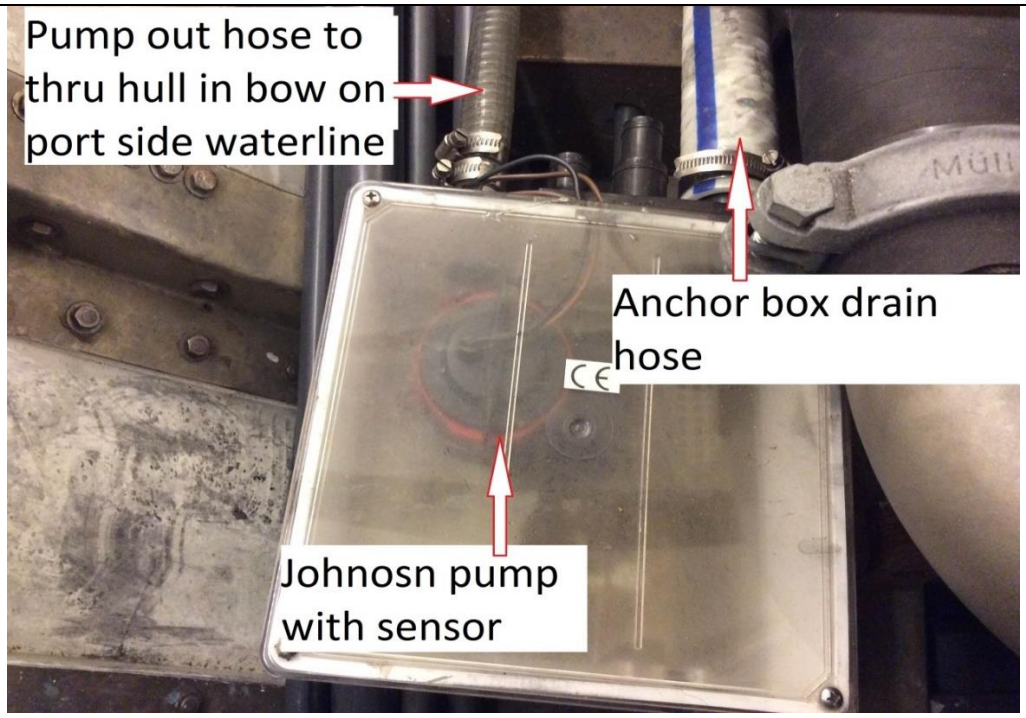
Safety Related tools	Quantity	Type
Deck Jack lines for harness attachment	2	Spinlock
Lines for harness and Jack line connection	16	Spinlock
Boat hooks	2	Wood, 2,1m long
Plastic bucket with line	1	N/A
Rigged life line system	1	2 safety wires around the vessel for fall prevention
Life Jacket rearm kit	10	Spinlock CO2 rearm/refill kit
Safety Tethers and Harness Kit	16	Spinlock (life jacket compatible)
Bowman's harness	1	Spinlock
Bosun's chair	1	Harken
Snap shackle opener spikes	Various	2-3 different sizes
Wooden plugs	Various	Various sizes
Rubber hammer	1	N/A
Hydraulic Rod cutter	1	N/A
Radar reflector	1	N/A
Signal flag set	1	A-Z code flags + no. 1-9
Curtesy flag set	1	Contains flags pf Europe
SOLAS Day signal set	1	Contains the following day signals

4.5 Through hull points

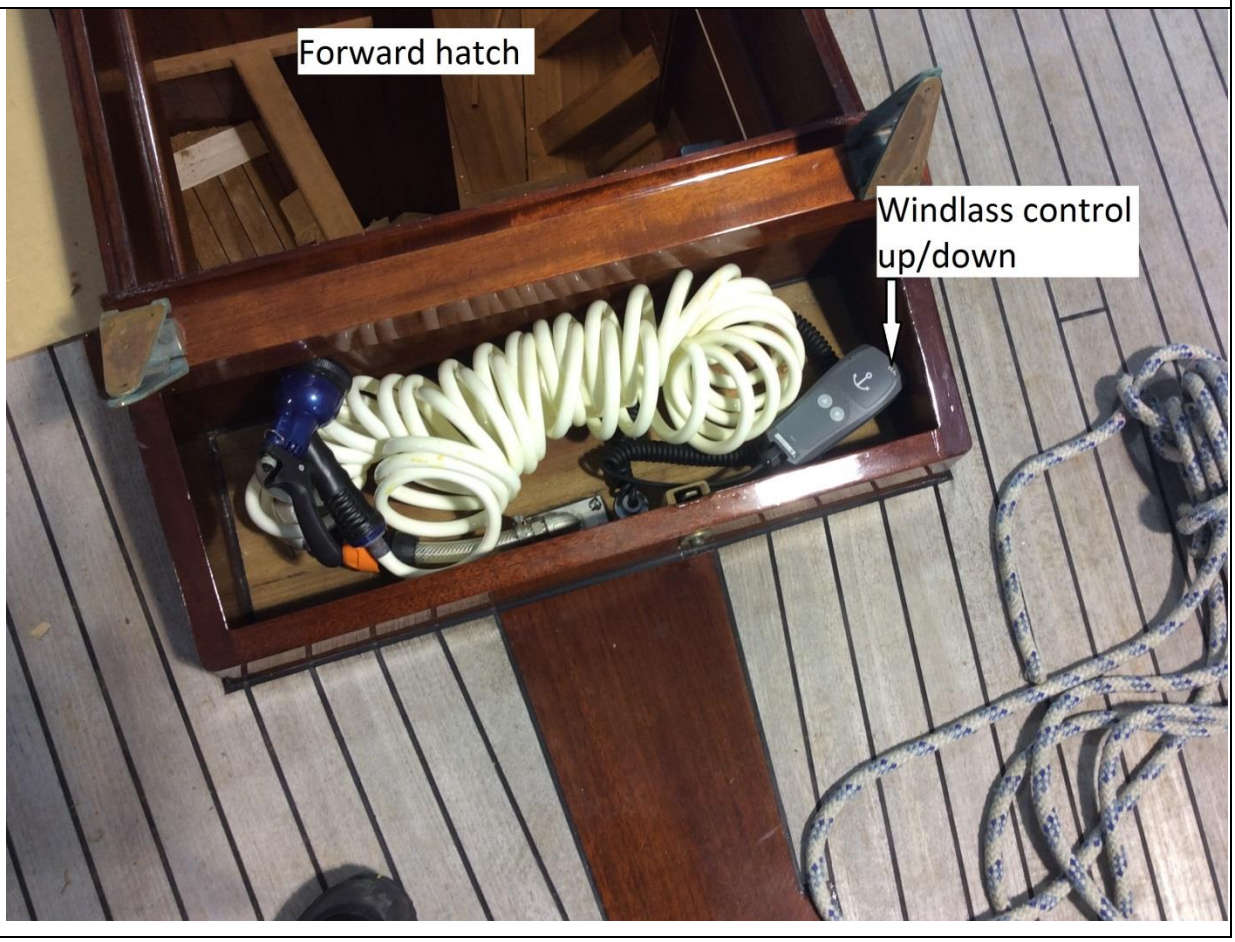
Blue Marlin has the following through hull points as per the illustrations. The through hulls are indicated by arrows and text in the pictures for clarification. The series of pictures will start from the bow of the vessel and end at the aft.

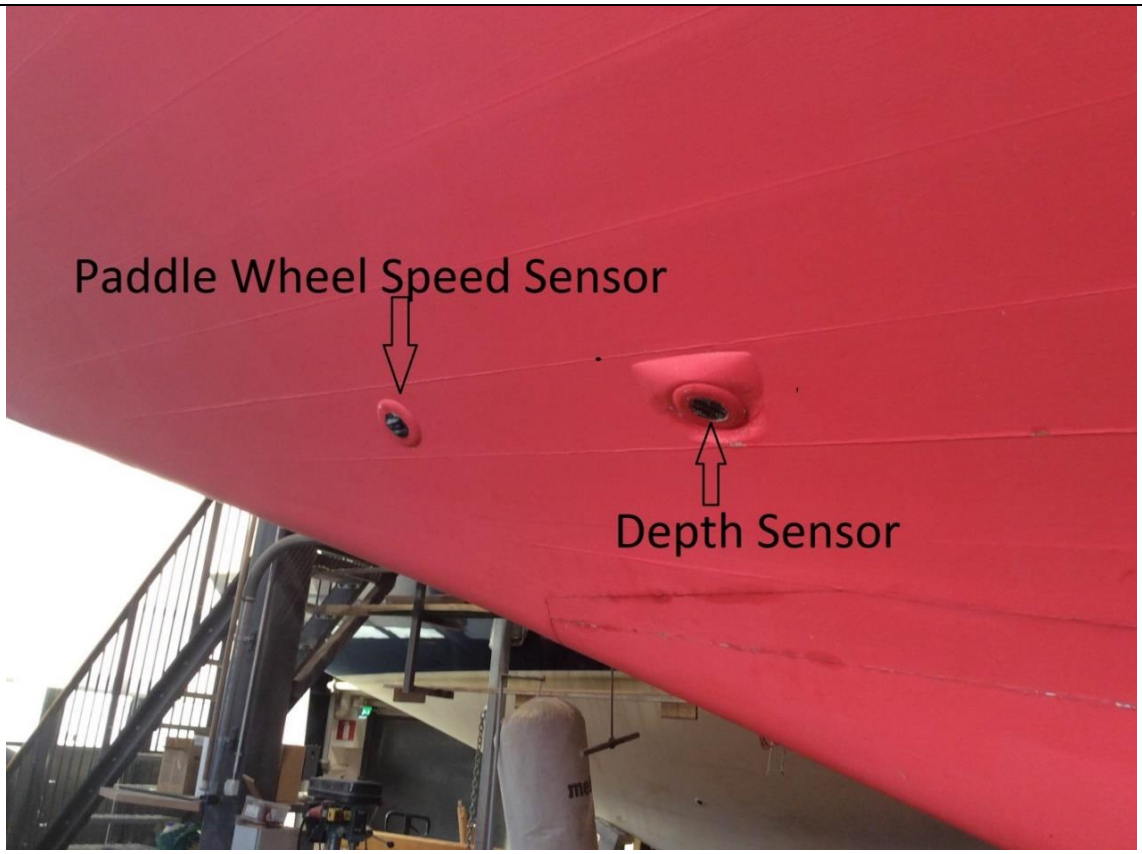
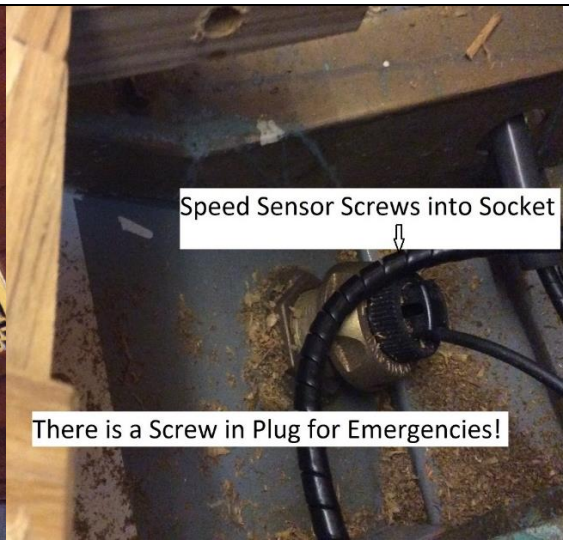
➢ Port bow	

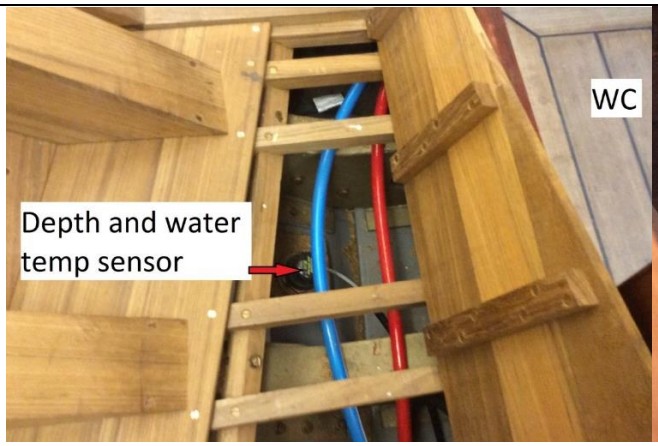
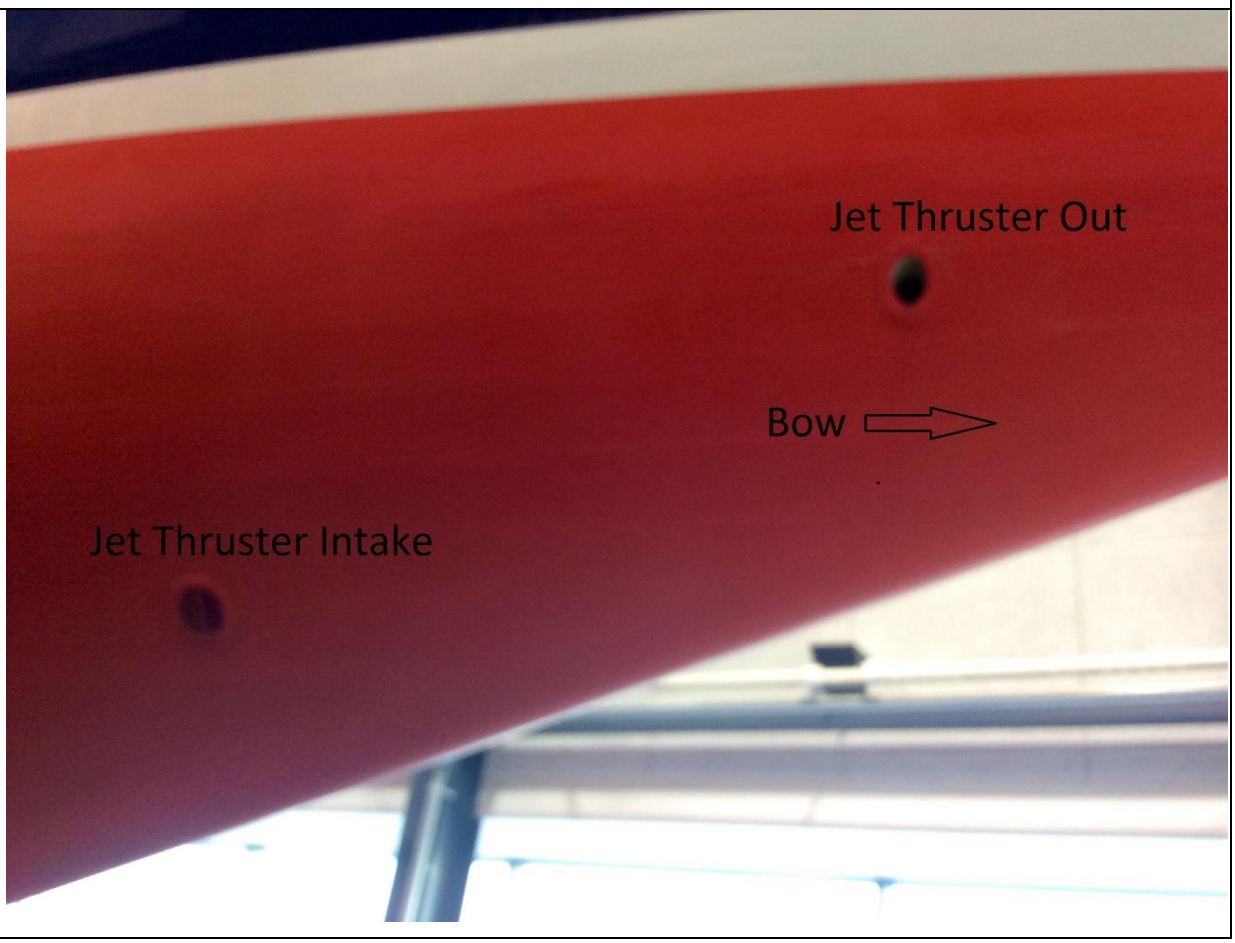
- Port Bow inside



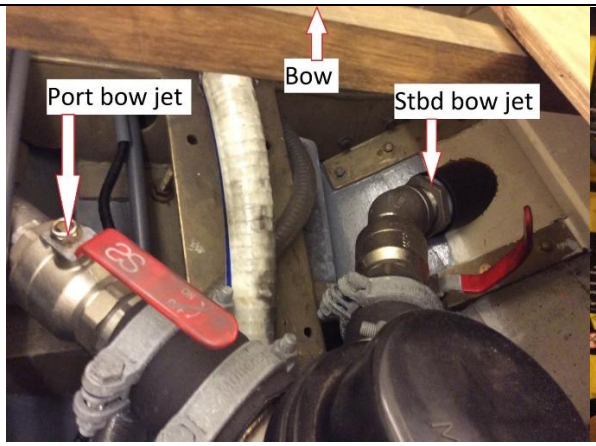
- Windlass controller and anchor wash hose

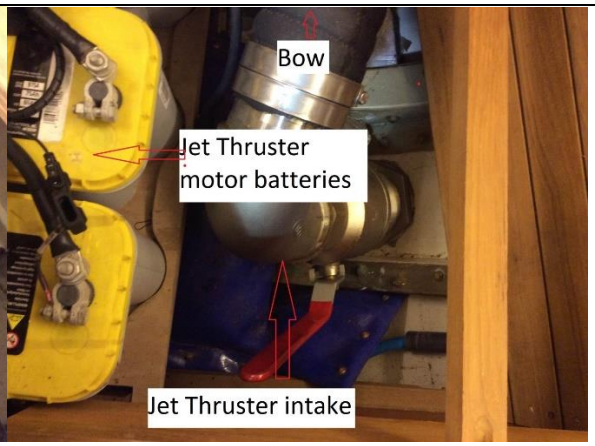


➢ Port bow	
➢ Port Bow inside	 

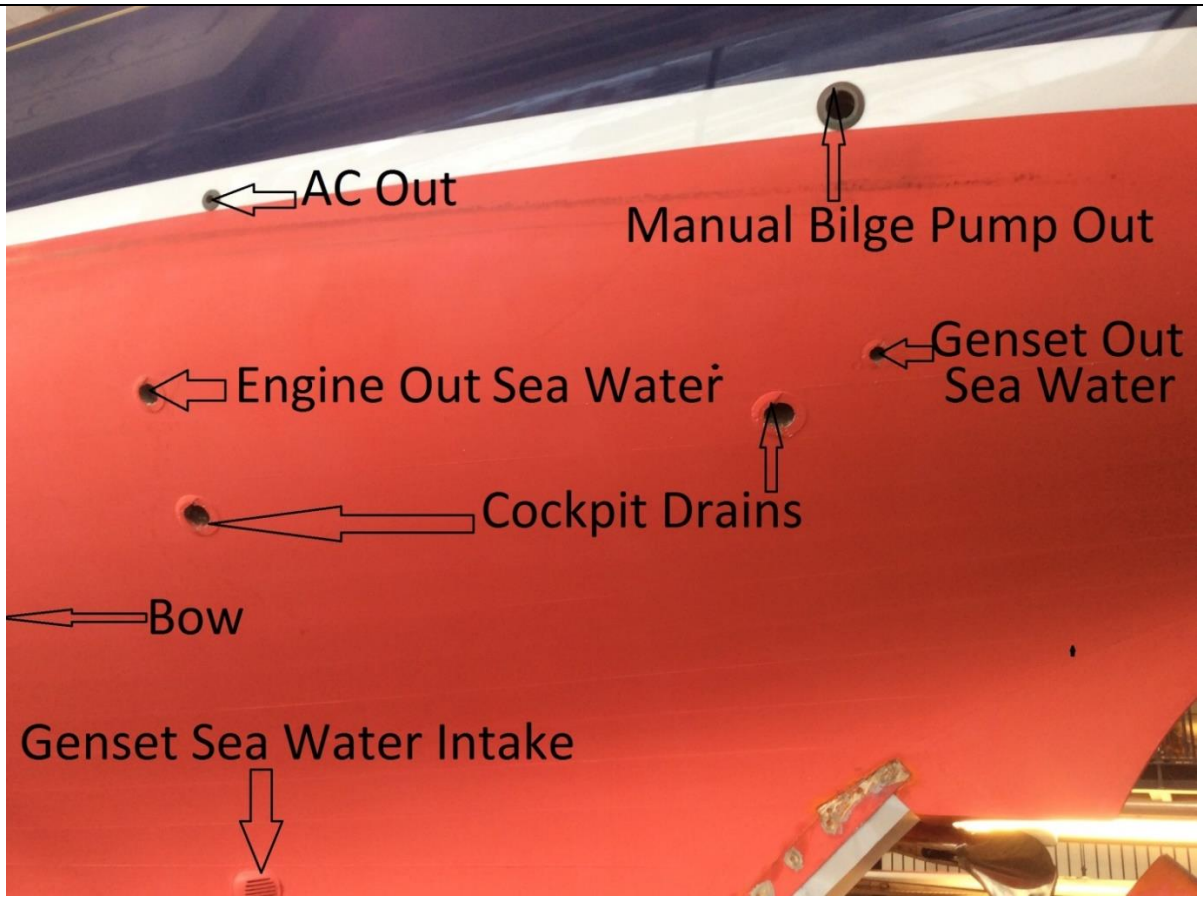
➢ Port midship, inside, front of mast base	 
➢ STBD bow	

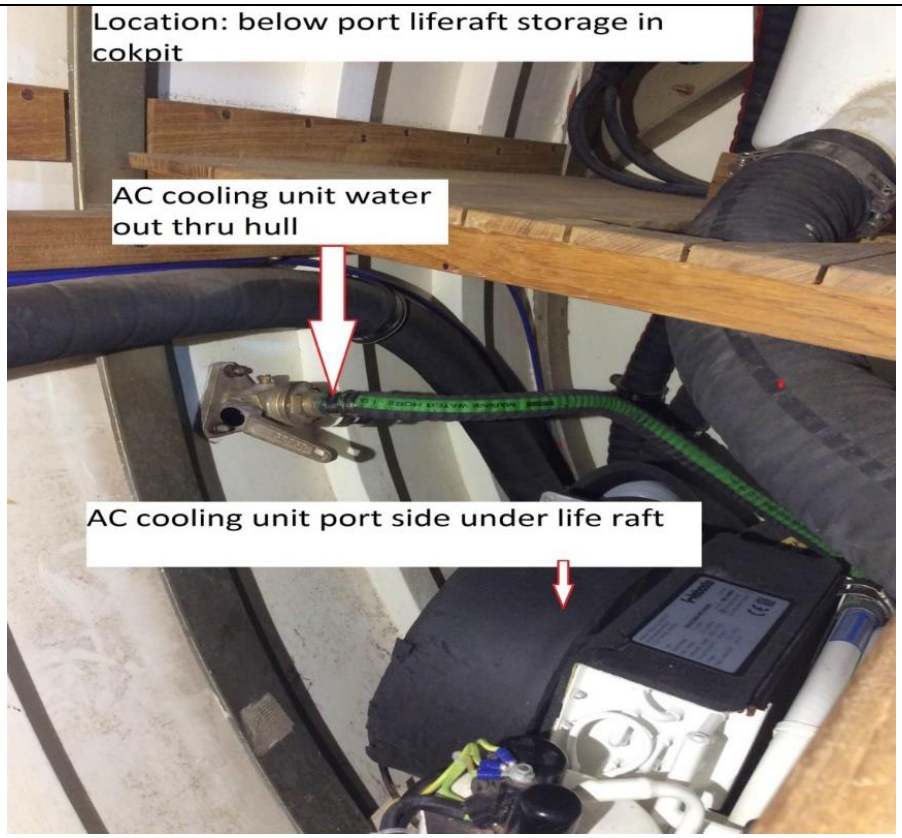
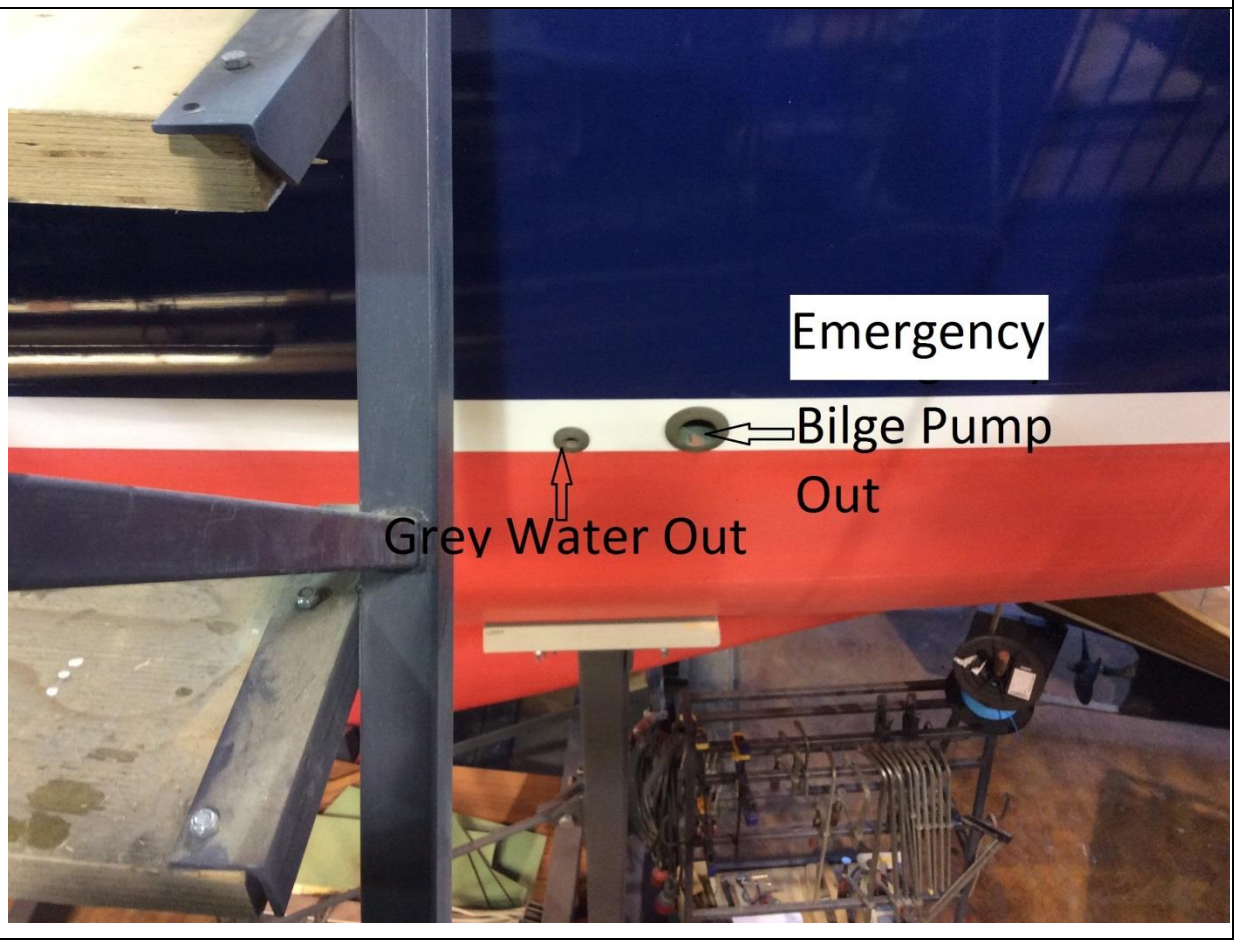
- Bow compartment

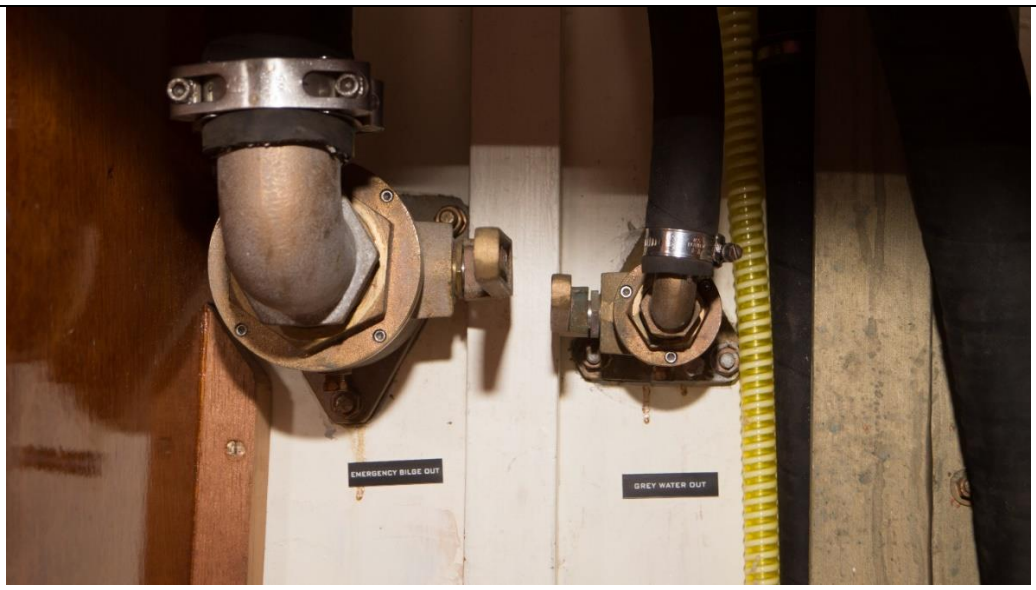
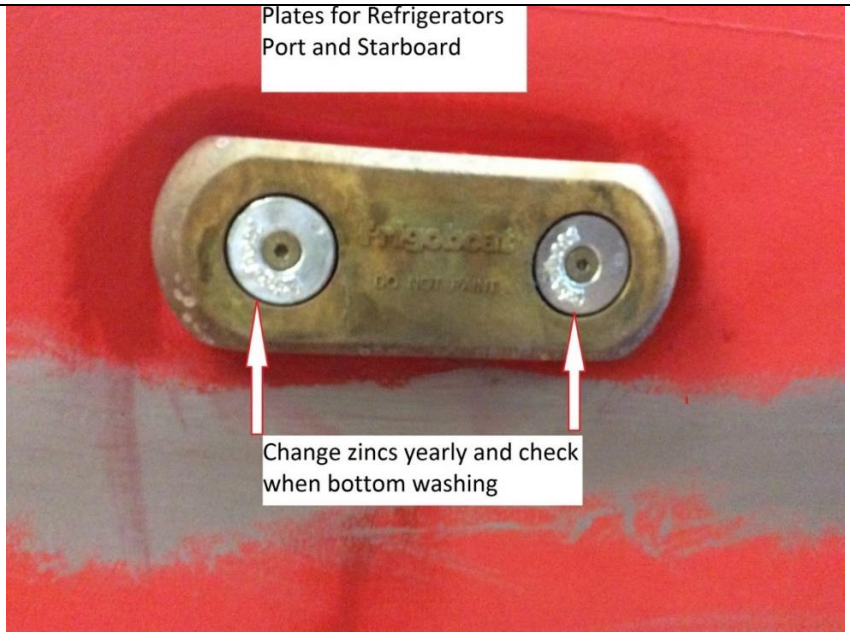


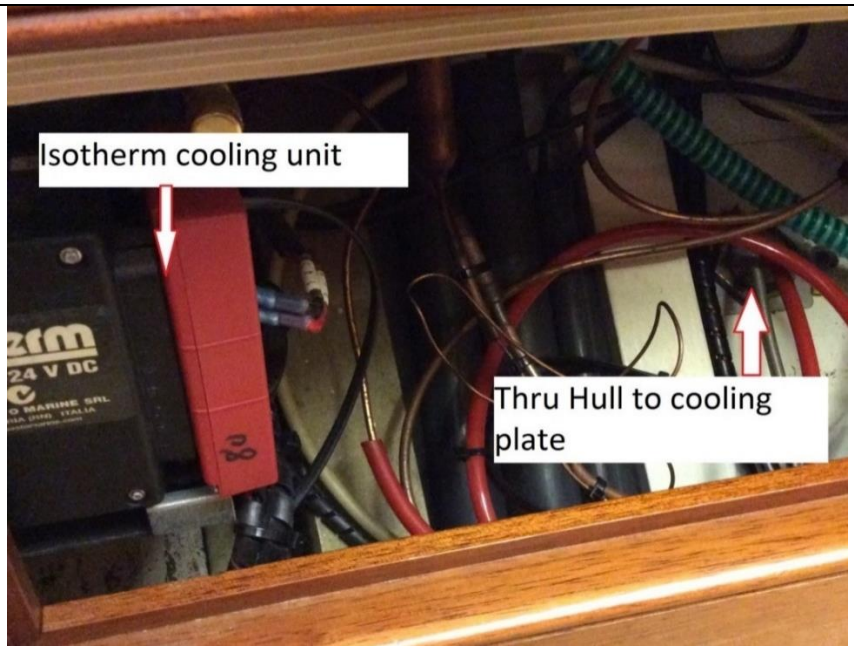


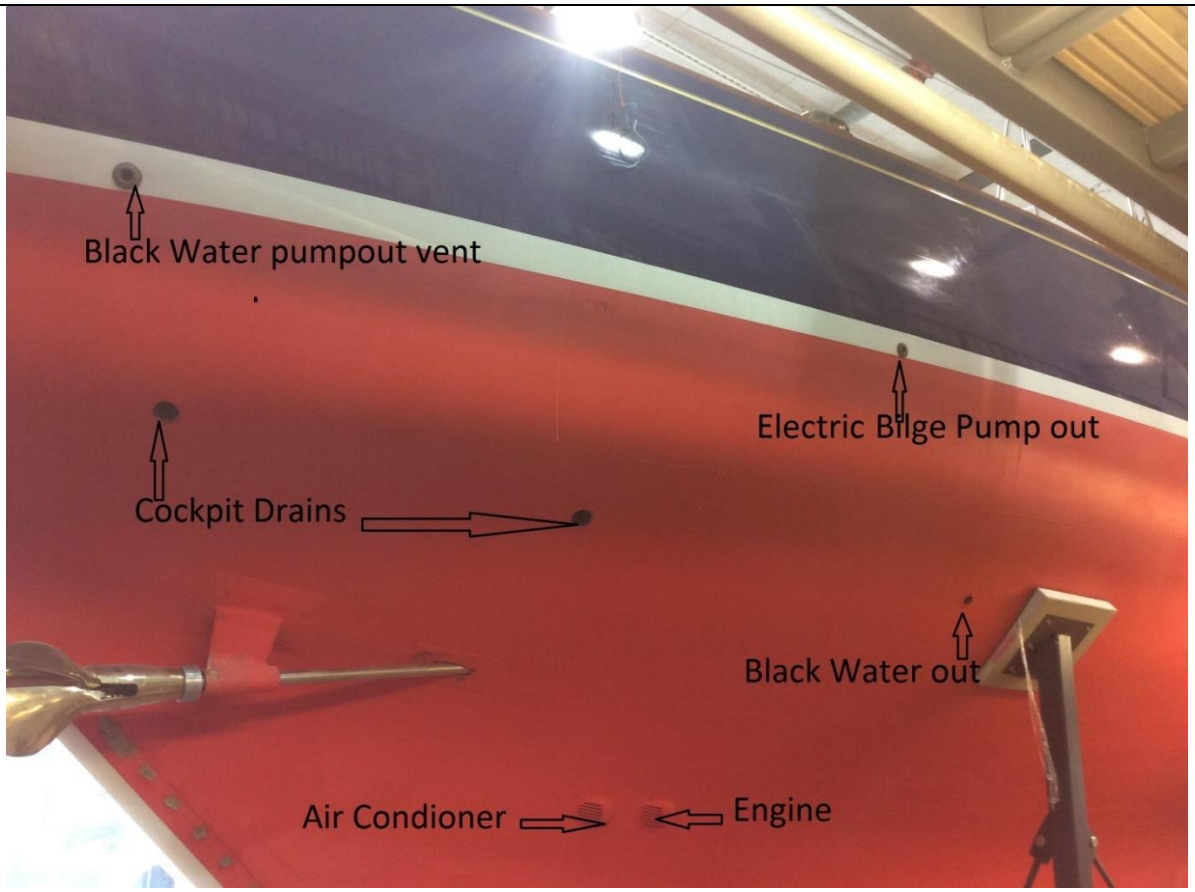
- Port mid/aft

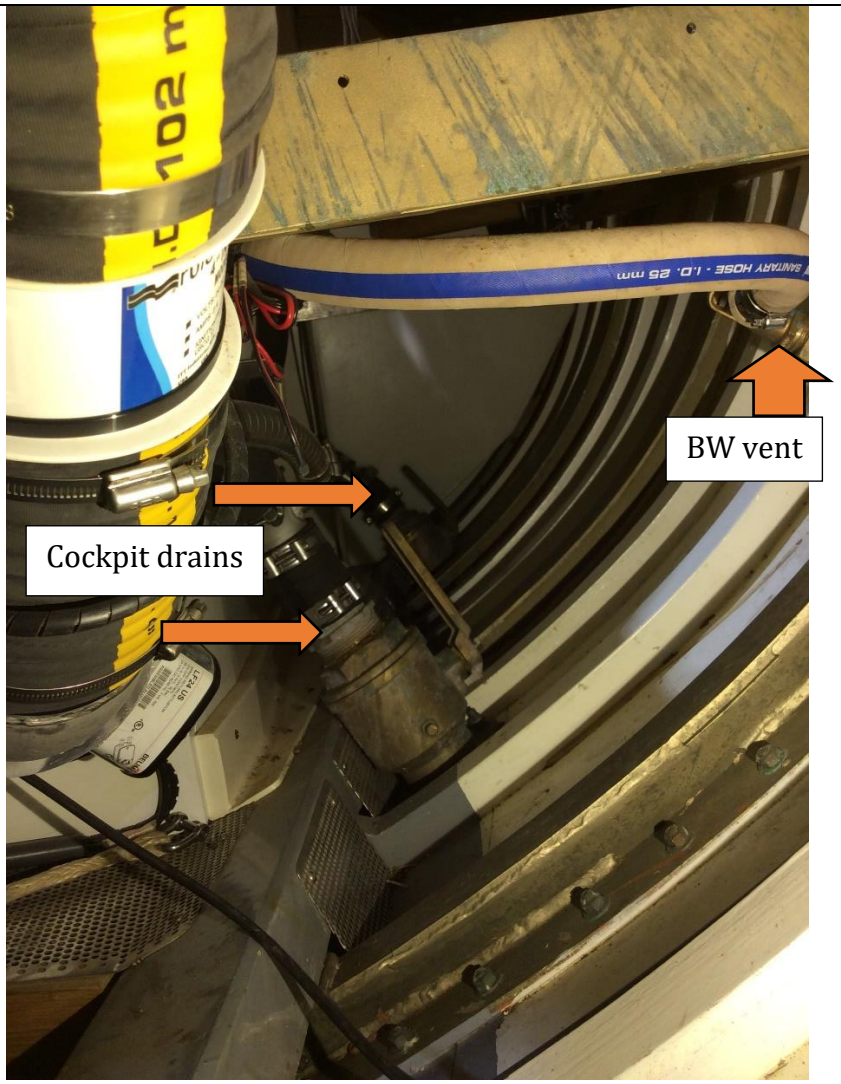


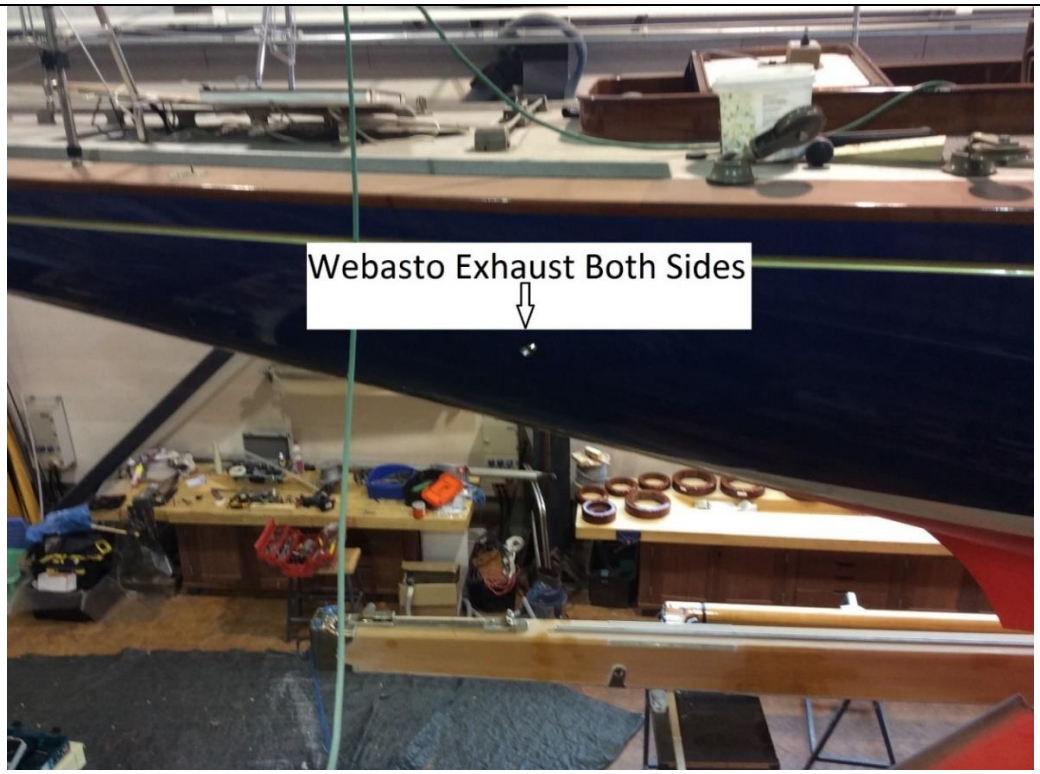
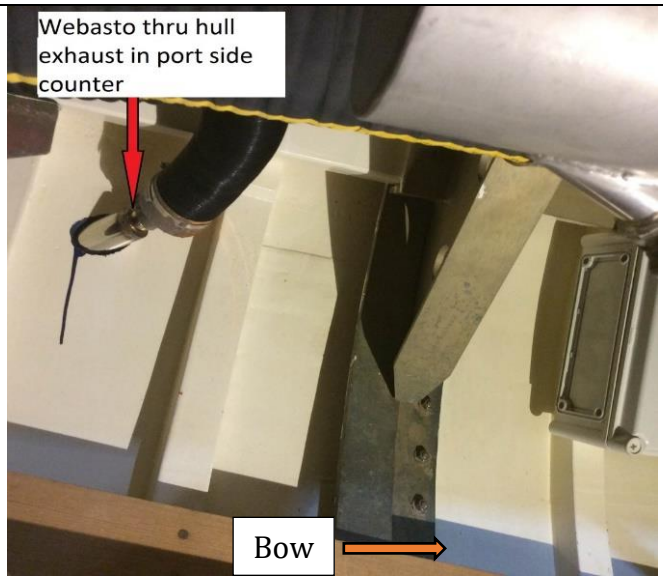
➢ Port mid/aft inside	
➢ STBD mid	

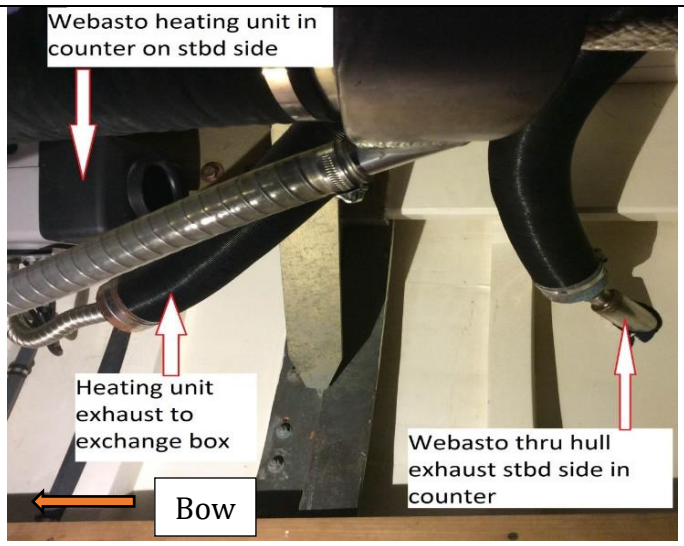
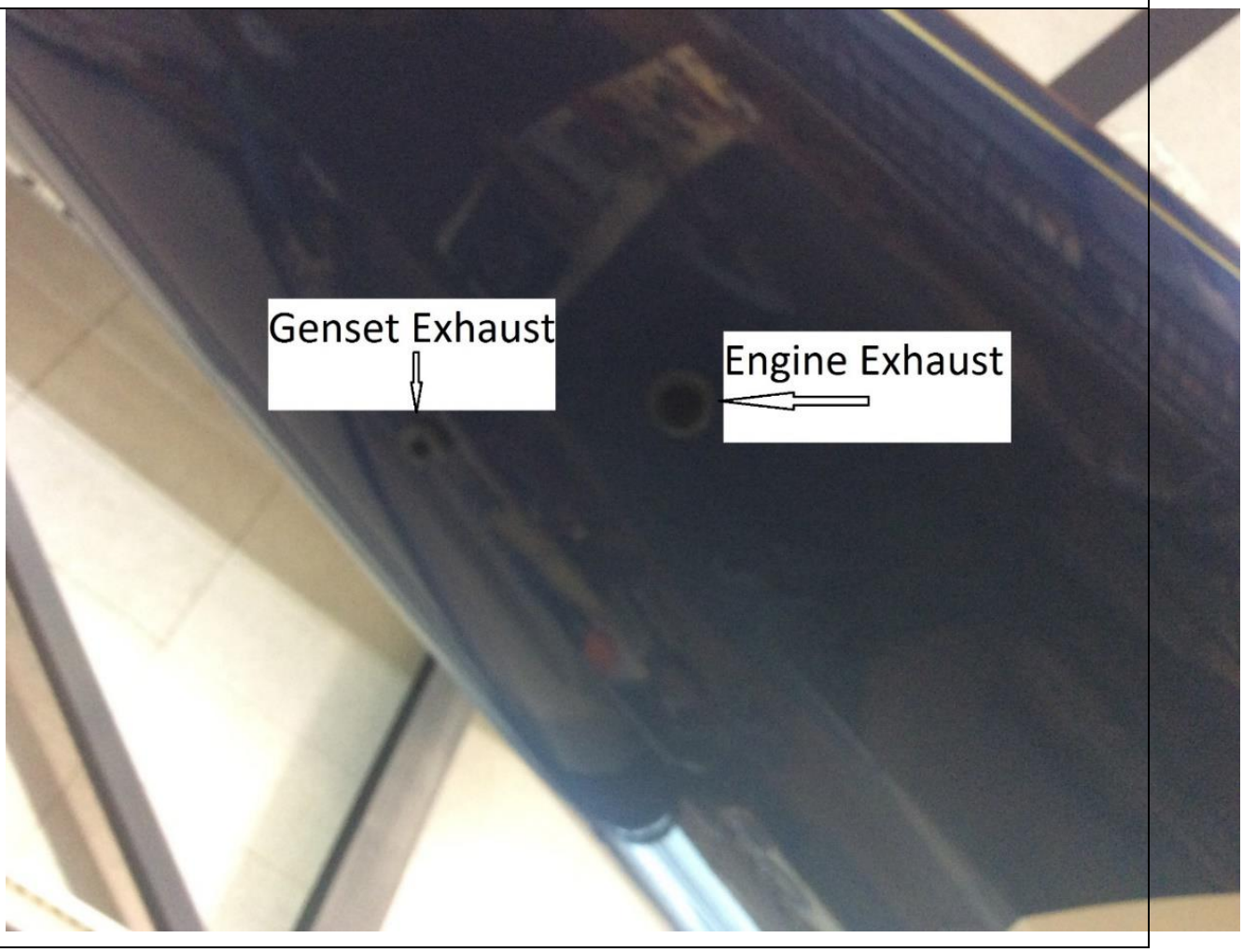
➢ Midship STBD side, Behind kitchen closet ➢ Emergency bilge and Grey water out	
➢ Zincs on both port and starboard cooling plates	

➢ Midship, aft of mast base in the Galley	
➢ Midship, aft of mast base in the Galley ➢ Port and STBD units are identical.	

➢ STBD aft	 Black Water pumpout vent Electric Bilge Pump out Cockpit Drains Black Water out Air Condioner Engine

➢ STBD aft inside	

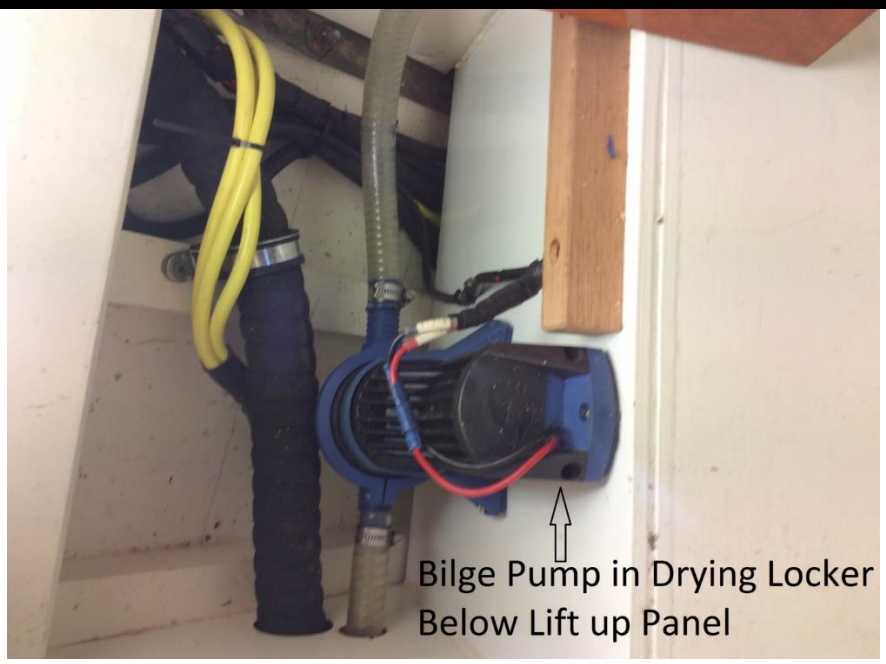
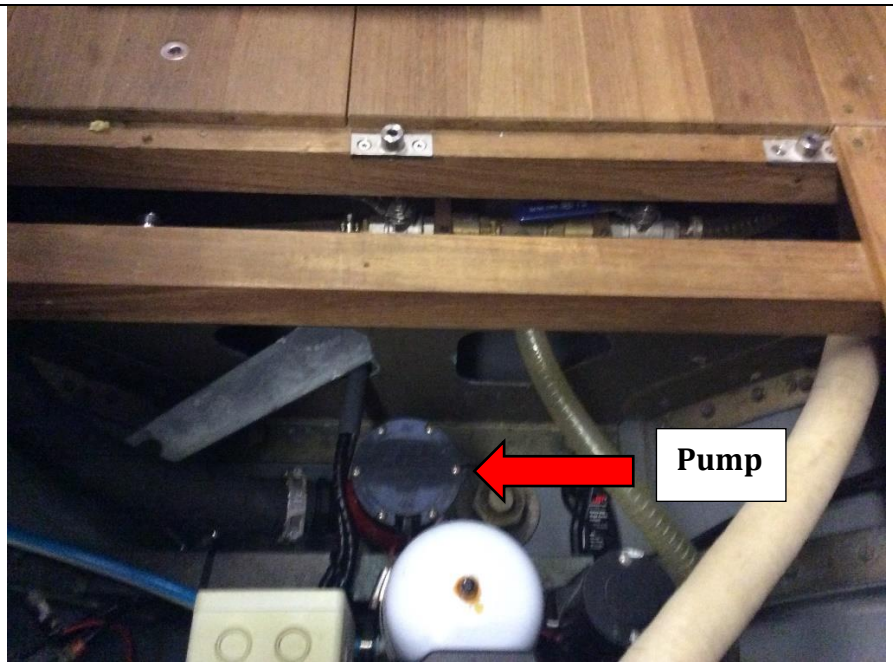
➢ STBD aft	
➢ Webasto exhaust behind counter, port	

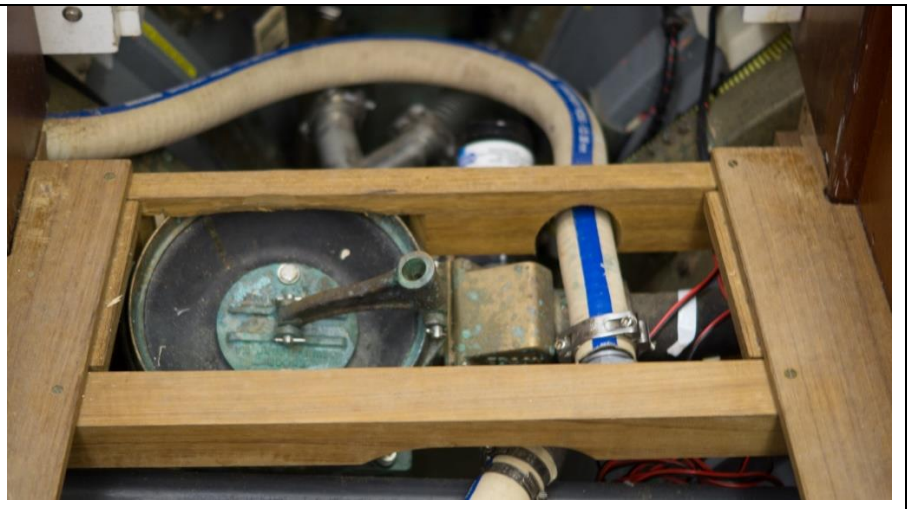
➢ Webasto exhaust behind counter, STBD	
➢ Aft	

➢ Engine exhaust behind counter	

4.6 Bilge and bailing

There are three (3) pumps systems, both automated and manual installed to deal with emptying the bilge of the vessel. One electric main bilge pump and two spare/emergency systems.

Pump	
➢ Whale Gulper 320 electrical bilge pump. Located in the drying locker.	
➢ Johnson Electric Emergency pump. Located under the center main cabin floor boards, forward of the BW tank.	

➢ EDSON Manual Bilge pump. Located Below stair case floor board.	

5. Updates from last revision

6. Updates to come

I. *Aluminum racing rig*
II. *Inventory expansion*
III. *Checklists*
IV. *Vessel Operations chapter*
V. *Plotter cards*
VI. *B&G Racing Displays*
VII. *Groco seacocks*
VIII. *Lights, navigation & domestic*